

ISSN-0976-0245 (Print) • ISSN-0976-5506 (Electronic)

Volume 8

Number 3

July-September 2017



# Indian Journal of Public Health Research & Development

An International Journal

## SCOPUS IJPHRD CITATION SCORE

Indian Journal of Public Health Research and Development  
Scopus coverage years: from 2010 to 2016 Publisher:  
R.K. Sharma, Institute of Medico-Legal Publications  
ISSN:0976-0245E-ISSN: 0976-5506 Subject area: Medicine:  
Public Health, Environmental and Occupational Health  
CiteScore 2015- 0.02  
SJR 2015- 0.105  
SNIP 2015- 0.034



Website:

[www.ijphrd.com](http://www.ijphrd.com)

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**Print-ISSN:** 0976-0245-**Electronic-ISSN:** 0976-5506, **Frequency:** Quarterly  
(Four issues per volume)

**Indian Journal of Public Health Research & Development** is a double blind peer reviewed international journal. It deals with all aspects of Public Health including Community Medicine, Public Health, Epidemiology, Occupational Health, Environmental Hazards, Clinical Research, and Public Health Laws and covers all medical specialties concerned with research and development for the masses. The journal strongly encourages reports of research carried out within Indian continent and South East Asia.

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**Website : [www.ijphrd.com](http://www.ijphrd.com)**

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501, Manisha Building, 75-76, Nehru Place,  
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## Printed, published and owned by

**Dr. R.K. Sharma**  
Institute of Medico-legal Publications  
501, Manisha Building, 75-76, Nehru Place,  
New Delhi-110019

## Published at

**Institute of Medico-legal Publications**  
501, Manisha Building, 75-76, Nehru Place,  
New Delhi-110019



# Indian Journal of Public Health Research & Development

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# Colposcopy as an Adjunct to Cytology in the Diagnosis of Cervical Pre-cancer and Cancer in an Executive Health Care Set-up: A Retrospective Study in Mumbai, India

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## ABSTRACT

**Background:** Cervical cancer is one of the major public health problem in India. There is no organized screening in place. Cytology performed sporadically in various centers throughout the country, which has its own limitations. Colposcopy, of late has shown promise in the detection of cervical pre cancers and cancers.

**Aim:** To evaluate the performance of colposcopy in the detection of cervical pre cancers and cancers when used as an adjunct to cytology.

**Method:** This is a hospital based retrospective study conducted in a corporate hospital in Mumbai, India. Women attending the Obstetrics and Gynecology department between August 2010 to July 2012 were included in the study based on history and clinical findings. The Pap smear which was part of health care package was collected and processed by conventional method and reported by Bethesda system. The results of Pap smear were given to women when they returned within a month of Pap smear examination. Whatever the cytology report was, the women in the age group of 25-70 years with history of chronic leucorrhoea, post coital bleeding, post-menopausal bleeding, irregular or inter menstrual bleeding and whose cervix appeared unhealthy on examination as well as those whose pap report was abnormal, colposcopy was performed. Histopathology was considered as reference standard to compare the results of cytology and colposcopy.

**Results:** A total of 143 women attended the hospital. About 57% of women had come for routine examination. Comparison between Pap smear and colposcopy showed fair agreement. Pap smear showed only 9.09% sensitivity and 88.57% specificity when compared with histopathology. Positive predictive value was 20% and negative predictive value was 75.61%. Colposcopy showed 100% sensitivity and 74.28% specificity when compared with histopathology. Positive predictive value was 55% and negative predictive value was 100%.

**Conclusions:** Colposcopy is an ideal method to diagnose cervical pre cancer and cancer when used as an adjunct to cytology.

**Keywords:** Colposcopy, Cytology, Cervical pre-cancer, Cancer

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## INTRODUCTION

Cervical cancer is a major public health problem in developing countries of South-east Asia, South and Central America and Sub-Saharan Africa and these regions account for almost 80% of global burden. Although in some developing countries the incidence of

cervical cancer is slowly decreasing due to improvement in living conditions, same cannot be said about countries in sub-Saharan Africa which have shown an increase in the cervical cancer incidence. In developed countries, as a result of regular and organized cervical cytology screening and timely referral for prompt treatment of pre cancerous lesions, the incidence of cervical cancer and the number of deaths has declined dramatically.<sup>1</sup>

The burden of cervical cancer in India is alarmingly high with about 1, 34,000 new cases detected and more than 72,000 deaths every year <sup>2</sup>.The main reason for this is the lack of awareness of the disease and its early detection facilities. There is no set protocol in our healthcare system for early detection and timely treatment of precancerous lesions, leading to women coming to higher centers with advanced stages of cancer, where in very little can be done to alleviate the morbidity and mortality. Cervical cytology (Papanicolaou test) which is considered as the most popular primary screening test for cervical cancer is done sporadically in certain centers throughout the country. It has its own limitations like paucity of high end infrastructure, well trained staff, standard quality control systems, regular training programs for staff members, sophisticated laboratories and excellent referral systems.<sup>3</sup> In addition, due to low to moderate sensitivity and high false negative results of pap smear, there is a possibility to miss precancerous conditions of the cervix with serious consequences.<sup>1,4</sup>

Colposcopy, a procedure which involves the examination of uterine cervix, vagina and vulva using a magnifying lens and good illumination, alone cannot be used as a screening tool but can be useful as a diagnostic tool after a clinical examination, in case of abnormal cytological finding after screening with pap smear or if there is a history of persistent post-coital bleeding.<sup>4,5</sup> Although studies have revealed colposcopy as an important diagnostic tool <sup>6</sup>, many recent studies have demonstrated a low sensitivity<sup>3</sup> and low specificity especially in detecting low grade cervical lesions.<sup>7,8</sup> Considering these findings we propose this study to evaluate the combined performance of cytology and Colposcopy in improving the detection of cervical cancer precursors in a certain section of society when compared to cytology and Colposcopy done individually.

## METHODOLOGY

This is a retrospective analysis of patient data amongst the women who attended executive health

check in a corporate hospital in Mumbai which caters to women of middle and high income group between August 2010 and July 2012. The gynecologist at the health facility who was trained in colposcopy offered this test to women who were booked for executive health check, based on history and clinical findings. The Pap smear which was part of health check package was collected by using Ayers spatula and processed by conventional method and reported by Bethesda system. Those who showed signs of cervicitis were given treatment prior to colposcopy. The result of pap was available when the woman returned for colposcopy at her convenience within a month. Whatever the pap report was, the woman in the age group of 25-70 yrs who gave history of chronic leucorrhoea, post coital bleeding, post menopausal bleeding, irregular or inter menstrual bleeding and whose cervix appeared unhealthy on examination as well as those whose pap report was abnormal, colposcopy was performed.

The women were asked to fill up a set of questionnaire and after an informed consent, were examined in detail using Welsh Allyn digital colposcopy. Initially the cervix was bathed in normal saline and gross findings were documented including green filter examination. The next step was 5% acetic acid application using cotton swabs which were kept in contact with the cervix for one minute. The presence or absence of aceto white epithelium was noted. This was followed by Lugol's iodine application and findings were noted. All the images were captured and stored in computer for evaluation. The positive cases either with acetic acid test or with Lugol's test were biopsied from the most abnormal areas. The oozing was either controlled by pressure or by silver nitrate crystals. The colposcopy image was scored as per Reed's scoring method and histopathology was reported as per CIN classification. The histopathology was considered as the reference standard to compare the results of pap and colposcopy. The women were divided in to two groups based on age in order to prepare appropriate health check package.

**Ethical Clearance:** Ethical clearance for the study was obtained from the Hospital Ethical Review Committee.

**Statistical Analysis:** The categorical outcomes were summarized by rates. To find the agreement between the results given by two tests namely pap smear and colposcopy, Kappa statistics was used. To compare

the individual tests with the histopathology which is considered as gold standard, sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy were used.

### RESULTS

A total of 143 women visited the tertiary care hospital during the specified time period. Majority of them (38.46%) belonged to 35-44 year age group followed by 45-54 year age group (26.57%). More than 75% of the women had got married between 18-25 years of age. About 57% of women had attended the clinic for routine examination followed by those who were suffering from leucorrhoea (20.98%) and various bleeding problems (17.48%). Majority of the women (88.81%) had no deleterious habits like tobacco use, alcohol consumption and multiple sexual partners. About 35% of the women were practicing some kind of family planning methods.

When we compared the results of pap smear and colposcopy, out of 143 women, 6 had pap smear positive results and 21 had colposcopy positive results. Analysis with kappa statistics showed a statistically significant association ( $p < 0.001$ ) between them, indicating a fair agreement between the two tests.

The pap smear test results were compared with histopathology which is considered as gold standard, the sensitivity of pap smear test was found to be only 9.09% and specificity was 88.57%. The positive predictive value was 20% where as negative predictive value was 75.61%. The diagnostic accuracy was 69.56%.

Similarly when we compared the results of colposcopy with histopathology, the sensitivity of colposcopy was found to be 100% which was promising. The specificity was 74.28%, positive predictive value was 55% and negative predictive value was 100%. Overall the diagnostic accuracy was found to be 80.43% which was better than pap smear test.

### DISCUSSION

The various combinations of tests for detecting precancerous cervical lesions are being tried world over. Our study was conducted to analyze combined colposcopy and Pap smear over cytology alone as an added advantage in routine health check scenario. Our study did detect CIN cases on colposcopy not detected by Cytology alone. The low grade lesions were over

diagnosed by colposcopy but there was good correlation in high grade lesions as with other studies.<sup>8</sup> The Pap smear alone as a screening method has proved to be a valuable tool in the west because of organized screening programme where, repeated Pap test once in 2-5 years will detect the disease at sometime during the natural course of the disease and prevent them from progressing to invasive disease.<sup>1</sup> The role of Colposcopy as a screening tool has a varying opinion and it is not suitable on a community level screening but in a hospital set up with an availability of trained personnel and with low cost, can be a viable tool. Colposcopy alone would miss many lesions in older age group where transformation zone is not visible as well as endocervical lesions. Supplementing cytology with colposcopy for evaluating women for cervical neoplasm can be considered as one of the effective combination to reduce the number of cervical lesions being missed.<sup>9</sup> In recent times HPV DNA testing has been proved to be good screening modality along with Pap test or with Colposcopy in various studies.<sup>8,10</sup> Until this high quality testing is widely available and properly priced, pap and Colposcopy can be used in synergy to pick up CIN lesions. Combining cytology with colposcopy as a screening method might reduce the impact of high false negative pap reports. The high false negative results of Colposcopy could be minimized by prior treatment of infections as most of the histopathology finding in suspicious low grade lesions were cervicitis in our study.

**Table 1: Basic characteristics of study participants (n=143)**

Characteristics	Number	Percentage
<b>Age group(in years)</b>		
25-34	30	20.98
35-44	55	38.46
45-54	38	26.57
≥55	20	13.99
<b>Total</b>	100	100
<b>Age at marriage</b>		
<18 years	4	2.80
18-25 years	110	76.92
>25 years	29	20.28
<b>Total</b>	100	100



**Cont... Table 1: Basic characteristics of study participants (n=143)**

<b>Purpose of hospital visit</b>		
Routine examination	81	56.64
Leucorrhoea (white discharge)	30	20.98
Bleeding problems	25	17.48
others	7	4.90
<b>Total</b>	<b>100</b>	<b>100</b>
<b>Risk factors</b>		
Tobacco use	5	3.50
Alcohol use	8	5.59
Multiple sexual partners	3	2.10
none	127	88.81
<b>Total</b>	<b>100</b>	<b>100</b>
<b>Family planning methods practiced</b>		
OCPs	15	10.49
IUCDs	22	15.38
Barrier method	8	5.59
Tube ligation	6	4.20
None	92	64.34
<b>Total</b>	<b>100</b>	<b>100</b>

**Table 2: Comparison of the results of Pap smear and Colposcopy**

	Colposcopy positive	Colposcopy negative	Total
Pap smear positive	5	1	6
Pap smear negative	16	121	137
<b>Total</b>	<b>21</b>	<b>122</b>	<b>143</b>

**Kappa statistics = 0.326**

**P < 0.001**

**Fair agreement**

**Table 3: Comparison of pap smear results with histopathology (gold standard)**

	Histopathology positive	Histopathology negative	Total
Pap smear positive	1	4	5
Pap smear negative	10	31	41
<b>Total</b>	<b>11</b>	<b>35</b>	<b>46</b>

**Sensitivity =  $1/11 * 100 = 9.09\%$**

**Specificity =  $31/35 * 100 = 88.57\%$**

**PPV =  $1/5 * 100 = 20\%$**

**NPV =  $31/41 * 100 = 75.61\%$**

**Diagnostic accuracy =  $32/46 * 100 = 69.56\%$**

**Table 4: Comparison of colposcopy results with histopathology results (gold standard)**

	Histopathology positive	Histopathology negative	Total
Colposcopy positive	11	9	20
Colposcopy negative	0	26	26
<b>Total</b>	<b>11</b>	<b>35</b>	<b>46</b>

**Sensitivity =  $11/11 * 100 = 100\%$**

**Specificity =  $26/35 * 100 = 74.28\%$**

**PPV =  $11/20 * 100 = 55\%$**

**NPV =  $26/26 * 100 = 100\%$**

**Diagnostic accuracy =  $37/46 * 100 = 80.43\%$**

## CONCLUSION

We would like to conclude that colposcopy is an ideal method to diagnose cervical pre cancer and cancer when used as an adjunct to cytology.

**Conflict of Interest:** None

**Source of Funding:** None

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# Epidemiology of Unintentional Injury in a Rural Community, Tiruchirapalli District

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## ABSTRACT

**Background:** Injury is an increasingly important health problem particularly in developing countries like India. Community-based studies are of paramount importance to develop preventive measures. Not many community-based studies have been done to assess the burden and nature of injury in India and the State of Tamil Nadu. **Methods:** A systematic random sample of households was selected from each of two selected Health sub-centers. All adult members were interviewed with a semi-structured questionnaire to collect information on unintentional injuries in a 30-day recall period. For children below 5 years, a responsible adult member (mostly mother or father) of the family was interviewed. **Results:** Totally 2216 members were surveyed in 502 households. The overall incidence of unintentional injuries was 9.6 % [95% Confidence Interval (CI): 8.4, 10.9]. Incidence was lowest in 15-44 age-groups and highest in 0-4 age-group (8.7% Vs 12.2%). The incidence was high in male than female ( $\chi^2=10.88$ ;  $p < 0.001$ ). All reported injuries were non-fatal in nature. The common types of injuries were minor injuries, falls, animal and insect bites and traffic injuries. The incidence of minor injuries was high (3.4%) compared to other types like falls (2.9%) and animal bite (1.6%). No injury was reported due to accidental poisoning and drowning. **Conclusions:** The incidence of unintentional injuries was found to be low in the present study. However, further studies using larger and more representative samples are needed to delineate the problem of unintentional injuries and their risk factors in rural Tamil Nadu.

**Keywords:** Accidents, Tamilnadu, Health seeking pattern, Injuries, Falls, RTA

## INTRODUCTION

Globally, most countries are already facing the double burden of communicable and non-communicable diseases. Almost half of the disease burden in high-mortality regions of the world is now attributable to non-communicable diseases<sup>1</sup>. Since long, injuries have been considered synonymous with “accidents” assuming that occurrence of such events was sudden and caused by external factors and these factors were the uncontrollable acts of fate and luck<sup>2,3</sup>. The preventive strategies developed in the high-income countries can be adapted to the low-income countries with appropriate modifications according to the local conditions<sup>4</sup>. According to official statistics, morbidity and mortality due to injury are on the increasing trend in Tamil Nadu and also the number of vehicles increasing in the state. Unintentional Injury is defined as any unintentional damage to the body resulting from acute exposure to

thermal, mechanical, electrical, or chemical energy or from the absence of such essentials as oxygen<sup>5</sup>.

Injury data from hospital or institutions are highly biased, since not all people are reporting to Government health institutions and not all injuries are coming to the knowledge of the health institutions both private and government. Hence, it is important to understand the epidemiology of the unintentional injuries. For this a community-based study is necessary. Hence this study was conducted to estimate the incidence and nature of unintentional injuries in a rural community, describe the health seeking pattern for the management of unintentional injuries in Tiruchirapalli district.

## METHOD

A cross-sectional survey of all individuals in a selected sample of households using a reference period of 30 day preceding the date of interview was carried

out during 2003. Tiruchirapalli district, Tamil Nadu State. The present study was conducted in two randomly selected health sub centre area of Arasankudi primary health centre with a total population of 28,364. The population of the study area was around 9,012 with 2,159 households spreading over 12 villages. The details regarding number of households in the HSCs were collected from the PHC registers. Since our sample size was 250 households from each of the selected HSCs, the total available households in the entire HSC were divided by 250, which turned out to be 4 in one HSC and 4.6 in another HSC. To have uniformity, it was decided to collect information from every 4<sup>th</sup> houses in both HSCs. The households available in all villages in each HSC were numbered continuously as per the geographical contiguity of the village and every 4<sup>th</sup> was selected by systematic random sampling procedure. Among the 550 selected households, 502 households with a population of 2216 could be contacted and data collected with a response rate of 91.3%.

## RESULTS

Among the surveyed population, 1078 (48.6%) were males and 1138 (51.4%) were females. The age of the population ranged from 1-90 years (Median: 27 years) (Table 1)

**Table 1: Distribution of the study population by age and sex**

Age-group	Male n (%)	Female n (%)	Total n (%)
0-4	76 (7.0)	105 (9.2)	181 (8.2)
5-14	225 (20.9)	205 (18.0)	430 (19.4)
15-44	552 (51.2)	583 (51.2)	1135 (51.2)
45-59	149 (13.8)	176(15.5)	325 (14.7)
60 & above	76 (7.0)	69 (6.0)	145 (6.5)
<b>Total</b>	<b>1078 (48.6)</b>	<b>1138 (51.4)</b>	<b>2216</b>

The proportion of illiterate accounted for highest (27%) followed by primary level 24% and the middle level 20%. Among the adults, ( $\geq 15$  years) slightly lower percent (25%) was illiterate. Fifty two per cent of population employed.

Totally 213 individuals reported to have

unintentional injuries in the study population for the 30-day recall period. Among the injured, 10 persons reported two episodes of unintentional injury. Thus totally 223 episodes of injury occurred in the study population. All reported injuries were non-fatal in nature.

The overall incidence of unintentional injuries in the studied rural population was 9.6 % [95% CI: 8.4, 10.9]. The village wise incidence of injuries was similar for all the villages surveyed. The incidence of injuries among different castes, education, occupation and other individual socio-economic variables did not show any significant difference.

Though not statistically significant, the incidence of unintentional injuries was lowest in 15-44 age-groups (8.7%) and highest in 0-4 age-group (12.2%).

**Table 2: Incidence (%) of various types of unintentional injury by sex**

Type of Injuries	Number injured	Incidence (%)		
		Overall % (95% CI)*	Male n (%)	Female n (%)
Road traffic accidents	22	1.0 (0.7, 1.6)	12 (11.1)	10 (8.8)
Falls	65	2.9 (2.3, 3.7)	41(38.0)	24 (21.0)
Animal and insect bites	35	1.6 (1.1, 2.2)	17(15.8)	18 (15.8)
Burns	15	0.7 (0.4, 1.1)	3 (2.8)	12 (10.5)
Minor Injuries	76	3.4 (2.7, 4.3)	54 (50.0)	22 (19.3)
Overall	213	9.6 (8.4, 10.9)	127 (117.8)	86 (75.6)

The overall incidence of unintentional injuries among males 11.8% (95% CI: 9.95, 13.9) was found to be high than among females 7.6% (95% CI: 5.9, 8.9). ( $\chi^2=10.88$ ;  $p<0.001$ ).

**Treatment seeking behavior:** Among the injured persons, 194 (91%) had treatment. The different institutions where they had treatment vary from home to district hospitals (Table 3). Among those who got treated (n=194), about 43% had self-treatment within their household and 30% went to private practitioners. Approximately 14% approached the government institutions. Around 10% of the injured were treated as in-patient in various hospitals.

**Table 3: Distribution of unintentional injuries by place of treatment**

Type of injury	Type of Hospital					ISM
	Self	Private	Government**			
			HSC	PHC	GGH	
Road traffic accidents	2	11	0	5	3	1
Falls	31	17	3	3	0	4
Animal and insect bites	4	9	0	3	0	19
Burns	13	1	0	0	0	0
Minor injuries	30	21	2	9	0	3
<b>Total</b>	<b>80</b> <b>(42.6%)</b>	<b>59</b> <b>(30.0%)</b>	<b>5</b> <b>(2.5%)</b>	<b>20</b> <b>(10.0%)</b>	<b>3</b> <b>(1.7%)</b>	<b>27</b> <b>(13.7%)</b>

\*\*HSC = Health Sub centres; PHC = Primary Health Centre; GGH = Government

General Hospital; ISM = Indigenous System of Medicine

**Available Health facilities:** There are two HSCs with trained multi- purpose health workers and one primary health centre (PHC) located in the study area. The block PHC with in- patient facilities is situated 15 – 20 km away from the study areas. In addition, 10-15 indigenous system of medicine practitioners and two allopathic doctors were available. In-patient facilities and ambulance services were not available in the study area. The nearest referral hospital is the medical college hospital situated 15 –25 km away from the study areas.

## DISCUSSION

The overall incidence of unintentional injuries in the study area was 9.6% indicating that injury is a problem of public health concern in this area. However, the incidence is lower than the expected level based on results of similar population based studies conducted in India and elsewhere<sup>6-12</sup>.

In India, very few community-based studies were undertaken on injuries<sup>6-8,11</sup>. Most of these were either urban or hospital- based studies except the study done by Gordon and colleagues<sup>6</sup> in rural Punjab.

Epidemiological studies based on interview data are likely to underestimate the rates because of under reporting<sup>13</sup>. However, underestimate is likely to be low in this study because principal investigator interviewed the people personally. The recall-period is sufficiently shorter to avoid bias associated with longer periods of recall<sup>12,14</sup>.

The incidence of injuries was more in male than

female. This was consistently seen in all ages. This could be due to the fact that males were usually engaged in outdoor activities including travelling in motor vehicles. This incidence difference by gender was consistent with most of the community and hospital based studies<sup>2,10-12,15,16</sup> and inconsistent with Malaysian study where household injuries were common than injuries occurring outside<sup>17</sup>. The overall incidence of unintentional injuries in different age-group indicates that it was highest in 15-44 years and similar in both the sexes. Next was the 5-14 years in male and whereas in female it was in both 5-15 and 45-59 age-groups. This age distribution was consistent with other studies like Ghana and Uganda and Indian studies<sup>2,6-8,12,15,18</sup>.

Minor injuries due to occupational and other household activities were the commonest type of injuries. The incidence of minor injuries was 3.3%, which was comparable with other similar studies<sup>12,18</sup>. The minor injuries formed 36% of reported unintentional injuries in the total injuries during the 30-day recall period of which majority were due to occupational activities. This finding of high percent of injury due to agricultural activities was consistent with study by James<sup>19</sup>.

The second common type of injuries in this area was injuries due to falls. This finding is consistent with other studies<sup>12,18,20</sup>. Falls have been reported as responsible for the largest number of hospital visits for non-fatal injuries, especially for children and young adults<sup>12</sup>. The proportion of injuries due to falls was 30%, which is similar to findings from a hospital-based study<sup>21</sup>. The proportion of injuries due to falls was pronounced in children and old age people. This is in agreement with findings from Ghana<sup>12</sup> and other studies<sup>18</sup>.

Animal and insect bites were the third important cause of injuries in this rural setup. It is an important public health problem like in other developing countries<sup>15</sup>. Females and males were almost equally affected by animal and insect bites. The most common type of insect bite was scorpion.

RTAs were the fourth leading cause for injuries. The burden of RTA was next only to minor injuries, falls and animal and insect bites. This finding is in sharp contrast to other community-based studies where RTA was the commonest cause of injuries<sup>8,11,12,22</sup> except the Uganda study<sup>18</sup> where other injuries were more common than RTA in rural areas. The relatively low incidence of RTA in the present study was probably because of the remoteness of the selected rural area from national highways as well as lack of use of private vehicles for travel to nearby urban areas. More than 50% of RTA reported in this area were due to cycle related injuries followed by passengers travelling in transports shared auto, lorry and cart.

The other injuries that were less common but nonetheless important were due to burns. In this study the incidence of burns was 0.7% and the estimates of injury due to burns were the last category (lowest incidence). This finding is similar to Ghana study<sup>12</sup>. Most of the injuries due to burns were of low severity (less than 5% involving only exposed part of skin and the body surface). Females were more affected than male. This finding is comparable with other studies<sup>15,23,24</sup>. In this study, no injury was reported due to accidental poisoning and drowning which was not consistent with other studies<sup>11,12,18,25</sup>.

The proportion of disability in this study due to unintentional injuries was similar to other studies<sup>11,12,18,19</sup>. Among males, minor injuries [including agricultural related injuries] were the single largest contributor to disability whereas among females it was due to animal and insect bites. Falls contributed to disability equally in both the sexes. RTAs ranked fourth in disability contribution. In this study all reported injuries were non-fatal in nature.

Hospitalisation is considered as one of the important outcomes of injuries indicating severity of injuries. The rate of hospitalization observed in this study was comparable with other studies<sup>12,18</sup>. The number of days hospitalized varied from 2-20 days which is a great

burden to the individual, by way of financial burden of cost of treatment and loss of wages, as well as psychological sufferings. The hospitalization was higher for RTA (45%) than any other injuries. Infact, it is higher than Ghana study findings<sup>12</sup>. Similarly, the number of days hospitalized was highest in RTA. Majority of the injured had treatment either in the home or in hospitals. The type of hospitals utilized for treatment was mainly private and indigenous hospitals, which is contrary to the Malaysian study<sup>17</sup> where majority favoured treatment in government hospitals. In an Indian study, also the hospitalization was more in government sectors rather than in private sectors<sup>3</sup>. The reason may be the ready availability of services when needed, nearness of facilities to their residence and people's greater faith in quality of services in private sectors.

## CONCLUSION

The incidence of unintentional injuries was found to be low in the present study. In the process of economic development and modernization, there is a phenomenal increase in injury events due to a greater interaction of host with environment and agents of mechanical, electrical, thermal or chemical energy. Intentionally or not, injury has so far lacked public awareness and is under-recognized as a serious public health problem in both developed and developing countries. There is a need to carry out larger studies in the same place and other similar areas stratified by potential contributing factors like distance from national high ways, location of industries and nature and density of vehicular traffic.

**Conflicts of Interest:** None declared

**Source of Funding:** Nil

**Ethical Issues:** Patient's identity was not revealed at any stage of the study and strict confidentiality was maintained.

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# Medical Error in Health Care: A Sleeping Giant

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## ABSTRACT

This study is the part of our extensive work on the medical error and patients' safety in which we as a team indulge to find out the way to reduce medical error in the hospitals of India. Worldwide several programs are running under the umbrella of experts who are sharing their intellect with the hospital professionals. In current scenario such incidents have been increased due to safety and errors. Patient care is the prime responsibility of the hospitals. Health services are now facing serious problems unique to complex technology-driven work systems compounded by a severe medical liability crisis. It shall facilitate medical fraternity to educating the staff and set a standard protocol for patient safety. In this research primary data has been collected from the corporate and government hospitals of the Delhi and NCR and analysed with the help of t-test.

**Keywords:** Patient safety, medical error and WHO.

## INTRODUCTION

In ancient times, health and illness were interpreted in a cosmological and anthropological perspective. Medicine was dominated by magical and religious beliefs which were an integral part of ancient cultures and civilizations. Since there is an organic relationship between medicine and human advancement, any account of medicine at a given period should be viewed against the civilization human advancement at that time. Since man's knowledge was limited, the primitive man attributed disease, all human sufferings and calamities to wrath of gods, invasion of body by evil inner health and nasty influence of environments. After exploration of the Ayurveda and its practices practice and use of aromatic plant and other plant parts were used for the bad health.

## WHO AND HEALTH SERVICES

After the existence of the WHO, an international body of health coordination started working across the world. United Nations of Organization realized that WHO plays important role in the health hazards issues of the world. Government jointly deal with global health issues and improve the public health. At the times of epidemic WHO come forward to manage the berserk. World Health Organization become effective to ensure

the complete remedies for all health related issues across the world. Good Physical condition is beyond price part of humans. Good health makes us inspired, motivated, enable us for victory. It's directly correlate with the individual output and quality of the life. Generally, the context in which an individual lives is of great importance on health status and quality of life.

## CURRENT STATE OF HEALTHCARE AT A GLANCE

Policy makers believe that crisis of health management can be reduced with increasing the budget of health services. According to the information of the health ministry the shortage of medical specialist in community health centres where the majority of children born, are not getting proper medical care. Shortage of medical care givers is high in Indian medical system. Second most populated country health system is on ventilator. Maternal mortality and infant mortality is still worse in Indian sub continents. With demand expected to outstrip supply over the next decade, the outlook for private medical care providers is very positive. The Ernst and Young Report projects a need for 10'00'000 hospital beds in the next five years, and anticipates that 88% of this comes from the private sector. The most fundamental structural change altering the healthcare scene in India is the shifting demographic and socio-economic profile of



the country's population. The proportion of the country's population in the 15-54 and the 55 and above age groups is increasing owing to improvement in life expectancy levels. The Confederation of Indian Industry's (CII) Indian Healthcare Federation estimates that fresh investments of US\$ 25 billion over the next 8-10 years to establish facilities will put the sector on the global healthcare map.

### The flip side of Healthcare

But even with such astonishing optimistic figures, public health is still a major concern of the state government because of the continuing incidence of epidemic diseases, high rates of infant mortality, HIV/AIDS, malaria, deaths due to medical equipment, etc. And ironically the number of deaths due to hospital negligence has increased over the years. Some of the reasons of deaths due to hospitals include medical errors, medical malpractice, technical faults of medical equipment, systems errors, failures in communication, information flow, process flaws, training and education and lack of knowledge and training of doctors and nurses to operate medical equipment<sup>5</sup>.

According to an article in "The Telegraph" dated 6<sup>th</sup> January 2009<sup>7</sup>, the deaths caused by hospital mistakes have gone up to 60 per cent. A recent figure shows WHO quoting those medical errors come in the top 10 causes of deaths in India. Around the globe, numerous deaths are reported due to hospital errors. The developing countries contribute 90% of the medical error. In developed countries one patient in every 10 patients is harmed while receiving hospital care<sup>8</sup>. As many as 100,000 people a year could be dying in U.S. hospitals because of easily prevented errors according to the FDA report, dated January 28, 2008<sup>8</sup>.

Healthcare lies in the dangerous zone where 1 person is affected in every 1000 patients compare to the other high risk industries like Aviation, nuclear power, Chemical manufacturing etc<sup>9</sup>. Healthcare is not safe.

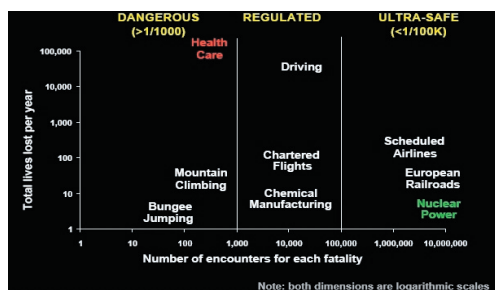


Figure 1.1 Health care: The high risk industry

A medical error<sup>10</sup> may be defined as a preventable adverse effect of care, whether or not it is evident or harmful to the patient. This might include an inaccurate or incomplete diagnosis or treatment of a disease, injury, syndrome, behaviour, infection, or other ailment. Medical malpractice<sup>11</sup> is professional negligence by act or omission by a health care provider in which the treatment provided falls below the accepted standard of practice in the medical community and causes injury or death to the patient, with most cases involving medical error.

### OBJECTIVE OF THE STUDY

Over the past two decades, a number of Indian private sector companies have set up hospital facilities and clinics. Prominent examples include Apollo, Max, Fortis, Escorts and Lockhart; out of an estimated total of 150 that represent a rapidly growing number of high-end facilities that offer top of-the-line medical treatment. Private hospitals account for over 32 per cent of hospital beds in India. Besides providing basic health and medical care services, these corporate hospitals often undertake complex surgeries like bone marrow transplants, open-heart surgeries and kidney transplants. There is ample chance of the errors in Indian hospitals. Objectives of the study are following.

- 1) To find out the iatrogenic mistakes occurring every day and unsafe medical care.
- 2) To analyse the relationship between the medical error and skilled care givers in medical fraternity.

### RESEARCH METHODOLOGY

This study was conducted in the major corporate, private and government hospitals of national capital territory of Delhi in India. A primary data based study conducted where researchers used structured questionnaire for data collection. In questionnaire researcher framed some scale based questions for the respondents. Since the study is exploratory in nature where different parameters of safety and medical error were covered. The respondents were selected on the basis of their availability and it has been considered that all parameters of safety must be covered in the questionnaire. A pilot study was initially carried out in government as well as in the corporate hospitals of NCR<sup>12</sup>.

The determination of the sample size has been

scientifically calculated and it has been administered to 200 respondents from each categories of the hospital (Caregivers, Senior Residents and paramedical staffs). Finally study has been carried out with the 400 sample size.

**Tools used for Data analysis**

Since researchers had covered a wide range of the problems existing in the medical field, where several reasons are quantified for the errors. Comparison of the mean is helpful for the further analysis. In this study researcher are testing the hypothesis that the population means are equal for the two samples and it assumed that the variance for the two samples are equal. So t-test is the appropriate tool for the further analysis.

The basic hypotheses for the two-sample *t*-test are as follows, where  $\mu$  denotes the mean of the population from which the sample was selected, and  $\mu_0$  denotes the hypothesized value of this mean. It should be reiterated that  $\mu_0$  is a value that does not depend on the current sample (Posten, H. O. 1978).

$H_0: \mu = \mu_0$  (in words: the population mean is equal to the hypothesized value  $\mu_0$ ).

$H_a: \mu \neq \mu_0$  (the population means is not equal to  $\mu_0$ ).

**Testing of the hypothesis**

As hypothesis testing is the mathematical tool for the data analysis. Hypothesis known as the tentative solution of the problems. In reference to this study several important features of quantitative research reflects, where researcher is not used any of their personal experience or assumptions. So chance of biases in conducting the study and drawing conclusions is almost zero. Uses of hypothesis testing to make deductive inferences about characteristics of a population.

**Hypothesis 1:**

Occurrence of the Intentional and unintentional medical errors everyday within the supply chain management leads to mortality and morbidity of the patient and for that preventive measure are required for infusing the patient safety within the healthcare system.

**H<sub>0</sub>:** There is no significant relationship between the iatrogenic mistakes occurring every day and unsafe medical care.

1.1 Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Iatrogenic & death	400	.049	.304

**H<sub>a</sub>:** There is significant relationship between the iatrogenic mistakes occurring every day and unsafe medical care

1.2 Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Iatrogenic	2.2044	400	.91898	.04332
	death	4.2067	400	1.84583	.08701

1.3 Paired Samples Correlations Paired Samples Test									
		Paired Differences					t	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Iatrogenic - death	-2.0023	2.02160	.09530	-2.18951	-1.81493	-21.010	399	.009

Hypothesis proposed in this study in occurrence of the Intentional and unintentional medical errors everyday within the supply chain management leads to mortality and morbidity of the patient and for that preventive measure are required for infusing the patient safety within the healthcare system. In this hypothesis the calculated value of the p is 0.009 which is more than the standard value (alpha: 0.05).

So in this hypothesis researcher is failing to accept null hypothesis.

**Hypothesis-2**

Errors at the hospital are the consequences of the scarcity of skilled caregivers. Skilled care givers may reduce the rate of mortality, injuries and longer hospital stay but it also increase the cost for the ailing patients.

**H0:** There are no significance relationship between skilled care givers and rate of the medical errors in Indian hospitals

**Ha:** There are significance relationship between skilled care givers and rate of the medical errors in Indian hospitals

2.1 Paired Samples Correlations				
		N	Correlation	Sig.
Pair 2	caregivers & Errors	400	.18	.702

2.2 Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 2	caregivers	1.1042	400	.30583	.01471
	Errors	1.1528	400	.36019	.01733

2.3 Paired Samples Test									
		Paired Differences					t	Df.	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 2	caregivers - Errors	-.0486	.47679	.02294	-.09370	-.00352	-2.119	431	.035

In the testing of third hypothesis with the help of SPSS software calculated value of t is 0.035 which is less than the table value which known as the standard value 0.050. Here once again researcher fail to accept the null hypothesis. Thus it has come out after the analysis that there is significant relationship between skilled care givers and rate of the medical errors in Indian hospitals.

**RESULTS**

Field like arts and sciences, medicine, and engineering (Parsons & Platt, 1973), have a long practice of philosophies, concept and procedures that are supposed to be pertinent to use when conducting

such kind of research. Following research moving around the patient safety and medical error having several pros and cons. After analysis of the data against the first hypothesis, calculated value of the p is 0.009 which is less than the standard value (alpha: 0.05). So in this hypothesis researcher is failing to accept null hypothesis.

Therefore researcher reaches on the conclusion that there is significant relationship between the iatrogenic mistakes occurring every day and unsafe medical care.

Against the second hypothesis the calculated value of p is 0.035 which is less than the table value

which known as the standard value 0.050. It shows the rejection of null hypothesis. Therefore, it has come out after the analysis that there is significant relationship between skilled care givers and rate of the medical errors in Indian hospitals.

## CONCLUSIONS

2000 year ago, Hippocrates said 'First do no harm'. This may not hold true in modern medicine which has been engulfed with frequent occurrence of intentional and unintentional medical error resulting into the unsafe medical care. Medical error resulting from clinical practice and bad outcome/unsafe care is the double edged sword which kills the patient safety.

Caregiver utilizes their skill set, knowledge, competence, hospital system and technology in treating the patient. Patient safety and patient recovery fully depend upon the caregiver, while as caregiver in turn depend upon the available tools and technology within the hospital. Caregiver need to be skilful, abreast with the latest technology, knowledgeable to use available tools effectively and ensure the flawless system in which he is working. This alone will lead to best outcome of the care and this we can define a safe care. Any kind of mistake or mismatch within the process of care will result into the medical error or iatrogenic incidence which will lead to the injury or death of the patient. Patient being at receiving side will have a direct impact of any kind of failure or error which may arises within the process of care in any hospital.

As this study is moving around the medical error in health care industry, after a quantitative analysis of the study the resultants come accordingly...

- o Majority of the institutes follows SOP protocol and maintains the records for any type of medical error or iatrogenic incidences.

- o Most of the respondents who have received training on various equipment feel that the training was not adequate.

- o After the expiry of the warranty of the medical devices, majority of the hospitals enter into a service contract with the company for the timely servicing of the devices.

- o In case of an emergency for instance in case of a breakdown of the ventilator, the respondents have

observed that the service providers report with the hospital within 2 days. This shows that the service providers are not prompt in their actions despite ventilators being crucial for saving a patient's life.

- o The major reasons of delay in the patient recovery in ICU are due to patient developed VAPS and Medical errors.

- o Researcher have spent twenty years in field of critical care and from his point of view, the most common approach to eliminating medical error is the frequent training & orientation, adaptability, know-how of the technology and safe usage of available resources, this in turn will save millions of patient from unsafe care.

## LIMITATION OF THE STUDY

No study is perfect in this world and especially area like medical error and patient safety is having various pros and cons. This study is also passed through the various limitations.

- o Non availability of the data over patient safety and reduction of medical error and cost within the supply chain management in India.

- o Medical error is happening at all the stages of the healthcare delivery system but it goes down the line as far as Indian healthcare industry is concern. None of the hospital staffs a doctor, a nurse, management comes openly and speak about this epidemics.

**Ethical Clearance-** Not required

**Source of Funding-** Self

**Conflict of Interest -** Nil

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# Phenomenology of Perimenstrual Psychiatric Symptoms

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## ABSTRACT

The aim of current study was to observe, assess and screen the phenomenology of perimenstrual symptoms, & identify if any other form of psychiatric syndrome. Non experimental quantitative descriptive Research design was used to conduct the study. The study population consisted of 50 consecutive patients of Perimenstrual syndrome attending psychiatry OPD at PMCH, Patna during 2005 – 2008. Purposive sampling was used to collect the sample. International classification of diseases (ICD-10) and Diagnostic and Statistical manual of mental disorders – IV (DSM-IV), Structured Perimenstrual symptoms and syndrome check list diary, Perimenstrual symptoms severity rating scale & Temporal – Profile Performa of perimenstrual symptoms tools were used to collect the data. The findings analyzed by descriptive statistics. Data analysis showed that the mean age of patients was 30.7 years. The most distressing symptom was irritability (66%) in patients included in study followed by bloating in 18% and breast pain in 16% of cases. Most patients were symptomatic for 6-10 days in each menstrual cycle during premenstrual phase, and symptoms were relieved after beginning of menstrual flow.

**Keyword:** Perimenstrual Symptoms, PMDD, Irritability

## INTRODUCTION

Menstruation is a key phenomenon that defines womanhood. It not only reinforces her sexual identity but also reinstates her potential for motherhood which is the most defining feature of the fair sex. But paradoxically anything related to menstruation is considered a taboo and dirty and may even be stigmatized in many cultures.<sup>1</sup>

The sufferer usually has a “window” period each month when she feels, acts and behaves as completely normal individual capable of performing all her duties. This mostly unrecognized inability at self-conciliation often leads to a great deal of inner turmoil, fear, guilt, confusion and strife within herself which tends to have

a negative impact on her most intimate relationship, with spouse and children, who often bear the brunt of her emotional ups and downs. Perimenstrual symptoms include cyclic perimenstrual pain and discomfort, dysphoric mood, altered behavior, psychological tension and many other somatic symptoms. They generally appear about 7-10 days prior to the onset of menstrual flow and may continue through the first or second day of menstrual cycle.<sup>2</sup>

In 1930s, RT Frankfirst used the term “Premenstrual tension syndrome” to describe the premenstrual mood problems that he noted in 15 women; by the 1950s terminology had evolved into the now-familiar, “Premenstrual Syndrome” or PMS<sup>3</sup>.

In 1987, the diagnostic and statistical manual of mental disorders, third edition, revised (DSM-III-R) listed criteria for diagnosis of what it called “Late Luteal Phase Dysphoric Disorder” or LLPDD<sup>4</sup>. In 1993, DSM-IV changed the name to “Premenstrual Dysphoric Disorder” or PMDD, and modified the diagnostic criteria

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slightly. For the sake of completeness of description the word ‘Perimenstrual Psychiatric Syndrome’ has been used in the present study includes symptoms occurring both before and after menstrual flow<sup>5</sup>.

PMDD is a severe form of premenstrual syndrome (PMS) with emphasis on mood symptoms during premenstrual phase<sup>6</sup>. According to a report by the Committee on Gynecologic Practice of the American College of Obstetricians and Gynecologist, up to 80% of women of reproductive age have physical changes with menstruation; 20 to 40% of them experience symptoms of PMS, while 2-10% report severe disruption of their daily activities. Menstruation related physical discomfort, such as dysmenorrhoea, may begin with menarche, often this condition is superseded by PMS in late adolescence or the early 20s<sup>7</sup>.

The term “Cyclic Pelvic Pain and Discomforts (CPPD)” is used to describe women’s these health problems which do not get included in other i.e.; diagnostic terms, Premenstrual dysphoric disorder (PMDD), and premenstrual syndrome (PMS) and dysmenorrhoea. CPPD includes symptoms clusters before, during and after the menstrual flow<sup>8</sup>.

There is a syndrome called premenstrual magnification of pre-existing, independent psychiatric or somatic symptoms. Premenstrual magnification may occur in depressive disorder, panic disorder, generalized anxiety disorder, irritable bowel syndrome, asthma, chronic fatigue syndrome and allergies<sup>9</sup>. 30% to 50% of menstruating women experience moderately severe premenstrual symptoms and 4% to 14% experiences severe premenstrual symptoms<sup>10</sup>.

Considering the large prevalence of perimenstrual symptoms in general population and its seminal significance in the life of individual female patient, a study was planned to describe the phenomenology and time course of perimenstrual symptoms as seen in the psychiatric OPD of Patna Medical College, Patna, Bihar, India.

### AIMS AND OBJECTIVES

1. To study the phenomenology of perimenstrual symptoms.
2. To assess and screen the target symptoms.
3. To assess if any form distinct psychiatric

syndrome.

### Material & Methods:

The study material consisted of 50 consecutive patients of perimenstrual syndrome attending psychiatry OPD at PMCH, Patna during 2005 – 2008.

### Inclusion Criteria:

- Patient having psychiatric and/or nonorganic somatic symptoms immediately preceding, during or immediately after the menstrual flow.
- Patient in the age group 15 – 45 years of all socio-economic strata.
- Patient having such symptoms in more than 25% of the cycles.
- Patient who are co-operative, willing and are able to discuss the perimenstrual problems.

### Exclusion Criteria:

- Patients younger than 15 and older than 45 years of age.
- Patients having pelvic inflammatory disease, fibroid, endometriosis, and other gynecological condition sufficient enough to explain the symptoms.
- Patients having history of preexisting psychiatric, neurological, medical disorders.
- Patients who are taking oral contraceptive pills (OCP) or hormone replacement therapy (HRT), IUDs or any drugs which cause any menstrual problems.
- Patients with history of substance abuse, mental retardation are excluded from study.

### Tools (Scales):

- Semi structured Performa for demographic data and clinical history.
- International classification of diseases (ICD-10) and Diagnostic and Statistical manual of mental disorders – IV (DSM-IV).
- Structured perimenstrual symptoms and syndrome check list diary.
- Perimenstrual symptoms severity rating scale.

- Temporal – Profile Performa of perimenstrual symptoms.

## PROCEDURE

The patients attending psychiatric OPD for their perimenstrual complaints were assessed according to prescribed tools. During the assessment the tracing of phenomenon was retrospective. Perimenstrual symptoms checklist diary was provided to the patients for recording of symptoms prospectively for 2 months to confirm the diagnosis. The severity of symptoms and temporal profile of symptoms were evaluated by using appropriate tools as mentioned above. The other associated psychiatric, neurological, physical symptoms and treatment modalities influencing menstrual cycle were paid due attention. The data obtained was analyzed through appropriate statistical technique. The information was kept confidential and due attention to ethical consideration was given.

## DISCUSSION & RESULTS

Fifty consecutive cases of perimenstrual syndromes seen in the psychiatry OPD of PMCH, Patna were studied. This includes description of the perimenstrual symptoms, assessment of their severity and two months prospective recording of the symptoms. Other gynecological, surgical, medical and pre-existing psychiatric illness was ruled out by using psychiatric interview and clinical and other biological examination.

In study 98% reported anxiety, 96% depression, 92% impatience, 92% desire to be alone, 92% decreased sexual desire, 92% impulsivity. 90% tension, 88% anger, 88% tearfulness, 88% irritability, 88% sleep disturbance, 86% work absenteeism, 84% breast pain and 84% decreased food intake. 80% feeling of weakness and 70% patient had swelling of limbs and feet's. Guilt feelings reported by 50% of patients of menstrual flow.

As the name implies, PMDD is a cyclical disorder consisting of distressing mood and behavioural symptoms arising during the late luteal (premenstrual) phase of a woman's ovulatory cycle. Women with PMDD experience marked irritability as well as dysphoria, mood lability, anxiety, fatigue, change in appetite, and a sense of feeling overwhelmed. Up to 75% of women experience some physical and emotional symptoms before menses, but in only 3-8% are symptoms severe enough to qualify as PMDD<sup>11</sup>.

Study reported "as many as 75%–80% of women of reproductive age group having premenstrual symptoms at some time during their lives"<sup>12</sup>. While 3% - 8% of women are suffering from PMDD. Premenstrual symptoms usually begin when women are in their early twenty's (20s), but women do not seek treatment for up to 10 years<sup>13</sup>.

30%- 50% of menstruating women experiences moderately severe premenstrual symptoms, 4%-14% experiences severe premenstrual symptoms<sup>10</sup>. Cyclic perimenstrual pain and discomfort affect 70% of menstruating women and approximately 8% of menstruating women experiences premenstrual dysphoric mood.

According to a report by the Committee on Gynecologic Practice in the American college of Obstetricians and gynecologists, up to 80% of women of reproductive age have physical changes with menstruation; 20% - 40% of them experiences symptoms of PMS<sup>14</sup>.

Parry BL et al 1995, reported, 70% of women whose mother have been affected by PMS have PMS themselves, compared with 37% of women whose mother have not been affected. There is 93% concordance rate in monozygotic twins, compared with rate of 44% in dizygotic twins<sup>15</sup>.

In present study, data shows that the mean age of patients was 30.7 years, with maximum patients falling in the group of 21- 30 years of age. Most patients who participated in study were Hindu (80%), from urban background (86%), educated up to graduation (68%) and above, working as house wife (88%), and average socioeconomic status (84%).

Most patients reported at psychiatry OPD directly (68%). Only 32% were referred from Gynecology department, where they were consulting for their other problems. 82% of patients had duration of menstrual flow between 3-5 days. No methods of contraception were practiced by majority (48%) of patients. 34% had tubal ligation done and 18 % were using condoms.

Duration of symptoms in 54% of patients was 8 to 10 years, and 28% had more than 10 years of suffering before consultation. Most distressing symptom was irritability (66%) in patients included in study. Next most distressing symptoms were bloating in 18%



and breast pain in 16% of cases. Most patients were symptomatic for 6-10 days in each menstrual cycle during premenstrual phase, and symptoms were relieved after beginning of menstrual flow.

**CONCLUSION**

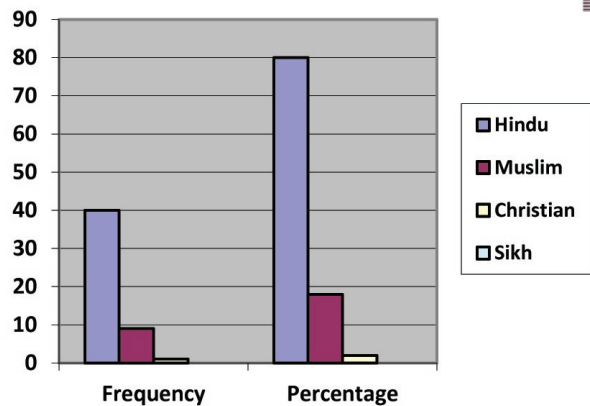
Premenstrual symptoms are common among young adulthood. Common PMS include in young adult are anxiety, depression, nervousness, impatience, loneliness, decreased libido, impulsivity & irritability. Structured perimenstrual symptoms and syndrome check list diary & perimenstrual symptoms severity rating scale are useful among young adult population for diagnosis and severity of PMS and PMDD.

**Financial support and sponsorship - Nil**

**Conflicts of Interest- Nil**

**Ethical Clearance-** Taken from competent authority.

**Graph:1**



**Religion Distribution**

**Table 1: Education Distribution**

Education Standard	Frequency	Percentage
> Graduation	07	14
Graduation	31	62
Matriculation	06	12
< Matriculation	06	12

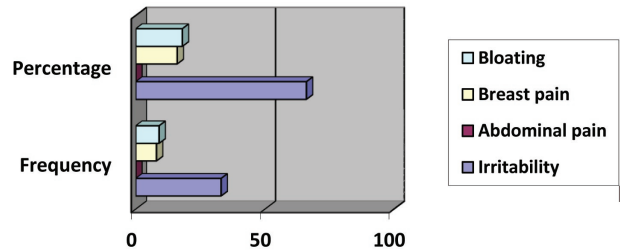
**Table 2: Referral Distribution**

Referral	Frequency	Percentage
Self-reporting	34	68
Gynecology	16	32

**Table 3: History of sexual abuse Distribution**

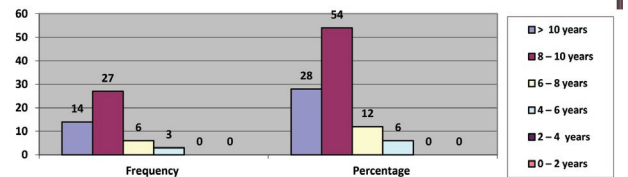
History of sexual abuse	Frequency	Percentage
Yes	4	8
No	46	92

**GRAPH-2**



**Distressing Symptoms**

**GRAPH-3**



**Duration of Distribution**

**Table 4: Contraception Practice Distribution in Patients**

Types of contraception	Frequency	Percentage
Condom	9	18
Oral-contraception	00	0
IUD	00	0
Permanent tube ligation	17	34
No contraception	24	48

**Table 5: Disease Distribution in Patients**

Diagnosis	Frequency	Percentage
Premenstrual dysphoric disorder	34	68
Premenstrual syndrome	12	24
Cyclic pelvic pain & discomfort	4	8
Premenstrual magnification	00	0

**Table 6: Frequency distribution of Symptoms of Perimenstrual Syndrome**

Symptoms	Frequency	Percentage
Backache	00	0
Change in frequency of bowel	00	0
Fatigue	26	52
Sleep disturbance	00	0
Leg and thigh discomfort	00	0
Tension	45	90
Feeling out of control	00	0
Depression	48	96
Anger	44	88
Feeling of weakness	40	80
Guilt feeling	25	50
Tearfulness	44	88
Anxiety	49	98
Nervousness	46	92
Rapid mood swing	4	8
Irritability	44	88
Impatience	46	92
Desire to be alone	46	92
Weight gain	8	16
Abdominal swelling	8	16
Breast pain	42	84
Swelling of feet's& hands	37	74
Skin disorder	3	6
Nausea & vomiting	6	12
Lower desire to move	6	12
Decreased food intake	42	84
Pain abdomen	26	52
Headache	32	64
Decreased sexual desire	46	92
Aches & pain	32	64
Impulsivity	46	92
History of domestic violence	41	82
Increased feeling of well being	4	8
Craving for food	33	66
Work absenteeism	43	86

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# Surgical Decompression in Pott's Paraplegia Patients by Anterior Approach

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## ABSTRACT

**Background:** Spinal tuberculosis is the most serious form of skeletal tuberculosis. Most of the patients with pott's spine or grade I and II pott's paraplegia responds well to chemotherapy alone but patients with grade III and IV paraplegia and those patients with grade I and II paraplegia, who do not responds to conservative treatment need urgent surgical decompression to avoid irreversible damage to spinal cord.

**Material and method:** This study is based on 13 patients with preoperative diagnosis of grade III and grade IV Pott's paraplegia, who did not respond to three to four weeks of conservative therapy or deteriorated neurologically during treatment and were treated by anterior decompression and fusion, at department of orthopaedics, JN Medical College, AMU Aligarh.

**Results:** Out of 13 patients 10 patients recovered & among these complete recovery was seen in 8 patients while 2 patients had partial recovery. Two patients didn't show neural recovery until last follow up & one patient deteriorated after anterior decompression.

**Conclusion:** Early decompression of cord by anterior approach in patient with grade III & grade IV paraplegia gives satisfactory results in terms of early recovery, short period of hospitalization, early mobilization & healing of the lesion. With this approach adequate exposure can be obtained and post operative rehabilitation of patients is better.

**Keywords:** Decompression, Pott's paraplegia, Anterior.

## INTRODUCTION

More than 30 million patients suffer from overt tuberculosis in the world today, of whom 2-3% have involvement of skeletal system. Spinal tuberculosis accounts for roughly 50% of all the cases and is the most serious form of skeletal tuberculosis. Untreated spinal tuberculosis leads to continued destruction of vertebral bodies and progressive deformity with potential for neurological deficit due to compression of the neural structures by caseous and granulation tissue.<sup>1-4</sup> Incidence of neurological involvement in spinal

tuberculosis is between 10 and 40% in most of the series.<sup>3,4</sup> Neurological involvement is more frequent in the cervicodorsal and the dorsal region.<sup>3-6</sup>

More than 50% of lesions occur in dorsolumbar region. Children show a higher incidence of cervical involvement than adults.

Pott's paraplegia, neurological complication is the most dreaded and crippling complication of spinal tuberculosis. Over all incidence of neurological involvement in spinal tuberculosis is between 10 and 40%. It is the commonest pathology responsible for paraplegia in developing countries.

Neurological involvement is more frequent in the cervicodorsal and the dorsal region. Dorsal lesion is also more prone to severe kyphosis and this leads to retropulsion of sequestered fragments of bone and disk

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into the canal.

The compression of the cord takes place primarily and maximally anteriorly in Pott's spine. Compression of spinal cord, which may be due to abscess, granulation tissue, or sequestered bone or disk material, is the usual cause of paraplegia.

In surgical treatment of Pott's disease, the anterior approach gives direct, wide access to the diseased area and through this approach it is possible to remove all pathological material and to make an accurate diagnosis.<sup>7-10</sup> The advantage of this operation is early healing of disease and no progress of kyphosis.<sup>11</sup>

### **MATERIAL AND METHOD**

This is a prospective study conducted on 13 out of 50 patients with Pott's paraplegia who presented to orthopaedic OPD, Jawahar Lal Nehru Medical College Hospital over a period twenty six months from Feb 2007 to April 2009. All the patients gave the informed consent prior being included into the study. The study was authorized by the local ethical committee and was performed in accordance with the ethical standards of the 1964 declaration of Helsinki as revised in 2000. The cases were carefully examined and assessed properly according to prefixed protocol prior to subjecting them to a definitive line of management. For patients with stage I and Stage II Pott's paraplegia conservative treatment was started. The surgical decompression was planned for stage III and stage IV Pott's paraplegia patients and for those, who did not respond satisfactorily to four weeks conservative treatment. Chemotherapy was given for a total duration of 12 months.

Thirteen patients were operated upon to decompress the spine. The decompression was carried out by anterior transthoracic approach in twelve cases and in one case with affection of cervical spine by anterior approach to cervical spine (C3 to C7) along with fusion with rib strut or iliac crest graft. Operated cases were initially followed up every two weeks for initial twelve weeks then every six weeks.

Results of treatment were graded as complete recovery, partial recovery, and no recovery on the basis of Shanmugasundaram (1982) criteria.<sup>12</sup>

### **SURGICAL TECHNIQUE**

#### **TRANS THORACIC APPROACH**

This approach is effective for disease of T2 to T12 vertebrae. The patient is placed in lateral decubitus position. Incision is made along the rib which crosses the mid axillary line, lies at the level of lesion or to resect the rib which is two ribs higher than the rib which arises at the apex of kyphosis.<sup>13,14,15</sup> The skin and subcutaneous tissue are incised from the lateral border of the paraspinal musculature to sternocostal junction. The wound is extended with the electrocautery down through the muscle layers to the thorax. After the chest wall is exposed, the ribs were counted from the twelfth up to the appropriate rib or from the first rib downward. Identification of the rib confirmed with a radiograph. The rib was removed and saved for bone graft. The parietal pleura was opened along the line of rib. The lung was retracted medially or deflated. The lesion is easily identified by surrounding abscess and abscess wall is opened by T shaped incision followed by a thorough debridement of the focus. Disease free cancellous iliac bone graft or rib graft placed for interbody fusion. The lung is visualized while fully expanded. Chest tube drainage is placed.

Chest physiotherapy encouraged and intercostal tube drainage removed third or fourth post-op day when ipsilateral lung expanded clinically. The patient is allowed sitting with brace on fourth or fifth post-op day.

For patient with Pott's spine C5-6 with neurological deficit, anterior approach to cervical spine (C3 to C7) was used.

### **RESULTS**

The maximum age incidence was in the range of 20-40 years. The male to female ratio was 0.8:1 (22 males and 28 females). The lower dorsal spine was most commonly affected, followed by dorsolumbar spine and upper dorsal spine. Most of the patients were having symptoms lasting between 3-12 months and pain was the commonest symptom before development of neurological deficit in these patients. Most of the patients in our study group were having grade IV paraplegia and only 15.4% were having grade III paraplegia. The pathological cause of cord compression was fluid pus, caseous material and granulation tissue in almost all

cases. In two cases cord was found angulated over the internal gibbus and stretched. Out of all patients of pott's paraplegia in our series, 70% patients responded well to conservative therapy. 13 patients who did not respond or deteriorated during conservative treatment were taken for surgical decompression by anterior approach. None of the patients in our study group, who subjected to decompression by anterior approach developed serious per-op complication.

After surgical decompression patients were recumbent for 3 to 4 weeks and were mobilized thereafter with their spine supported in brace. In our study group, complete recovery was seen in 61.5% and partial recovery was present in 15.4% patients. One patient deteriorated after surgical decompression and two patients did not recover after surgical decompression by anterior approach.

### SUMMARY OF PATIENTS TREATED BY ANTERIOR APPROACH

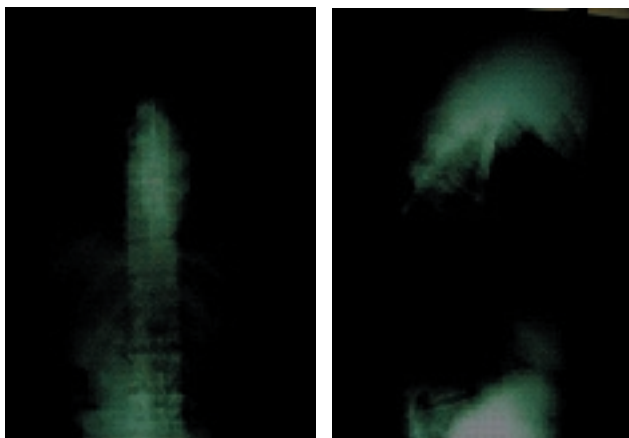
Case no	Age/sex	Duration of paraplegia	Grade of paraplegia	Level of involvement	Start of recovery of objective symptoms	Result of decompression by anterior approach	Follow up
1.	60 yrs/F	10 days	IV	T10-T11	3 days	Complete recovery at 6 months	25 month
2.	18 yrs/M	25 days	IV	T4,T5,T6	5 days	Complete recovery at 3 months	24 months
3.	45 yrs/M	10 months	IV	C5-C6	6 days	complete recovery	14months
4.	50 yrs/F	3 1/2 months	IV	T4,T5,T6	---	deterioration	12 months
5.	40 yrs/M	7 days	III	T7-T8	5 days	Partial recovery	15 months
6.	24 yrs/F	1 1/2 months	III	T11,T12,L1	3 days	Complete recovery at 7 months	21 months
7.	60 yrs/F	1 month	IV	T6,T7	6 days	Complete recovery	25 months
8.	30 yrs/M	1 year	IV	T4,T5,T6	4 days	complete recovery	14 months
9.	30 yrs/M	15 days	IV	T7,T8	30 days	Complete recovery at 7 months	25 months
10.	32 yrs/F	2 months	IV	T4,T5,T6	---	No recovery	15 months
11.	56 yrs/M	4 months	IV	T9,T10	2 days	Partial recovery	13 months
12.	70 yrs/M	7 days	IV	T8,T9	---	No recovery	13 months
13.	40 yrs/M	3 months	IV	T6,T7,T8	2 day	Complete recovery at 2 months	16 months

### DISSCUSSION

Pott's spine is the most common form of osteoarticular tuberculosis and if not managed properly, leads to permanent deformities and neural complications in the form of paraplegia or quadriplegia.<sup>1-4</sup>. It is well

established that a significant number of patients get satisfactorily controlled and cured with conservative treatment but it is also a fact that a large number of patients do not get cured and even worsen under conservative regime and requires surgical intervention.<sup>6</sup> Radical operation for spinal tuberculosis has been recommended

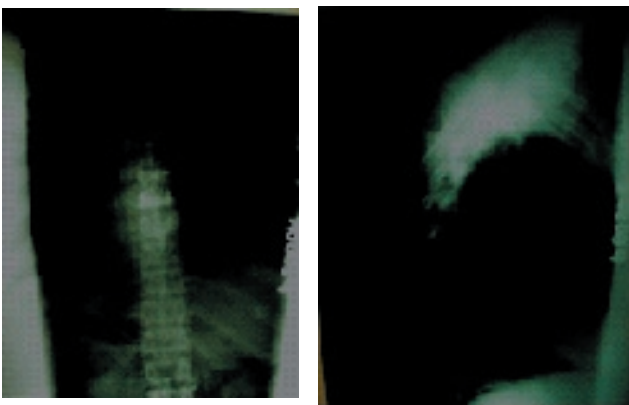
by many workers on the supposition that drugs are unable to gain access to skeletal tuberculous abscesses and necrotic bone (Wilkinson 1950,1955,1969, Orell 1951, Kondo & Yamada 1957, Hodgson et al 1960).<sup>16</sup> Hodgson and stock (1960), in their series decompressed the patients by anterior approach with neural recovery in 74% cases.<sup>17-19</sup> Konstam and Blesovsky (1962) treated patients with antitubercular drugs and operative for failure for paraplegia and showed recovery in 89% cases. Masalawala (1963) treated patients with focal debridement and bone grafting and showed neural recovery in 74.2% cases.<sup>20</sup>



I (a)

I (b)

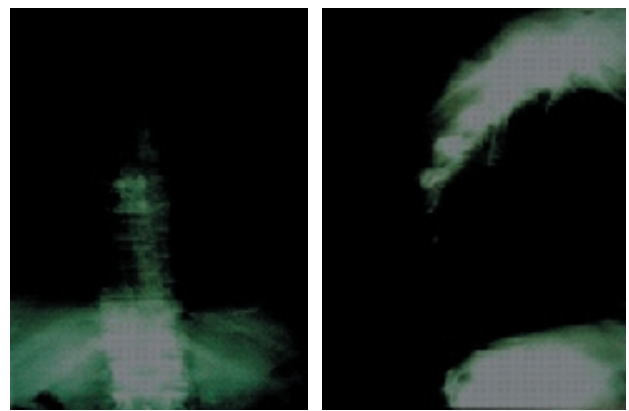
AP and Lateral Radiographs of sixty years old female with grade IV paraplegia with destruction of end plates of T6-7 with decrease in intervertebral disc space



II (a)

II (b)

Immediate post op Radiograph following transthoracic decompression and strut grafting.



III (a)

III(b)

Eight month post op Radiograph showing fusion of T6-7 vertebrae and incorporation of graft. This patient recovered complete neurologically.

Kirkaldy- Willis and Thomas (1965) treated their patients surgically by direct approach and neural recovery rate of 79%.<sup>21</sup> Kohli (1967) treated Pott's paraplegia patients with radical operation and antitubercular drugs and reported neural recovery in 84.4% cases.<sup>22</sup>

Other workers have shown similar results with conservative therapy, so it is arguable whether all case of paraplegia in active spinal tuberculosis should be treated by operative decompression.<sup>22</sup>

Anterior approach is an excellent approach which allows accurate visual assessment of the extent of disease. It allows complete evacuation of the abscess and decompression of the spinal cord in established paraplegia. Radiological healing occurs early and bony fusion is more frequent in patients treated by this approach. It provides direct access for decompression of anterior pathology and it more effectively deals with diffuse disease involving more than 3 consecutive levels. Pedicle is not removed so spine remains stable and exposure of midline lesion provides for repair of dural tears and perforation.

Although anterior decompression, strut grafting and instrumentation is currently recommended safe and effective method in treatment of tubercular spondylitis, we had limitation of using instrumentation in only one case while performing anterior decompression in our study

Hence it is evident that early decompression of the cord by anterior approach, in patients with grade III and grade IV paraplegia gives satisfactory results in terms

of early recovery, shorter period of hospitalization, early mobilization and healing of the lesion.

**Source of Funding:** Self

**Conflict of Interest:** None

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# Decomposition of Crude Death Rates for India and its Selected States - 1971 and 2011

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## ABSTRACT

The study of Mortality is an essential component for demographic studies and public health administration. When comparing the CDRs between any two situations, it is important to understand the contribution of various factors towards the difference in CDR; this can be done through the method of decomposition. The present study examine the decomposition of difference between CDR of India and some of its selected states from various zones of India for the period 1971 and 2011 for both sexes. We use Kitawaga (1955) decomposition method which gives an additive contribution of age compositional difference and age specific mortality rates. It has been found that Andhra Pradesh has the highest decline of CDR (4.81 points) for males which is due to the highest contribution of age specific mortality rate whereas Haryana for females (27.74 points) which is due to the contribution of both age specific mortality rates and age compositional difference. The outcome of the study at national and state level of India was rather meaningful as we observed the improvement of females' mortality rates over males.

**Keywords:** *Age compositional difference, Age specific mortality rate, Crude death rate, Decomposition*

## INTRODUCTION

Mortality study reflects the progress in quality of life through the improvements in health and nutritional status of people. Crude death rates (CDR) is one of the mortality measures which gives the total number of deaths per year per thousand populations. To study the change in crude death rates, it is important to understand the contributions of various factors towards the differences in CDR; this can be done through the method of decomposition. In demography decomposition methods are useful tool for comparing rates and means between groups with different composition. The principle of decomposition is that the difference in value between two indicators is divided – broken down – into several effects or components<sup>(13)</sup>. These techniques have been used in demography since the 1980s<sup>(15)</sup>. The decomposition methods are use to study the difference in demographic measures between two periods of time or two places. When comparing the difference between two crude death rates of two groups or same group with different periods, demographers are always been curious to identify the structural difference in population that might slightly or fully explain the differences<sup>(4)</sup> and for these since 1980's, decomposition method has been

used in demography<sup>(15)</sup>. The principle of decomposition is that the difference in value between two indicators is divided–broken down into several effects or components<sup>(13)</sup>. These techniques has been used to study the difference in demographic measures between two periods of time or two places. In demography, decomposition methods also follow this separation principle by dividing demographic variables into specific component<sup>(11)</sup>. Several decomposition methods have been proposed and Kitagawa's (1955) decomposition method is one of them. Kitagawa decomposition method focuses on the additive contributions of two components that sum up to the difference in their overall rates.

The historical record of India reveals that there has been a rapid demographic change over the years. Although India has witnessed a spectacular improvement in mortality situation, the changes in mortality conditions across its states has been different. One can make an attempt to study the contribution of different factors to the changes in crude death rates for India and some of its selected states belonging to different zones of India from 1971 and 2011 for both the sexes separately. An attempt may be made to compare the decomposition of crude death rate of India with United States of America and Sri

Lanka for the period 1971 and 2011 for both males and females separately. The difference between the male and female mortality rates can also be helpful to understand the gender gap.

### OBJECTIVES

The objective of this paper is to study the decomposition of crude death rate of India and some of its selected states from various zones of India (males and females separately) over the period 1971 and 2011. These states include Uttar-Pradesh and Madhya Pradesh from the Central, Kerala and Andhra Pradesh from the South, Maharashtra and Gujarat from the West, Punjab and Haryana from the North, Orissa and Assam from the East.

### DATA AND METHODOLOGY

The basic data required for this study are age specific death rates and proportionate age distribution of both males and females for the census periods 1971 and 2011. These data are taken from the Sample Registration

System (SRS). The SRS is a large scale demographic sample survey based on the mechanism of a dual record system with the objective of providing reliable estimates of birth and death. For studying the decomposition of difference between rates; we used Kitagawa (1955) decomposition method. Kitagawa's proposed decomposition is based on the difference between crude death rates, generally expressed as  $\Delta$ .

Notations:

$C_i^A$  = Proportionate age distribution of population for the period A.

$C_i^B$  = Proportionate age distribution of population for the period B.

$M_i^A$  = the set of age specific death rates for the period A.

$M_i^B$  = the set of age specific death rates for the period B.

For decomposition of differences between crude death rates (CDR), the formula used is as follows:

Here A and B refers to the period 1971 and 2011 respectively.

$$\begin{aligned} \Delta &= CDR^B - CDR \\ &= \sum_i C_i^B M_i^B - \sum_i C_i^A M_i^A \\ \Delta &= \sum_i \frac{C_i^B M_i^B}{2} + \sum_i \frac{C_i^B M_i^B}{2} - \sum_i \frac{C_i^A M_i^A}{2} - \sum_i \frac{C_i^A M_i^A}{2} \\ &\quad + \sum_i \frac{C_i^B M_i^A}{2} - \sum_i \frac{C_i^B M_i^A}{2} + \sum_i \frac{C_i^A M_i^B}{2} - \sum_i \frac{C_i^A M_i^B}{2} \\ &= \sum_i C_i^B \cdot \left[ \frac{M_i^B + M_i^A}{2} \right] - \sum_i C_i^A \cdot \left[ \frac{M_i^B + M_i^A}{2} \right] + \sum_i M_i^B \cdot \left[ \frac{C_i^A + C_i^B}{2} \right] - \sum_i M_i^A \cdot \left[ \frac{C_i^A + C_i^B}{2} \right] \\ &= \sum_i (C_i^B - C_i^A) \cdot \left[ \frac{M_i^B + M_i^A}{2} \right] + \sum_i (M_i^B - M_i^A) \cdot \left[ \frac{C_i^A + C_i^B}{2} \right] \end{aligned}$$

= Difference in age composition. [Weighted by average age specific mortality] +

Difference in rate schedules. [Weighted by average age composition]

= contribution of age Compositional difference to  $\Delta$  + contribution of rate schedule difference

to  $\Delta$ .

Where,  $\Delta$  refers to original differences of CDR for the period 1971 and 2011. While decomposing the difference between two crude death rates, we get the additive contribution of contribution of age compositional difference and rate schedule difference. The above methodology has been taken from Murthy P.K., Gandhi A.R. (2005).

## RESULTS AND DISCUSSIONS

Tables 1 and 3 represent the decomposition of crude death rates (CDR) of India and some of its selected states changes over the time period 1971 and 2011 and table 2 represent the decomposition of crude death

rates for United States of America and Sri Lanka for the period 1971 and 2011 for both sexes. In the tables the components of change are denoted as  $\Delta C_i$  and  $\Delta M_i$ , referring to the change in age compositional difference and changes in age specific death rates respectively. Figure 1 shows the original differences during the periods 1971 and 2011 and Figures 2 and 3 represent the contribution of age compositional difference and changes in age specific death rates for both sexes.

From table 1 we have observed that CDR of India for males in 1971 is higher than the CDR of 2011 by 4.09 points which indicate the decline of mortality rates in 2011 from 1971. In India both the factors contributes in opposite direction towards the changes.

**Table 1: Decomposition of CRD over the time period 1971 and 2011 for India and some of its selected states**

States	Decomposition of Crude Death Rate for males (1971 and 2011 )					
	CDR_1971	CDR_2011	$\Delta_{\text{Observe}} = \text{CDR}_{2011} - \text{CDR}_{1971}$	$\Delta C_i$	$\Delta M_i$	$\Delta_{\text{Estimate}} = \Delta C_i + \Delta M_i$
India	10.48	6.39	-4.09	0.66	-4.75	-4.09
Assam	11.99	7.29	-4.7	0.49	-5.2	-4.71
Gujarat	9.58	6.08	-3.5	0.86	-4.35	-3.49
Haryana	8.72	6.5	-2.22	2.96	-5.17	-2.21
Andhra Pradesh	12.15	7.34	-4.81	1.04	-5.85	-4.81
Kerala	9.15	6.16	-2.99	2.15	-5.13	-2.98
Madhya Pradesh	10.64	7.26	-3.38	0.14	-3.52	-3.38
Maharashtra	9.8	5.64	-4.16	0.96	-5.11	-4.15
Orissa	10.91	7.33	-3.58	1.18	-4.76	-3.58
Punjab	11.44	7.04	-4.4	11.84	-16.24	-4.4
Uttar Pradesh	7.28	7.38	0.1	1.4	-1.3	0.1

The change in age specific death rates account for 116 percent (-4.75/-4.09) towards the improvement of CDR but difference in age schedule account negatively -16 percent (0.66/-4.09) towards the improvement of CDR in 2011. We can say that the improvement of mortality rates of males in India mainly attributable to change age specific mortality of the population.

**Table 2: Decomposition of CRD over the time period 1971 and 2011 for United States of America and Sri Lanka.**

Males						
	CDR_1971	CDR_2011	$\Delta_{\text{Observe}} = \text{CDR}_{2011} - \text{CDR}_{1971}$	$\Delta C_i$	$\Delta M_i$	$\Delta_{\text{Estimate}}$
U.S.A.	0.0054	0.0041	-0.0013	0.00086	-0.0021	-0.0013
Sri Lanka	0.0067	0.0048	-0.0018	0.0011	-0.0030	-0.0018
Females						
U.S.A.	0.0066	0.0038	-0.0028	0.00058	-0.0034	-0.0028
Sri Lanka	0.0053	0.0025	-0.0027	0.0010	-0.0038	-0.0027

We have seen from the table 2 that CDR for males of the United States of America in 2011 is decreasing from 1971 by .0013 points and in Sri Lanka by .0018 points. In both the countries change in age specific death rates contributes towards the improvement of CDR in 2011 but change in age composition does not contributes towards the decrease of CDR in 2011. Though in India, there have been a significant decrease in CDR of males since 1971 but yet far behind as compared to U.S.A. and Sri Lanka in terms of crude death rates.

Also, it is significant to note that for males, the crude death rates of all the above mentioned states (except Uttar Pradesh) experienced an improvement of mortality rates in 2011 from 1971. In Uttar Pradesh the increase in CDR is due to an ageing process of the age structure of the population, seen in high positive value of the

component  $\Delta C_i$ . In all the above mentioned states both the factors contribute in opposite direction towards the differences. These decreases are due to the contribution of age specific mortality of the population, seen in high negative value of the component  $\Delta M_i$ . Among all the selected state, Andhra Pradesh has the highest decline of mortality rates by 4.81 points from 1971 and change in age specific mortality rates contributes 1.21% (-5.85/-4.81) to the original difference of 4.81 points. On the other hand change in age schedule account negatively i.e. -0.002% (1.04/-4.81) towards the original difference. It is found that among all the selected states of India, the contribution of age specific mortality of the population seems to be higher in Punjab during 1971 and 2011. Table 1 also shows that the observed and estimated change i.e.  $\Delta$  are identical.

**Table 3: Decomposition of CRD over the time period 1971 and 2011 for India and some of its selected states, Females.**

States	Decomposition of Crude Death Rate for females (1971 and 2011)					
	CDR1971	CDR2011	$\Delta_{\text{Observe}} = \text{CDR}_{2011} - \text{CDR}_{1971}$	$\Delta C_i$	$\Delta M_i$	$\Delta_{\text{Estimate}} = \Delta C_i + \Delta M_i$
India	11.532	5.025	-6.507	0.227	-6.733	-6.506
Assam	14.984	6.071	-8.913	-0.044	-8.868	-8.912
Gujarat	10.808	4.753	-6.055	0.404	-6.459	-6.055
Haryana	32.851	5.111	-27.74	-8.248	-19.491	-27.74
Andhra Pradesh	11.804	4.998	-6.806	0.389	-7.195	-6.806
Kerala	9.292	3.769	-5.523	1.406	-6.929	-5.523
Madhya Pradesh	12.659	6.157	-6.502	-0.628	-6.306	-6.934
Maharashtra	10.494	4.269	-6.225	0.587	-6.813	-6.225
Orissa	18.743	6.393	-12.35	-2.484	-9.865	-12.35
Punjab	8.378	5.685	-2.693	16.316	-19.009	-2.692
Uttar Pradesh	10.898	5.893	-5.005	-1.038	-3.966	-5.004

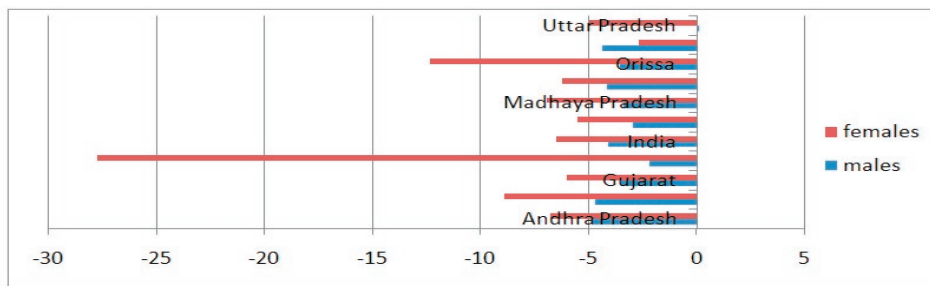
A similar trend as male has been observed in case of females in India as well as the states under study. A look at table 3 reveals that for females in India the change in age specific mortality rates account for 103 percent (-6.73/-6.50) towards the improvement of CDR but difference in age schedule account negatively i.e. -3.48 percent (0.22/-6.50) towards improvement of CDR in 2011. Therefore we can say that the improvements of mortality rates of India from 1971 are mainly due to change in the age specific mortality rates. We have also seen from the table 2 that CDR of female population of United States of America in 2011 decreases by .0038

points and Sri Lanka by .0025 points. Change in age specific death rates contributes towards the improvement of mortality during these periods in both the countries. Here we have seen that crude death rate of USA and Sri Lanka for the year 1971 and 2011 was seems to be much less than the crude death rates of India for both the sexes. The improvement of CDR of USA and Sri Lanka may be due to an improvement in nutrition, advance in clinical medicine, access to health care, educational level, standard of living which have an important effect on reducing CDR of both the sexes as compare to India.

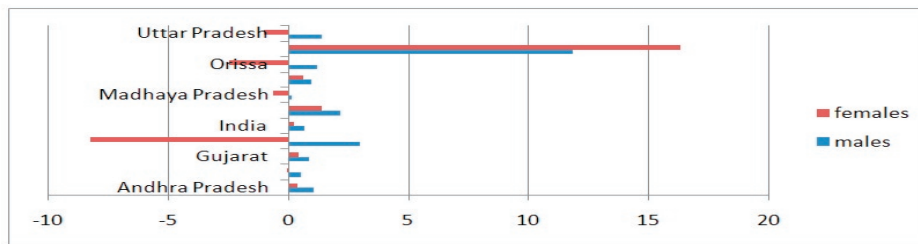
It is seen that among all the selected states of India, for females Haryana experienced a huge decline of crude death rates from 1971 which is due to the contributions of both the changes in age specific death rate and age compositional difference which account -70.25 percent (-19.49/27.74) and -29 percent (-8.24/27.74) respectively. In this case along with change in age specific death rate, age compositional difference also contributes towards the improvement of mortality rates in 2011. In Assam, Haryana, Madhya Pradesh, Orissa and Uttar Pradesh both the factors contributes in same direction to the improvement of mortality rates. We can say that the changes in population age structure exert a significant influence on the improvement of CDR from 1971. On the other hand in Andhra Pradesh, Gujarat, Kerala, Maharashtra and Punjab, only difference in age specific death rates contributes to reduce difference in CDR in 2011.

From the above discussion we have seen that CDR is changing over the years in India and its states. It has been observed from figure 1 that India and all its selected states had the highest improvement of crude death rates in female as compare to males in 2011. From figure 3 we have seen that change in age specific death rates contributes dramatically towards the improvement of mortality difference of India and its selected states for both sexes. On the other hand for some specific states only, age compositional difference contributes towards the improvement of mortality for both sexes from 1971. The changes in economic, social, and sanitary conditions first trigger an important decline in infant, child, and early adult mortality, which may contribute to the improvement of mortality rates over the 40 years period.

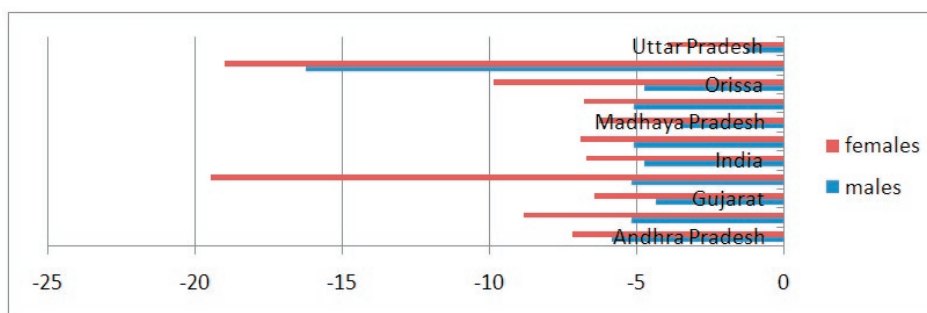
**Figure 1:** Original difference for male and female (1971 and 2011).



**Figure 2:** Contribution of age compositional differences  $\Delta C_i$  (1971 and 2011).



**Figure 3:** Contribution of age specific rates difference  $\Delta M_i$  (1971 and 2011).



## CONCLUSIONS

The objective of the study was to compare CDR of some population with two different periods. To explain these differences, Kitawaga decomposition method is a useful method which decomposed the differences in mortality rates into the contributions of rates schedules difference and age compositional differences. In order to accurately explain population phenomena, demographer usually separate the variables into smaller parts and these parts are study separately. We generally observed the improvement of mortality rates for all states including India. The decrease in mortality in all states was mostly determined by contributions of mortality among infants and children. This highlights the scenario of mortality improvement at national and states level over the past 40 years from 1971.

**Ethical Clearance:** We have used secondary data, so the case of ethical clearance might not be arise.

**Source of Funding:** Self

**Conflict of Interest:** Nil

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# Exploratory Study on Tobacco Use among Adolescents

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## ABSTRACT

**Background of the study:** The increasing burden of tobacco-related diseases, particularly oral cancer, in India bears a direct association to the increase in consumption of a wide range of tobacco products. Adolescents are the most vulnerable section of the population exposed to tobacco use.

**Objective :** to explore the extent of use of tobacco use among adolescents ,knowledge and attitude of adolescents towards smoking

**Materials and method:** A descriptive survey design was used for the study. The sample consisted of 200 adolescents studying in plus one and plus two of a selected private higher secondary school of Ernakulam District, Kerala. Data were collected using Global Youth Tobacco Survey (GYTS) questionnaire. The data obtained was analyzed using descriptive statistics .

**Results:** Out of 200 subjects, 44(22%) subjects used cigarettes even one or two puffs during their life time. Majority 22(50%) of them used tobacco for the first time between the age of 14-15 years. Approximately 22% of the students stated that they live in homes where family members smoke in their presence and nearly half of the students (44%) are around others who smoke in places outside their home. Majority of them 137(68%) have average level of knowledge and 38(19%) have good level of knowledge regarding smoking. More than half of the ever smokers (57.1%) reported that they want to stop the tobacco use but 42.9% said that they don't want to stop tobacco use

**Conclusion:** The findings of the study show that tobacco addiction is emerging as a big threat among adolescents. There is urgent need for implementation of the comprehensive tobacco control program.

**Keywords:** adolescents, Global Youth Tobacco Survey (GYTS), tobacco use, knowledge, attitude.

## INTRODUCTION

Tobacco use is one of the major preventable causes of premature death and disease in the world <sup>1</sup>. The World Health Organization (WHO) attributes approximately 5 million deaths a year to tobacco. The number is expected to exceed 10 million deaths by 2020, with approximately

70% of these deaths occurring in developing countries<sup>2</sup>. Nearly 70% of the world's smokers live in low and middle-income countries <sup>3</sup>.

India is the second largest consumer of tobacco in the world. The tobacco situation in India is unique because of a vast spectrum of tobacco products available for smoking.<sup>4</sup> In India, it is estimated that one million deaths occur due to tobacco every year. If left unchecked, it is projected that the mortality due to tobacco consumption will rise to 1.5 million by 2020.<sup>5</sup> The increasing population, easy availability of cheap tobacco products, and weak enforcement of existing regulations are some of the factors that contribute to the increase in tobacco consumption. <sup>6</sup>

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The annual deaths due to tobacco use in Kerala can be estimated to be close to 24,000. <sup>7</sup>Oral cancer is the most common form of cancer in India and accounts for a major proportion of cancer-related deaths among men<sup>8</sup>. It is known that tobacco addiction among the majority of adults was initiated during their adolescence. <sup>9,10</sup> The survey conducted in Tamil Nadu among school students of classes 8-10 under the Global Tobacco Survey initiative found that 7% of students reported using tobacco in some form.<sup>11</sup> Similar to other states of India, in Kerala too adolescents are the most vulnerable section of the population exposed to tobacco use. This is mainly attributable to easy accessibility and availability, less social stigma, and weak legislation.<sup>12</sup>

In India alone, nearly 1 in 10 adolescents in the age group 13–15 yr have ever smoked cigarettes and almost half of these report initiating tobacco use before 10 yr of age.<sup>13</sup> Recent studies have found that tobacco use is increasing among school children in India and a sizeable proportion of them experiment with drugs quite early in life<sup>14</sup>. Among the youth, late adolescents belonging to 16–19 years age group are particularly vulnerable due to increasing academic pressures, encouragement by peers, lure of popularity, and easy availability.<sup>15</sup>

A number of factors are found to influence the use of tobacco by adolescents. Some of these are the family history of tobacco use by elders, peer influence, experimentation, and easy access to such products along with personality factors and underlying emotional and psychosocial problems<sup>16</sup>.

The prevention of tobacco use in young people appears to be the single greatest opportunity for preventing non communicable disease in the world today. Addiction to tobacco and harmful non tobacco products by youth is assuming alarming proportion in India .<sup>13</sup> The early age of initiation underscores the urgent need to intervene and protect this vulnerable group from falling prey to this addiction.

## MATERIALS AND METHOD

### Study design, sample and setting

The present study used a descriptive survey design to collect the data. The sample consisted of all the students studying in plus one and plus two of a selected private higher secondary school of Ernakulam District, Kerala. Informed consent was taken from the head of the school

and an ascent was taken from the students. Participation in the study was voluntary. A total of 200 students took part in the study. **Data collection instruments**

#### 1. Tool I- Demographic data

**2. Tool II- GYTS (Global Youth Tobacco Survey) Questionnaire.** The Global Youth Tobacco Survey (GYTS) questionnaire is a school-based tobacco survey, designed to gather information about the tobacco use among adolescents.

#### Data analysis

Data were optically scanned and entered into SPSS version 19 .Data were analyzed with descriptive statistics.

#### Ethical consideration

Permission had been taken from the research committee of Amrita College of Nursing and Thesis Review Committee of AIMS,Kochi. Consent was obtained from the head of the schools and an assent was taken from the students prior to data collection.

## RESULTS

### Section 1: Socio-demographic characteristics of the subjects

**Table 1. Distribution of subjects based on socio-demographic characteristics n=200**

Sl.No.	Demographic variables	Frequency	Percentage
1	Age (in years )		
	15-16	93	46.5
	17-18	107	53.5
2	Gender		
	Male	104	52
	Female	96	48
3	Education		
	Plus one	81	40.5
	Plus two	119	59.5
4	Religion		
	Hindu	124	62
	Christian	64	32
	Muslim	12	6
5	Income		
	<1000	64	32
	1000-3000	101	50.5
	3001-5000	10	5
	>5001	25	12.5
6	Type of family		



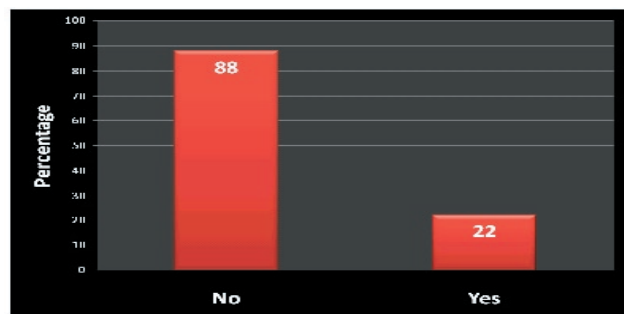
**Cont... Table 1. Distribution of subjects based on socio-demographic characteristics n=200**

	Nuclear	180	90
	Joint	10	10
7	Occupation of father		
	Skilled jobs	79	39.5
	Unskilled jobs	121	60.5
8	Occupation of mother		
	Cooli	22	11
	Tailor	4	2
	Homemaker	171	85.5
	Others	3	1.5
9	No. of siblings		
	0	20	10
	1	154	77
	2	23	11.5
	3	3	1.5

Out of 200 adolescents, half of the subjects 107(53%) were in the age group of 17-18 years of age and also were males 104(52%). Of the total subjects 119(59.5%) were studying in plus two. Majority of them 124(62%) were Hindu by religion and were from nuclear family 180(90%). Considering the occupation of the parents, 121(60.5%) of fathers were doing unskilled jobs and majority 171(85.5%) mothers were homemakers. Majority of them were single child of their family i.e 154 (77%).

**Section 2. Exploring use of tobacco among adolescents**

**a. Use tobacco by adolescents n=200**



**Figure 1 : Adolescents who ever used cigarettes even one or two puffs**

Figure 1 depicts that 44(22%) of the subjects used cigarettes even one or two puffs during their life time.

**b. Age of initiation of smoking by adolescents**

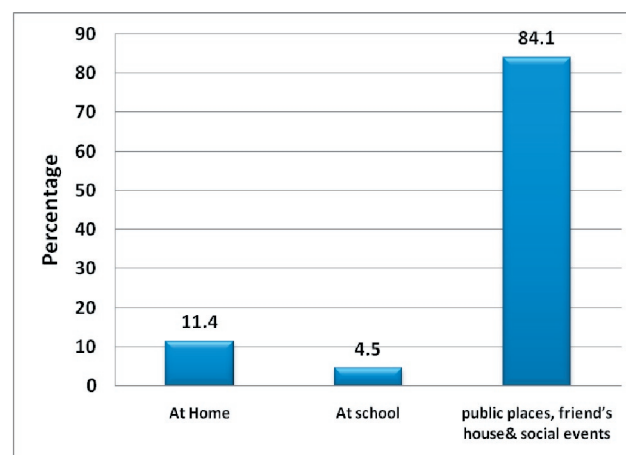
Out of 200 adolescents, 44 of them used cigarettes even one or two puffs during their life time. Majority

22(50%) of the subjects used tobacco for the first time between the age of 14-15 years. Others used tobacco for the first time above 16years of age i.e. 9(20.5%), 8(18.2%) of them between the age of 12-13years, 3(6.8%) of them between the age of 10-11years and 2(4.5%) of them used between the age of 8-9 years .

**c. Access and availability of tobacco among current smokers**

Majority of the adolescents 19(67.8%) reported that they are getting cigarettes from shops. Four of them getting it from some other person and 5 of them from other sources. Only 11 (25%) reported that the shop keepers refused were refused to give cigarettes because of their age and majority of the adolescents 33 (75%) reported that they didn't get any refusal form shop keepers for buying cigarettes because of their age.

**d. Place of smoking of the ever smokers n=44**



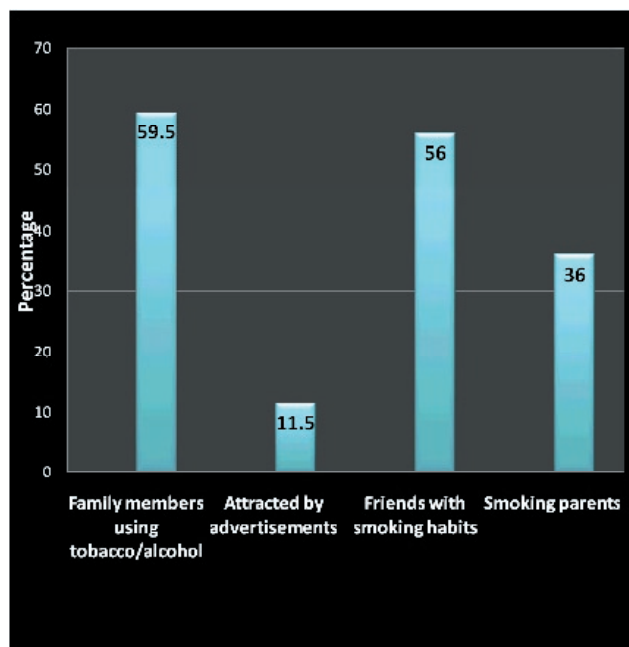
**Fig:2 Place of smoking of adolescents**

In order to get indication of venues where adolescents smoke, participants were asked where they smoke. Majority of them 37 (84.1%) smoked in other places such as public places ,friend's house and during social events. Five of them 5(11.4%) smoked at home and 2(4.5%) of them smoked at school.

**e. Exposure to second hand smoke**

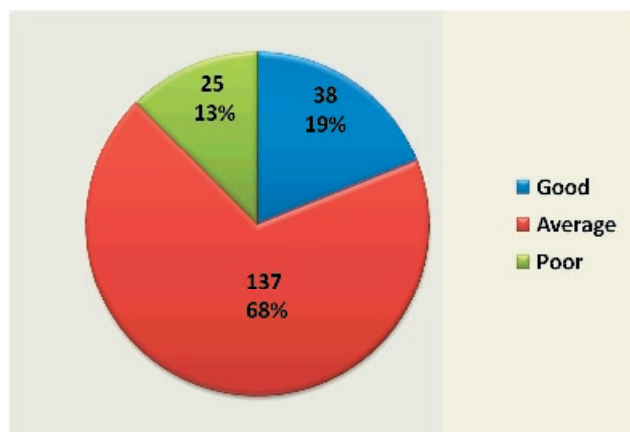
Approximately 22% of the students stated that they live in homes where family members smoke in their presence and nearly half of the students (44% ) are around others who smoke in places outside their home.

**Section 3: Risk factors of smoking n=200**



**Fig.3. Opinion of subjects regarding risk factors of smoking**

Figure 3 depicts the opinion of subjects regarding risk factors of smoking. Majority of them 119(59.5%) expressed the use of tobacco/alcohol by family members and 112(56%) as having friends with tobacco use as the main risk factors for smoking. The other risk factors were having parent with smoking habit 112(56%) and attracted by advertisements 23(11.5%).



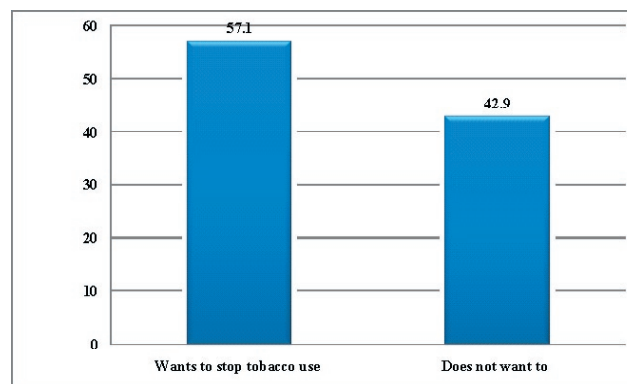
**Section 4. Knowledge of adolescents regarding smoking n=200**

**Figure 4: Knowledge level of adolescents regarding smoking**

Figure 4 depicts the knowledge level of adolescents regarding smoking. Majority of them have 137(68%) average level of knowledge and 38(19%) have good level of knowledge regarding smoking. Twenty five of them (13%) had poor knowledge regarding smoking.

**Section 5. Attitude of adolescents towards smoking**

**5a. Attitude towards quitting tobacco use n=44**



**Figure 5: Attitude of ever smokers towards quitting tobacco use**

More than half of the ever smokers (57.1%) want to stop the tobacco use but 42.9% of them said that they don't want to stop tobacco use

**5b. Attitude towards people who smoke**

Majority of the adolescents expressed the opinion about a man who smoke was that they lack confidence (35.5%), he is a loser(32%) and he is stupid(32%). Only 10% of them viewed person who smoke as a real man. Similarly their outlook towards women who smoke was that she is a loser (28.5% and lacks confidence (26.5%). Interestingly 15.5% of the adolescents considered women who smoke as a sophisticated.

**DISCUSSION**

Tobacco is a major public health problem. Unfortunately, tobacco use is on the rise in several developing countries including India.<sup>17,18</sup> The present study explored the extent of use of tobacco, level of knowledge regarding harmful use of tobacco and risk factors of tobacco use among adolescents studying in a higher secondary school of Ernakulum, Kerala. Present study shows that out of 200 subjects 44(22%) of them used cigarettes even one or two puffs during their life time. Among the 44, 28(63%) of them were current users. Similarly, the study from Chennai reported a higher use of tobacco (41.6% ever users and 46.3% current users) among boys.<sup>20</sup>

In the present study majority of the subjects 22(50%) used tobacco for the first time between the age of 14-15 years. This finding was consistent with that observed in developed countries. Among the Indian studies, the

mean age of initiation of tobacco use has been found to vary from 8 to 15 yr.<sup>23</sup> Majority of the tobacco users worldwide have reportedly first tried tobacco prior to age 18, some starting as young as 10 yr.<sup>24</sup> In a study from Kerala the mean age at initiation was 10.7 yr for boys.<sup>25</sup>

In our study majority of the adolescents 119(59.5%) expressed the use of tobacco/alcohol by family members and 112(56%) as having friends with tobacco use as the main risk factors for smoking which is similar to observations from studies in Delhi (38%) and Mumbai (46%).<sup>3,5 19,21</sup>

Most (87%) of the students in this study were having good(19%) to average(68%) knowledge regarding the harmful effects of tobacco use Studies from Delhi<sup>21</sup> and Jaipur<sup>22</sup> and have shown that 99.2% and 80% of students respectively were aware of the harmful effects of tobacco use on health.

Another observation of great significance is that of exposure to environmental tobacco smoke among adolescents is 22% at home and 44% places outside their home. These findings are supported by a similar study conducted in North Indian states where exposure to environmental tobacco( ETS) smoke amongst youth that varied between 10 to 34% at home and 24 to 43% outside home. ETS exposure is important for its harmful cumulative effects. Moreover, any kind of tobacco use by the parents and/or sibs is also a trigger or an incentive for the youth to start and/or continue smoking. Parents significantly constitute a role model in the development of youth. Their smoking behaviour is obviously a bad trendsetter for the children.<sup>17</sup>

### CONCLUSION

The findings of study give insight into the implementation of the comprehensive tobacco control program in different levels. Health education programs on ill effects of tobacco should be started in early age. These programmes should root from the school level because adolescent is the period of development of these kind of risk behaviours. Design and implement programs that help adolescents to quit smoking. Regular and systematic education programmes catering to teachers, children and also their parents should be undertaken. Teachers can play vital role in educating the young minds regarding life style disorders like tobacco and alcohol use within the community.

### Financial Support : Self

**Conflicts of Interest :** There are no conflicts of interest

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# Explore the Motives of Organ Donation

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## ABSTRACT

**Introduction:** The transplant waiting list has increased seven fold during the last 20 years with increasing number of patient's death in need of an organ abruptly. The motives and decision making of living donors are critical areas for transplant, yet these topics remain relatively unstudied. The objective of the study was to examine the motives for organ donation as experienced by the donors.

**Materials and method:** A qualitative descriptive phenomenological study was conducted among living donors in AIMS, Kochi. Ten living donors voluntarily participated in two staged unstructured in-depth interview. The interviews were tape recorded and transcribed and analyzed to facilitate the development of themes.

**Results:** The major themes identified were the real motives core to the decision to donate, the factors influenced which had the controlling power over the decision to donate, the concerns before the donation, responding about the feeling of donation, categorizing the live donors. Based on the content analysis, the units identified and evolved into subthemes which were utilized to generate main themes. Majority of the donors were relationship oriented donor, whose major motives were desires to relieve the suffering and save the life of their loving ones. **Conclusion:** The donor motives are complicated and influenced by multiple factors. This study helps us to identify the donor motives and factors affecting their motive and decision making. By deriving the motives many more intervention to improve the willingness to be a living organ donor can be evolved.

**Keywords:** motive, explore, donor, organ donation

## INTRODUCTION

Solid organ transplantation from a live organ donor is an ethically acceptable and widely used practice that affects not only the transplant recipients, but also the healthy volunteers to donate and whose interests are equally important.<sup>1</sup> Each year, hundreds of people die while waiting for an organ transplant. There is a

shortage of organs, and the gap between the number of organs donated and the number of people waiting for a transplant is getting larger.<sup>1</sup>

The motives and decision making of living donors are critical areas for transplant. Most donors are likely to be motivated by multiple factors, intrinsic factors (ex: desires to relieve the suffering) and extrinsic factors (ex: social pressure) that may operate simultaneously, differ depending on whether and how the donor is related to the recipient.<sup>2</sup> The process of transplantation with living donor is not simple because it involves ethical issues. These factors can affect the family system that suffers great impact, because the family faces dilemma both possibility of organ removal from a healthy relative, surgical risk such as feeling responsible to ensure patient survival.<sup>3</sup>

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Almost 1.5 lakh people in India need a kidney; however, only 3000 of them receive one. Only 1 out of 30 people who need a kidney receive one. 90% of people in the waiting list die without getting an organ. India's annual liver transplant requirement is 25,000, but only about 800. 70 % liver transplants are taken care of by a live donor, but 30% are dependent on cadaver donations.<sup>4</sup>

India is facing an acute shortage of organ donors due to prevalence of myths and superstitions, and the country should bring in changes to organ donation laws to alleviate the situation. Thus it is important to understand the expectation of other people involved in donating and the acceptance of the organ by the recipient. This study, accordingly, was conducted to examine the motives for organ donation as experienced by the donors.

## **RESEARCH METHODOLOGY**

### **Design**

This is a qualitative study. The design used is descriptive phenomenological approach, to analyze and study the emotions and experiences of the live organ donors. The phenomenological method focuses on cases which are aware of but do not have a thoroughly and detailed understanding about. The descriptive phenomenology stimulates the perception of lived experiences while emphasizing the richness, breadth and depth of those experiences.<sup>5</sup> The research question was "what are the motives for donating the organ by live donors to someone who is in a necessity of transplantation?"

### **Participants**

Total of 10 living donors based on the inclusion criteria between the age 20- 65 years, who came for follow up at OPD, AIMS, Kochi were purposively selected. The sample was selected until it reached the data saturation. Six live kidney donors and four live liver donors had participated in the study.

### **Data collection**

The study data were collected by two staged in-depth unstructured interview. All of the interviews occurred in renal and liver transplant OPD of AIMS, Kochi and lasted for 20-30 min. Each participant was asked open ended questions like

1. Can you tell about the reasons why you have chosen to donate the organ?
2. How has your decision to donate influenced your life?
3. What are the core feelings while the decision was made and undergoing pre-assessments of organ donation?

Interviews were tape recorded and transcribed. The researchers did not have any interference with the answers of the participants. The researchers made coding regarding data obtained from interview separately and were compared. The coding was reliable and consistent. All the results were given directly without any comment in-order to increase the internal reliability of the study.

## **ETHICAL CONSIDERATION**

The research proposal was presented before the Research Committee of Amrita College of Nursing and was approved. The Ethical Committee of Amrita Institute of Medical Sciences, Kochi granted the permission to conduct the study. Informed consent was obtained from the participants before the study instructing the name, purpose, duration and format of the study. The participants were also reminded that they could leave the study at will.

## **DATA ANALYSIS**

A qualitative content analysis was done to the transcribed tape recorded data using Modified Colaizzi's Analysis framework to facilitate the development of description of meaning. The feedback of the live donors was read by both researchers. The provided reactions, clarifications and comments were encoded individually, then discussed and analyzed in detail until researchers came to an agreement. The data analyzed was carefully evaluated and interpreted by the researchers to produce common and meaningful statements. The researchers found five common themes after negotiation and clarification of the meanings of statements.

## **FINDINGS**

The findings of this study are presented as themes and subthemes identified from the feedback of the participants. The four main themes identified in this study were:

1. The real motives core to the decision to donate.

2. The factors influenced which had the controlling power over the decision to donate.
3. The concerns before the donation.
4. Responding about the feeling of donation.
5. Categorizing the live donors

**Theme 1: The real motives core to the decision to donate.**

Each participant narrated their own reasons for donation as they experienced. First theme identifies the core motive that ended in firm decision to donate. All donors under the study experienced intrinsic motivation. Four subthemes evolved were a wish to help, a wish to help only loved ones, self -benefit from recipients improved health.

A wish to help.

Two participants developed an inner desire which was critical for decision making and were ready to donate to anyone in need.

“I heard about a year before I did the donation. From that time onwards I had a desire to donate my organ to someone.”

A wish to help only loved ones.

Five participants donated only because of their special consideration and love towards the recipient. Affection towards recipients brought them to the decision rather than the feeling of obligation. These participants would not be donated for another person other than their loved ones.

“When I heard of the organ donation first, I thought only about saving my child’s life at any cost and her recovery”

“I came forward and asked the doctor to test mine. The only reason I want to save my husbands’ life at any cost”

“My husband should return to life. That’s my only wish. I want my husband back.”

Self-benefit from the recipient’s improved health

As they themselves get benefited, three participants donated to recipients who are their immediate relative. For them, they could never imagine the donation to

anyone other than their immediate relatives so that the whole family system gets balanced again without losing the member.

“I was not willing to donate to anyone else other than my husband”

“I was neither imagined nor wished to donate. I thought of this idea when such a situation came for my husband otherwise not at all”

“I donated because she is my little girl otherwise I would never think of it seriously”

**Theme 2: The factors influenced which had the controlling power over the decision to donate.**

It is found that relational ties were a core factor influenced by the participants except for two. Most of the donors and recipient are relatives. Religious belief of each donor influenced considerably in the decision to donate.

“Saving one’s life is a great thing according to our religion”

The ambivalence, the feeling of donating and non-donating at the same time, was felt by one of the participants. All the decision was taken immediately to save the life of the recipients

“I couldn’t take a decision at first worrying whether I’m fit or not, I can or not”

Previous knowledge regarding organ donation from media influenced the decision of participants who had no relational ties. For others little knowledge was there before confronting such a situation.

“I heard about organ donation for the for the first time, when I came to knew about my sister’s condition”

“I came to know more about donation from media.”

**Theme 3: The concerns before the donation**

One of the donor was worried of disfigurement caused by the body post donation, which was relieved by the health care team member through effective teaching and clarification and by the shared experience of previous donor. Initially, the fear was experienced by some of them. Some family concern involved about donation from healthy person to a critically ill patient, thought of procedure failure and financial constraints.

“I was afraid when I heard it for the first time.”

“At the beginning my family were not supporting. They were worried about my health after donation”

“I thought there will be disfigurement of body and change of posture, look like a sick person”

**Theme 4: Responding about the feeling of donation.**

All the participants were happy and satisfied after donation. They were feeling a sense of proud and worthiness.

“I can say that I’m very much satisfied, feeling positive after donation.”

“I’m very happy because my son is saved”

The participants claimed that they got recognition in family and community and their relationship grew deeper after donation and there was no feeling of regret by any of them on their decision.

“a strong emotional bond developed in our family”

“I am so happy that my sister got her life back and our family feelings also grew deeper. I know she is there for me and I am there for her”

“people are showing more caring and sincere attitude to me.”

All the donors had given a positive message to those who are preparing for the donation

**Theme 5: categorizing the live donors**

All donors narrated their feeling of doing something immediately for the recipients who were fading away. The donors were categorized in accordance with their nature of motives behind the donation. Each donor narrated how their desire was, its nature and its role in the decision making. The categories identified are altruistic donor, relationship oriented donor, self-interested donor. For an altruistic donor, the motives behind was a wish to help. Self-interested donor focuses on their own benefits. Thus the motive found was self-benefits from the recipients’ improved health. A wish to help only loved ones was served the real motive behind the relationship oriented donor.

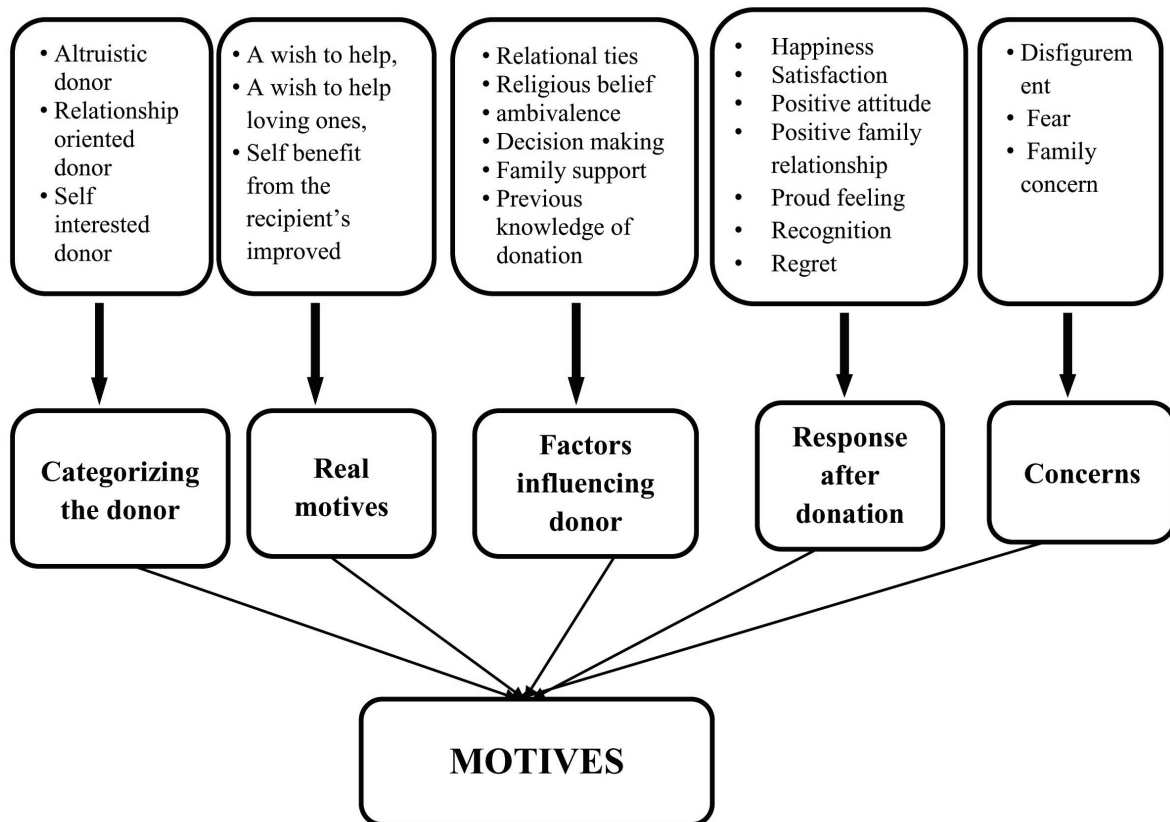


Figure 1: Illustration showing the themes and subthemes of this study



## DISCUSSION

Donor motives are complex. It is influenced by many factors many concerns raised also influenced the donors' motivation to take the decision to donate. The nature of the real motive behind the donation categorizes the donors.<sup>6</sup> The relationship of the donor to the intended recipient plays a significant role in donor motivation for decision making. The immediate relatives were more motivated toward organ donation.

In this study the main reason for donation was they wanted to save the life of recipient and to alleviate the suffering of the recipient. Most of the donors are immediate relatives. The categories of donor identified are relationship oriented donor, altruistic donor, self-interested donor. This study shows that most of the donors took the decision to donate only when they faced such a situation. Family concerns, fear, ambivalence, thought of disfigurement, previous knowledge, relational ties and religious belief had a great influence. All the donors gained a positive outlook and their family relationship grew deeper after donation and had no regrets. The real motives were a wish to help, self-benefit from recipients' improved health, a wish to help only loved ones which showed the pathway for categorizing the donors.

Annette Lennerling et.al, in 2004 conducted a qualitative descriptive study on "Motives for becoming a living kidney donor" in two transplant centers in Sweden and one in Norway using a questionnaire sent to 207 potential kidney donors undergoing evaluation for kidney donation<sup>4</sup>. An in-depth interview was conducted. The study showed the strongest motives to become a donor were a wish to help, self-benefit from recipients' improved health. In contrast, a sense of guilt regarding the past relationships, pressure from other religious motives and increased self-esteem were rare or weak incentives for donation.<sup>7</sup> In this study, the findings showed the same kind of motives with varying degree of their effect on decision to donate

Michelle J Irving et.al, in 2011, conducted a systematic review on "Factors that influence the decision to be an organ donor". A thematic synthesis of the results and conclusions reported by the primary authors was performed with eighteen qualitative studies that explored community attitude towards living and deceased organ donation involving 1019 participants. The factors identified were decision to be an organ

donor was influenced by relational ties, religious belief, cultural influences, family influences, body integrity, previous interaction with the health care system-medical mistrust, validity of brain death and fear of early organ retrieval, the individuals' knowledge about organ donation process and major reservations about the process of donation even in those who support organ donation.<sup>8</sup> In this study, some of these factors are identified similarly.

By analyzing various motives, it is useful in creating awareness, developing right attitude towards organ donation and formulate interventions to improve the willingness to be a living organ donor. This study highlighted the motives for organ donation among live donors. In the light of this study, the covert motives become overt through the narration of experiences by the participants.

## LIMITATIONS

Limitations of this study pertained relying on participants' memory of past events. Despite this fact, study participants readily remembered their experiences in detail. Furthermore, the sample had limited racial and ethnic diversity.

## CONCLUSION

From the findings of the present study and in the light of available literature it can be concluded that donor motives directly contribute to their decision to donate, is not uniform and is influenced by multiple factors. Majority of the donors were relationship oriented donor, whose major motives were desires to relieve the suffering & save the life of their loving ones. Creating awareness to the organ donation will directly influence the donor motives and willingness. By deriving the motives many more intervention to improve the willingness to be a living organ donor can be evolved. Recruitment of living donors represents a medical and moral responsibility. The possibility of organ removal from healthy donor to a recipient needs great inner motivation. Saving one's life is divine.

**Conflict of Interest:** There are no conflicts of interest

**Funding:** The source of funding is self

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# Application of Lot Quality Technique for Immunization Coverage and Quality Assessment

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## ABSTRACT

**Background:** India's universal immunization programme is the world's largest. It caters to 27 million infants, 30 million pregnant women and 9 million routine immunization sessions organized annually. 4,00,000 children were saved every year. Still out of 27 million children born every year, 7.2 million children miss out basic vaccines that could mean the difference between life and death. If vaccination programs do not reach these children, they are also unlikely to receive other needed health services. **Objectives:** To estimate the immunization coverage, quality of services and to know the reasons for partial/un-immunization by using lot quality technique. **Material and Methods:** It was a community based cross-sectional study conducted in 9 villages under the rural field practice area of DR.PSIMS&RF, which caters its services to 31,420 people. Using LQT 279 children in the age group of 12 to 23 months were selected for study. The study was done for a period of 6 months from November 2014 to April 2015. Data was entered and analyzed using SPSS version 19.0. **Results:** Data shows that more children meet the fully immunized criteria than the quality criteria. The performance of the lots was considered good and all lots were accepted.

**Keywords:** Lot Quality Technique, Immunization Coverage, Quality Assessment.

## INTRODUCTION

According to the WHO manual on 'Monitoring Immunization services using Lot quality technique', in addition to its capabilities as an assessment and supervisory tool the Lot quality technique (LQT) can be used to survey coverage.<sup>1</sup> It is used to determine whether a group (lot) has achieved a particular standard of performance by looking at some members (a lot sample) of the group. It is not necessary to interview every child in a community, for example, to find out whether immunization coverage is at acceptable level, collecting data from a small number of target group may

be sufficient. With LQT, you can find out how lots in an area performing and judge whether that performance is acceptable in each lot or whether improvements are needed. When data is aggregated from all lots, coverage for the total area can be estimated. When compared with most commonly used EPI 30 cluster survey that does not permit data on individual clusters to be interpreted and Data from clusters can be used only in aggregate to evaluate the total area surveyed. In LQAS data do not have to be collected from all units before action can be taken. Populations of less than 30,000 can also be studied.

In countries like India where people do not have access to safe water and adequate sanitation, immunization is one of the most cost effective public health interventions as it provides direct and effective protection against preventable morbidity and mortality. It has been a major contributor in the decline of under-5 mortality rate over last five decades in India. According to the Coverage Evaluation Survey (CES), conducted during November 2009 to January 2010 by UNICEF,

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the national full immunization coverage against the six vaccines included in UIP in the age group of 12-23 month old children was 61% and in Andhra Pradesh (AP), the full immunization coverage was 68%. At the national level coverage of FI was higher in urban areas (67.4%) compared to that in rural areas (58.5%)<sup>2</sup>. Still out of 27 million children born every year, 7.2 million children miss out basic vaccines that could mean the difference between life and death. If vaccination programs do not reach these children, they are also unlikely to receive other needed health services<sup>3</sup>. As there is a need to assess the immunization status of children in rural areas, the present study was undertaken by using lot quality technique to estimate the immunization coverage, quality of services and to know the reasons for partial/un-immunization in the rural field practice area of Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation (DR. PSIMS&RF).

## MATERIAL AND METHOD

It was a community based cross-sectional study conducted in 9 villages under the rural field practice area of DR.PSIMS&RF, which caters its services to 31,420 people. The study was done for a period of 6 months from November 2014 to April 2015. Institutional ethical committee permission was obtained prior for the study.

### SAMPLING METHOD<sup>1</sup>:

#### Target population:

Children of age between 12-23 months as on the date of survey in the study area were considered as the study subjects.

#### - Inclusion criteria:

- Children aged 12-23 months residing in the study area

- Children with or without immunization cards.

#### - Exclusion criteria:

- Children whose informants were not found.

- Parents who are not willing to participate in the study.

Assessment criteria for quality immunization services:

- The immunization is given when the child is at

the appropriate age

- If immunization is one of the series (eg.,OPV,DPT,HEP-B),subsequent doses are given after an appropriate interval.

- The child has immunization card on which immunizations are recorded.

- For BCG only, if the child does not have an immunization card, he or she has a BCG scar.

### Immunization status.

To assess children's immunization coverage it has to be determined whether each child in a sample is fully immunized, partially immunized and unimmunized.

• Fully immunized<sup>4</sup>: The child has received all the doses against 7 killer diseases in one year i.e. BCG, 3 doses of DPT, 3 doses of OPV (excluding OPV '0', Hepatitis B 'At birth'), three doses of Hepatitis B and 1 dose of Measles at the right time as mentioned in the immunization schedule.<sup>[SEP]</sup>

• Partially immunized<sup>5</sup>: If the child has missed even a single dose mentioned in the immunization schedule.<sup>[SEP]</sup>

• Non-immunized: The child has not received even a single dose of any vaccine.<sup>[SEP]</sup>

### Lot sample size calculation<sup>1</sup>:

Step 1: Level of accuracy for the survey results = + 5%.

Step 2: Level of confidence for the survey results = 95%.

Step 3: Make a first estimate of the total sample size = 384.

Step 4: Size of the target population from which you will select sample = 942 (3% of total population)

Step 5: Calculate the sample fraction:

Sampling fraction shows what proportion of a total population will be included in a study. This fraction tells you whether your total sample size is too large in comparison to the population. In LQ studies, 10% or higher is considered too large.

Sample fraction = total sample size/target

population=  $384/942 = 0.4$  or 40%.

Since the sample fraction is more than 0.1 or 10% sample size is large. The total sample size has to be recalculated by dividing the total sample size by 1+ sampling fraction.

Final estimate of the total sample size=  $384/1+0.4=274.28$  rounded to 275.

Step 6: Count the number of lots to be studied.

Lot: Is the group to be studied in a lot quality survey. A lot may be a specific population (e.g., children with in a target age group) living within a specific geographical area

In the present study lot was defined as all children aged 12-23 months residing in a village. As there are 9 villages in the rural field practice area, total number of lots (villages) = 9.

Step 7: Calculate the minimum lot sample size.

Which is the number of individuals from whom you will get data in each lot.

= Total sample size/number of lots= $275/9=30.5$  rounded to 31.

Total sample size=  $31 * 9= 279$

Step 8: Set a low threshold level = 46.7 %<sup>6</sup>.

Is based on estimates of coverage obtained from the sources such as past surveys. Lower than the low threshold level is used to judge lots as acceptable or unacceptable

Step 9: Set a high threshold level= 85%

High threshold value is often based on the coverage goal set at the national level. The High threshold is needed to determine the decision value

Step 10: Select a decision value.

Decision value is the number of unimmunized individuals that can be tolerated in a lot before the whole lot is considered unacceptable. Decision values are based on lot sample size and on low and high thresholds. For present study it was selected as 2.

This means a maximum of 2 un-immunized children were acceptable in a lot. If more than 2 children were un-

immunized, lot was rejected and coverage in the village was considered to be low. If the number of unvaccinated children was 2 or fewer, the lot was accepted, and coverage in the village was considered to be good.

## METHOD OF DATA COLLECTION

### Selection of Households (HH):

Village wise household record was available at RHTC. From that record 31 households from each village were selected randomly using table of random numbers.

### Selection of children<sup>1</sup>:

From each selected household, information was obtained for all eligible children.

When more than one eligible child was present in a house, only the youngest one was included. Children's age was estimated using birth certificates or any other records showing the date of birth. When no written documentation was available, the age given by the mother or the guardian was used.

### Study tools:

Data was collected using a pretested and structured questionnaire. Before collection of the data oral consent was taken from the parents of study subjects after explaining the importance of the study in detail. The data was collected by interview method, physical examination and record verification. Those who do not have immunization card the history given by the mother regarding immunization was considered. The questionnaire so developed was field tested in a pilot study and appropriate modifications were made as per the objectives of the study. Data was entered and analyzed using SPSS v.19.0. Descriptive data are presented as frequency and percentages.

## FINDINGS

**Table No 1: Immunization coverage among study subjects.**

Immunization Status	No.	Percentage
Fully immunized	251	90%
Partially immunized	28	10%

Full immunization coverage in the study area was 90.0% and partial immunization was 10%. Unimmunized children were not found in the study area.

**Table No 2: Lot wise distribution of Quality of immunization Services**

Lot number	Lot Name	Quality criteria Met	
		Subjects	%
Lot-1	Ampapuram	23	74.2%
Lot-2	Bandarugude	26	83.9%
Lot-3	Kodurupadu	26	83.9%
Lot-4	Mallavalli	26	83.9%
Lot-5	Remalle	24	77.4%
Lot-6	SN Palem	22	71.0%
Lot-7	SR Gudem	20	64.5%
Lot-8	Veeravalli	26	83.9%
Lot-9	Veleru	21	67.7%

Data shows that more children meet the fully immunized criteria than the quality criteria.

The major reason for the low quality of services was non-availability of immunization card (16.1%) with the parents at the time of interview.

In the present study reasons for partial immunization were being unaware of the need of immunization 6.1%, unaware of the need to return to next dose 2.9% and child being ill and hence not brought 1.1%.

As the number of unimmunized children in the lots was fewer than the decision value 2, performance of all the lots was found to be acceptable.

## DISCUSSION

### Immunization card:

In the present study, immunization cards were available with 83.9% of the respondents. Similar results were shown in the studies conducted by Tapare et al <sup>7</sup>, S V Kulkarni et al <sup>8</sup> and Kadri et al <sup>9</sup>, in which 81.25%, 87.78% and 88.4% of the mothers possessed the immunization cards with them respectively.

### Immunization status:

In the present study, 90.0% children were fully immunized, 10.0% were partially immunized. The DLHS survey IV <sup>6</sup> done in the year 2013-14 for Krishna

district reveals 46.7% of full immunization coverage.

Similar findings were seen in the study by Punith et al<sup>10</sup> in 2005 in Bangalore, the percentage of fully immunized and partially immunized children with lot quality assurance sampling was 92.11% and 6.58% respectively.

A cross-sectional survey was carried out in October 2004 by Tapare VS et al<sup>7</sup>, in Miraj to highlight methodology and application of lot quality technique to assess child vaccination performance. Overall full vaccination coverage in whole sample was 87.50%.

In a study conducted by Nirmal KM et al<sup>11</sup>, in West Bengal (2008) Fully immunized children were found more in rural area 81.7% than the urban area (62.5%) of the district 47.

In a study done by Gupta PK et al<sup>12</sup> in Pune, 2011, 86.67% were fully immunized, 11.90% were partially immunized and 1.43% were unimmunized.

A study was carried out by Sanket V et al <sup>8</sup>, in the field practice area (cheetah camp urban health centre) of the T. N. Medical College, Mumbai during the period of January 2007 to October 2008 by using LQAS. 76.99% of the children were fully immunized in less than 1 year.

In this present study to assess immunization in those who did not have card during interview the history given by mother was also considered, which could be a source for recall bias.

### Reasons for partial immunization:

In the present study reasons for partial immunization were unawareness of the need of immunization 6.1%, unaware of the need to return to next dose 2.9% and child being ill and hence not brought 1.1%.

Vohra et al <sup>13</sup> and Saxena et al <sup>14</sup> in their studies showed that lack of awareness and side effects of vaccination were the main reasons for non-immunization of children.

Punith et al <sup>10</sup> in their study the major reasons for non acceptance /discontinuation of immunization services were unawareness of the need of immunization, unawareness of the need to return for 2 or 3 dose, lack of information about the place of immunization, fear of side reaction, and postponing until another time.

## CONCLUSION

In this present study the overall immunization coverage is good but the quality of services have to be improved among the individual lots. The LQ technique can be used by immunization system staff to determine whether their individual lot is acceptable or not using a relatively small sample. Because of the small sample needed for assessment of an individual lot, the assessment can be made more frequently. Such results help supervisors focus their remedial actions on specific problems for example in the present study lack of immunization cards with the parents. Information, Education, and Communication (IEC) services should be directed to create more awareness should be generated among the people living in study area to immunize their children? Emphasis should be laid on use of immunization cards and its proper use should be taught to all mothers. <sup>[11]</sup><sub>SEP</sub>

**Conflicts of Interest:** Nil

**Source of Funding:** Self

**Ethical Clearance:** Obtained prior to the study.

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# Eating Experiences of Head and Neck Cancer (HNC) Patients after Radiotherapy- Qualitative Meta-Synthesis

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## ABSTRACT

**Background:** Head and Neck Cancer (HNC) patients' often experience problems related to eating of various severities. Damages to the salivary gland, changes in salivary consistency and pain have greater influence on eating behaviour and psychosocial life.

**Method:** The purpose of this study was to conduct a qualitative meta-synthesis on eating experiences of HNC patients followed by radiation therapy. A comprehensive literature search of qualitative studies was done between March and May 2015, using the MeSH words, key words and Boolean operators from three online data bases such as PubMed, Ovid Medline and CINAHL for the articles published between 2010 and 2015. A summative approach of qualitative content analysis was adopted for summarizing the findings.

**Results:** Total of 878 articles was identified. Critical Appraisal Skills Programme (CASP) qualitative checklist was used to for critical appraisal of individual studies. Data was extracted from four research articles which were relevant for the review question. Experience of eating was described as difficult and painful. Longer time was taken to eat due to longer chewing, changes in the consistency of saliva and difficulty in opening the mouth. Because of the changes in the behaviour of eating HNC patients isolate themselves. A theme-"Disquieting eating experience" evolved from the present review.

**Conclusion:** Patients with HNC experience many problems related to eating. Early identification and rehabilitation of such patients is essential to improve the Quality of Life (QOL).

**Key-words:** Head and neck cancer, eating, deglutition, experiences, qualitative.

## INTRODUCTION

Head and neck cancer (HNC) patients often face multiple severe functional and psychological problems corresponding with the treatment or diagnosis of the disease <sup>(1)</sup>. Due to the location of cancer and long term therapies, HNC patients are at risk for impaired eating

<sup>(2)</sup>. Among HNC patients', radiotherapy is used as a primary therapy, adjuvant therapy, in combination with chemotherapy or palliation therapy. Changes in the tissue due to radiotherapy can produce long term variations in swallowing. Radiotherapy has greater influence on swallowing, in addition to chemotherapy. Damage to salivary glands secondary to radiation therapy also changes pH and consistency of saliva and also causing permanent xerostomia has an added effect on swallowing difficulties <sup>(1)</sup>. Long term eating problems are continued to be experienced by patients with HNC despite of advances in the treatment such as nerve sparing surgical techniques and intensity modulated radiation therapy. De-epithelialisation of taste receptor cells is caused by both chemotherapy and radiation therapy. Eating behaviours are influenced by taste since

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stimulation of pleasure centres in the brain occurs due to pleasant tasting <sup>(2)</sup>. Sequel related to dysphagia is common after treatments for HNC and chemo-radiation has higher odds (40%) of experiencing dysphagia <sup>(3)</sup>. Experiencing pleasure from eating generally induces eating more. Food selection and eating experiences generally affect the nutritional status and QOL <sup>(2)</sup>.

Qualitative research aims at providing in-depth understanding of human emotions, experiences, attitude and behaviour<sup>(4)</sup>. Qualitative meta-synthesis is rigorous analysis of existing qualitative research studies. Meta-synthesis is a systematic approach in reviewing and integrating the findings from completed qualitative studies like other types of systematic review<sup>(5)</sup>. Qualitative meta-synthesis also guides researchers to analyze research findings across multiple studies to create a new interpretation<sup>(6)</sup> and provides a range and depth of experiences, meanings and participants perspectives across the context of health- care. Thus “bringing together” the findings of primary studies and generating a new conceptual or theoretical model helps in identifying the research gaps and provides evidence for developing, implementing and evaluating the health intervention <sup>(4)</sup>.

Qualitative research in HNC has gained exposure and credibility. HNC and treatments are believed to be affecting the eating habits and good choices <sup>(2)</sup>. However, qualitative meta-synthesis is not yet been conducted on the eating experiences of HNC clients. Proliferation of qualitative research, increase in volume of qualitative studies in the area of HNC emphasizes the opportunity for meta-synthesis of eating experiences. The finding of research synthesis, which is collective and unique experiences grounded on the lived experiences of HNC clients, enhances increase in understanding of such clients by the health care provider. Hence, the quality of care for such clients can be improvised.

### **PURPOSE OF RESEARCH QUESTION**

The purpose study was to examine the qualitative research focused on eating experiences of the clients with HNC followed by radiotherapy. Researchers aimed at gathering the findings from various published qualitative research and interpretation of essential phenomenon of eating experiences. The review question was, “What are the eating experience of Head and neck cancer patients followed by radiotherapy?”

### **STUDY DESIGN**

Focuses of qualitative meta-synthesis is on research integration by combining the findings of similar topics from qualitative studies. It is aimed at developing broader assertions which is achieved through interpretation and analysis of findings from qualitative research studies. Several methodological and technical approaches are available for qualitative meta-synthesis. In the current research, an approach of reciprocal translation and synthesis was adapted as described by Sandelowski and Barroso (2007). In reciprocal translation, the reviewer consistently compares the research studies and conceptualizes the synthesis, or the reviewer may import concepts from other studies to incorporate results <sup>(7)</sup>. In this study, concepts of included studies were compared to synthesize the findings. Themes were derived through inductive process.

### **METHOD**

The systematic review was focused to identify various experiences associated with eating of the patients with HNC. The review was conducted based on the guidelines described in the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA). A checklist in ensuring transparency in reporting systematic reviews in four-phase diagram is included in PRISMA <sup>(8)</sup>.

A comprehensive search for original relevant research studies which are published between 2000 and 2015 was conducted among three scientific data bases of PubMed, Ovid Medline and CINAHL. Following combination of keywords, “head and neck cancer”, “swallowing” “eating” and MeSH terms used were “head and neck neoplasms”, “deglutition”, “explode Adverse Effects, Complications”. The search was performed between March and May 2015 by using terms in combination with Boolean operators ‘AND’, ‘OR’, ‘NOT’. The detailed method of study retrieval is shown in figure 1. References of retrieved studies are also scanned for relevant and additional research studies, but none were identified.

Inclusion criteria included qualitative research articles which included participants diagnosed as HNC, focused on HNC patients’ perspectives and views collected through qualitative measures, full text and original articles published in English language and studies published after 2005. Investigator screened the

titles and abstracts for the inclusion criteria. Full text of the required articles was then retrieved for further assessment.

### Data extraction

Quality appraisal of the studies was done by using CASP qualitative checklist. CASP is widely used for the appraisal of qualitative research with 10 items, which facilitates rapid evaluation. The research studies included in the final review were of high quality papers with CASP scores 9-10 <sup>(9)</sup>. Data was extracted independently from the included studies by reviewers into the pre-designed structured data extraction forms.

### Data Synthesis

The study adopted a summative approach of qualitative content analysis to synthesize the data. This approach begins with identifying and quantifying the text that appears in the data with the purpose of understanding the contextual use of content or words. Latent content analysis is a process of interpretation of content by discovering underlying meanings of the content <sup>(10)</sup>.

## RESULTS

The initial search produced 878 studies. After removing the duplicates 764 studies were included for title screen. After removing the non-relevant, non-English and quantitative studies, only six articles were included for the full text review. Based on the inclusion criteria four relevant articles were included in the final review. And among four, two studies were represented more than one database. The selection process for the articles in the review is shown in Figure 1.

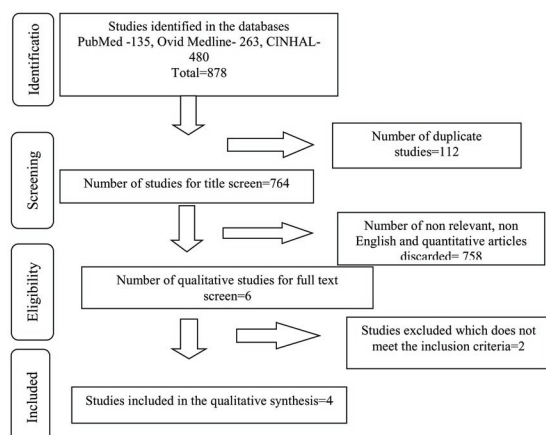


Figure 1: Prisma Chart Representing the Selection Process of Articles for Review

### Sample characteristics:

Based on the inclusion criteria four relevant articles were included in the final review. And among four, two studies were represented more than one database. The demographic and methodological characteristics of chosen studies shown in the table 1 and table 2 respectively. Total sample size from four studies was 67 and the age group varied from 45-86 years from both the genders. Data analysis was done by reading each qualitative study carefully. The findings were highlighted from each study and the themes and subthemes were extracted to synthesize the final core category of themes.

### Disquieting eating experience

Eating is a major disquietude for HNC patients during the course of therapy. HNC patients are obligated to rely on nutritional support and necessitated to adjust the food intake <sup>(11)</sup>. Eating impelled choking among patients HNCs. This experience necessitated the need for tube feeding during the course of radiation therapy for many patients <sup>(12)</sup>. The process of food consumption is longer due to deglutition difficulties, prolonged chewing and the time required to clean the mouth and remove the residues after the food. The experience of eating is termed as new way of eating <sup>(11)</sup>.

Managing side effects among HNC patients always left little time and wish for meals. The action of deglutition induces excruciating pain for HNC patients and experience of eating was described as pure hell. Swallowing was impaired among patients with HNC due to gross impairment in the salivary secretion <sup>(12)</sup>. The experience of eating, cleaning the mouth and keeping it clean termed stressful for patient with HNC. HNC patients feel that eating is required to acquire nutrients and energy. Loss of variety in food selection and eating, changes in the taste and eating without satisfaction collectively imposed the limited meaning of food. Eating with the family is self-assured; in contrast the limitations on food choices, coughing, unclean mouth and inability to eat in a socially accepted way were the basis for feeling shame and insecure <sup>(11)</sup>.

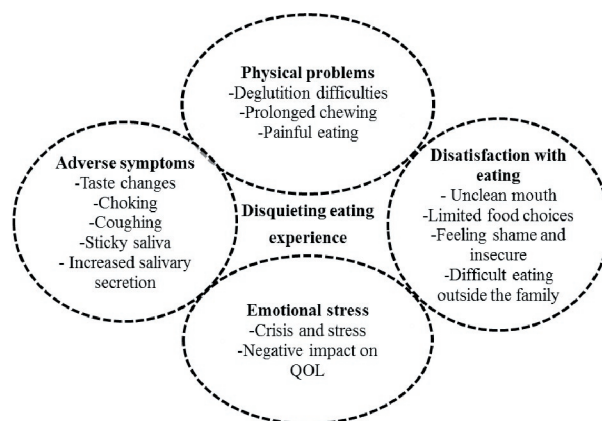
**Table 1: Demographic characteristics of studies**

Study	Author/Year	Journal	Sample Size	Age Group	Gender	Population
The experience of food, eating and meals following radiotherapy for HNC: a qualitative study	Ottoson S et al/2012	Journal of Clinical Nursing	13 (11 male and 2 female)	47-70 years	Both	Patients older than 18 years with tumour of the H&N treated with radiotherapy as single or combined modality treatment
HNC patients' perceptions of swallowing following chemoradiotherapy	Patterson JM et al/ 2015	Support care cancer	21 (18 male & 3 female)	45-77 years	Both	HNC patients from a larger longitudinal study on swallow outcomes following (chemo) radiotherapy
Lived Experiences During the Trajectory of Care for patients With HNC Treated With Radiotherapy	Larsson M et al/2007	Cancer nursing	9 (7 male and 2 female)	52-86 years	Both	Clients treated with radiotherapy for HNC at an oncology clinic
Survivors' experiences of dysphagia-related services following HNC: Implications for clinical practice	Nund RL et al/2014	International journal of language & communication disorders	24 (20 male and 4 female)	Not mentioned	Both	People who had received radiotherapy for HNC in the past five years, and experienced dysphagia as a result of treatment

**Table 2: Methodological characteristics of the studies**

Author/year	Discipline	Country	Focus	Data analysis	Research design
Ottoson S et al/2012	Nursing	Sweden	Describe the experience of food, eating and meals up to nine months after radiotherapy in patients with H&N cancer.	Graneheim and Lundman (2004)	Qualitative study
Patterson JM et al/ 2015	Oncology	England	Observe real-time eating behaviors individuals' perceptions of living with dysphagia.	Thematic analysis	Two phases -Ethnographic observations -Interviews
Larsson M et al/2007	Nursing	Sweden	To acquire a deeper understanding of HNC patients' lived experiences of daily life during the trajectory of care with a focus on eating problems.	Colaizzi's method	Phenomenology
Nund RL et al/2014	Speech and language therapy	Australia	Explore the lived experience of people with dysphagia following non-surgical treatment for HNC	Thematic analysis with inductive approach by Braun and Clarke (2006).	A qualitative descriptive phenomenology

Improper movement and stiffening of the jaw poses restricted mouth opening among HNCs. Many patients with HNCs couldn't be bothered with drinking and eating<sup>(12)</sup>. They had to follow variety of strategies to combat the symptoms such as xerostomia. They also had to learn the importance and broader implication of oral hygiene to attenuate the difficulties associated with eating and deglutition. Many of them also try trial and error method to select the food which is ideal to them and continuing with the same food if they were success. Food which was enjoyed previously was problematic after the therapy for HNC patients<sup>(13)</sup>.

**Figure 2 Conceptual model of eating experiences**

The dominating eating problem along with other side effects represses other thoughts associated with the disease. Eating problems also had a huge negative impact on daily life. Crisis and stress generated by cancer diagnosis caused furthermore negative effects on eating. As the side effects worsens over time, the desire and ability to eat also decreases gradually and later impossible to eat any regular food. Unwillingness to see other people and avoiding meeting people in front of whom they wanted to appear healthy and strong was common due to change in appearance due to weight loss secondary to fewer intakes, awkwardness related to inadequate oral hygiene and abnormal eating behavior. Consequences of increased amount of sticky and ropy saliva also had additional consequences on eating<sup>(14)</sup>. However, being optimistic of returning their eating abilities to normal, vicariously enjoying the food what they eat and with other people was evident among them<sup>(13)</sup>.

Eating experience for HNC patients was inducing anxiety and worry. It necessitated for many of them to adapt for nutritional requirements. Thus the eating experience was disquieting for many of them in one way or the other.

### DISCUSSION

The findings of the review showed that changes in the eating behavior due to changes in the consistency in saliva, painful swallowing, and inability to maintain oral hygiene which had an avoidance and negative impact on social life. Difficulties related to nutrition such as inability to eat certain food, dysphagia, embarrassment and anxiety during mealtime, less enjoyment of food causes social isolation, depression and increase length of time for intake of meals<sup>(15)</sup>. Results of an exploratory cross-sectional survey to explore the taste dysfunctions among HNC survivors showed inability to discriminate one or more different tastes. Dysgeusia was associated with weight loss at statistically significant level<sup>(16)</sup>.

### CONCLUSION

Patients with HNC experience many problems related to eating due to changes in the salivary secretions, xerostomia, inability to maintain oral hygiene, stiffness of the jaw and pain. Many also may have social isolation, depression, weight loss and fatigue due to impaired eating behavior. Early identification of such psychosocial problems and functional rehabilitation is

very much essential to improve the QOL.

**Ethical Clearance-** Obtained from Institutional Research Committee (IRC) from Manipal College of Nursing Manipal.

**Source of Funding-** Self

**Conflict of Interest -** Nil

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# A Study of Patterns of Thyroid Lesions on Fine Needle Aspiration Cytology in Hapur Region, Uttar Pradesh

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## ABSTRACT

**Background:** Fine needle aspiration cytology (FNAC) is widely considered as the diagnostic technique of choice in the assessment of thyroid lesions. Thyroid nodules are very frequent, with an annual incidence rate of 48%. Thyroid fine needle aspiration cytology (FNAC) is more than 50 years old and is the principal method of preoperative diagnosis in both children and adults.

- Aims:** (1) To assess the pattern and frequency of thyroid lesions in cytology  
(2) To study the correlation of thyroid lesions with different age groups  
(3) To identify the frequency benign and malignant thyroid lesions in cytology

**Materials and Method:** This is a prospective study, from April 2016 to September 2016, who attended the pathology department of Saraswathi Institute of Medical Sciences, Anwarpur, Hapur, Uttar Pradesh. Thyroid lesions were classified according to Bethesda system of reporting.

**Results:** Male to female ratio was 1:8.09. Frequency of benign thyroid lesions were diagnosed in 86%, malignancy in 10% and unsatisfactory in 4% cases. Thyroid lesions can be efficiently classified on cytology.

**Keywords:** Cytology, rural population, thyroid pathologies.

## INTRODUCTION

FNAC of the thyroid gland is now a well established, first line diagnostic test for the evaluation of diffuse thyroid lesions as well as of thyroid nodules with the main purpose of confirming benign lesions and thereby, reducing unnecessary surgery.<sup>1</sup> Thyroid nodules are very frequent, with a number of studies showing an annual incidence rate of 4-8%.<sup>2</sup> Autopsy and ultrasound data suggest that the prevalence rate for thyroid nodules in

clinically normal individuals is around 50%.<sup>3</sup> Thyroid fine needle aspiration cytology (FNAC) is more than 50 years old and is the principal method of preoperative diagnosis in both children and adults<sup>4,5</sup>. Different imaging techniques are now used for diagnosis of thyroid nodules like radio nucleotide scanning, high resolution ultrasonography etc. However, FNAC is still regarded as the single most accurate and cost effective procedure, particularly if ultrasound is used as a guide for better sample collection, especially for cystic lesions.<sup>6</sup> FNAC has an overall accuracy rate around 95% in the detection of thyroid malignancy.<sup>7</sup> FNAC requires careful aspiration technique and interpretation of the cytological findings. FNAC, by giving direct morphological information has supplanted most other tests for preoperative evaluation of thyroid nodules. Practice guidelines set forth by

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the American Thyroid Association and National Comprehensive Cancer Network, state that FNAC should be used as an initial diagnostic test because of its superior diagnostic reliability and cost effectiveness, before both thyroid scintigraphy and ultrasonography. As FNAC distinguishes between benign and malignant lesions quite effectively, it is the preoperative screening method of choice worldwide<sup>8</sup> Most practitioners rely on FNAC alone, especially for the first attempt at diagnosis.<sup>4,5</sup> Cytopathologist use different terminologies and diagnostic criteria for reporting thyroid lesions, Bethesda reporting pattern developed by Papanicolaou Society is one among them.<sup>9,10</sup> Due to its simplicity, low cost, and absence of major complications, it is the initial investigation in the management of thyroid disease in our teaching hospital. Nevertheless, like any other test, FNAC has its limitations and diagnostic pitfalls. The reported pitfalls are those related to specimen adequacy, sampling techniques, the skill of the physician performing the aspiration, the experience of the pathologist interpreting the aspirate and the overlapping cytological features between some benign and malignant thyroid lesions.<sup>11,12,13,14</sup>

## MATERIALS AND METHOD

The study aims to determine the cytological pattern of thyroid lesions, in addition to the utility and accuracy of FNAC as an initial diagnostic method in the investigation of thyroid swellings. Three hundred FNAs (fine needle aspirations) were performed on patients with diffuse or nodular thyroid enlargement, referred to the Pathology Department of our institute, during the period between April 2016 and September 2016. FNAC (Fine Needle Aspiration Cytology) in all these patients was performed by experienced cytologists. The procedure was performed without local anesthesia with the help of the non aspiration technique, using 23 - 25 gauze needles. Coagulation screening was not routinely done unless there was a preexisting risk of bleeding. The procedure was generally well tolerated with no significant complication. Both air dried and wet fixed smears (fixed in 95% alcohol for about 30 minutes) were made from the aspirated material, stained with May Grunwald Giemsa (MGG) and Papanicolau stains, respectively, and examined under a light microscope.

### Statistical analysis

Data was entered in SPSS software and analysis was done. Chi-square test was applied to find statistical

significance of findings.

## RESULTS

Between April 2016 and September 2016, 300 thyroid cytology were done in pathology department. On the basis of cytology smears specific diagnosis was recorded in 300 patients. Patients gave a history of swelling being present for more than one year in 245 (81.66%) cases, less than six months in 32 (10.66%) cases and between six months and one year in 23 (7.66%) cases. The cytologic diagnostic categories included non-neoplastic, neoplastic and inadequate as shown in Table 1. In this study the patient's age ranged from 11-70 years, but highest was seen in 21-30 years [Table 2]. Male to female ratio was 1:8.09. Most of the lesions were benign 86.00%. The most common diagnosis was Hashimoto thyroiditis 25.00% followed by Lymphocytic thyroiditis 19.00%, colloid nodule 17.66% and granulomatous thyroiditis 13.33%. Thyroid malignancies were diagnosed in 10% of cases (Follicular adenoma constituted 7.33%, Papillary carcinoma 2.66%). and other cases 1.33%. Unsatisfactory cases were 4%, of total cases [Table 4]. The major presenting symptom in all the patients was diffuse and/nodular swelling of the thyroid. Other symptoms were less frequent hoarseness of voice in eighteen patients, dysphasia in ten patients, cough in four and pain in the thyroid region in two patients.

**Table: 1 Distribution of cases according to benign, malignant and unsatisfactory**

Lesions= 300	Frequency	Percentage
Benign	258	86.00%
Malignant	30	10.00%
Unsatisfactory	12	4.00%

**Table: 2 Distribution of cases according to age and sex**

Age	Male	Female	Total
11-20 years	09	33	42
21-30 years	07	62	69
31-40 years	04	59	63
41-50years	09	37	46
51-60years	02	35	37
>60years	02	41	43
<b>Total =300</b>	<b>33</b>	<b>267</b>	<b>300</b>

**Table: 3 Distribution of cases according to Lobe affected**

Age	Right	Left	Bilateral	Midline	Total
11-20years	18	10	12	02	42
21-30years	28	15	17	09	69
31-40years	24	18	12	09	63
41-50years	09	12	15	10	46
51-60years	06	08	13	10	37
>60years	08	15	12	08	43
<b>Total</b>	<b>93</b>	<b>78</b>	<b>81</b>	<b>48</b>	<b>300</b>

**Table: 4 Distribution of cases according to age and diagnosis**

Age(yrs)	A.N.	C.G.	L.T.	H.T.	D.Q./G.T.	O.B.	F.N.	P.C.	O.M.
11-20	08	09	05	10	08	02	00	00	00
21-30	07	18	08	18	11	03	02	01	01
31-40	06	12	17	15	08	02	02	01	00
41-50	05	05	09	12	07	01	04	02	01
51-60	04	04	07	08	04	00	08	01	01
>60	03	05	11	12	02	00	06	03	01
<b>Total</b>	<b>33</b>	<b>53</b>	<b>57</b>	<b>75</b>	<b>40</b>	<b>08</b>	<b>22</b>	<b>08</b>	<b>04</b>

A.I. = ADENOMATOID NODULE

C.G. = COLLOID GOITRE

L.T. = LYMPHOCYTIC THYROIDITIS

H.T. = HASHIMOTO THYROIDITIS

D.Q. /G.T. = DE QUERVAIN/ GRANULOMATOUS THYROIDITIS

F.N. = FOLLICULAR NEOPLASM

P.C. = PAPILLARY CARCINOMA

O.B. = OTHER BENIGN

O.M. = OTHER MALIGNANCY

Chi- square tests	Value	df	Asymp sg.
	Pearson Chi- square	12.256	5

### DISCUSSION

Thyroid enlargement is a common occurrence in most regions of the world. India has the world’s biggest goiter belt in the sub- Himalayan region. Fine needle aspiration cytology is regarded as the gold standard initial investigation in the diagnosis of thyroid swellings. Thyroid enlargement, whether diffuse or in the form of a nodule, leads to sum of investigations, mainly to rule out the possibility of a neoplasm or a thyroiditis. FNAC is usually the first line of investigation and other investigations like thyroid scan, ultrasound examination, thyroid function tests, and antibody levels are done subsequently with an aim to triage patients into those who would require surgery and those that can be managed conservatively.<sup>15,16,17,18</sup> FNAC of the

thyroid has become increasingly popular as a diagnostic technique as it provides a sensitive and economical method of obtaining cytologic material for examination and its distinct advantages include accurate diagnosis, low cost, excellent patient acceptance and minimal or no morbidity. The accuracy of the FNAC analysis approaches 95% in the differentiation of the benign nodules from the malignant nodules of the thyroid gland.<sup>19</sup> Several other tests, such as ultrasonography, radioisotope scanning and others have been used for evaluation of thyroid swellings before proceeding to thyroid surgery. Studies had demonstrated that among all these diagnostic modalities, FNAC is the most accurate, cost effective screening test for rapid diagnosis of thyroid swellings.<sup>16</sup> Fine needle aspiration cytology has greatly improved the clinical management of



thyroid nodules. However, FNA has inherent limitations related not only to inadequate sampling but also, most importantly, to its inability to distinguish between benign and malignant follicular lesions in the absence of nuclear features of papillary carcinoma. The indeterminate diagnosis of follicular neoplasm encompasses a number of heterogeneous thyroid lesions including cellular adenomatoid nodule, follicular adenoma, and follicular carcinoma. Additionally, the interpretation of follicular variant of papillary carcinoma (FVPC) in cytology may be difficult when prominent classic nuclear features of papillary thyroid carcinoma are absent. In such cases, a preoperative diagnosis of “follicular lesion suggestive of papillary carcinoma” results in conservative surgical assessment until a definitive diagnosis can determine the appropriate treatment.<sup>20</sup>

Inadequate smears were labelled when less than six follicular cells clusters and each cluster containing less than 10 follicular cells were present. Inadequacy rate was 04% in present study, 7.1% as reported by Sinna<sup>5</sup> 2012, 1.6% as reported and 34% as reported<sup>21</sup> by Naugler. Thyroid malignancies accounted for 5% of all cases which is less in comparison to Sinna 2012 and somewhat more than by Bagga 2010.<sup>22</sup> Thyroid FNAC offered a first diagnosis in our cases and differentiated between benign and malignant thyroid lesion thus helping in early diagnosis and treatment of malignant lesions an accurate diagnosis could not be rendered because of sampling of areas of cystic change rather than cellular areas.

In the year 2007, the National Cancer Institute (NCI), Bethesda, Maryland, United States, organized the NCI Thyroid Fine Needle Aspiration State of the Science Conference, and an initiative was undertaken to publish an Atlas More Details and guidelines using a standardized nomenclature for the interpretation of thyroid fine needle aspirates (FNAs), known as the Bethesda system for reporting thyroid cytopathology.<sup>23</sup> The atlas describes six diagnostic categories of lesions: Non diagnostic/ unsatisfactory, benign, atypical follicular lesion of undetermined significance (AFLUS), “suspicious” for follicular neoplasm (SFN), suspicious for malignancy (SM), and malignant<sup>4</sup>

Ultrasound guided FNAC results in better sample acquisition, especially in patients with small thyroid nodules, solid-cystic lesions or difficult-to-palpate lesions.<sup>21</sup> Essential to the success of FNAC is an

experienced and competent cytopathologist who is prepared to give an opinion. While interpretation is not always easy, it can always be learnt. Our surgeons find that the cytopathologic information is very useful for scheduling patients’ visits and making their surgical plans. It can thus be concluded that FNAC as such is expedient, effective and safe diagnostic method for defining thyroid disorders.

## CONCLUSION

The results of our study are comparable with the current published data and demonstrate that FNA cytology is a sensitive, specific, and accurate initial diagnostic test for the preoperative evaluation of patients with thyroid swellings in our setting as well. It is a minimally invasive, safe, easily performed OPD procedure. The clinicians should be encouraged to use FNAC as the initial modality in the evaluation of thyroid lesions.

**Source of Funding** - None

**Ethical Permission** – Taken from ethical committee of Institute

**Conflict of Interest** - None

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# Obstetric and Perinatal Outcome of Pregnancies with Nuchal Cord

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## ABSTRACT

**Background:** To evaluate the obstetric and perinatal outcome of pregnancies with nuchal cord.

**Method:** A prospective 1 year controlled study was conducted in the Department of Obstetrics and Gynaecology, Rajindra Hospital, Patiala. 50 women with term singleton pregnancy having nuchal cord and 50 women without nuchal cord as diagnosed on ultrasound were selected. They were allowed to go into spontaneous labour and followed till delivery. Outcome variables like mode of delivery, APGAR scores at 1 and 5 minute, meconium stained liquor, neonatal resuscitation were compared.

**Results:** Results were analysed statically using Pearson Chi-square method. Rate of normal vaginal delivery, LSCS and instrumental delivery in the study group was 82%, 12% and 6% respectively and in control group was 80%, 16% and 4% respectively indicating that nuchal cord as such had no significant impact on mode of delivery (df=2, p-value = 0.498) however, tight loop of cord which was found in 22% of cases was associated with 36.36% caesarean and 36.36% normal vaginal delivery affecting the mode of delivery (p-value = 0.00). Average duration of second stage was 56.41 ± 26.64 minutes in study group and 55.44 ± 25.69 minutes in control group which was not significant. Nuchal cord had no significant impact on APGAR score (p-value = 0.50).

**Conclusion:** The presence of a nuchal cord was not associated with the risk of operative intervention and poor neonatal outcome. Such women require close monitoring during labour, preferably by continuous fetal electronic heart rate monitoring, however tight and multiple nuchal loops are associated with persistent variable or late deceleration affecting the mode of delivery and duration of second stage.

**Keywords:** Fetal heart monitoring, Mode of delivery, Nuchal Cord, Perinatal Outcome

## INTRODUCTION

The term nuchal cord is used to describe an umbilical cord that has become wrapped around a baby's neck and is defined as a loop of umbilical cord 360° around the fetal neck. It can be tight or loose depending upon the

ability to manually reduce it over the fetal head.<sup>[1]</sup> It can be described as Type A or Type B depending upon whether it encircles the neck in a freely sliding pattern or locking pattern.<sup>[2]</sup> It can be one circle to many. The maximum number recorded are up to eight.<sup>[3]</sup>

The presence of a nuchal cord at birth occurs frequently enough to be considered as a normal event, the incidence varies between 10% to 37%. More number of cases are diagnosed these days due to accessibility of obstetric imaging. The actual significance of the nuchal cord on intrapartum events and perinatal outcome is controversial. It may be associated with preterm

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deliveries, slow progress of labor<sup>[4]</sup>, variable fetal heart rate decelerations, meconium stained liquor<sup>[5]</sup>, low birth weight<sup>[2]</sup>, emergency and elective caesarean sections, admission to NICU.<sup>[5]</sup> A longer second stage of labor has been reported, especially in primigravida<sup>[6]</sup> and multiple looping nuchal cords.

Nuchal cord can be seen with 2-D USG. Gray-scale ultrasonographic 'divot sign' are visible upon sagittal view.<sup>[7]</sup> Tightness of the nuchal cord may change with time, and is difficult to diagnose especially if the fetal head is not fully engaged in pelvis at the time of examination.

Nuchal cord is rarely associated with significant neonatal morbidity or mortality. Nuchal cord is not an indication for caesarean section but it should be considered when nuchal cord is tight or there are multiple loops or if there are signs of fetal distress.<sup>[8]</sup>

## MATERIAL AND METHOD

An observational, controlled 1 year prospective study was conducted in the Department of Obstetrics and Gynaecology, Rajindra Hospital, Patiala. The inclusion criteria were term singleton pregnancy with cephalic presentation. Complicated pregnancy like Placenta Praevia, Contracted pelvis, maternal medical complications like GDM, Pre-eclampsia etc., malpresentations, IUGR, multiple pregnancy were excluded. 50 term singleton pregnant women having nuchal cord diagnosed on ultrasound were selected in study group and another 50 without nuchal cord were taken as control.

After selection of the cases and obtaining her consent, USG was performed to look for nuchal cord and number of loops around the neck with the help of 2D ultrasonography. The ultrasound machine used was Phillips HD-3 EXPV 225, Phillips Envisor whole body Colour Doppler or GE LOGIQ α200.

Women were allowed to go into spontaneous labour and intra partum fetal monitoring was done and partograph was recorded. Presence of meconium-stained liquor, duration of labour, mode of delivery and Apgar scoring was recorded. Newborns were followed up for birth asphyxia and need of oxygenation according to Downe's scoring.

## RESULTS

The age & parity of women in two groups were comparable. In the study group, 88% women delivered vaginally and 12% had LSCS whereas in control group, 84% delivered vaginally and 16% had LSCS. Nuchal cord had no significant impact on mode of delivery.

In the study group, duration of second stage was upto 60 minutes in 63.1%, 61- 120 minutes in 32.6% and > 120 minutes in 4.3%. In control group, duration of second stage was upto 60 minutes in 75.6%, 61- 120 minutes in 22.2% and > 120 minutes in 2.2%. Average duration of second stage in study group is 56.41± 26.64 minutes and in control group is 55.44 ± 25.69 minutes which is non-significant. **Table 1.**

Fetal distress was the main Indication of caesarean section in 4 cases (66.7%) in study group. Fetal distress and maternal exhaustion were the main indication for caesarean section in 3 cases (37.5%) each in control group. **Table 2.**

Nuchal cord was not the cause for meconium staining of liquor with p-value = 0.826. Mild to moderate birth asphyxia (APGAR 4-7) was observed in 10% in study group and 4% in control group. Severe birth asphyxia (APGAR 0-3) was observed in 4% babies in each group which was not significant.

In study group, 86% babies had single loop of cord around neck, 6% had Double loop of cord and 8% had multiple loops. 22% had tight loop of cord and 78% had loose loop of cord around neck. 3 (6%) babies had both multiple and tight loop of cord around the neck.

Out of 11 babies who had tight loop of cord, 4 delivered vaginally (36.36%), 4(36.36%) had caesarean section and 3(27.27%) had instrumental delivery. Tight loop affected the mode of delivery with highly significant p- value of 0.00

11.1% women with tight loop of cord had second stage duration less than 60 minutes. 66.6% had second stage duration between 61 to 120 minutes and 22.2% had more than 120 minutes. Tight loop of nuchal cord was associated with prolonged duration of second stage with significant p- value. **Table 3.** Out of 11 babies with tight loops of cord around neck, 9.1% babies had APGAR between 0-3, 27.3% between 4-7 and 63.6% between 8-10. Variety of loop of cord had no affect on APGAR score with p-value of 0.051. Nuchal cord

had no significant impact on immediate resuscitative measure required by babies and did not affect the weight of newborns as per their gestation age with non significant p-value

## DISCUSSION

In our study, nuchal cord did not affect the duration of second stage with  $df=4$ ,  $p$ -value = 0.613. Ogueh O et al<sup>[4]</sup> (2006) found that cases with nuchal cord had a longer second stage of labor ( $p=0.0013$ ) and a greater proportion of primiparous women with tight nuchal cord had second stage of labor that lasted longer than two hours (adjusted OR 1.21, 95% CI 1.03-1.41).

In our study, rate of caesarean delivery was 12% in study group and 16% in control group which was non-significant. However the rate of caesarean section is significantly higher in cases with tight loop of cord 36.36% as compared to 5.13% with loose loop of cord which is similar to the study of Begum AA et al<sup>[9]</sup> (2011) with  $p$ -value = 0.001. Rate of caesarean section in most of the studies is lower in group with nuchal cord than control group except the study of Víctor Hugo González-Quintero<sup>[10]</sup> (2004) & Peregrine E et al<sup>[11]</sup> (2005).

In present study, non-reassuring fetal heart is the main indication for caesarean section in cases with nuchal cord with 8% cases in study group and 6% cases in control group in concordance with Víctor Hugo González-Quintero<sup>[10]</sup> (2004) and Begum AA et al<sup>[9]</sup> (2011).

In present study, out of 6 cases who had abnormal CTG findings, 66.67% had variable deceleration and 16.67% had late deceleration and 16.67% had bradycardia. In our study, Variable deceleration was seen only in cases with nuchal cord not in control group.

In a study done by Shrestha NS, Singh N<sup>[12]</sup> (2007) and Peregrine et al<sup>[11]</sup> (2005) APGAR score <7 at 1 min was seen more in study group. In present study, 2 (4%) of babies had severe birth asphyxia in both study and control group which was comparable. Our study was in concordance with the study of Mahendra G et al<sup>[13]</sup> (2015) showing that nuchal cord had no significant impact on APGAR score ( $p$ -value = 0.50). APGAR score of all babies in our study at 5 minute was  $\geq 7$ .

In concordance with study of Pascal Foumane et al<sup>[8]</sup> (2013) and Farnaz Zahoor et al (2013), mode of delivery had no significant effect on perinatal outcome in terms of APGAR score. In our study, although severe birth asphyxia was seen in babies born by vaginal route in study group, but the value was not significant ( $p$ -value = 0.326). In control group also, mode of delivery had no significant impact on APGAR score of babies at 1 minute.

Meconium stained liquor was seen in 54.5% women in group with tight nuchal cord and in 5.13% women with loose nuchal cord. Tight loop of cord was the cause of meconium with highly significant  $p$ -value= 0.001

**Table 1. Distribution of Cases According to Duration of Second Stage of Labour**

Duration of Second Stage (in minutes)	Group				Total	
	Study Group		Control Group			
≤ 60	29	63.1%	34	75.6%	63	69.2%
61- 120	15	32.6%	10	22.2%	25	27.5%
> 120	02	4.3%	01	2.2%	03	3.3%
<b>Total</b>	<b>46</b>	<b>100%</b>	<b>45</b>	<b>100%</b>	<b>91</b>	<b>100%</b>

**Table 2. Distribution of Cases as per Indication of Caesarean Section**

Indication	Study group		Control group		Total	
Fetal distress	4	66.7%	3	37.5%	7	50%
Maternal exhaustion	2	33.3%	3	37.5%	5	35.71%
Non descent of head	0	0%	2	25%	2	14.29%
<b>Total</b>	<b>6</b>	<b>100%</b>	<b>8</b>	<b>100%</b>	<b>14</b>	<b>100%</b>

**Table 3. Correlation of Duration of 2<sup>nd</sup> Stage and Variety of Nuchal Cord**

Duration of 2 <sup>nd</sup> Stage (in minutes)	Variety				Total
	loose		Tight		
≤ 60	28	75.7%	01	11.1%	29
61 - 120	09	24.3%	06	66.6%	15
> 120	00	0%	02	22.2%	02
<b>Total</b>	<b>37</b>	<b>100%</b>	<b>09</b>	<b>100%</b>	<b>46</b>

**CONCLUSION**

Out of 50 cases with nuchal cord, tight loop was observed in 22% women. There was no significant association of nuchal cord with adverse outcomes like prolongation of second stage of labour, operative delivery, meconium in liquor, APGAR scoring and birth asphyxia. However, tight loop of nuchal cord did correlate with mode of delivery, prolonged second stage and meconium in liquor. Tight loop of cord is difficult to diagnose on ultrasound prior to labour. Close monitoring on fetal heart by auscultation and CTG can detect non reassuring fetal heart. Presence of Nuchal cord on ultrasound is a common finding these days due to routine ultrasound examinations, but there is no need to get anxious as it is not associated with unfavourable outcome and there is no need to do unnecessary caesarean section in the presence of nuchal cord unless it is tight and is associated with non reassuring fetal heart.

**Funding:** Nil

**Conflict of Interest:** None declared

**Ethical approval:** Taken from the ethical committee of G.M.C & Rajindra Hospital, Patiala

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# Preventive Role of Probiotic in Antibiotic Associated Diarrhoea in Children

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## ABSTRACT

**Aim and Objective-** The study was carried out to assess the preventive role of Probiotic in antibiotic associated diarrhoea in children.

**Material Method-** A randomized, open, parallel study was conducted in tertiary care hospital. 600 children in the age group of 6 months–12 yrs, receiving beta lactam antibiotics for various ailments like Otitis media, Tonsillitis, UTI etc. were included in the study. All these children did not have diarrhoea. 300 out of 600 children were also given probiotic sachets along with beta lactam antibiotic.

**Result-** 72 [24%] out of 300 patients in Control group developed diarrhoea whereas only 16 [5.3%] out of 300 in the Test group developed diarrhoea. The results were statistically significant [ $p < 0.001$ ] as calculated by Chisquare test.

**Conclusion-** Probiotic was effective in preventing antibiotic induced diarrhoea in children in the Indian population. Hence, it can be used prophylactically to prevent AAD in children.

**Keywords:** Antibiotic associated diarrhoea [AAD], Probiotic

## INTRODUCTION

Diarrhoea is one of the most common adverse effects associated with antibiotic therapy<sup>1</sup>. Such a diarrhoea is called **Antibiotic Associated Diarrhoea**. AAD is considered clinically significant when there are 3 or more abnormally loose stools in 24 hrs<sup>2</sup>. Antibiotics commonly associated with AAD are aminopenicillins, cephalosporins, clindamycin and erythromycin<sup>1</sup>.

The key factor in pathogenesis of AAD is disturbance in normal intestinal microflora<sup>3</sup>.

Eli Metchnikoff suppressed growth of harmful microbes by giving useful microbes and termed these friendly non-pathogenic organisms as probiotics<sup>4</sup>. Probiotic is a live micro-organism, which, when

administered in adequate amounts confers health benefits to the host<sup>5</sup>. *Saccharomyces boulardii* and *Lactobacilli* GG are probiotics commonly used in treating AAD<sup>6</sup>

*Saccharomyces. boulardii* has been shown to maintain and restore the natural flora in the large and small intestine<sup>7</sup>. As AAD is more common in the paediatric age group<sup>8</sup> but the data in the Indian population is scarce<sup>9</sup>, so we decided to undertake this study.

## MATERIAL AND METHOD

The study was conducted in paediatric out-patient department in tertiary hospital after approval from the Institutional Ethical Committee. The study subjects were 600 children of age group 6 months-12 years, who attended paediatric OPDs of the institution for diseases like UTI, Otitis media, Tonsillitis and were given antibiotics namely Co-amoxyclav, Cefpodoxime, Cefdinir, Cefixime and Cephalaxin. Any children with acute or chronic diarrhoea, severely ill patients, immunocompromised patients, patients who received probiotics within a week prior to starting antibiotics

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and those who received antibiotics within the previous two weeks were excluded from the study. A written informed consent was obtained from the parents of the children included in the study.

The children were randomly divided into two groups- A Control group receiving antibiotic alone [n=300] and a Test group receiving antibiotic and a Probiotic namely *Saccharomyces boulardii* [n=300]. The Control group was sub-divided into five different sub-groups receiving five different antibiotics as follows –

A1—Co-amoxyclav 25-45 mg /kg/day in two divided doses.

A2—Cefpodoxime 10 mg/kg/day in two divided doses.

A3—Cefdinir 14mg/kg/day in two divided doses.

A4—Cefixime 8mg/kg/day in two divided doses.

A5—Cephalaxin 25-50 mg/kg/day in three -four divided doses.

The Test group was also sub-divided into five similar sub-groups ,who received the same antibiotic and *Sacchromyces boulardii* 250 mg B.D [one sachet of 250 mg contains 2-3 billions CFUs] .The treatment was given for seven days .The children were called for follow up on the third day , seventh day and fourteenth day after the start of antibiotic therapy . The frequency and consistency of stool was enquired and noted at each visit and the parents were instructed to report immediately ,if they had any significant problem . The results were tabulated and statistically analysed by SPSS software version 17.01 using Chisquare test.

## RESULTS

The role of using *Saccharomyces boulardii* prophylactically to prevent AAD in children was assessed by comparing the percentage of the patients having diarrhoea in the Control group and Test group.

The age, weight and gender distribution of the patients were comparable in both Control and Test groups . In the Control group 72 [24%] out of 300 patients developed diarrhoea whereas only 16 [5.3%] out of 300 in the Test group developed diarrhoea. The result was statistically significant  $p < 0.001$  [ shown in tables1]

## DISCUSSION

AAD is a common side-effect of broadspectrum antibiotics. Probiotics are commonly used for the treatment of AAD. However, as majority of patients stop the antibiotic as soon as diarrhoea appears, probiotic hardly can show their therapeutic effect thus leading to incomplete treatment and development of antibiotic resistance. Hence the idea to give probiotics prophylactically with the antibiotics, to prevent AAD emerged. Beta- lactam antibiotics were chosen as they could be taken orally and are commonly used in the paediatric OPD for various illnesses .These antibiotics cover anaerobic bacteria in their spectrum also so produce a higher rate of AAD as their adverse effect<sup>10</sup>. *S.boulardii* was discovered by Henry boulard during its visit to Indo China<sup>11</sup>. It is non -pathogenic yeast which can be commonly used as probiotic in AAD.

In our study ,*S.boulardii* was found to have significantly reduced the incidence of diarrhoeal patient. The number of diarrhoeal patients in the Control group was 72 / 300 i.e 24% and in the Test group was 16 / 300 i.e 5.3 % ,which is statistically highly significant [ $p < 0.001$ , table1] This shows that Probiotic like *S.boulardii* when given prophylactically along with the antibiotic, has a definite role in the prevention of diarrhoea .

Similiar findings have been found by other reseachers also. Mc Farland et al conducted a double blinded placebo controlled study of hospitalized patients to determine the safety and efficacy of *S.boulardii* as a preventive agent for AAD in patients receiving at least one beta- lactam antibiotic. The incidence of diarrhoea in the patients receiving *S.boulardii* was 7.2% where as in those receiving antibiotic with placebo was 14.6% <sup>10</sup>. Kotoswska et al reported an incidence of diarrhoea of 23% in the patients receiving antibiotics with placebo and 8% in those receiving antibiotics with *S.boulardii*<sup>11</sup>. Szajewska et al reported a reduction of diarrhoea from 17.2% to 6.7% when *S.boulardii* was used with the antibiotic<sup>12</sup>. The decrease in diarrhoeal patients could be because these studies had been performed in Western countries and microfloral colonization of the gut of the individuals varies from country to country. In India , the children are exposed to a more microbiologically hostile environment as compared to the Western world . The possible benefits from the probiotic preparation also depend on the host response which may be different in



different settings<sup>13</sup>. Unfortunately, similar studies in Indian population are not available for comparison. The mechanism of action how *S. boulardii* reduces AAD has not yet been fully established. However, the probable mechanism could be that in AAD there is a disturbance of colonic microflora, which results in alternation in the degradation of bile salts and non absorbable carbohydrates. This causes reduced production of small chain fatty acids which are responsible for growth of colonic epithelium. The disturbed growth of colonic epithelium leads to decrease glucose facilitated Na<sup>+</sup> ion absorption, thus causing osmotic diarrhoea<sup>14</sup>. *S. boulardii* produces polyamines (spermidine and spermine) which

have a trophic effect on the small intestine enterocytes<sup>15</sup>. Polyamines stimulate the maturation and turnover of small intestine, thus preventing diarrhoea.

Side-effects of *S. boulardii* reported in literature are rare. We also did not encounter any side effects of *S. boulardii* in our patients. Hence we recommend that Probiotic can be given prophylactically in beta-lactam induced diarrhoea in case of paediatric patients. However, the high cost of *Saccharomyces boulardii* may be a limiting factor in the case of the patients of the poor economic conditions such as in our country.

**Table 1: Distribution of Diarrhoeal and non diarrhoeal Patients with antibiotic and antibiotic with *S. boulardii* groups**

	GROUPS		Total
	Antibiotic	Antibiotic+ <i>S. boulardii</i>	
Diarrhoeal	72(24%)	16(5.3%)	88
Non-Diarrhoeal	228(76%)	284(94.7%)	512
Total	300	300	600

p value < 0.001

**Table 2: Distribution of Diarrhoeal Patients with different antibiotics and antibiotic with *S. boulardii* groups**

	Amoxyclav	Amoxyclav + <i>S. boulardii</i>	Cefpodoxime	Cefpodoxime+ <i>S. boulardii</i>	Cephalaxin	Cephalaxin+ <i>S. boulardii</i>	cefixime	Cefixime+ <i>S. boulardii</i>	cefdinir	Cefdinir+ <i>S. boulardii</i>
Diarrhoeal	26 43.3%	2 3.3%	12 20.0%	4 6.7%	14 23.3%	2 3.3%	16 26.7%	8 13.3%	4 6.7%	0 0%
Non diarrhoeal	34 56.7%	58 96.7%	48 80.0%	56 93.3%	46 76.7%	58 96.7%	44 73.3%	52 86.7%	56 93.3%	60 100%
<b>Total</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>60</b>

**Source of Funding** - Self

**Conflict of Interest** – None

**Acknowledgement** – None

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# A Study on Factors Influencing Magnitude of HIV among Patients with Diagnosed Tuberculosis

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## ABSTRACT

**Background:** Tuberculosis (TB) is one of the oldest diseases known to affect humans and is likely to have existed in pre-hominids and is a major cause of death worldwide. More than 9 million people fall sick with tuberculosis every year. India has the highest burden of tuberculosis accounting for one fifth of the global incidence with an annual estimate of approximately 2 million cases. Tuberculosis as such is not a single disease entity but an end result of various socio demographic influences like socioeconomic status, education, overcrowding etc. Along with these factors tuberculosis is known to co-exist with other morbidities like HIV, Diabetes mellitus etc. Hence the present study intends to assess the magnitude of HIV among diagnosed tuberculosis patients and also the association of socio-demographic factors on these.

**Aim:** To study the factors influencing magnitude of HIV among tuberculosis patients

**Setting and design:** Community based cross sectional study

**Methods and material:** All the patients confirmed to have tuberculosis and put on DOTS therapy under these PHC's and DMC's were approached.

Patients were classified into various socio-demographic strata by using modified B. G. Prasad classification. Patients identified to have any co-morbidity were appropriately referred to their respective PHC's. Magnitude of HIV of tuberculosis was estimated along with 95% confidence interval. Chi-square test of significance was employed to test for association between factors.

**Results:** In the present study magnitude of HIV among Tuberculosis was 125 (25%). On analysis a statistical significant association among Tuberculosis patients was noted between socio-economic status and HIV

**Conclusions:** The high magnitude of HIV among Tuberculosis patients was noted in our study. According to RNTCP and NACO guidelines a bi-directional screening for HIV in TB patients and TB in HIV patients must be done.

**Keywords:** HIV, Tuberculosis, RNTCP, Socio-demographic factors.

## INTRODUCTION

Tuberculosis (TB) is one of the oldest diseases known to affect humans and is likely to have existed in

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pre-hominids and is a major cause of death world-wide.<sup>1</sup> More than 9 million people fall sick with tuberculosis every year.<sup>2</sup> India has the highest burden of tuberculosis accounting for one fifth of the global incidence with an annual estimate of approximately 2 million cases.<sup>3</sup>

TB is a disease of poverty mainly affecting young adults in their most productive years, adding to this malnutrition, overcrowding, indoor air pollution, tobacco, alcohol abuse and other diseases like Human Immunodeficiency Virus (HIV) infection and

Diabetes mellitus makes them more vulnerable to TB.<sup>4</sup> Tuberculosis is a multifactorial disease comprising of necessary cause and various sufficient causes such as influence of socio-demographic profile, co-infection with HIV. About 12% of all tuberculosis cases are HIV positive.<sup>5</sup> About 15% of all tuberculosis cases globally are linked to diabetes.<sup>5</sup> Nearly 0.4 million deaths are due to HIV associated tuberculosis.<sup>6</sup>

### Objectives

1. To study the magnitude of HIV among patients with diagnosed tuberculosis.
2. To study the factors influencing the magnitude of HIV patients with diagnosed tuberculosis.

### SUBJECTS AND METHOD

**Study area:** Study was done in the two selected district tuberculosis units (DTU) of Davangere district, Karnataka state, India. Davangere District situated in central Karnataka has 6 Taluks **Channagiri TU:** Channagiri TU has 5 Designated Microscopic Centres (DMC), **Davangere TU:** Davangere TU has 6 DMC's

**Study population:** Patients put on DOTS therapy in the selected tuberculosis units of Davangere.

### Inclusion criteria:

1. Diagnosed cases (from June 2014 to December 2014) of tuberculosis as per RNTCP.
2. Diagnosed cases of tuberculosis who gave consent to participate in the study

### Exclusion criteria:

1. Patient put on pediatrics weight band regimen was excluded.
2. Patients who does not gave consent to participate in the study

**Study design:** A Community based Cross-sectional study.

### Sample size:

According to TB INDIA 2013, the magnitude of HIV-TB co-infection is about 5% in India for the year 2012.<sup>17</sup> For estimating the sample size in the present study, it was proposed to assume the magnitude rate of 5% with 2% absolute precision. The sample size has

been estimated to be 500.

### Sampling method:

There are four tuberculosis units in Davangere districts, two tuberculosis units was selected for the study by simple random sampling method. Under these selected tuberculosis units all the patients put on DOTS therapy under RNTCP from all the DMCs' and PHCs' were approached.

**Study period:** One year (June 2014 to June 2015).

**Methodology:** There are four tuberculosis units (TU) under Davangere districts namely Davangere, Jagalur, Channagiri and Harapanahalli of which, two TUs' were selected by simple random sampling. Sample size for the present study has been calculated to be 500 and hence 250 patients from each Tuberculosis unit (TU) were approached.

Requisite permission for conducting the study was obtained from the District Tuberculosis Officer, Davangere. Among the selected TUs' all the Designated Microscopic Centres (DMC) and Primary Health Centres (PHC) were included. All the patients confirmed to have tuberculosis and put on DOTS therapy under these PHCs' and DMCs' were included in the study.

A pre-designed and pre-tested semi-structured questionnaire was developed which was used to gather information relating to factors influencing HIV among tuberculosis cases. A pilot study was undertaken in the study area to field test the instrument for data collection which was later standardized and was used for the main study.

Information concerning HIV status was obtained from RNTCP treatment card.

### Statistical analysis:

The data was entered in Microsoft office 2010 excel sheet. The statistical significance was set at 5% ( $p < 0.05$ ). Magnitude of HIV and selected non-communicable diseases of tuberculosis was estimated. Chi-square test of significance was employed to test for association between factors. Fischer's exact test was employed when the expected cell-frequency are very small (less than 5).

## RESULTS

The participants in the present study were divided into two groups TB with HIV and TB without HIV. The socio-demographic details of the two groups were compared.

On comparison between the two groups, the presence of HIV as a co-morbidity was found to be higher among tuberculosis patients in the age group of 18-30 years. But this was not statistically significant.

HIV was found to be higher among female patients diagnosed with TB (82.73%) when compared to male patients (71.08%) but this difference was not statistically significant.

History of occupation was taken according to kuppuswamy classification. HIV was found to be high among semiskilled workers having TB (75.39%) when compared to other occupation.

### I. Socio-demographic details of the study

participants

In the present study; 33.4% of the participants belonged to the age group 18-30 years, 28.4% belonged to age group 31-40 years, 21.4% belonged to the age group 41-50 years and 16.8% belonged to age group >51 years. Majority of the subjects were males (66.4%). Majority of study participants belonged to semi-skilled worker (25.2%), followed by unskilled (19.8), homemaker (26.8%) and skilled worker (13.2). Majority of belonged to Hindu religion (80.6%). Majority (36.6%) of study participants had education up to 1<sup>st</sup> to 5<sup>th</sup> standard.

Majority (79.8%) of study participants were married. Around 75% of the participants lived in nuclear or joint family. Most of study participants belonged to socio economic class III, IV or V (92.6%). Overcrowding was seen in majority (60.8%) houses of study participants according to sex separation or rooms per person. HIV was found to be positive in 25% of the tuberculosis cases.

**Table 1a: Factors influencing magnitude of HIV among Tuberculosis patients**

Factors influencing		TB without HIV	TB with HIV	Total	$\chi^2$	df	P value
Age (in years)	18-30	44 (24.8)	123 (75.2)	167 (100)	0.903	3	0.825
	31-40	33 (23.2)	109 (76.8)	142 (100)			
	41-50	29 (27.1)	78 (72.9)	107 (100)			
	>51	19 (22.6)	65 (77.4)	84 (100)			
Gender	Male	96 (28.9)	236 (71.1)	332 (100)	8.08	1	0.825
	Female	29 (17.3)	139 (82.7)	168 (100)			
Occupation	Professional	0 (0)	2 (100)	2 (100)	5.313	7	0.848*
	Semi-Professional	1 (6.2)	15 (93.8)	16 (100)			
	Clerk, etc.	13 (35.1)	24 (64.9)	37 (100)			
	Skilled	25 (37.9)	41 (62.1)	66 (100)			
	Semi-skilled	31 (24.6)	95 (75.4)	126 (100)			
	Unskilled	26 (26.3)	73 (73.7)	99 (100)			
	Unemployed	4 (20)	16 (80)	20 (100)			
Religion	Hindu	102 (25.3)	301 (74.7)	403 (100)	0.309	2	0.848*
	Muslim	21 (24.4)	65 (75.6)	86 (100)			
	Others	2(18.2)	9 (81.8)	11 (100)			

**Cont... Table 1a: Factors influencing magnitude of HIV among Tuberculosis patients**

<b>Education</b>	Illiterate	41 (24.8)	124 (75.2)	165 (100)	4.921	5	0.524*
	1 <sup>st</sup> to 5 <sup>th</sup> standard	44 (24.6)	139 (76.0)	183 (100)			
	6 <sup>th</sup> to 10 <sup>th</sup> standard	33 (30.6)	75 (69.4)	108 (100)			
	PUC	5 (21.7)	18 (78.3)	23 (100)			
	Graduate	2 (11.8)	15 (88.2)	17 (100)			
	Post graduate	0 (0)	4 (100)	4 (100)			
<b>Total</b>	<b>125 (25.0)</b>	<b>375 (75.0)</b>	<b>500 (100)</b>				

**Table 1b: Factors influencing magnitude of HIV among Tuberculosis patients**

<b>Factors influencing</b>		<b>TB without HIV</b>	<b>TB with HIV</b>	<b>Total</b>	$\chi^2$	<b>df</b>	<b>P value</b>
<b>Marital status</b>	Married	97 (24.3)	302 (75.7)	399 (100)	4.135	3	0.325*
	Unmarried	15 (24.2)	47(75.8)	62 (100)			
	Widow/ Widower	7 (25.9)	20 (74.1)	27 (100)			
	Divorcee/Separated	6 (50)	6 (50)	12 (100)			
<b>Type of Family</b>	Nuclear	35 (22.4)	121 (77.6)	156 (100)	3.024	3	0.377
	Joint	50 (23.6)	162 (76.4)	212(100)			
	Three generation	27 (29.0)	66(71.0)	93 (100)			
	Broken	13 (33.3)	26 (66.7)	39 (100)			
<b>Socioeconomic status (Modified B. G. Prasad)*Annexure II</b>	I	0 (0)	2 (100)	2 (100)	3.368	4	0.436*
	II	6 (17.1)	29 (82.9)	35 (100)			
	III	32 (28.6)	79 (71.2)	111 (100)			
	IV	36 (22.6)	123 (77.4)	159 (100)			
	V	51 (26.4)	142 (73.6)	193 (100)			
<b>Total</b>	<b>125 (25.0)</b>	<b>375 (75.0)</b>	<b>500 (100)</b>				

\*Fischer exact value

significant

\*Figures in parenthesis indicates percentages

The participants in the present study were divided into two groups TB with HIV and TB without HIV. The socio-demographic details of the two groups were compared.

On comparison between the two groups, the presence of HIV as a co-morbidity was found to be higher among tuberculosis patients in the age group of 18-30 years. But this was not statistically significant.

HIV was found to be higher among female patients diagnosed with TB (82.73%) when compared to male patients (71.08%).but this difference was not statistically

History of occupation was taken according to kuppuswamy classification. HIV was found to be high among semiskilled workers having TB (75.39%) when compared to other occupation.

### DISCUSSION

In the present study 50% of the study participants were in the age group of 30-50 years. There were 332(66.4%) males and 168(33.6%) females with the ratio of 1.9:1.<sup>7,8</sup> These findings are comparable with a study conducted in Gujarat where 68% of the study participants were males and 32% were females with mean age of 34.59 years.<sup>9</sup> Another study conducted in Delhi in 2000 found that 67.6 % of the participants were

males and 32.4 % females and majority (58.8%) of them were in the age group 21-40 years.<sup>10</sup>

In our study majority 78% of the participants were engaged in skilled, semiskilled or unskilled work. 26.8% were housewives and 4.0% were unemployed. A study carried out in TRC, Chennai from 1994-2004 showed that 62% of the patients were employed and 31% were unemployed.<sup>11,12</sup>

In this study it was observed that 80.6 % of the participants were Hindus. A study conducted in Jodhpur in 2004 showed that 70.7% were Hindus and 29.3% belonged to other religion.<sup>13</sup>

In the present study majority of the participants were educated up to primary school (37.1%) followed by illiterates (31.8%). Only 4% were educated up to graduation or more. This finding is comparable with the cross sectional study carried out in Gujarat in 2008-2009 which showed that 29% of the participants were illiterate, 46% were educated upto primary school and 6% were graduates.<sup>14</sup>

In our study, 31.2% of the participants belonged to nuclear family, 42.4% stayed in joint families, 18.6% in extended families and 7.8% in broken families. In the present study 399 (79.8%) were married, 62 (12.4%) were unmarried, 5.4% were widows/widowers and 2.4% divorced. Similar results were seen in a study done in Wardha in 2007. The marital status showed that 77.4% were currently married, 17% unmarried, 3.8% widows/widower and 1.9% divorcees.<sup>16</sup>

In the present study 38.6% of the participants belonged to Class V SES followed by Class IV (31.8%) and Class III (22.2%). Only 7.4% of the participants belonged to class I & II SES. Similar findings were found in a study carried out in Calcutta in 2001, where majority of the study participants belonged to lower and middle income group.<sup>17</sup>

In our study overcrowding was reported by 196(39.2%) study participants. Similar findings were also seen in a study carried out in wardha in 2007 where overcrowding was reported by 31.8% of the study population.<sup>18</sup>

The participants in the present study were divided into two groups TB with HIV and TB without HIV. The socio-demographic details of the two groups were compared.

On comparison between the two groups, the presence of HIV as a co-morbidity was found to be higher among tuberculosis patients in the age group of 18-30 years. But this was not statistically significant.

HIV was found to be higher among female patients diagnosed with TB (82.73%) when compared to male patients (71.08%) but this difference was not statistically significant.

History of occupation was taken according to kuppuswamy classification. HIV was found to be high among semiskilled workers having TB (75.39%) when compared to other occupation.

According to religion, TB with HIV was higher among Hindus (25.31%) when compared to other religion. But this difference was not statistically significant.

Majority of the illiterate patients with TB (75.15%) did not have HIV. HIV was found to be higher among TB patients who were educated till 1<sup>st</sup> to 5<sup>th</sup> standard (75.95%) when compared to other groups.

On distribution of study subjects based on marital status, TB with HIV was found to be higher among married subjects (75.68%) when compared to other groups. But this association was not statistically significant.

TB with HIV was found to be higher among the study participants belonging to nuclear family (77.56%) when compared to other groups. But this difference was not statistically significant.

On distribution of study subjects based on socio-economic status (Modified B.G.Prasad), Magnitude of HIV was found to be comparatively higher among middle and lower socioeconomic status when compared to other groups. But this difference was not statistically significant.

In our study, among 500 study participants 125(25%) patients showed HIV status positive. Our findings were similar to the observation made by a study carried out in South Texas- Mexico border wherein HIV co-infection was present in 23.2 % of patients with TB-HIV<sup>18</sup>.

The HIV/TB-infected patients were most abundant in the 41 to 45 year old group. Previous studies demonstrated predominance in young adults averaging

33 years of age<sup>6</sup>. The results in our study reflect the prolonged survival of HIV patients. The average age of those with registered cases of AIDS in Brazil between 2002 and 2005 was 35.4.<sup>19</sup>

### CONCLUSIONS

The high magnitude of HIV among Tuberculosis patients was noted in our study. According to RNTCP and NACO guidelines a bi-directional screening for HIV in TB patients and TB in HIV patients must be done strictly.

**Conflict of Interest:** Nil

**Source of Funding:** Self

**Ethical Clearance :** Yes

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# Knowledge, Awareness and Attitude Towards Mental Illness among Adult Population of Dharwad District – A Cross Sectional Study

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## ABSTRACT

**Introduction:** People's beliefs and attitudes toward mental illness set the stage for how they interact with, provide opportunities for, and help support a person with mental illness. Such attitudes can be expressed positively or negatively. Negative attitude may result in avoidance, exclusion from daily activities, exploitation and discrimination of the mentally ill.

**Materials and methodology:** This was a community based cross-sectional study conducted in 4 different areas of the district, namely, a village, a block/taluka, an urban slum and urban area. The questionnaire was designed to assess the knowledge, awareness and attitude towards mental illness.

**Results:** The knowledge of most of the manifestations was more in the urban area, less in the urban slum area and intermediate in taluka and village. There was unfavorable attitude towards mentally ill people in village area, better in urban slum area and intermediate in urban city and taluka area. The knowledge of causes of mental illness was poor in village area, better in urban city area and intermediate in urban slum and taluka. 43.5% people felt mental illness is preventable. 86% said we have responsibility to provide best possible care for people with mental illness. 77% said good health care services should be provided by Community Health Centre's.

**Conclusion:** As socio-economic status and literacy levels improved, the knowledge regarding manifestations, causes and treatment also increased. The knowledge, awareness and attitude towards mental illness were poor in the district.

**Keywords:** *Mental illness, attitude, beliefs, slum, literacy*

## INTRODUCTION

Mental disorders include depression, bipolar affective disorder, schizophrenia and other psychoses, dementia, intellectual disabilities and developmental disorders including autism. Worldwide, there are about

350 million people with depression, 60 million people with bipolar affective disorder, 21 million people with schizophrenia and 47.5 million people with dementia<sup>1</sup>. Mental disorders are noticed in all geographical regions, cultures and societies regardless of age, gender and income. Hence, they are universal in nature<sup>2,3</sup>.

People with mental disorders experience discrimination as a consequence of stigmatizing attitudes that are largely socio-culturally constructed<sup>4</sup>. Most families are ill-prepared to deal with the initial onset of severe mental disorder in their family member. Families generally have little knowledge of mental illness, and

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find that they not only have to deal with the ups and down of illness but also need to deal with the stigma, and attitudes in the community<sup>5</sup>. The role of family becomes even greater in a developing country like India with more than 1 billion people where there is a paucity of trained personnel, with the number of mental health professionals not exceeding 5,000<sup>6</sup>.

People’s beliefs and attitudes toward mental illness set the stage for how they interact with, provide opportunities for, and help support a person with mental illness. When such attitudes and beliefs are expressed positively, they can result in supportive and inclusive behaviors (e.g., willingness to date a person with mental illness or to hire a person with mental illness). When such attitudes and beliefs are expressed negatively, they may result in avoidance, exclusion from daily activities, exploitation and discrimination of the mentally ill.<sup>7</sup>

A person’s mental health literacy is defined as his or her “knowledge and beliefs about mental disorders that aid the recognition, management or prevention of these disorders”. Mental health literacy includes the ability to recognize and differentiate various types of mental illness and disorders, knowledge of how and where to seek information about risk factors, intervention strategies, and professional help; and attitudes and beliefs that influence a person’s ability to identify mental illness and seek appropriate help<sup>8</sup>. Hence, we took up this study to assess the knowledge, awareness and attitude of people in Dharwad district.

**MATERIALS AND METHOD**

This was a community based cross-sectional study conducted from December 2015 to January 2016 in Dharwad District of Karnataka after obtaining Institutional Ethical Committee clearance (EC13072015). From the District, an urban slum, a village, a taluka and an urban area in the city were selected nonrandomly.

By taking 50% prevalence & absolute error 5%, the sample size was calculated to be 400. Hence, we took 100 participants each from the areas selected. A list of houses was prepared to provide sampling frame. Individual households were selected by systematic random sampling. Any 1 adult member (≥18 years) residing in a selected household for more than 6 months and gave consent for interview was recruited in the study. A pre-tested, semi-structured questionnaire was used to

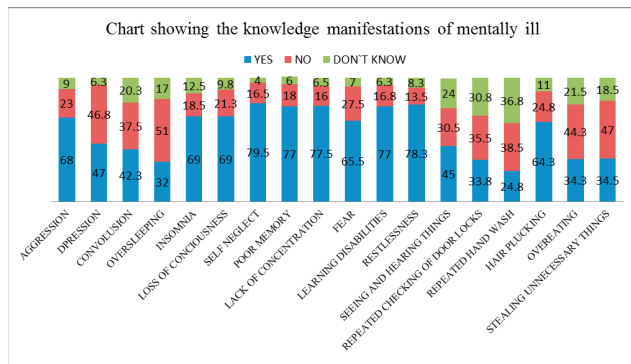
assess the awareness, knowledge and attitude towards mental illness. The data was entered in MS-EXCEL 2010 and statistically analysed by SPSS software 20.0

**RESULTS**

A total of 400 participants were recruited in the study of which 51% were females and 49% males. 75% were Hindus, 13.5% Muslim, 10.5% Christian and 1 % others. 71% were married, 24% unmarried, 4.5% widowed and 0.5% divorced. 21% of participants were illiterates. The mean age of the participants is 36.3±14.1.

**Table 1: Showing the socio-demographic characteristics of participants**

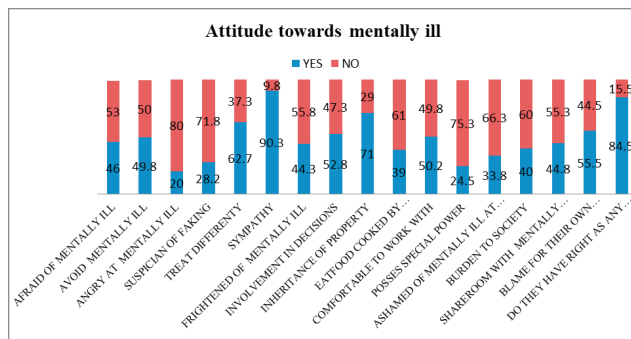
VARIABLES	GROUPS	PERCENTAGE	FREQUENCY
<b>Age</b>	18-25	28.5	114
	26-40	41.5	165
	41-64	26.3	105
	65 and above	4	16
<b>Gender</b>	Male	49.3	197
	Female	50.7	203
<b>Religion</b>	Hindu	75	300
	Muslim	13.5	54
	Christian	10.5	42
	Others	1	4
<b>Income</b>	Class-i	33.3	133
	Class-ii	18.5	74
	Class-iii	20.3	81
	Class-iv	23.8	95
	Class-v	4.3	17
<b>Marital status</b>	Married	71	284
	Unmarried	24	96
	Widow/er	4.5	18
	Divorce	0.5	2
<b>Education</b>	Illiterate	21	84
	Primary	12.8	51
	High	22.8	91
	Intermediate	10	40
	Graduate	33.5	134
<b>Residence</b>	Urban	75	300
	Rural	25	100
<b>Occupation</b>	Professional	7	2.6
	Semi-professional	38	14.1
	Skilled	39	14.4
	Semi-skilled	35	13
	Unskilled	11	4.1
	Unemployed	140	51.9



**Bar Chart 1: Showing the knowledge of manifestations of mentally ill**

The most common manifestations of mentally ill preferred by the respondents were aggression(68%), depression(47%), convulsion(42.3%), self-neglect(79.5%), poor memory(77%), lack of concentration(77.5%), learning disabilities(77%), restlessness(78.3%), hair-plucking(64.3%) and stealing unnecessary things(34.5%).

It was seen that, the knowledge of most of the manifestations was more in the urban city area, namely, depression 43.1%, oversleeping 32.8%, loss of consciousness 27.9%, fear 30.5%, seeing and hearing things 32.2%, repeatedly checking for door locks 41.5%, repeated hand wash 42.4% and stealing unnecessary things 41%. For most of the manifestations, the knowledge was less in the urban slum. The knowledge of taluka and village people was intermediate in most of the manifestations of mental illness.

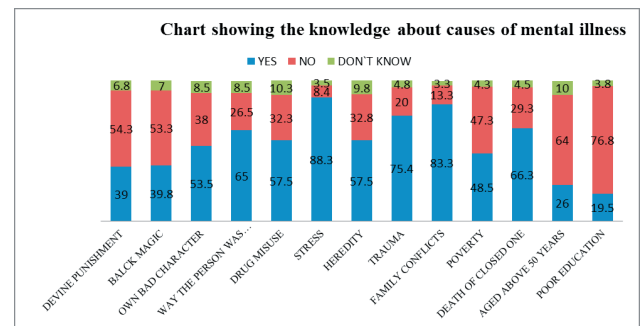


**Bar Chart 2: showing the attitude of study participants towards mentally ill**

46% were afraid of mentally ill, 49.8% avoided mentally ill, 90.25% showed sympathy towards mentally ill, 44.25% said they get frightened of mentally ill persons, 24.8% felt they possess special power, 40% said they are burden to the society, 55.5% said they should be blamed for their own condition and 84.5%

said they have equal rights as any other.

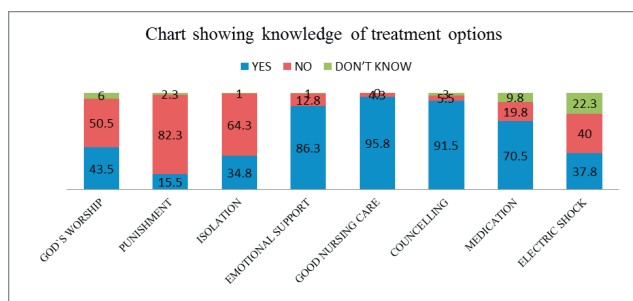
It was noticed that, there was unfavorable attitude towards mentally ill people in village. 29.3% were afraid of mentally ill, 30.2% avoid mentally ill, 35% were angry at mentally ill, 31.9% had suspicion of faking, 29.1% said they treat them differently, 30% were frightened of mentally ill, 35.7% felt they possess special power, 37% were ashamed of having mentally ill at home, 31.9% said they were burden to the society and 30.6% said they should be blamed for their own condition. But it was noticed that attitude towards mentally ill was better in urban slum, namely, only 18.5% were afraid of mentally ill, 20.1% avoid mentally ill, 17.5% angry at mentally ill, 15% had suspicion of faking, 16.4% were frightened of mentally ill, 29.2% said they should also inherit the ancestral property, 30.8% were comfortable to work with them. It was intermediate in urban city and taluka areas.



**Bar Chart 3: showing the knowledge about causes of mental illness**

39% said mental illness is due to God's punishment, 39.8% due to black magic, 53.5% said due to their own bad character, 57.5% due to substance abuse, 83.5% due to family conflicts, 26% due to old age and 19.5% said due to poor education.

It was observed in the study that, the knowledge of causes of mental illness was poor in village. The knowledge was better in the urban city area, namely, 33.9% said its due to substance abuse, 28.3% said due to heredity, 26.6% said due to trauma, 31.4% due to poverty, 27.9% felt due to death of closed one, 41.3% felt aging cause mental illness, 41% felt due to poor education and only 21% said due to God's punishment and 33.3% said due to black magic. The knowledge regarding causes of mental illness in taluka area and urban slum was intermediate between these two areas.



**Bar Chart 4: showing knowledge of treatment options**

43.5% thought that mental illness can be cured by God's worship, 34.8% felt they should be isolated, 86.3% said emotional support is necessary, 95.8% felt good nursing care, 70.5% medication and only 37.8% opted for electric shock as treatment option. 30.5% of people in village area said God's worship is the only treatment. The knowledge regarding treatment options was almost same in the urban posh area, urban slum area and the taluka.

**Table 2: Showing the knowledge of prevention of mental illness**

PREVENTION	YES	NO	DON'T KNOW
ISOLATION	50(12.5)	116(29)	16(4.1)
EMOTIONAL SUPPORT	147(36.8)	24(6)	8(2)
PUJA	82(20.5)	90(22.5)	7(1.8)
YOGA	122(30.5)	42(10.5)	15(3.8)

43.5% people felt mental illness is preventable. In that 12.5% felt through isolation, 36.8 through emotional support, 20.5% pooja to God and 30.5% through Yoga and meditation.

On comparing literacy with manifestations of mental illness, it was found that, as the literacy levels improved, the knowledge regarding the manifestations of mental illness namely depression, oversleeping, lack of concentration, fear, checking of locks, repeated hand wash and stealing were found significant. Comparison of socio-economic status with manifestations of mental illness found that as the socio-economic status improved from Class5 to Class1, the knowledge of the manifestations namely, depression, fear, checking for locks, repeated hand wash and stealing were found significant.

On comparison of causes of mental illness with literacy we found that, as the literacy levels improved the knowledge regarding the causes of mental illness like upbringing, substance abuse, heredity. The lower literacy people felt mental illness is caused by God's will and black magic. Comparison of causes of mental illness with the socio-economic status showed, it was found that as the socioeconomic classes improved from class 5 to class 1 the level of knowledge on causes of mental illness namely, substance abuse, trauma, poor education were found significant. The lower socio-economic class people felt it to be due to God's will and black magic.

On comparing literacy vs treatment options we saw that the literate people felt that the mental illness is untreatable and the illiterate felt that it can be treated by worshipping God. Comparison of treatment options with socio-economic status showed the lower socio-economic class felt that the mental illness can be cured through God's worship.

43.4 % said mental illness can be prevented. 49.3% said it cannot be prevented and 7.3 said they don't know about it. 36.8% felt mental illness can be prevented through emotional support, 30.5% through yoga which was followed by spirituality (20.5%). 73% said virtually anyone can become mentally ill. 86% said we have responsibility to provide best possible care for people with mental illness. 77% said good health care services should be provided by Community Health Centre's.

**DISCUSSION**

In a similar study done at Bangalore, Karnataka in 2015 by Poreddi et al., 69% attributed to genetic inheritance, 34.8% due to God's punishment, 64% to substance abuse and 59.6% to brain disease. 61.5% said mentally ill are largely to be blame for their own condition. 54% feel mentally ill are dangerous and 34.2% avoid mentally ill persons. 55.9% were ashamed of mentally ill person at home. 45.9% were not able to maintain friendship with mentally ill. 59.1% said mentally ill are not capable to work. 47.9% said even

mentally ill can take part in taking important decisions. 62.2% said they have same rights as anyone else.<sup>9</sup>

In a study done by R.Safwi Sadia et al., in 2014 at Aligarh, Uttar Pradesh, 63.8% said mental illness is caused due to God's punishment for past sins, 33.5% due to genetic inheritance, 38.9% due to biologic changes in the brain, 36.9% due to witchcraft, 63.3% due to death of closed ones, 88.3% due to financial/familial conflicts and 47.1% attributed to old age where as in our study, 39% said due to God's punishment, 69% due to genetic inheritance, 59.6% due to brain trauma, 39.8% said due to black magic/witchcraft, 66.3% said due to death of closed ones, 83.5% due to familial conflicts, 26% due to old age. 56% in our study said mental illness is caused by the way a person is raised (upbringing of children) and 53.5% by the bad character. In their study, 36.4% said weak/nervous personality and 76.7% physical illness as the cause of mental illness.<sup>10</sup>

In a study done by Ganesh K in Southern India in 2014, 60% said they are afraid of mentally ill, 25% said they are willing to maintain friendship with mentally ill, 55% were ashamed of having mentally ill in the family. 35% in their study said visit healer and 18% psychiatrist for emotional problem. 55% were of opinion that marriage can treat mentally ill. Majority in our study said mentally ill should be given good nursing care(95.8%), counseling(91.5%), emotional support(86.3%) and electric shock(37.8).<sup>11</sup>

In a study done by Mohammad Kabir et al., at Karfi in Northern Nigeria, 22% said aggression as manifestation of mental illness, whereas in our study, 68% said aggression as cause of mental illness. Causes of mental illness as said in their study; misuse of drugs was 34.3%, divine punishment/God will 18.8%, magic, spirit possession 18%, accidents/trauma 11.7%, heredity 10.5%, family conflicts/marital disharmony 5.5%, financial distress/poverty 1.2%. 45.2% in their study feared mentally ill. 32.4% avoided, 20% felt angry, 16% suspicion, 46.8% were sympathetic towards mentally ill. More than half harbored negative feelings toward mentally ill. Literates were more likely to exhibit positive feelings. Participants in their study preferred orthodox medicine (46%), spiritual healing (34%), traditional medicine 18% for treatment<sup>37,8</sup>.

## CONCLUSION

As socio-economic status and literacy levels

improved, the knowledge regarding manifestations, causes and treatment also increased. There was good knowledge and awareness about manifestations and causes among people in urban area and they even had fairly good attitude towards mentally ill. Though the knowledge, awareness was poor in urban slum and attitude towards mentally ill was good. The knowledge and awareness and attitude all were poor in village and intermediate in taluka area.

Mental Health education should be given to the lower socio-economic status and low educated people regarding cause, manifestations and treatment of mental illness. The improvement in the literacy of the people will automatically bring about the overall improvement in all the aspects like socio-economic status, living standards, etc. The people in the village, urban slum and taluka areas should be made aware regarding the knowledge of mental illness and improve their attitude towards the mentally ill. Good health care services should be available at primary and community health centers.

**Conflict of Interest** –None Declared

**Source of Funding**- Self

**Ethical Clearance** – The study was approved by the Institutional Ethics Committee(EC13072015).

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# An RCT to Assess the Effectiveness of Cold Compress on Relieving Symptoms of Allergic Conjunctivitis amongst Indian Children

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## ABSTRACT

**Purpose:** To assess the effectiveness of cold compress in relieving symptoms of allergic conjunctivitis. **Method:** Tools included survey and assessment proforma and interview schedule. Total 217 subjects (108 experimental, 109 controls) were identified by stratified systematic random sampling. Pre interventional assessment of symptoms of allergic conjunctivitis was done in both groups. In experimental group cold compress was applied on both eyes as per protocol. Final post interventional assessment of symptoms was done on 6<sup>th</sup> day in both groups. **Results:** Cold compress reduced overall intensity of all symptoms of allergic conjunctivitis significantly (p value < 0.05 - Mann-Whitney Test) in experimental group compared to control group. **Conclusion:** Cold compress is an effective measure and can hence be used as a routine home-based practice to provide satisfactory relief from symptoms of allergic conjunctivitis.

**Keywords:** allergic; conjunctivitis; cold; compress; symptoms.

## INTRODUCTION

Allergies are common health problem worldwide and allergic conjunctivitis is a common condition.<sup>1,2</sup> Allergic conjunctivitis refers to inflammation of eyes resulting from reaction to any allergen. The delicate tissues of the eyes frequently are the first to be affected by allergies. Histamine release leads to eyes becoming red and itchy, with watery discharge. Rubbing of the eyes by the patient leads to further histamine release, thus aggravating the symptoms. This becomes a vicious cycle.<sup>2,3</sup> In some cases, eye irritation is the only symptom of allergy but in most others, these are usually accompanied by nasal allergy symptoms (sniffing, sneezing and stuffy nose). Mostly people treat nasal allergy symptoms and ignore eye allergy.<sup>3</sup> Allergic conjunctivitis is often under-diagnosed and consequently undertreated.<sup>4</sup>

Diagnosis of allergic conjunctivitis can be easily made by careful examination by a general practitioner / primary care physician from signs (e.g. red eye) and symptoms (e.g. itching). Mildness of symptoms (like redness and itching) prevents patients from seeking medical help. However, at times, the symptoms can be extremely severe and debilitating – including sensations of grittiness and burning of eyes. Occasional reports in literature suggest that cold compress relieves the symptoms of allergic conjunctivitis but evidence based practice for the same needs to be established.<sup>5,6</sup>

Prevalence of symptomatic allergic conjunctivitis in general population is high, roughly 1 in 5 persons.<sup>1,2,7,9</sup> Debilitating symptoms like itching, watering and discharge adversely affect patients' quality of life as they are a continuous source of irritation. This causes interference in their day to day activities leading to decreased ability to concentrate and hence, productivity.<sup>10</sup> In children, it may affect social and extracurricular activities, lead to poor attention in school, low academic performance and, reduced school attendance.<sup>10</sup> Hence, allergic conjunctivitis is a serious health problem though it may not cause life-threatening

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symptoms or hospital admission and proper control of symptoms is important in a patient. Because allergic conjunctivitis lasts for many months /year in most patients, control of symptoms with purchased medicines each time can be a financial strain on the family. Neglect may lead to chronicity of the condition.<sup>10</sup> The present study was undertaken to objectively assess the effectiveness of cold compress on relieving the symptoms of allergic conjunctivitis in children of age group 5-15 years in a North Indian community.

## MATERIAL AND METHOD

Study area chosen was Daddu Majra colony of North Chandigarh, India having 3003 numbered houses with a population of 18,000 approximately as per the official records and hosts migratory population from various states of India. Majority of people here belong to low socio economic group and are uneducated. Written informed consent was taken from study subjects. The controls were not given the intervention but were demonstrated the procedure of cold compress application during the last visit.

The sample size was calculated by using "Statcalc Software" (Epi Info) taking prevalence - 15%, error interval - 5% ( CI 95%). Calculated sample size considering 10% dropouts was 206~210. The total number of houses were divided into six strata of 500 houses each; and were randomly allocated to experimental and control groups by lottery method - comprising of three strata each in the 2 groups. From each stratum every 2<sup>nd</sup> house was surveyed (even numbered house ) to identify the subjects belonging to of 5-15 years age group, having allergic conjunctivitis. The tool and protocol for cold compress was developed by relevant literature search on allergic conjunctivitis through books, journals and internet search ; and subsequently validated by experts in the field of nursing and ophthalmology. Tools developed in the study included – a survey proforma to identify the children with allergic conjunctivitis, an interview schedule to gather information on socio demographic profile and allergic conjunctivitis data among the study subjects. Among 1775 children surveyed, ( 5-15 years age group ), 217 subjects were identified having allergic conjunctivitis; of these, 108 were allocated to experimental group and 109 to control group. Pre interventional assessment of ocular symptoms was done in both groups. In experimental group cold compress

was applied on both the eyes as per protocol for 5 consecutive days. The intervention of cold compress was given daily in the morning by the researcher and the procedure was demonstrated to a family member; subsequently, he/she provided cold compress in the evening. This intervention was given till the symptoms of allergic conjunctivitis subsided or maximum upto 5 days. In control group , no intervention was given. Final post interventional assessment of symptoms was done on 6<sup>th</sup> day for both the groups. The scores of each symptom were categorized on a scale of 0-10. No symptom ( 0 ), mild – (0.1-3 ), moderate – (3.1-7 ) and severe – ( 7.1-10). The individual scores of all the symptoms were added –up and divided by 5 to obtain the average scores (0-10). This gave the overall intensity of the symptoms of allergic conjunctivitis for each patient. This overall intensity also was further categorized as no symptom – (0 ), mild– (0.1-3 ), moderate– (3.1-7 ) and severe– (7.1-10 ).

The data collected was analysed using descriptive and inferential statistics and calculations were done with the help of SPSS-16.0 Program. Various statistical tests used were Chi square, Wilcoxon, Mann-Whitney. Value of  $p < 0.05$  was considered statistically significant.

## RESULTS

### Socio-demographic profile

Mean age of subjects was  $9.40 \pm 2.86$  years in the experimental group and  $9.77 \pm 3.26$  years in control group. Male preponderance was seen in both groups ( 57.4% and 64.2% respectively). 63% of the subjects were educated upto primary level in experimental group and 57.8% in control group. Majority (93-95%) of the subjects in both groups were Hindus. Family type was nuclear in 58.3% and 50 % respectively. Comparing family size; 56.4% of the experimental group and 46.7% of the control group had 4-8 members in their family. There was no statistical difference between both the groups with regard to socio demographic variables except for family size (  $p$  value – 0.038).

Environmental factors - Liquefied petroleum gas (LPG) was the type of fuel used by majority of the families in both groups. Most houses had separate kitchen in their house ( 77.7% experimental and 87.2% in control group ). In experimental group very few (6.4%) had kept a pet in their house while in control group 13.8% had some pet . There was no



statistical difference between groups for exposure to environmental factors.

### Symptoms of Allergic Conjunctivitis among the study subjects at the baseline assessment

69% and 71.6% of the subjects in the experimental and control group respectively had reported 3 symptoms in allergic conjunctivitis. Presence of all 5 symptoms was rare (4.6% & 8.3% respectively). Itching and frequent eye rubbing (Figure 1) were observed in all the subjects in both the groups and watering of eyes was also observed in the majority. Redness & occurrence of ropy discharge were less frequent.

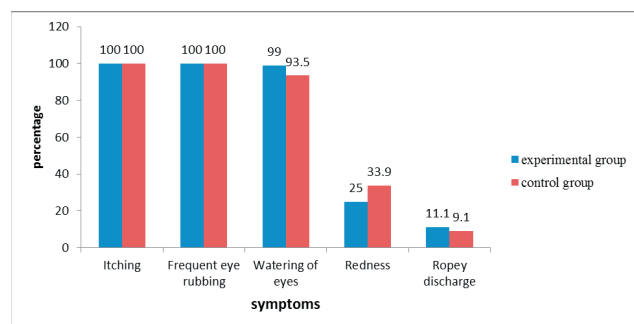


Figure 1: Prevalence of symptoms of Allergic Conjunctivitis study subjects N-217

### Intensity of each symptom of allergic conjunctivitis before and after intervention ( cold compress )

In pre intervention assessment, majority of subjects in both groups had moderate to severe itching, frequent eye rubbing and watering of eyes. The other 2 symptoms viz. redness and ropy discharge were not observed in most subjects in the 2 groups. With application of cold compress in experimental group, all the symptoms reduced to zero in most subjects; rest had mild persisting symptoms. Reduction of symptoms with time in control group was minimal. From table 1, it is seen in preintervention assessment that there is no significant difference between the 2 groups for all the symptoms except redness ( $p$  value  $< 0.05$ ). However, in post interventional assessment symptoms in experimental group had reduced to zero or mild intensity, with very small changes in the control group (highly significant statistically  $p$  value  $< 0.001$ ).

Table 1: Intensity of each symptom of allergic conjunctivitis before and after the intervention of cold compress N-217

Intensity of symptoms (Scores)	Pre interventional assessment(Day 1)			Post Interventional assessment(Day6)		
	Experimental group (n <sub>1</sub> -108) n <sub>1</sub> (%)	Control group (n <sub>2</sub> -109) n <sub>2</sub> (%)	$\chi^2$ /Fischer's Exact, df, pvalue	Experimental group (n <sub>1</sub> -108) n <sub>1</sub> (%)	Control group (n <sub>2</sub> -109) n <sub>2</sub> (%)	$\chi^2$ /Fischer's Exact, df, p value
<b>Itching</b>						
No symptom(0)	-	-		92 (85.2)	-	264.96* 3 <0.001
Mild (1-3)	-	2 (1.8)	3.48*	16 (14.8)	5 (4.6)	
Moderate (3-7)	84 (77.8)	91 (83.5)	3	-	96 (88.1)	
Severe (7-10)	24 (22.2)	16 (14.7)	0.122	-	8 (7.3)	
<b>Frequent eye rubbing</b>						
No symptom(0)	-	-		92 (85.2)	-	262.44* 3 <0.001
Mild (1-3)	-	2 (1.8)	3.48*	16 (14.8)	6 (5.5)	
Moderate (3-7)	84 (77.8)	91 (83.5)	3	-	96 (88.1)	
Severe (7-10)	24 (22.2)	16 (14.7)	0.122	-	7 (6.4)	
<b>Watering of eyes</b>						
No symptom(0)	1 (0.9)	7 (6.4)		98 (90.7)	7 (6.4)	214.32* 3 <0.001
Mild (1-3)	5 (4.6)	5 (4.6)	4.67*	10 (9.3)	9 (8.3)	
Moderate (3-7)	89 (82.4)	86 (78.9)	3	-	85 (78.0)	
Severe (7-10)	13 (12.0)	11 (10.1)	0.331	-	8 (7.3)	

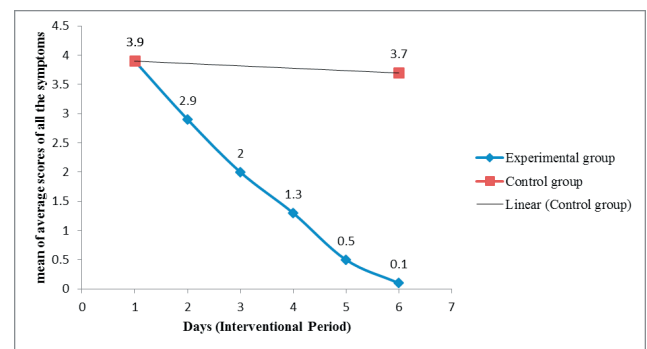
**Cont... Table 1: Intensity of each symptom of allergic conjunctivitis before and after the intervention of cold compress N-217**

<b>Redness</b>						
No symptom(0)	81 (75.0)	72 (66.1)	18.37	103 (95.4)	72 (66.1)	43.15*
Mild (1-3)	8 (7.4)	5 (4.6)	3	5 (4.6)	7 (6.4)	3
Moderate (3-7)	10 (9.3)	31 (28.4)	<0.001	-	29 (26.6)	<0.001
Severe (7-10)	9 (8.3)	1 (0.9)		-	1 (0.9)	
<b>Ropy discharge</b>						
No symptom(0)	96 (88.9)	99 (90.8)	2.16*	107 (99.1)	99 (90.8)	8.95*
Mild (1-3)	2 (1.9)	-	3	1( 0.9)	2 (1.8)	3
Moderate (3-7)	8 (7.4)	9 (8.3)	0.648	-	7 (6.4)	0.01
Severe (7-10)	2 (1.9)	1 (0.9)		-	1 (0.9)	

\*Fischer’s Exact Test

**Impact of cold compress on intensity (mean scores) of each symptom**

The mean score for all the 5 symptoms in the pre interventional assessment was between 5.49 to 6.06. With intervention , in experimental group , the mean score remarkably decreased to less than 1 for all the symptoms . In the control group , difference between the mean scores of all the symptoms was much less . (Figure 2).



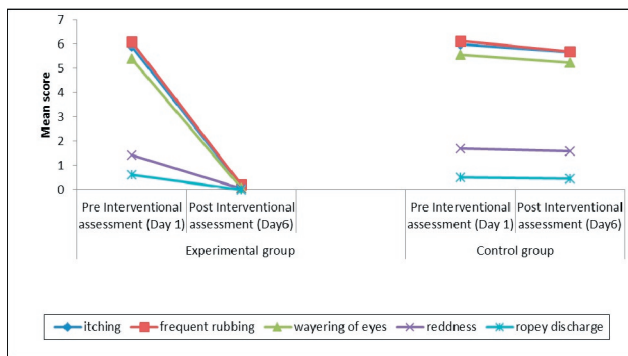
**Figure 3: Comparison of mean scores of overall intensity of all the symptoms of allergic conjunctivitis between experimental and control group**

**Effectiveness of cold compress on overall intensity of all symptom (median scores) of allergic conjunctivitis**

In pre-interventional assessment, the median of overall intensity of all the symptoms for experimental and control group was 3.60 (Intra quartile range of 3.00-4.75) and 3.80 (Intra quartile range of 3.40-4.60) respectively. There was no statistical difference ( Mann-Whitney test ) between the 2 groups.

In post interventional assessment ( Table 2 ) the median of overall intensity of all the symptoms for the experimental group decreased to 0.00 ( range of 0.00-0.00) and in control group it decreased to 3.60 (range of 3.00-4.20) ; p value < 0.001 as per Mann-Whitney Test.

Further it was also observed that there was significant difference (Table 2) between the median of overall intensity of all the symptoms during the *pre-interventional assessment* of both groups ; and also during the *post interventional assessment* for both groups (p value < 0.001)



**Figure 2: Impact of cold compress on intensity (mean scores) of each symptom**

The mean score of *overall intensity of all the symptoms* reduced from 3.9 to 0.1 in experimental group and from 3.9 to 3.7 in control group (Figure 3).

**Table 2: Effectiveness of cold compress on overall intensity of all symptom (median scores) of allergic conjunctivitis**  
N-217

Groups	Median(IQR) score of overall intensity of all the symptoms		Wilcoxon Signed Rank Test Z value p value
	Pre Intervention assessment(Day 1)	Post Intervention assessment(Day 6)	
Experimental group n <sub>1</sub> -108	3.60(3.00-4.75)	0.00 (0.00-0.00)	-9.036 <0.001
Control group n <sub>2</sub> -109	3.80(3.40-4.60)	3.60(3.0-4.20)	-3.777 <0.001
Mann-Whitney Test Z value (p value)	-1.776 0.078	-13.253 <0.001	

## DISCUSSION

Allergies affect 10 to 20 percent of the population.<sup>1,2</sup> They often run in families. People with allergies are more likely to develop allergic conjunctivitis as conjunctiva is easily accessible to allergens. When eyes are exposed to allergens like pollen, dust, animal dander, etc. they become symptomatic. Morbidity of allergic conjunctivitis is associated with *frequency* rather than its *severity* because repeated episodes of even mild attacks may be debilitating for patients. Although the burden of allergic conjunctivitis is high<sup>1, 7-9</sup> it is frequently overlooked by patients and remains under-diagnosed in majority of the population.<sup>4</sup>

Literature suggests that cold compresses, when held against the eyes for 5-10 minutes (twice a day, 3-4 days), are effective in controlling symptoms.<sup>3-5</sup> Since allergic symptoms are seasonal and recurrent, it would be justified to put to use easily available low-on-price agents to control symptoms related to this disease and provide relief to the patient so that use of costly long-term ocular medication can be avoided.

In the present study, cold compress was performed twice a day for 5 days. Involvement of family members for implementation of any home based intervention is very important so that they can perform the intervention in case of future reoccurrence.

Only limited data is available on the effectiveness of cold compress. Bhikhu et al<sup>11</sup> compared efficacy of artificial tears, cold compress and anti-allergy medications for benefit in allergic conjunctivitis; concluding that use of cold compress had synergistic

effect with both artificial tears and topical antihistamine medications.

In the present study, there was complete resolution of symptoms in the experimental group; this reduction was seen only partially in control group. The possible mechanisms for reduction in severity of symptoms could be reduction in release of histamine by mast cells (due to cold compress) and vasoconstriction. The capillary constriction might be limiting the spread of allergen and histamine secreting cells to larger areas of conjunctiva ; thus arresting the vicious cycle of allergen-rubbing-redness.

People with mild/moderate symptoms do not approach a medical practitioner for their symptoms; hence this simple measure can be taught to community members, so that they can get relief from their symptoms. It is a very cost-effective measure which can be practiced by all, in a home-setting. The easy accessibility of conjunctival mucosa enables local measures to be easily applied and this is advantageous in control of allergic symptoms.

To summarise, the intervention of cold compress was found to be effective in reducing the overall intensity of symptoms of allergic conjunctivitis. It is easy to administer and enables avoidance of use of other costly ocular medications. Thus it has potential to be used by health professionals working in the community to provide relief to patients with symptoms of allergic conjunctivitis; especially in third world countries.

**Conflicts of Interest :-** None of the authors have any proprietary interests or conflicts of interest related to this submission.

**Source of Funding:-** No financial grant was taken for the study project, the study was self sponsored by the primary author.

**Ethical Clearance:-** Ethical clearance was taken from the Institute ethical committee (PGIMER, Chandigarh). Written informed consent was taken from the study subject. Subjects were empowered with the full autonomy to participate in the research and withdraw at any time. The trial is also registered with Clinical Trials Registry- India (CTRI) with registration number CTRI/2016/02/006586.

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# Knowledge and Attitude of Antenatal Mothers Regarding Cord Blood Donation, AIMS, Kochi

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## ABSTRACT

**Background:** Stem cell research is one of the most important and at the time, the most controversial topics of science today. Blood stem cells have been used to treat certain cancer, blood and metabolic and immune disease. **Methodology:** The aim was to assess the knowledge and attitude of antenatal mothers about cord blood donation and to associate between knowledge score and selected demographic variables. It was a descriptive study conducted among 70 antenatal mothers at Amrita Institute of Medical Sciences, Kochi. The sample selected by Non Probability convenience sampling technique and data collected by semi structured knowledge questionnaire including socio-demographic variables. Investigator developed five point Likert scale to assess the attitude of antenatal mothers regarding cord blood donation. **Result:** Majority of the antenatal mothers (61%) had poor knowledge, 29% of the mothers had average knowledge and only 10% of them had good knowledge regarding cord blood donation. The mean knowledge of antenatal mothers was 4.17 with a Standard Deviation of 1.802. Out of total subjects 41.4% mothers had positive attitude, 48.6% mothers had average attitude and 10% of the mothers had negative attitude towards cord blood donation. There was no significant association between knowledge score and selected demographic variables. **Conclusion:** From the study, investigator observed that antenatal mothers had very little knowledge regarding the concept of cord blood donation, on the other hand majority of them have average attitude to cord blood donation.

**Keywords:** Knowledge, Attitude, Cord blood donation, Antenatal mothers

## INTRODUCTION

The most precious gift that the God has given to a family is “birth of baby”. This occasion delivers unique happiness and gives new meaning to parent’s life. The birth of a child presents us a very unique opportunity along with the happiness, the occasion delivers us that we have someone more, very important to care about. The opportunity is nothing but something that could be derived from the umbilical cord and placenta<sup>1</sup>. Advancement in medical research has been established the use of cord blood based stem cells in the treatment of more than 75 diseases, especially in the treatment of deadly diseases like leukaemia, lymphoma, etc...

In India, umbilical cord research started in 1990 at Cancer Research Institute Mumbai. The first stem cell in India however, was set up in 2002. Constantly growing attempts are being made to spread awareness of the

phenomenon of umbilical cord blood banking that has created a sensation in the scientific community. Research on stem cell therapy could be used to treat more than 75 life threatening diseases. Although a relatively new concept, cord blood storage is fast gaining momentum as a less traumatic alternative to waiting lists, as a way to treat neurological illness and as an insurance for the family against host diseases<sup>2</sup>.

A descriptive study was conducted to assess the pregnant women’s knowledge and attitude about stem cells and cord blood donation. The sample size was 334 pregnant women. Data were collected by using interview forms. This study concluded that the participants had lack of knowledge about cord blood donation and health care professionals need to offer accurate and scientific counselling services on the subject to the parents<sup>3</sup>.

A study conducted to determine the antenatal

mother's knowledge of umbilical cord blood donation. The total sample size was 350 patients. The data collected by using questionnaire revealed that 37% of patients had poor knowledge regarding umbilical cord blood donation 48% of mothers had little knowledge regarding cord blood donation and 15% of mothers having good knowledge. These studies have proved that mothers do not have enough knowledge about cord blood donation and to enhances their knowledge by providing directional guide sheets<sup>4</sup>.

### **AIMS AND OBJECTIVES**

The aim is to study the knowledge and attitude of antenatal mothers about Cord Blood donation.

### **MATERIALS AND METHOD**

The descriptive study was initiated after obtaining Ethics committee permission. Informed consent is taken from the participants those who meet the inclusion criteria. They were selected by Non probability convenient sampling technique and 70 mothers were recruited as per inclusion criteria. The data collection period was one month. The data collection done by using semi structured knowledge questionnaire and five point Likert scale for Knowledge and Attitude respectively. The study setting was Gynec OPD and antenatal wards at AIMS Hospital .

### **RESULT**

Majority of antenatal mothers were in the age group of 18-25 years (49%).The highest percentages of antenatal mothers were Hindu (35.7%) and having education upto higher secondary (51.4%). Most of antenatal mothers (51.4%) were primigravida. Majority of antenatal mothers 58.6% were unemployed, living in urban area (57.1%) and 32.9% of them gain knowledge through health professionals (Table:1). Majority of the antenatal mothers (61%) had poor knowledge, (29%) mothers had average knowledge and only (10%) of them mothers had good knowledge regarding cord blood donation (Figure: 1). The mean knowledge of antenatal mothers was  $4.17 \pm 1.802$ . Out of total subjects 41.4% mothers had positive attitude, 48.6% of the mothers had average attitude and 10% of the mothers had negative attitude towards cord blood donation (Figure:2). There was no significant association between knowledge and selected demographic variables (Table: 2).

### **DISCUSSION**

In Kerala, cord blood banking is a new concept and the people have lack of knowledge regarding cord blood banking and its uses. Thus the present study was conducted to assess the knowledge and attitude of antenatal mothers regarding cord blood donation in AIMS, Kochi

The results of the study showed that 61.4% of antenatal mothers had poor knowledge regarding antenatal cord blood donation and 28.5% of antenatal mothers had average knowledge and only 10% of antenatal mothers had good knowledge.

Results of the current study supported by a study which was conducted to investigate the knowledge and attitude towards cord blood banking among well educated Pregnant Koreans. The data were collected by using questionnaire from 1001 women attending a maternity education program. In this study most of the students received information from promotional materials distributed by cord blood bank and media; and the minimal information was obtained from obstetricians. 863 women answered that they had heard of cord blood, more than 90% of women planned to donate cited altruism and 75% of women planned for private preservation. This study concluded that a considerable portion of educated pregnant women has more than minimal knowledge of cord blood, but the level of knowledge regarding the potency of public bank and current usefulness and limitations of cord blood are generally low and obstetrician should play an important role in disseminating knowledge regarding cord blood donation<sup>5</sup>.

Another study was conducted to evaluate and better understand the knowledge regarding issues of umbilical cord blood banking among 400 pregnant women. The research revealed that 3% of patients were extremely knowledgeable, 74% were minimally informed. Only 14% of pregnant women stated that they had been educated about umbilical cord blood banking by an obstetrical care provider, but 90% did have an expectation that their obstetrician could answer their questions on this topic. The researcher concluded that the pregnant women have less knowledge regarding issues of umbilical cord blood banking<sup>6</sup>.

Regarding the attitude, showed that 48.6% of antenatal had average attitude regarding cord blood

donation and 41.4% of antenatal had good attitude regarding cord blood donation and 10% of antenatal mothers had poor attitude regarding cord blood

The above study findings were supported by a study conducted to evaluate the attitude of women towards cord blood donation and transfusion. Data were collected from 180 women who were attended the maternity clinic, by using questionnaire. The donation and transfusion of cord blood were acceptable to 81% and 19% of women were not accepted and study concluded that the donation of umbilical cord blood and its transfusion were acceptable to the majority of women <sup>7</sup>

The association between knowledge regarding cord blood donation and selected demographic variables was calculated by using Chi square test. The result showed that there was no statistically significant association between knowledge regarding cord blood donation and selected demographic variables.

#### **Compliance with ethical Standard**

The study was initiated after obtaining permission from the Ethics Committee of Amrita Institute of Medical Science. This article does not contain any studies with animals performed by any of the authors.

#### **Disclosure of potential conflict of interest**

Authors (Linda Varghese and Bency Bhasy ) declare that there has no conflict of interest

#### **Informed consent**

Informed consent was obtained from all individual participants included in the study.

#### **CONCLUSION**

Cord blood banking is a Once-In-A-Life time opportunity to protect the family's long term health. Cord blood provides a rich source of stem cells for use in many situations where bone marrow is considered today. Cord

blood stem cells are used in disease treatment to fight over 80 diseases including many forms of malignancies such as Leukaemia, autoimmune diseases. Stem cell research is exploring new applications for treatment every day. This research may prove effective in the future treatment of many common diseases and injuries that plague today's society, including Spinal cord injury, Stroke, Heart disease, Diabetes and HIV. Though it is an emerging technology in the field of Medicine, people are less aware regarding cord blood donation.

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# Psychological Impact of Cancer Diagnosis in Newly Diagnosed Breast Cancer Patients

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## ABSTRACT

**Aim:** The aim of the study was to examine the impact of cancer diagnosis on the psychological status of women with breast cancer, focusing on anxiety and psychological distress experienced by breast cancer patients.

**Materials and Method:** A descriptive, cross-sectional study was conducted among 80 breast cancer patients after an initial cancer diagnosis by using purposive sampling. The study was conducted in a tertiary care hospital in South India. Data was collected by using Demographic and Clinical proforma, State-Trait Anxiety Inventory and Impact of Event Scale. Sample characteristics were analyzed using descriptive statistics, the influence of anxiety on psychological distress was tested with correlation and a chi-square test was used to test the association between anxiety and distress with demographic and disease-related variables.

**Results:** The sample consisted of 80 women with a mean age of 48.1 years. 96% were married, and 90% of them were housewives. Half of the subjects were educated upto primary school. 80% were in stage II of cancer with a duration of diagnosis of 2-4 weeks. 48% of the subjects were suffering from a moderate range of distress and 16% had severe psychological distress. Similarly, 80% of subjects had moderate to high level of anxiety. Anxiety did not have any influence on psychological distress. And only duration of diagnosis was associated with psychological distress.

**Conclusion:** Results of the study suggest that cancer diagnosis can cause moderate to severe distress in breast cancer patients. Recognizing distress and intervening it on time is pivotal to improve treatment outcomes of women with breast cancer.

**Keywords:** Anxiety, cancer diagnosis, psychological distress, quality of life

## INTRODUCTION

Breast cancer is the most commonly detected malignancy and major cause of cancer death in

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women around the world.<sup>[1]</sup> Cancer diagnosis is usually associated with pain, chronicity, changes in body image, loss of function and death.<sup>[2]</sup> Literature shows that third to half of women with breast cancer experience psychological distress and multiple stressors influence the psychological functioning of these patients over time.<sup>[3,4]</sup> A study conducted by Burgess *et al.* <sup>[5]</sup> reported that more than 30% of women in early breast cancer had depression or anxiety or both at diagnosis. Dastan and Buzlu <sup>[6]</sup> in their study reported that 35% of their patients had anxiety. Similarly, studies reveal that 20-40% of breast cancer patients experience high levels of



psychological distress.<sup>[7, 8]</sup> Anxiety and psychological distress can reduce the quality of life of cancer patients and are associated with poorer clinical outcomes.

Psychosocial care for cancer patients often has been neglected as an aspect of quality clinical care.<sup>[9]</sup> Attention to psychological problems is also equally important as fast and accurate diagnosis and treatment. Distress screening provides an opportunity to determine the basis of psychological distress and provide appropriate treatment. Therefore the present study aims to examine the impact of diagnosis of cancer on the psychological status of women with breast cancer, especially focusing on anxiety and psychological distress experienced by them.

## MATERIALS AND METHOD

This cross-sectional descriptive study was conducted in a tertiary care hospital in South India. Using a purposive sampling technique 80 women with newly diagnosed breast cancer were recruited for the study from July to December 2015. All the patients were recruited during their hospitalization for further examination. At the time of admission the specific type of surgery that was to be performed was not determined. The inclusion criteria were women in the age group of 25-75 years, within a diagnosis period of 1-4 weeks and with stage I, II, III of cancer. The study excluded those subjects with stage IV cancer and metastasis to brain or bone, with concurrent malignancies and with severe cognitive impairment or psychiatric illnesses.

The study was conducted after obtaining administrative permission and institutional ethical clearance. Written consent was obtained from participants after giving clear information about the study. They were informed that their participation is voluntary and can withdraw from study at anytime.

Data were collected using Tool 1: Demographic and clinical Proforma, Tool 2: SpielbergerState-Trait Anxiety Inventory (STAI) and Tool:3 Impact of Event Scale .Tool 1 consisted of demographic variables like age,religion,marital status, education, occupation, income and clinical variables like stage of cancer , duration of diagnosis, other co morbidities. Tool 2 SpielbergerState-Trait Anxiety Inventory (STAI Form Y-1) which consists of 20 items describes the current state of anxiety. Subjects were asked to rate on a four point scale ranging from 1 (not at all) to 4 (very much

so). The minimum score was 20 and maximum score was 80.Tool 3 Impact of event scale (IES).The IES is a 15 item questionnaire developed by Horowitz et al., 1979.In the present study the tool was used to measure current subjective distress related to cancer diagnosis.IES is a 4 point scale with response options for each item range from 0 (not at all) to 5 (often).Score ranges from 0 -75. All the instruments were validated and translated into local language. Data collected were analysed using SPSS version 16.0.Both descriptive and inferential statistics were used to analyse the data.

## FINDINGS

### Description of sample characteristics

This section describes the samples characteristics which include demographic and clinical variables.

**Table 1: Frequency and percentage distribution of samples according to demographic characteristics (n=80)**

	Demographic characteristics	Frequency (f)	Percentage (%)
1.	Age (in years)		
	26-50	51	63.8
	51-75	29	36.2
2.	Religion		
	Hindu	71	88.8
	Muslim	2	2.5
	Christian	7	8.7
3.	Marital status		
	Married and living with partner	68	85.0
	Unmarried	3	3.8
	Widow	8	10.0
	Divorced	1	1.2
4.	Education		
	Primary	42	52.5
	Secondary	25	31.2
	Higher secondary	4	5.1
	Graduate and above	9	11.2
5.	Occupation		
	Employed	7	8.8
	House wife	72	90.0
	Any other	1	1.2
6.	Income		
	Below ₹6000	25	31.3
	₹6001-10000	37	46.3
	₹10001-15000	9	11.3
	₹15001-20000	3	3.6
	Above ₹ 20001	6	7.5

It is evident from Table 1 that most of the subjects belong to the age group of 26-50years (63.8%).Majority of the samples belongs to Hindu religion (88.8%).52.5% of the samples had primary education.85% of samples were married and living with their partners whereas 10% were widows,3.8% were unmarried and 1.2% were divorcées. Majority of the samples (90%) were housewives. Most of the samples (46.2%) belong to the income group of Rs. 6001-10000, 31.2% were having an income belowRs.5000.There were only 11% of subjects who have a monthly income more than Rs.15000.

	Clinical variables	Frequency (f)	Percentage (%)
1.	Stage of cancer		
	Stage 1	5	6.2
	Stage2	52	65.0
	Stage3	23	28.8
2.	Duration of diagnosis		
	1-2 weeks	20	25
	2-4 weeks	60	75

Data presented in Table 2 shows that 65% of the samples were in stage 2 of breast cancer. Majority of samples (75%) had duration of diagnosis of 2-4 weeks.

**Distribution of samples based on anxiety scores**

This section describes the frequency and percentage distribution of sample based on anxiety scores .Anxiety scores were categorized as mild (20-39) moderate (40-59) and severe anxiety (60-80).Data depicted shows that majority (73.8%) of the subjects were suffering from moderate level of anxiety and 6.2% had severe anxiety. Only 20% had mild level of anxiety [Figure 1].

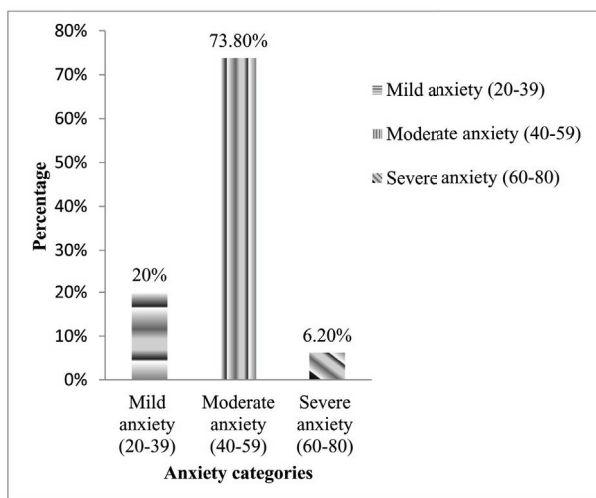


Figure 1: Distribution of samples based on anxiety scores

**Distribution of sample based on Psychological distress scores**

This part of the analysis describes frequency and percentage distribution of samples based on psychological distress scores. The psychological distress scores were categorized into sub clinical (0-8), mild (9-25), moderate (26-43) and severe range (44-75).

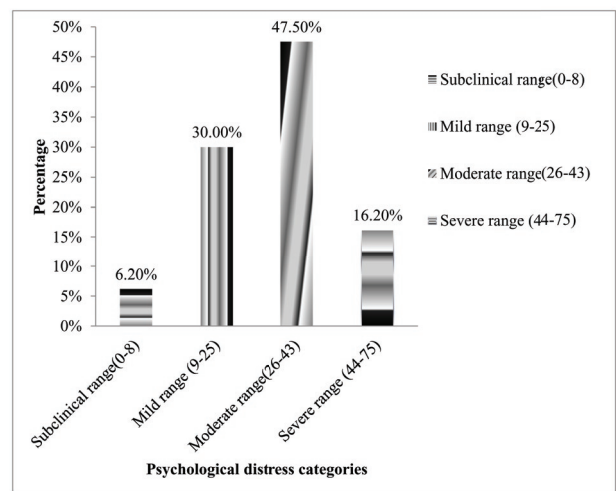
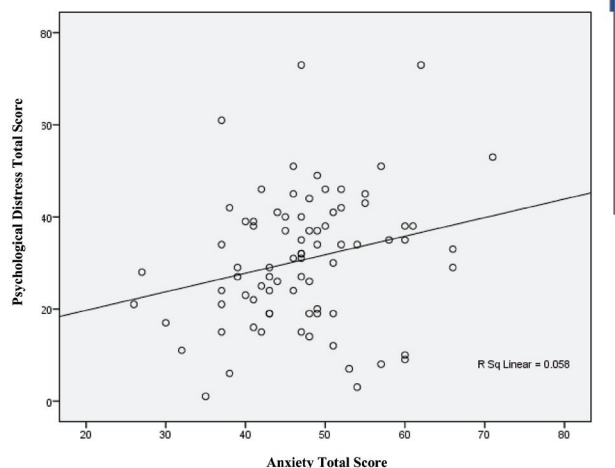


Figure 2: Distribution of samples based on psychological distress scores

Data in Figure 2 reveals that 47.5% of the samples had moderate range of psychological distress, 16.2%had severe range of distress ,30% had mild level of distress where as only 6.3% had subclinical distress due to the impact of cancer diagnosis.

**Correlation between anxiety and psychological distress**

The Pearson’s correlation coefficient was computed to find relationship between anxiety and psychological distress.



**Figure 3: Correlation between anxiety and psychological distress**

Figure 3 reveals that there exists a very weak positive relationship between anxiety and psychological distress ( $r = 0.24, p = 0.03$ ) which is not very significant. Therefore anxiety doesn’t have an influence on psychological distress in the present study.

**Association between anxiety and selected demographic and clinical variables**

A chi square test used to test the association between anxiety and selected demographic and clinical variables reveals that only duration of diagnosis has an association with anxiety ( $\chi^2 = 11.79, p = 0.02$ ). No other demographic or clinical variables are associated with anxiety [Table 3].

<b>Table 3: Association between anxiety and demographic and clinical variables (n=80)</b>				
	<b>Variables</b>	<b>Chi square value</b>	<b>df</b>	<b>p value</b>
1	Age	0.94	02	0.63
2	Educational status	7.84	06	0.25
3	Marital status	0.56	06	0.47
4	Occupation	7.05	04	0.13
5	Income	3.00	08	0.93
6	Stage of cancer	4.44	04	0.35

7	Duration of diagnosis	11.79	04	0.02**
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\*\* ( $p < 0.05$  level of significance)

Association between psychological distress and selected demographic and clinical variables

**Table 4: Association between psychological distress and demographic and clinical variables(n=80)**

	<b>Variables</b>	<b>Chi square value</b>	<b>df</b>	<b>p value</b>
1	Age	3.93	03	0.27
2	Educational status	9.82	09	0.37
3	Marital status	12.81	09	0.25
4	Occupation	9.10	06	0.17
5	Income	7.79	12	0.80
6	Stage of cancer	9.29	06	0.16
7	Duration of diagnosis	7.85	06	0.25

( $p < 0.05$  level of significance)

It is evident from Table 4 that none of the demographic or clinical variables are associated with psychological distress.

**DISCUSSION**

The aim of the present study was to examine the impact of cancer diagnosis on psychological status of newly diagnosed breast cancer patients. The findings of the present study support and illuminate the results of similar studies on psychological distress experienced by breast cancer patients after diagnosis.

The present study which is conducted among 80 samples shows that most of the participants were in the age group of 26-50yrs (63.8%) with a mean age of 48.1 yers. This finding is similar to a study conducted by Srivastava V *et al.*,(2016) [10], in which 59.5% of the sample were in age group 20-40yrs, whereas a study conducted by Lueboonthavatchai P,(2007) [11] shows that 64.3% were in the age group of 41-60 years.

In our study most of the subjects were having primary or secondary educational status (52.5% and

31.2% respectively) and only 16.2% had educational status above secondary level. This finding is contradictory to the finding of a study conducted in Thailand by Lueboonthavatchai P,(2007) <sup>[11]</sup> where 80% of the women had educational status above secondary school level.

Our study findings are in par with the study conducted by Srivastava V *et al.*,(2016) <sup>[10]</sup> which reported that majority of the subjects were married and housewives.

Economic status has an important role in cancer treatment. In this study 31.3% of the sample was below income ₹ 6000 per month. This is supported by the study by Srivastava V *et al.*,(2016) <sup>[10]</sup> which found that 55.5% of the sample was below income of ₹ 2000 per month. Low economic status and lack of employment may contribute to high financial burden in these patients, which can in turn cause psychological distress in women.

In contrast to the findings of studies conducted by Chirico *et al.*,(2015) and Nakatani Y *et al.*,(2013) <sup>[12,13]</sup> present study shows that 65% of samples were in stage II of cancer. Whereas the above mentioned studies show that majority of their samples were in stage I of cancer.

Previous research has reported moderate to high level of anxiety among women (Millar K *et al.*,(1995) ;Lueboonthavatchai P, (2007);Srivastava V *et al.*,(2016) <sup>[14,11,10]</sup> ;Similarly in present study 73.8% showed moderate level of anxiety,6.2% exhibited severe anxiety and only 20% of samples exhibited mild anxiety.

Studies conducted by Zabora J R *et al.*,(2001); Andreu Y *et al.*,(2012); Schubart J *Ret al.*,(2014) <sup>[7,15,16]</sup> show that during preliminary diagnosis, women experienced psychological distress. This study finding reports that 30% exhibited mild distress, 47.5% moderate range of distress, 16.2% severe distress and 6.5% with subclinical range of distress. Distress in cancer patients has been identified as a significant problem which affects their quality of life and clinical outcomes.

In our results, we found that anxiety doesn't have a correlation with psychological distress which was an unexpected finding. Generally, people who experience anxiety will exhibit a high level of distress. A study conducted by Iwamitsu *et al.*,(2005) <sup>[17]</sup> showed that breast cancer patients with high anxiety reported more

psychological distress.

In the present study there was no significant association with anxiety and demographic or clinical variables. Only duration of diagnosis was found to have an association with anxiety. In contrast, a study conducted by Srivastava V *et al.*,(2016) <sup>[10]</sup> revealed that age group, educational level and monthly income were significant factors. In another study Andreu Y *et al.*,(2012) <sup>[15]</sup> has reported psychological distress was not related with any of demographic or clinical variables.

Overall, the findings of this study suggest that cancer diagnosis can be a stressful experience for women which in turn increase their psychological distress.

The use of small sample size, a cross sectional design and single setting limit the interpretation of findings and generalizability of the study. Furthermore the narrow scope of the instrument used for measuring psychological distress was another limitation in this study. Thus, future studies should consider longitudinal designs on larger population and comparative studies to investigate psychological stages of young, middle aged and older women with breast cancer.

## CONCLUSION

Results of study suggest that cancer diagnosis can cause moderate to severe distress in breast cancer patients. Therefore health care professionals including doctors, nurses and social workers need to recognise that individual patients differ in psychological distress levels. Also care must be tailored to reflect this unique differences and work together to develop specific and focused interventions to reduce distress.

**Conflict of Interest:** Nil

**Source of Funding:** This study was supported by Sigma Theta Tau International Honor Society of Nursing Omicron Delta Grant-2014

**Ethical Clearance:** Taken from Institutional Ethical Committee in January 2014.

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# The Yellow Lure: A Cohort Study on Employee Perception on Creativity in Hospitality Sector

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## ABSTRACT

**Objectives:** This study has taken an effort to examine the employees intrinsic motivation, psychological empowerment and creativity among the hotel employees in Chennai. This study also proposed to assess the correlation between intrinsic motivation and psychological empowerment and its impact on the employee creativity among the hospitality employees.

**Methods/Statistical Analysis:** A total of 250 questionnaires were distributed randomly but only 232 were absolute and used for this cohort. This study was conducted from October 2016 to January 2017 in the particular hotels in Chennai. The SPSS 21 version AMOSS were used to analyse data. Two independent variables (Intrinsic motivation and Psychological Empowerment) were engaged with Employee Creativity as the dependent variable.

**Findings:** In the statistical findings, the scale reliability Cronbach's alpha value was 0.947. One way anova and correlation was done to know about the relationship among the variables.

**Applications/ Improvements:** In the study, the data were used to infer the variables that effect on the employee creativity. The hotel need to pay more weightage in supporting the employees in the creativity processes in the department. The employees need to take more interest in the active participation during the creativity programme which need to be induced in their daily operational process.

**Keywords:** *Employees Perception, Intrinsic Motivation, Psychological Empowerment, Employee Creativity.*

## INTRODUCTION

In the field of human resources, one of the major issues which is predominant is that employees are working under pressure in all sectors. The Indian hospitality industry faces high rate of attrition where more employees are psychologically disturbed or they quit the job. This situation brings in the perennial problems to the industry. When the employees leave their jobs the employees turnover increases, subsequently the replacement for that vacancy is never completed. The causes of psychological pressure, health hazards and intentions to quit are the reasons to undertake employees problem. This study has incorporated employee creativity, which helps to overcome the work pressure in hospitality industry.

The term employee is undefined in a particular bound as it varies upon the view of employee himself,

employer, and law<sup>1</sup>. The food and beverage department of the hotel industry runs manually and it has more requirements for employees hereby the hotel industry acts as major provision of employment opportunities. India's hospitality sector was awarded to be the second largest employer in the world employing more than 500 thousands of employees by 2019<sup>2</sup>. Every 2.5 seconds a new job opportunity is opened up online finding for a new employee. Beside there is an incursion of new jobs it also bears a higher than average of unemployment rate.<sup>3</sup>

Every personal attribute of the employee reflects in the service provided to the guests. He has to tackle tough situations between the management and guest. Thus the stress full job nature, low wages and improper work-life balance raises the attrition among the employees which results in a high employee turnover percentage.<sup>4</sup> This

proportionally affects the productivity standard of the hotel, leading to a unsatisfied guest service which brings an adverse effect on hotel's reputation.

The study includes the factors of motivation among the employees in the hospitality industry to overcome the tough situations. Among the motivational factors, the intrinsic motivation and the psychological empowerment variables were selected to overcome the issues in hospitality industry. The need of the study aroused to measures the relationship between the intrinsic motivation and psychological empowerment and discussed that the employees are significantly creative in job when associated with intrinsic motivation and psychological empowerment. Promotion of these qualities among the employees reduces the turnover and makes the employees whole heartedly satisfied in their job.<sup>5</sup>

## REVIEW OF LITERATURE

### INTRINSIC MOTIVATION

The employees are the main asset for the hospitality industry where the frontline employees are in direct contact with the consumers than the higher level of management. It is natural as they have their own individuality upon the personal attributes of the employees.<sup>6</sup>

Hospitality employers expect skilful and creative employees and this expectation varies according to the categorization of the hotel<sup>7</sup>. Motivation are of two types which consist of extrinsic motivation and intrinsic motivation. An extrinsic motivation is a tangible reward, whereas the intrinsic motivation is a phenomenal way of improving a sense of satisfaction, responsibility and involvement<sup>8</sup>. The Front desk staffs waits till his regular guest check out not considering his shift time show the intrinsic motivation in him servicing the guest than a monetary expectation from the employer<sup>9</sup>. Employees with elevated emotional intelligence is intrinsic motivated and more positively respond to a high perceived organizational support.<sup>10</sup> In the hotel industry the employees need to feel that the support given by the organization enhances the motivation level of employees and helps them to perform better.

### PSYCHOLOGICAL EMPOWERMENT

The psychological empowerment, affects or arise

in the mind related to the mental and emotional state of a person. Any normal individual has a percentage of empowerment inbuilt in them and to enable them to perform meticulously in the working environment. The researchers have used the word "empowerment" both to refer to the act of empowering<sup>11</sup> and to describe the internal mental process of the individual being empowered<sup>12</sup>. It is also described as the study of the mind and the thought, feeling, and behaviour.

Recently research has equated psychological empowerment with intrinsic task motivation<sup>13</sup>. This study correlates between Intrinsic Motivation and Psychological Empowerment. They were analysed so as to find the impact on the employee creativity. Empowering employees increases the responsibility and coordination among employees resulting in job satisfaction and employee performance<sup>14</sup>.

### EMPLOYEE CREATIVITY:

Creativity is the tendency to generate or recognize ideas, alternatives, or possibilities that may be useful in solving problems, communicating with others, and entertaining ourselves and others. Employee Creativity is a mental characteristic that allows a person to think out of the box, which results in innovative or different approaches to a particular task.

In the hospitality Industry to attract the attention of the guest, to increase the number of sales in the Food and Beverage department, to exhibit creativity and personal touch in the elite restaurant has proved that the employees are highly empowered and they are intrinsically motivated. Creativity is an outcome of employee intelligence and satisfaction it is in-depth thinking important for a long time survival of the organization. Creativity is an ongoing process that makes the organization to be innovative and existing.<sup>15</sup>

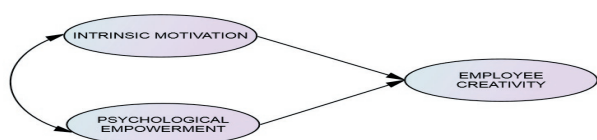
But in certain organizations the percentage of stress and the percentage of pressure is on the higher side which may not allow the employees to perform their task in a satisfactory level in the eye of the above superiors. This article has included the employee creativity to act as an enhancer to add a positive value to the employees intrinsic motivation and the employee to be psychologically empowered.

Besides the rewards the intrinsic motivation enhances the creativity, no rewards can motivate an

employee's involvement and creativity in doing his job.<sup>16</sup> Employees intrinsically motivated are contributory creativity employees who have an excitement and interest towards their task.<sup>17</sup>

### RESEARCH MODEL

This article's variables and their relationship are presented in the Figure 1. In this model, the intrinsic motivation and psychological empowerment are the independent variables and the employee creativity is the dependent variable. This model was based on Teresa M Amabile 1996 on model of creativity and innovations in organisations.



**Figure 1. The Research Model**

### OBJECTIVES OF THE STUDY

1. To analyze the hotelier's level of intrinsic motivation and psychological empowerment.
2. To assess the association between intrinsic motivation and psychological empowerment and its effects on employee creativity.
3. To examine the significant difference with opinion among employees' age with respect to creative inspiration.
4. To analyse the significant mean difference between gender and pleasure in new task.

### HYPOTHESIS

In enlighten of this article the following hypotheses are proposed:

H<sub>1</sub>: Intrinsic motivation has a positive and direct association with psychological empowerment.

H<sub>2</sub>: Intrinsic motivation and Psychological Empowerment have a positive influence on employee creativity.

H<sub>3</sub>: There is a significant mean difference among employees' age with respect to creative inspiration.

H<sub>4</sub>: There is significant mean difference among male and female employees with respect to pleasure in new task.

### RESEARCH METHODOLOGY

#### Data Collection and Sampling

The data was collected from Chennai hospitality industry. The employees have to deliver a qualitative and quantitative total service approach to the customers in the hotels.

So this study aimed at the employees in the selected hotels in Chennai Tamil Nadu. Data were collected from November 2016 to January 2017. A questionnaire was prepared and randomly distributed to the four major departments in the respective hotel's employee who volunteered themselves to participate. Questionnaires were distributed to the 3 Hotels respectively. Two hundred and thirty two questionnaires was valid.. The Employees were asked to respond in the following criteria.

- Degree of Intrinsic Motivation: Questions were asked about Inspired, Promotion, Creativity.
- Levels of Psychological Empowerment: Questions were addressed to the respondents with regard to meaning, competence and Impact of creativity.
- Assessment of Employee Creativity: The respondents were addressed with how creative they are in their respective departments.

The SPSS21 was used to analyse the collected data from the hospitality employees working in the four major departments. The collected valuable data was incorporated in the SPSS 21. The data was analysed in the Cronbach Alpha for Reliability, the tested data of 51 items resulted as .947, as it is above the accepted level and the data are internally consistent further test were conducted. Among the respondents, the male respondents were 73.3% and the female respondents were 26.7%. To find the differences among the employee's age with employee's creative Inspiration the association between the variables was conducted by using Pearson Correlation. To comprehend the employee's demographic information, descriptive statistics was employed.

### RESULT AND DISCUSSION

In the Table 1 the Cronbach alpha was used to analyse the employees response and this confirms the reliability of the items.



**Table 1**

Reliability Statistics	
Cronbach's Alpha	Number of Items
0.947	51

**Table 2: ANOVA between age and Creative Inspiration**

	Sum of Square	df	Means Square	f	Sig
Between Groups	22.984	3	7.661	7.271	.000
Within Groups	240.240	228	1.054		
Total	263.224	231			

In the above Table 2 one way Anova was conducted among the creative Inspiration and the age of the hotel employees. The significant  $p$  value exhibits that there is a difference in the age. The alpha value is lesser than 0.05 for the age which is a very substantial difference. ( $F(3,228)=7.3p=0.001.$ )

**Table 3: Group Statistics between Gender and Pleasure in New Task**

Gender	N	Mean	Std.Deviation	Std.Error Mean
Male	170	1.45	.499	.038
Female	62	1.26	.441	.056

In the Table 3 the descriptive statistics was analysed and results are to highlight the pleasure in new task on the gender. Here the male employees mean value is 1.45 which is higher than the female employees mean value.

**Table 4: Independent Samples Test between Pleasure in New Task**

Levene's Test							
		Levene's Test for Equality of Variances		T – Test for equality of Means			
		F	Sig	t	df	Sig(2-tailed)	Mean Difference
Pleasure in New Task	Equal Variance Assumed	39.936	.000	2.632	230	.009	.189
	Equal Variances not Assumed			2.786	121.571	.006	.189

Table 4. Exhibits the independent samples  $t$ -test conducted whether there is any difference between the mean of pleasure in new task of male and female groups. The significant value for the Levene's test  $p$  is .000, that states the variances of the pleasure in new task in these two groups are not equal as the  $\alpha$  value is .009.

**Table 5: Descriptive Statistics Pearson Correlations for Intrinsic Motivation, Psychological Empowerment & Employee Creativity.**

	Mean	Standard Deviation	N
Intrinsic Motivation	39.0690	7.04681	232
Psychological Empowerment	36.1209	8.10767	232
Employee Creativity	33.8448	9.15816	232

The result shown in the table 5 is that the bivariate Correlations among the Intrinsic Motivation, Psychological Empowerment and Employee Creativity. The mean value of in Intrinsic Motivation 39.0690 is higher than the other two variables Psychological Empowerment and Employee Creativity.

**Table 6: Correlations between Variables Intrinsic Motivation, Psychological & Employee Creativity**

		Intrinsic Motivation	Psychological Empowerment	Employee Creativity
Intrinsic Motivation	Pearson Correlation	1	.702**	.307**
	Sig.(2 – tailed)		.000	.000
Psychological Empowerment	Pearson Correlation	.702**	1	.516**
	Sig.(2 – tailed)	.000		.000
Employee Creativity	Pearson Correlation	.307**	.516**	1
	Sig.(2 – tailed)	.000	.000	

\*\*Correlation is significant at the 0.01(2-tailed).

The Table 6 shows that there is a linear positive Correlation between Intrinsic Motivation and Psychological empowerment among the employees. The Correlation Co-efficient is .702 and it is statistically significant as the *p value* is lesser than 0.05. Employee Creativity and Psychological Empowerment are positively correlated and the Correlation Co-efficient is .516 and its statistically significant( $p < 0.05$ ). There is a positive Correlation between Intrinsic Motivation and Employee Creativity and the correlation co-efficient is .307 and it is statistically significant( $p < 0.05$ ). Intrinsic Motivation is positively correlated with Psychological Empowerment at ( $r = 0.702, p < 0.05$ ) and with the Employee Creativity at ( $r = 0.307, p < 0.05$ ). Psychological Empowerment is positively correlated with Employee Creativity at ( $r = 0.516, p < 0.05$ ). This result exhibits that all variables used to measure Creativity Enhancer level on employees are associated and the correlation is significant at 0.01 level. Hence the null hypothesis is rejected and the alternative hypothesis  $H_1$  and  $H_2$  is accepted.

## DISCUSSION

The constructs in the model (intrinsic motivation and psychological empowerment) are concluded to be significant and impact employee creativity. The psychological empowerment is a critical factor (0.710) in determining the employee creativity. It is understood by the majority of the employees that, for the creativity in the hospitality sector, the organisational goal plays a vital role for creativity which can be achieved by supporting the employees in providing them with extra time, suitable shift, valid information and proper implementation. India is a hub for various tourist destinations in and around the world. India has well established hotels, the facilities are updated by improving its standards to the international level.

## CONCLUSION

This article concludes that the hotel employees are enhanced by the employee creativity. The result of the analysis exhibits that there is an association between the intrinsic motivation, psychological empowerment and employee creativity. This study reveals that there

is a difference between the male and female employees with regard to creativity. The employees are highly inspired by the creativity in the hotel sector and the analysis show that there is a difference with the mean value among the various employee's age and creative inspiration. Further more this article could be developed in future with the employee creativity scale with other human resources segments related to employees. The findings of that article provides managerial implications to the hospitality industry that interacts with guest with various demands. To strengthen this study the identifying factors have significant effect on psychological empowerment will also be helpful is expanding the model of this study. The study further should focus on the employee turnover, employees creativity and employee retention.

**Conflict of Interest** is nil among the authors.

**Source of Funding** : Self

**Ethical Clearance** : NA

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# Vaping as Smoking Cessation Methods: Is it a Solution or a New Problem ?

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## ABSTRACTS

Tobacco smoking has been responsible for 1 million deaths worldwide and predicted would kill 1 billion people in this century. Electronic cigarettes (e-cigarettes) or vaping become more popular in recent years and used by many tobacco smokers as alternative method to smoking cessations. Surprisingly, the new technology made this device more attractive for most teenager and young adults, who had never smoke. Many research has been conducted to answer the pro(s) and con(s) about the benefit and harm of vaping. E-cigarettes caused many health effects, such as cardiovascular diseases, pulmonary diseases, and psychological behavior effects. The in vivo and in vitro studies found that reactive oxygen species (ROS) play an important role for the development of diseases. For conclusions, more researches are still needed to found the effectiveness of e-cigarette as a smoking cessation therapy, including short term and long term health risks.

**Keywords:** *electronic cigarettes, vaping, cardiovascular, pulmonary, psychological behavior*

## INTRODUCTION

There were about 100 million deaths from tobacco in the 20th century, most in developed countries. If current smoking patterns persist, about 1 billion people in this century will be dead. Therefore, World Health Assembly in 2013 agreed to reduce the prevalence of smoking about a third by 2025, which would avoid more than 200 million deaths from tobacco during the remainder of this century.<sup>1</sup>

Complete tobacco cessation is the best target of therapy for all tobacco smokers. However, the addictive properties of nicotine and ritualistic habit of smoking become a huge barrier, even for those who have strong desire to stop smoking. Until now, there are many interventions that had been applicated to stop smoking habit, but still unsuccessful. E-cigarettes are the newest

products for tobbaoco harm reductions, which is believed to be effective in motivated persons.<sup>2</sup>

E-cigarette became popular in 2015, after Public Health England released a report that e-cigarette are 95% less harmful than smoking.<sup>3</sup> The popularity of e-cigarette may be due to their ability to overcome the physical and behavioral component of smoking addiction. Conventional cigarettes contain combustion process, which can emit free radicals to the smokers body. The amount of nicotine that is consumed and absorbed is quite low in e-cigarette.<sup>2</sup> However, as a new product, it still needs to be evaluated whether it is a solution or it will become a new problem.

### E-cigarettes

E-cigarette devices consisting of battery part and liquid storage. The battery creates heat to a resistance an encircling wick to disperse a solution. The dispersion of the solution created an aerosol that can be inhaled by the user. The liquid mostly consists of flavor, propylene glycol, distilled water, and nicotine. Users (vapers) can choose the desire nicotine strengths (including non-nicotine liquids) and flavors.<sup>4</sup>

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There are three basic types of e-cigarette. (1) First generation device 'Cigalike', e-cigarette that are disposable or use pre-filled cartridges, mimicking conventional cigarettes. (2) Second generation device 'Tank systems', e-cigarette that needs to be refilled with liquid by the users, consisting mainly of higher capacity of lithium batteries and atomizer. (3) Third generation device 'Variable power e-cigarette or Mods', tank systems that allow the users to control the power delivery from the battery to the atomizer, consisting of very large capacity of lithium batteries.<sup>4</sup>

### **E-cigarette in World and Indonesia**

The popularity of e-cigarette is not only affected adults, but also middle school and high school students. Common intentions by youth and young adults to smoke e-cigarette were curiosity, taste, less toxic than regular cigarettes and avoid the restrictions of indoor smoking. However, most of them had never smoked.<sup>5</sup>

This trend seems have also been spread to Indonesia, which the amount of e-cigarette smokers was increasing. Online market and social media had played a major role in e-cigarettes market and in Indonesia. At least 6 famous online market in Indonesia offered this products without restriction of age.<sup>6</sup>

### **Adverse Effects of E-cigarette**

#### **In vitro effects**

E-cigarette exposures did not cause significant cytotoxic effects, but decreased cell viability. Conventional cigarette strongly decreased human epithelial cells viability from 48 minute exposure, whereas e-cigarette did not induce cytotoxicity after 288 minutes exposure. However, these effects seems were affected by the flavor of the e-cigarette.<sup>7</sup>

#### **In vivo effects**

Inhalation of nicotine-containing e-cigarette in mice one-hour daily for 4 months increased airway hyperactivity, distal airspace enlargement, mucin production, cytokine and protease expression.<sup>8</sup> Exposure of nicotine-contained e-cigarette on larynx also caused hyperplasia and metaplasia of the laryngeal mucosa of rats.<sup>9</sup>

Exposure of e-cigarette was associated with increased risk of respiratory infection. Oxidative stress and macrophage-mediated inflammation increased significantly after 2 weeks exposure of e-cigarette

aerosol. The mice also had impaired phagocytosis by alveolar macrophages, causing ineffective pulmonary bacterial clearance. In response to influenza, e-cigarette exposed mice displayed increased lung viral titers and enhanced virus-induced illness and mortality.<sup>10</sup>

E-cigarette exposure in neonatal mice for the first day of life may adversely impact weight gain, diminished alveolar cell proliferation, and caused modest impairment in postnatal lung growth.<sup>11</sup> Following e-liquid exposure, histopathological examination of rat testis tissue produced germ cell desquamation, disorganization of tubular contents of testis, and cell deposits in seminiferous tubules.<sup>12</sup>

### **Human Health Effects**

Three potential hazards related to e-cigarette are (1) acute effects caused by ingestion of e-cigarette liquids, (2) toxic effects caused by long term use, and (3) physical injury caused by e-cigarette device. Ingestion by young children in small amounts caused mild nicotine toxicity, such as nausea, vomiting, headache, and dizziness.<sup>13</sup> However, ingestion of 10 ml or 20 ml of nicotine-containing liquids is lethal for a child.<sup>14</sup> A case of 24-year-old woman who ingested up to 3000 mg of liquid caused pulseless electrical activity (PEA), hypotension, and tachycardia. After aggressive supportive care and had return of spontaneous circulation, the patient died due to multiple acute infarcts and severe anoxic brain injury.<sup>15</sup>

Particulate are generated by e-cigarette are present in same concentration as conventional cigarettes. These particulates are present as liquid and easily dissipate, not like conventional cigarettes which produce solid particle from combustion process. However, heavy metals (cadmium, lead, nickel, and silver) and silicates may be present in trace amounts due to device heating element.<sup>16</sup>

Many studies had tried to explore the effect of e-cigarette to cardiovascular system. Acute increases in heart rate and blood pressure followed by tobacco-cigarette use were greater than e-cigarette use. Follow up study over 12 months revealed no elevation of blood pressure, in fact the blood pressure declined successfully after cessation of tobacco smoking.<sup>17</sup> An echocardiographic study revealed that after 7 minute of vaping there was no significant changes, while cigarette smoking resulted in impaired myocardial relaxation.<sup>18</sup>

E-cigarette usage also caused adverse effects in

other organs. E-cigarette vapor induced an apoptotic response in human gingival epithelial cells, leading to dysregulated gingival function.<sup>19</sup> Nicotine could be absorbed into skin and lead to intradermal deposition. It might cause minor health illness, especially in children. The skin cleansing significantly reduced the intradermal deposition of nicotine.<sup>20</sup>

E-cigarette also has metabolic effects. Analysis of lipid profile in e-cigarette groups showed significant decrease in cholesterol and LDL levels. Nicotine-free liquid exposure induced hyperglycemia.<sup>21</sup> A study quantified toxicant and carcinogen metabolites following e-cigarette use revealed that levels of urinary toxicant and carcinogen metabolites, including nicotine and cotinine in e-cigarette smokers were significantly lower than conventional smokers.<sup>22</sup>

### **Psychological behavior effects of e-cigarette use**

Vaping was related to some positive effects on cognitive, including improved memory and mood. It also caused positive benefits related to withdrawal reversal among smokers.<sup>23</sup> However, other study suggested that former smokers who use e-cigarette may have potential for higher alcohol use and those who use e-cigarette socially may heightened risk for hazardous patterns of alcohol consumption.<sup>24</sup>

### **Flavor related toxicity**

By January 2014, there were 466 brands and 7764 unique flavors of e-cigarette and this number is higher nowadays undoubtedly.<sup>25</sup> Many of the flavors are generally regarded as safe (GRAS) by the Flavour and Extract Manufacturers Association (FEMA). However, these criteria are designed based on ingestion effects. The effects of inhaled e-cigarette flavoring are still unknown.

Many studies had been found that flavor contained in e-cigarette were related to adverse health effect. Chocolate and vanillin flavoring 2,5-dimethylpyrazine reduced the ability of airway surface to respond in salt and water balance. It also caused transient loss of trans-epithelial resistance.<sup>26</sup> Menthol, coffee, and strawberry flavored aerosols significantly reduced cell activity and metabolic activity. Interestingly, the effects of a strawberry-flavored aerosol on metabolic activity and cell viability were similar with conventional tobacco cigarettes.<sup>27</sup>

Diacetyl was found in a large proportion of sweet-

flavored e-cigarette liquid and this chemical was associated with bronchiolitis obliterans, irreversible thickening of lung tissue, and making gas exchange difficult.<sup>28</sup> Benzaldehyde, which was a key ingredient of fruity taste was present in about 75% of e-cigarette products, with the highest concentration in cherry-flavored products. Repeated inhalation of benzaldehyde caused irritation of respiratory airways and DNA damage to human lymphocyte cells.<sup>29</sup>

### **Pathogenesis of E-Cigarettes Related Health Effects**

E-cigarette can abrupt the endothelial barrier by nicotine and vaporization. Endothelial cells barrier was regulated by the actin-myosin cytoskeleton, which the contraction was depend by myosin light chain kinase (MLCK) and Rho kinase. Nicotine from e-cigarettes causes activation of Rho kinase, which inhibit the myosin phosphatase target subunit 1 (MYPT1). Blockage of MYPT1 cause phosphorylation of myosin light chain (MLC-P), resulting to increase endothelial permeability. Nicotine inhibit lung endothelial proliferation by increasing the ceramide/sphingosine-1-phosphate (S1P) ratio. S1P decreased cell proliferation and increase the permeability of lung endothelial cells.<sup>30</sup>

Another pathway of endothelial barrier disruption was by reactive oxygen species (ROS), which generated by nicotine. ROS activated p38 MAPK, also resulting to inhibition of MYPT1. However, this pathway was not sufficiently to increase permeability without the first pathway. ROS also cause lung inflammation due to the elevation of circulating leukocytes to the lung microvascular.<sup>30</sup>

Goniewicz conducted a research from 12 brands of e-cigarettes to found the toxic compounds in vapour from e-cigarettes. There were consisted of (1) carbonyl compounds (formaldehyde, acetaldehyde, acrolein and o-methylbenzaldehyde); (2) volatile organic compounds/VOC (toluene and p,m-xylene); (3) tobacco-specific nitrosamines (NNN and NNK); (4) metals (Cd, Ni and Pb).<sup>31</sup>

Carbonyl compounds are the most part of toxic compounds in e-cigratte. International Agency for Research on Cancer (IARC) categorized formaldehyde as carcinogenic (group 1) and acetaldehyde as possible carcinogenic (group 2B) to humans.<sup>32</sup> Acrolein caused nasal cavity and eye irritation in acute exposures (<24 hours). However, chronic effect of acrolein to human has not been studied.<sup>33</sup>

E-cigarettes flavoring are also play a role in pathogenesis of disease related e-cigarette. Vanilin and 2,5-dimethylpyrazine altered airway epithelial physiologic response by cAMP/PAK/CFTR-signaling pathway, resulting in rapid activation of chloride current. Long term activation of CFTR signaling pathway will disturb salt-water balance in the airway surface. It will cause alter the epithelial cell innate immunity, such as mucocilliary clearance.<sup>26</sup>

### CONCLUSIONS

It is obvious that e-cigarette causes biologic and adverse health effect in person who had never smoked. Unfortunately, the popularity of e-cigarette is growing among middle and high school student, who had never smoked. It may promote nicotine addiction in this age groups if there are no tight regulation about e-cigarette use. However, many data had been revealed that using e-cigarette is much safer than conventional cigarette. Changing conventional cigarette to e-cigarette may bring positive health effects. This fact issued new challenge regarding the diversity of flavor among e-cigarette, which have different safety issues. Until now, it is impossible to reach a consensus on safety of e-cigarette, because there are differences in product engineering, components, and flavor. More research is still needed to explore the effectiveness of e-cigarette as a smoking cessation therapy, including short term and long term health risks. Regulation to make these products as safe as possible is still needed.

**Ethical Clearance:** This is an article review which is not done by research. There is no need for ethical clearance.

**Source of Funding:** The authors received no financial support for the authorship and/or publication of this article.

**Conflict of Interests:** The authors declare that there is no conflict of interests.

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# A Cyto-histopathological Study of Chondroid Syringoma in a Tertiary Teaching Hospital in Western Uttar Pradesh, India: An Eight Year Experience

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## ABSTRACT

**Introduction** – Chondroid syringoma is a rare mixed tumor of skin comprising of both epithelial and mesenchymal components. Cases of chondroid syringoma form a wonderful data in clinical and pathological literature.

**Aims and objectives**- The aim of the present study was to highlight the various cyto-histopathological aspects of chondroid syringoma lesions of various sites in our archives.

**Materials and method**- We performed an analysis of cyto-histopathological features of all diagnosed cases of chondroid syringoma from our archives. This was a retro-prospective type of study for eight years i.e. from July 2008- June 2016.

**Observation and Results** – In our study we studied 09 cases of chondroid syringoma from various sites. A few cases were unusual in terms of size and histopathological picture. Most common site was back. Wide surgical excision was the treatment of choice. Histopathological diagnosis was rarely difficult. Cyto-histopathological correlation was done in six out of nine cases.

**Conclusion**- The results from the present study displayed the various presentations, locations and variability on histopathological architecture, thus highlighting the various pathological aspects of chondroid syringoma lesions.

**Keywords**- Benign mixed tumor, Cytopathology, Histopathology, Skin.

## INTRODUCTION

Chondroid syringoma is a rare benign skin adenexal tumor of eccrine/apocrine origin. It is also called as mixed tumor of skin because of the presence of both the epithelial and mesenchymal components.<sup>1</sup> It is an

unusual tumor constituting less than 0.01% of primary skin tumors.<sup>2</sup> The commonest sites are head and neck regions and the extremities. The usual size is less than 3 cm.<sup>3</sup> Most cases are benign, few malignant or aggressive forms have also been described.<sup>2</sup> Fine needle aspiration cytology is useful in diagnosis. Confirmation has to be done by histopathology. Doubtful cases may need immuno-histochemistry.

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## AIM

The aim of the present study was to highlight the various cyto-histopathological aspects of chondroid syringoma lesions of various sites in our archives for

last eight years i.e. from July 2008- June 2016.

### MATERIALS AND METHOD

The present study was conducted in Department of Pathology, Muzaffarnagar medical college and hospital. The study was a retrospective study in nature. This was a retro-prospective type of study for eight years i.e. from July 2008- June 2016. We searched our archives for chondroid syringoma, in addition to performing a literature search on internet, especially PUBMED.

In the retrospective study (July 2008- June 2011), all the relevant material like blocks and slides available in Pathology Department, MMCH were studied.

In the prospective study (July 2011-June 2016), we studied all the relevant new excised lesions for histopathology from the Department of Surgery and Dermatology. The relevant clinical history like age of the patient, duration of swelling, any rapid progression, development of pain etc were recorded. Examination included general clinical examination and examination of the swelling proper.

### OBSERVATIONS AND RESULTS

A total of nine cases were taken for study. In retrospective six cases, slides and blocks of earlier diagnosed cases were submitted for histopathological review. In prospective three cases, fine needle aspiration cytology was also done. FNAC smears were stained with Giemsa stain. Histopathological study was done on H&E stained sections.

FNAC was done in six cases. Five cases were correctly diagnosed by FNAC. Age group was taken from first to sixth decade. Youngest patient was 25 year male, oldest patient was 60 year male. Maximum numbers of the cases were in 40-49 years of age group. Mean age is 41.8 years.

Six cases were of males (66.67 %) and 03 cases were females (33.33%). There was a significant variation in size of lesions ranging from few millimeters up to 3.5 centimeters.

**TABLE-1: Distribution of cases on basis of age, sex, site**

S. No	Age (years)/ Sex	Site	Size of lesions (cms)	FNAC done	Histo-pathological correlation	Other significant features
1	42/F	Back	3.2	Not done	NA	Absent
2	25/M	Head	1-2.5	Done	Correctly diagnosed on cytology	Abundant myxoid areas
3	42/F	Arm	2.8	Not done		Absent
4	60/M	Neck	0.5-2.2	Done	Correctly diagnosed on cytology	Hyaline areas present
5	55/M	Leg	0.5-2.0	Not done	NA	Cartilaginous metaplasia
6	25/M	Back	4.5	Done	Correctly diagnosed on cytology	Present (Nuclear pleomorphism)
7	40/M	Face	3.5	Done	Wrongly diagnosed as sebaceous adenoma on cytology	Absent
8	50/M	Arm	2.5	Done	Correctly diagnosed on cytology	Cystic areas seen
9	38/F	Leg	1.5	Done	Correctly diagnosed on cytology	Absent

Most common site involved in our study was head and neck region, followed by arm, leg and back in equal frequency (two cases each). FNAC was performed in six out of nine cases (66.67%). Fine needle aspiration cytology (FNAC) revealed cells arranged in cords and nests over the fibro-myxoid stromal elements. **(IMAGE 1)**

Excisional biopsy was done under general anesthesia. Tissue was fixed and sections were stained with Hematoxylin & Eosin stain.

The histological examination picture was more or less similar in eight cases. It showed a dermal and subcutaneous, well-circumscribed, multilobulated neoplasm characterized by proliferation of clusters of epithelial cells distributed in nests or in tubular structures, lined by two rows of cells, with round to ovoid nuclei. The stroma had myxoid and hyaline degeneration with areas of chondroid metaplasia. **(IMAGES 2 and 3)**

One case with mild atypical features needs special reference. The case history of the case with largest diameter in the study as follows: A 25 years old boy presented to the OPD of Surgery department, with a nodular mass of 4.5 cm located at left side of the back. The lesion was light-brown with hard-elastic consistency, mobile on the subcutaneous plane. The patient reported a history of recurrent episodes of scratching and subsequent rupture of the mass, with emission of white-brown secretions and reduction of the diameter of the lesion. A surgical excision of the mass was performed under local anesthesia.

The lesions showed nuclear pleomorphism and low mitotic activity. The margins of excision were positive and hence wide surgical re-excision of the previous scar with a 2.5 cm margin was carried out. Histological examination of the re-excised specimen was free of tumor. At one year follow-up, the patient has no local recurrence.

## DISCUSSION

Billroth in 1859 described 'mixed tumor of the skin', which was histologically similar to benign mixed tumor of salivary gland.<sup>2</sup> In 1961, Hirsch and Helwig coined the term chondroid syringoma due the presence of cartilaginous matrix (chondroid) and sweat gland elements (syringoma). This term may be preferred to the alternative designation-mixed tumor of the skin because of the recognition that the tumor is epithelial with merely secondary changes in the stroma.<sup>4</sup>

The World Health Organization has defined chondroid syringomas as benign adenexal tumors of skin composed of epithelial and stromal elements with a wide spectrum of patterns histologically analogous to mixed tumors of the salivary gland.<sup>5</sup>

Histogenesis of chondroid syringoma is controversial. Studies have suggested that the tumor can show either eccrine or apocrine differentiation.<sup>6</sup>

It has also been suggested that mixed tumors are monoclonal neoplasms with replicating cells that have the ability to differentiate towards both epithelial and mesenchymal lineage, thus giving rise to histological variation.<sup>7</sup>

It is usually seen in middle aged or older male patients. They grow in slow and painless manner as firm, subcutaneous, or intra-cutaneous region. Lesions usually measure 0.5-3cm.<sup>8,3</sup>

In the present study the mean age was 41.8 years, which is in concordance to study by Agarwal et al.

The commonest sites are head and neck region; particularly, cheek, nose, or lips. Cases have been reported from scalp, orbit, auditory canal, eye lid, hand, foot, axilla, abdominal wall, penis, vulva and scrotum.<sup>9,10,11</sup>

In our study similarly the most common site was head and neck region.

Hirsch and Helwig proposed the following histological criteria for diagnosis:<sup>4</sup>

- 1) nests of cuboidal cells or polygonal cells;
- 2) inter-communicating tubule-alveolar structures lined by two or more rows of cuboidal cells;
- 3) ductal structures composed of one or two rows of cuboidal cells;
- 4) occasional keratinous cysts;
- 5) a matrix of varying composition

Headington recognized two types, apocrine and eccrine. The apocrine type demonstrates irregular branching tubules (tubulocystic pattern) lined by at least two cell thick epithelium. The eccrine type is characterized by rather uniform, small, round tubules which are evenly placed within a chondromyxoid matrix. Thus, histologically, two types of chondroid syringomas are recognized: one with tubular and cystic, partially branching lumina and the other with small tubular lumina. The former type is much more common than the latter and shows marked variation in the size and the shape of the lumina. It also shows cystic dilatation

and branching. Embedded in an abundant stroma, the tubular lumina are lined by two layers of epithelial cells. A luminal layer of cuboidal cells and a peripheral layer of flattened cells.<sup>12,13</sup>

Histologically, follicular and sebaceous differentiations, along with the presence of Merkel cells has been described.<sup>14</sup> Lipomatous differentiation and clear cell changes are also been described. Ossification, chondrification and calcification can also occur.<sup>15</sup> Chondroid syringoma may be associated with hydrocystoma-like changes.<sup>16</sup>

Fine needle aspiration cytology is also useful in diagnosis of skin adnexal tumors and is now a widely accepted technique.<sup>17</sup> There are very few case reports of chondroid syringoma diagnosed on fine needle aspiration cytology (FNAC).<sup>18</sup> Cytological features of chondroid syringoma have been published very rarely in the literature.<sup>1,19</sup> A thick mucoid, and gelatinous aspirate is obtained.<sup>5</sup> Cytological examination reveals epithelial and myoepithelial cells embedded in abundant metachromatic chondromyxoid matrix material. The nuclei are monomorphic with finely dispersed nuclear chromatin.<sup>3,9</sup> Among the published literature on cytological features of chondroid syringomas, predominance of chondromyxoid elements and presence of only epithelial cell clusters have been commonly reported. Myoepithelial cells rarely seen.<sup>1,19</sup>

In our study, we did FNAC in six cases and the diagnosis was correct in five cases i.e. 88.33% cases. Only one case was wrongly diagnosed as sebaceous adenoma which came out to be chondroid syringoma on histopathology.

Malignancy in chondroid syringoma is rare. Malignant tumors appear as firm subcutaneous single or multiple nodules, with no particular age predilection; they are more common in females and tend to involve lower extremities.<sup>2</sup> Tumors greater than 3cm in size have more chances of malignancy. Reported cases are from young females in regions of torso and extremities.<sup>20</sup>

We also encountered a case with mild atypical features in a case of 25 years male with back swelling.

Histological features suggesting transformation to malignancy are cytological atypia, infiltrative margins, tumor necrosis, involvement of deeper structures and satellite nodules.<sup>21</sup> Metastasis have been reported in

lymph node, lung, and bones.<sup>13</sup> Rare malignant tumors lack histological hallmarks of malignancy but still metastasize reportedly as late as 17 years.<sup>22</sup>

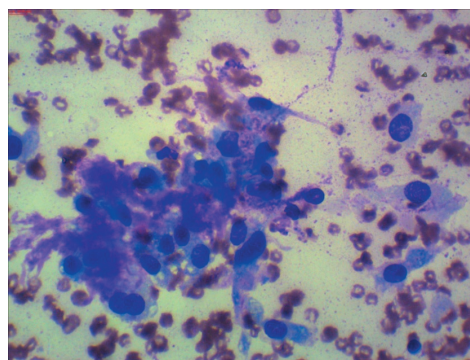
The tubulo-alveolar components of chondroid syringomas are composed of two layers of cells with different immunophenotypes. The inner epithelial layer expresses cytokeratin (CK), epithelial membrane antigen (EMA), and carcino-embryonic antigen (CEA). Outer layers express vimentin, S-100 protein, neuron-specific enolase, and in a few cases, glial fibrillary acidic protein, these are characteristic of both mesenchymal and epithelial differentiation.<sup>18,23</sup>

Differential diagnosis for chondroid syringoma from clinical point of view includes dermoid or sebaceous cysts, neurofibroma, dermatofibroma, basal cell carcinoma, pilomatricoma, histiocytoma, and seborrheic keratosis.<sup>3,8,18</sup>

Histologically, differential diagnosis includes eccrine hydrocystoma and syringocystadenoma papilliferum both of which lacked the distinctive chondromyxoid stromal elements.<sup>5</sup>

The optional treatment for chondroid syringoma is surgical excision. Electrodesiccation, dermabrasion, and vaporization with Argon or CO<sub>2</sub> laser have been used as alternative modalities of treatment.<sup>8,24</sup>

Because of malignant potential, a wide excision of CS must be done and patient should be followed carefully for both local recurrence and metastasis. Regional lymph node resection is indicated in the presence of clinically suspicious or palpable lymph node metastases. Few authors recommended an aggressive surgery and adjuvant radiotherapy, with or without chemotherapy as initial treatment modality for malignant tumors.<sup>25</sup>



**IMAGE 1-** Cytological smear of chondroid syringoma revealing cells arranged in small epithelial clusters structures with entangled fibrocollagenous stroma (MGG X 400)

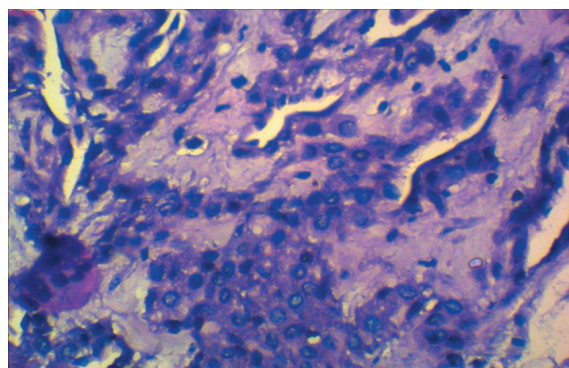


IMAGE 2- Histopathological examination revealing epithelial cells arranged in cords over the myxoid stroma.(H&E X 400)

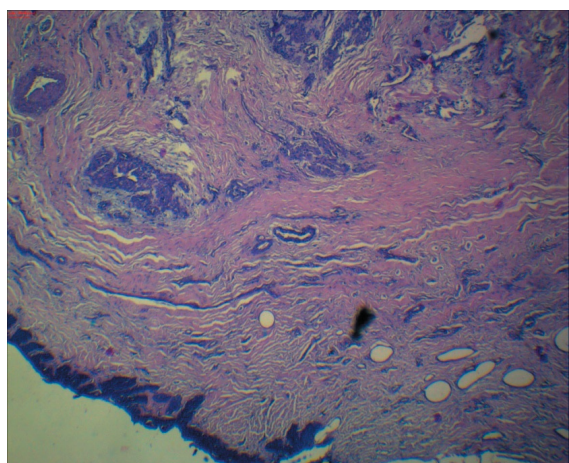


IMAGE 3- Histopathological examination revealing squamous epithelial covering over the epithelial cells arranged in cord over the myxoid stroma. (H&E X 200)

**Conflict of Interest :** None

**Source of Funding:** Self

**Ethical Clearance:** Not applicable, as it is not an experimental or interventional study. This is the study on patients coming to Department of Pathology advised by the clinicians for investigations and on biopsy/resected specimen and clinical data from Department.

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# Predictive Analytics in HR Management

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## ABSTRACT

**Objective:** - This paper accentuates how predictive analytics can offer HR pioneers assistance with scrutinizing the issues natural to HR procedures. It likewise highlights how some key HR challenges can be tended to utilizing predictive analytics.

**Analysis:** - This study proceeds in the following manner. It starts with a literature review in Predictive analytics for Human Resources that depend on setting up the information-driven measurable relationship between the objectives and activities of the HR function. Then followed by the assessment of the likelihood using the Predictive business intelligence tools ‘Data mining’ and ‘End-User query, reporting, and analysis’. Lastly, implementation of predictive analytic techniques, such as ‘Fraud analysis and detection applications’, ‘Multilayer perceptron (MLP)’ and ‘K-Nearest neighbour’ that studies the similar unit in a different sample will exhibit the specific performance.

**Findings:** - From this study, the key areas are identified from which the predictive analytics can create the values for HR perspective including

- 1) Employee Profiling,
- 2) Employee Attrition and Loyalty Analysis,
- 3) Forecasting of HR Capacity and Recruitment Needs,
- 4) Appropriate Recruitment Profile Selection,
- 5) Employee Sentiment Analysis and
- 6) Employee Fraud Risk Management.

Accepting these practices have set up, this paper investigates the distinctions in the way of objectives and accomplishments of ventures that utilized predictive analytics versus those that did not.

**Novelty:** - This study can further extend to the building of service outlines how businesses are performing relative to their peers and pinpoints improvement opportunities—and today, areas where robust workforce analytics can contribute game-changing insights.

**Keywords:** *Analysis, Data, Human Capital, Human Resources, Insights, Metrics, Predictive*

## INTRODUCTION

To compete effectively in a technological era in which advantages are ephemeral, companies need to move beyond historical, rear-view understandings of employee performance and employee behaviour and become more proactive. IT Organizations today want to be predictive; they want to gain information and insight

from data that enables them to detect patterns and trends, anticipate events, spot anomalies, forecast using what-if simulations, and learn of changes in employee behaviour so that employee can take actions that lead to desired business outcomes. Success in being predictive and proactive can be a game changer especially in Human Resource functions such as Recruitment, Attrition



and Loyalty, Learning and Development, and talent management.

The new era of HR executives is moving from settling on receptive choices exclusively taking into account reports and dashboards towards connecting business information and human asset information to foresee future results. Predictive analytics for HR is based on setting up the information-driven measurable relationship between the objectives and activities of the HR capacity and the achievement or disappointment of an association in accomplishing key objectives. This relationship can offer HR executives some assistance with assessing the consequences of their choices and devise a long haul technique.

We all know the US workforce is aging, with the quantity of individuals 55 and more established holding employments hitting a record 28 million in 2010. In the meantime, the segment of individuals' ages 16-24 in the work business sector was at the most reduced level subsequent to the administration started following in 1948, tumbling from 66% in 2000 to 55%, only 17 million of the general occupation base <sup>[1]</sup>. Leaving aside the undeniable issue of where we get trade specialists for the resigning workforce, these two employee associates are entirely diverse. The ways associations will procure and hold these employees going ahead must be diverse also. Holding more seasoned specialists requires maintenance programs that incorporate low maintenance or undertaking based work. Enlisting Gen-Xers and Gen-Yers requires new methodologies and maintenance programs that should furnish them with vocation improvement and decisions about where, when and even to what extent to work every day. The more seasoned accomplice is not yet as fascinated with developing social advancements that are turning into the essential method for correspondence and coordinated effort for the more youthful workforce. The more seasoned companion has an abundance of extremely valuable scholarly capital that associations can't bear to lose. The more youthful gathering offers inventive and innovative thoughts that are key to exploring today's advancements and financial difficulties and we should see how best to tap their commitments.

As per research by NASSCOM, top-performing organizations are three times more probable than lower performers to be modern clients of analytics <sup>[2]</sup>. These early adopters of workforce analytics essentially

outperform. Organisations at the most elevated amounts of ability examination work on, including the selection of workforce analytics, have 8% higher deals development, 24% higher networking salary development and 58% higher deals for each employee <sup>[3]</sup>. Today, organisations can drive financial return on human capital investment and enhance the quality the workforce conveys to hierarchical execution using workforce analytics.

This paper accentuates how predictive analytics can offer HR pioneers some assistance with scrutinizing the issues natural to HR procedures. It likewise highlights how some key HR challenges can be tended by utilizing predictive analytics.

## II. Significant Challenges Faced by HR

Every organisation tends to decrease costs, build income, amplify operational proficiency, and spotlight the key exercises to develop, support agility, and stay profitable. HR pioneers consistently struggle to bolster the business with the skilled workforce it needs, in view of investing arrangement and energy prerequisites <sup>[4]</sup>. One difficulty an organisation countenance is the point at which it arrange to dispatch another line of administrations or items in selecting the right individuals for the occupation in time for execution. Likewise, organisations bear certain expenses when capacity ability leaves the organisation <sup>[5]</sup>. It is awful when representatives quit not long after in the wake of taking an interest in a costly preparing program supported by the organisation. Is there an approach to predict such risks and decrease the costs associated with them?

**Other such questions to be addressed by HR leaders include:**

### Talent acquisition and resource management

- How would we have the capacity to get the right ability? By what means would we have the capacity to pick which profiles are perfect for the normal set of working responsibilities?
- How would we have the capacity to think high-worker regard?
- How would we have the capacity to hold and interface with our top capacity?

### Workforce administration

- How would we have the capacity as far as

possible preferably?

- How would we have the capacity to diminish employee fraud risk to ensure our brand image?
- How would we have the capacity to influence casual association data to ensure delegate driven HR operations?

#### Performance and learning

- How might we have the capacity to increase more prominent quality from our preparation programs?
- How might we have the capacity to the right workers for preparing?

### III. Applying Predictive Analytics in HR

Several organisations have proactively opted predictive analytics for his or her business functions, as an example, finance and risk, client relationship management, selling and sales, and producing. This empowers them to create choices over a scope of activities, as an example, client retention, sales Predictive, insurance rating, and campaign management, provide chain optimization, credit marking, and research<sup>[6]</sup>.

By foreseeing what each client loves, the sales and selling performers will decide on viable selections on product recommendations. Moreover, finance team draws upon predictive modelling and illustration for effective money analysis, which diminishes money risk<sup>[7]</sup>. Organizations are investigating new potential outcomes for befitting mistreatment the steady increasing intensive volumes of knowledge.

Organizations will mine progressive info known with turnover, investment in training programs, nature of contracts, and alternative basic components of HR administration. This may be used to create applied math models that gauge possibilities and foresee future conduct and patterns crosswise over key HR range.

To adopt predictive analytics, HR pioneers need an organized info supply that's adjusted to the business<sup>[8]</sup>. Whereas HR processes like enlisting and resourcing, men administration, performance and learning, payroll, and time management typically use structured knowledge sources, these are solely integrated with one another. The thanks to utilizing predictive analytic and

acknowledging most extreme benefits from the HR info lays in binding the data supply to important business results<sup>[9]</sup>.

The HR's, in addition, wants ability to utilize systematic devices with success supervise talent and enlisting info. HR personnel should be ready adequately to assume an important half in business development by proficiently utilizing examination. HR pioneers have to be compelled to guarantee that examination and its results are adjusted to business objectives<sup>[10]</sup>.

### IV. Key Areas Where Predictive Analytics Can Create Value

#### Employee Profiling and Segmentation

Predictive analytics is used for viable talent management by accurate identification and segmenting employee. Dividing the present employee can give management some help with understanding the men higher. The teachings from this division procedure are connected with success characterizing employee presently<sup>[11]</sup>. Predictive analytics acknowledges employee with specific training desires and additionally acknowledge trends in zones, as an example, program incoming, diversity, and so on.

Employee demographics, skills, instructional background, experience, and designation is consolidated with knowledge on roles and responsibilities to create such parts. Organizations will accomplish higher employee satisfaction and higher relationship with the employee by choosing necessary programs for sections that square measure probably to advantage the foremost from these initiatives.

Predictive analytics techniques are additionally connected to those phases to anticipate the standing of every employee to profit from learning opportunities or capitalize new undertakings each at the person and in addition segment level. Taking this into consideration, the HR division will set up learning programs or open new doors for these gatherings. Getting ready destinations need to be adjusted to explicit objectives to measure the impact of HR activities and arrangement for what is to return.

#### Employee Attrition and Loyalty Analysis

The attrition risk score of individual employees will be assessed with predictive models of attrition. This

could supply organisations some help with preventing the potential attrition of high performing arts employees, guarantee business continuation and acknowledge loyal employees<sup>[12]</sup>.

Employee's demographic info, performance, compensation and advantages info, market info, rewards and recognition info, training info, activity info, and employee survey scores will be utilised for this analysis. Managers will acknowledge the key explanations behind attrition.

At a private worker level, predictive risk models will be accustomed produce triggers to caution the HR performs concerning the potential loss of the employee. These cautions will be set at numerous edges for each worker visible of the organisation's desires.

By partnering attrition risk score with worker performance info, the HR division will distinguish high-performing employees. Performing this activity sometimes can give the organization some help with reducing potential attrition<sup>[13]</sup>.

### **Forecasting of HR Capacity and Recruitment Needs**

By foreseeing conditions for HR capability and enlisting, organisations will optimize resource utilization and support correct development and edges. HR managers will produce gets prepared for plans for enlisting, training, and infrastructure development<sup>[14]</sup>.

Precise crucial to boot empowers viable employing. Future requirements and also the amount of remaining employee will be evaluated in light-weight of theoretic attrition rates and business development forecast for every workplace or unit. Conditions (calculated as web demand = forecasted demand - expected attrition) will be assessed exactly for each fundamental measure. The in-streams (newcomers) and also the out-streams (exits) within the gift quarter will anticipate the conventional range of employee within the following quarter. Variables, for instance, attrition risk scores, business development figure and pipelines, range of employee in every workplace, profit level, and past performance of each employee will be incorporated to complement the prophetic models.

Managers will comprehend the real needs by registering the excellence between [projected requirements] and [expected range of loyal employees].

Case in purpose, suppose a specialty unit with fifty people wants sixty people within the following quarter. The common attrition risk score for 6 of those people is fifty percent, thus there's a high chance that 3 of them can leave the association.

***Therefore, the particular demand will be calculated as:  $60-50+3=13$ .***

Predictive analysis will anticipate the combination necessity from quarter to quarter. It is to boot minimizes the gap between 'what range of to recruit' and 'what range of employee' but very much like may be expected to forestall revenue leak. dominant a number of latest contracts and causing maintenance gets prepared for existing workers with high attrition scores empower HR to viably address enlisting wants while not experiencing over employing or below employing problems<sup>[15]</sup>.

### **Appropriate Recruitment Profile Selection**

Attrition in elements connected with high prices of contracting prompts noteworthy losses for the organization. By analysing the knowledge for current employees, as well as performance and productivity indices, attrition details, and lifetime esteem, HR will attain the proper profile for each potential employee<sup>[16]</sup>.

An applied math relationship between staff esteem and profile variables, for instance, education, coaching, and knowledge empower HR to acknowledge the foremost appropriate profiles. This expands quality, profit, and consumer loyalty scores, and lessens registration value munificently, creating maintainable value for the organisation.

Whereas the employee value is calculable by connecting the business unit performance and employee performance through a prophetic model. Attrition records, profile info, efficiency, performance info, output from employee's lifetime esteem analysis, remuneration and advantages info may be utilized for this investigation. assessed by foreseeing the attrition risk for each profile.

### **Employee Sentiment Analysis**

HR specialists need to gain organized and unstructured information from completely different sources to create, enhance, or overhaul their drives. Employee sentiment analysis is viable than yearly employee overviews in obtaining real, valuable criticism.

This procedure includes following, breaking down, and analysing key subjects that square measure most pertinent to representative notions over an amount, and might later be extended to a detailed ongoing procedure [17]. Such information will advance comprehension of an HR activity.

Interior info is known with the actual HR activities or modification, and to boot info from outer on-line networking, as an example, Facebook, Instagram, and LinkedIn, is utilised for this examination. Business experiences from employee slant info will offer associate in a nursing clear life of the result of various graded elements on potency, business development, or completely different targets.

### **Employee Fraud Risk Management**

Predictive analytics strengthens internal fraud risk management by enabling a relationship to recognize employees who are at high risk of rebelliousness with the organisation's security approach or diverse principles and regulations. Organisations can make a fraud risk score by separating employee activity data and scene data using genuine showing frameworks. This can guarantee the organisation's picture and notoriety, and forestall conceivable money related loss [18].

Information relating to employee action, profiles, demographics, framework and social data, favoured access data, standards and methodology data can be associated with episode risk in the predictive model.

### **CONCLUSION**

To have more noteworthy and key impact in the organisation, the HR function needs to move past insignificant answering to exact forecast. As opposed to just making responsive reports, it needs to grasp progressed analytics and predictive methods that support vital hierarchical objectives.

Usage of predictive analytics in HR includes utilizing critical data to take care of specific business issues. Predictive analytics offers organisations some help with containing HR-related expenses while developing high performing employees.

Predictive analytics might be uncharted space for HR, along these lines to totally comprehend its points of interest, HR work power need to collaborate with the various claim to fame units and client confronting

capacities to perceive how they impact data and analytics to make regard. Along these lines, HR divisions can empower superlative employee experiences that incite kept up whole deal preferences for the organisation. For instance, the client relationship management bunch predicts key parameters, for example, client lifetime esteem, client agitate danger, thus on to empower the organisation to enhance its client management. Thus the HR organisation (HRO) can adjust these kinds of systematic methods to superimpose on their information to pick up foreknowledge.

**Ethical Clearance:** Nil

**Source of Funding:** Self

**Conflict of Interest:** Nil

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# A Study on Buying Behavior of Eco-Friendly Apparel with Special Reference to Tanjore

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## ABSTRACT

Growing People consciousness and intelligence of communal conscientiousness and connected ecological issues have lead the fabric manufacturing to fabricate products with enhanced ecological outline . The aim of this study is to assess customer Brand Knowledge, attitudes on buying behavior for eco-friendly apparel . Research looks at the impact of customer knowledge on eco-friendly apparel manufacturing. Data Collection has been taken from Sample Tanjore district in Tamil Nadu by using convenience sampling technique and Collected data from the young consumer (N= 302) . Statistical Analysis Cronbach 's Alpha test were used to asses the interior reliability of the (degree) scale object. Reliability of the make assure that a test is even, precise. Correlation test were used to analyses the relationship between the two variables . SEM was to find the association between brand knowledge and attitude towards buying behavior of eco-friendly apparel among the young consumers of Tanjore district.

**Keywords :** *apparel, eco-friendly, buying behavior, brand knowledge, attitude*

## INTRODUCTION

Concern for the surroundings has taken place over the earlier period. Early 1960 ecosystem group concentrated on greenhouse gasses and power maintenance to the current use of ecological concern as a cause of aggressive benefit to companies. Apprehension for the atmosphere has turn gradually to be more visible. Trade of eco-friendly products bound from \$612.2 billion to an predictable \$776.1 billion in 2018 ,at present there is no real description for eco-friendly product categories . Eco-friendly things can be originate in all product category including: hotels , FMCG products, clothing, vehicles, food, etc. Between additional effects, things with the purpose of assert to be fine for the atmosphere hold harmless element.

Eco-friendly apparel products are frequently recognized on post by terms suchas, natural andeco-friendly. Consumers are purchasing eco-friendly apparels for diversity of cause as well as ecological serving for the atmosphere and unease for protection and healthiness. Customers were extra concerned in eco-friendly apparel , Apparel Manufacturer need to understand the customers attitude and their behavior level towards budding trends .

## OBJECTIVE OF THE STUDY

1. To examine the perceptual level among young consumers towards brand knowledge on buying behavior for eco-friendly apparel
2. To analyze the association between brand knowledge and buying behavior for eco-friendly apparel among young in Tanjore district
3. To examine the association between attitudes and buying behavior for eco-friendly apparel among young in Tanjore district

## PURPOSE OF STUDY

The reason of the study eco-friendly buying behavior for attire help to assessing customer attitudes and brand knowledge on buying behavior for eco-friendly apparel. Also , the research will also inspect the customer brand knowledge of eco-friendly companies proposal and eco-friendly fabric brand consciousness , Customers attitudes towards eco-friendly products and actual buying behavior. This research is based on a Non-Probability sampling taken among young consumer .

## REVIEW OF LITERATURE

### Brand Knowledge

Researcher examined that the Adolescent female were preferred as the customer grouping for which the brand variety was through in this research since profusion of field clothing brands accessible in the marketplace that embattled this customer grouping and the soaring level of brand awareness this customer grouping be inclined<sup>1</sup>. Researcher said that the Brand Knowledge can assist customer development and remember the brand artifact information. Customers involvement from a brand name to a item for consumption are more advantage, assist consumers understand a products positioning. Similar proportions are recommended by other researchers brand trustworthiness and brand involvement brand knowledge, collected of brand consciousness and brand representation<sup>2</sup>. Researcher involved between diverse proposition, professed eminence of brand, brand trustworthiness, and brand involvement with brand awareness are commonly acknowledged as frequent measurement of brand impartiality<sup>3</sup>. Researcher studied that the brand knowledge evokes positive affect as well as cognitive deliberation of reimbursement that provides a precise reason to purchase. Researcher investigate association from a brand name to a product category help customers distinguish probable handling situations and make buying decision. Researcher said that brand knowledge proportions essential to customers of UK area apparel. Brand consciousness mark young adult ,expand a suitable and dependable brand involvement scale for evaluating and watching customers involvement towards the brand name in the market. In this study researcher clearly define the brand knowledge dimensions like merchandise, store atmosphere, sales person service. This study identifies that the brand knowledge dimensions are essential for the adult customer to evaluate their brand preference based on the market segments<sup>4</sup>. Researcher examined that the youth brand extension and brand knowledge is correlated to their stage of predilection for a garment brand name. It also intend to inspect whether these connection vary depend on youth masculinity and individuality growth. Youth customers resembling garment brand name that they connected to their perfect communal concept. This relationship was mainly burly for male youth with fewer recognized established similarity<sup>5</sup>.

### Attitudes

Researcher examined that the despite preserve attitudes of ecological concern, customers were restricted in their commitment in ecologically responsible clothing buying<sup>6</sup>. Researcher examined that though contributors show constructive ecological attitudes, 93 percent of the respondents only occasionally, and frequently never, measured the environment in purchasing clothing<sup>7</sup>. Researcher said that the attitudes toward ecological issues related to the clothing and fabric industry, the appliance included the new ecological model scale<sup>8</sup>. Researcher examined that the associations between awareness about and attitudes towards communal and ecological issues in the clothing and fabric manufacturing and communally answerable clothing buying behavior. The result point to that though the samples demonstrate quite low score for rendezvous in communally and ecologically responsible clothing buying behavior, brand awareness and attitudes were major predictors of clothing buying behavior. Similar to the result of this study, renowned the implication in notify scholar about these topic<sup>9</sup>.

### Buying behavior

Researcher explained that the FHSP, called attitude as the the majority characteristic and crucial concept in communal psychology One study connected characteristic of a internet such as endorsement to purchasing behavior of clothing business Given the fast enlargement of online shopping and the individuality of shopping that encourages purchasing. (e.g. open 24/7), purchasing online is probable to be common<sup>10</sup>. Researcher examined that the effectual use of advertising strategies on trade web sites is liable to endorse buying. various retailer are implementing buying strategies that employ an array of promotional and personalization strategies to entice shopper's purchases. Young consumers are a high-quality delegate sample of purchaser, and purchasing behavior has be establish to be famous in young customers. Researcher examined that the consumer motivations underlying frequent impulse buying behavior provides another variable that might explain buying consumers' apparel return behavior. Participants' hedonic needs such as a need for novelty, entertainment, and an emotional lift were major motivators of buying<sup>11</sup>.

### Conceptual Framework

Based on the Partial TRA (Theory of Reasoned Action- Azjen and Fishein, 1980) model and previous research of this study to customer buying behavior , the research recommends a inclusive framework to understanding the eco-friendly apparel buying behavior. The conceptual framework look into the customers attitudes and brand knowledge towards eco-friendly apparel in the market. It mainly focuses on influence on the buying behavior towards eco-friendly-friendly apparel via brand knowledge and attitudes of young consumers.

### Research Methodology

Research design for the study is descriptive research design . The samplesize for the study was (N=302).

Convenience Sampling was chosen for the research study .Questionnaire was distributed among young consumers age between 18-25 years in Tanjore district (Tamil Nadu ) . SPSS version 16.1 were used for analyze the data. Numerical Analysis was conducted on the 302 questionnaires.

### Reliability statistic

Reliability replicate the uniformity of applicant answer to the statement of a questionnaire support on the normal association between those variable. Reliability figures for the extent locate are obtainable in Table 1. It is obvious from Table 1 that Cronbach Alpha evidence for the two assemble were beneath satisfactory series  $\alpha = 0.7$  (Girden, 2001).

**Table 1: Reliability statistic**

Variables	No of Items	Cronbach's Alpha
Brand Knowledge	5	.702
Attitude	5	.713
Buying Behavior	5	.714
Overall Reliability	15	.756

### Data Analysis and Interpretation :

The SEM was used to analysis the hypothesis and find the association among the variables . SEM define clearly that the association between the independent influence dependent variables .

Independent variables are attitude and brand knowledge and Dependent variables is buying behavior of eco-friendly apparel towards Tanjore district. In this model the researcher has used brand knowledge and attitude are stability influenced buying behavior of eco-friendly apparel.

SEM basically has two models one is model of measurement and another model of structural. Structural model was used to the level of hypothesized data

model fit based on the test of data. Model fit test also done to find the goodness of model fit among framed hypothesized figure and test data. Goodness of model denotes the particular model replicated the experimental covariance prevailing condition between the pointer items. Goodness of fit ensure that model is fit based on the theory which we follow. Chi-square indicates to find the association between the hypothetical condition and experimental data.

Structural equation model calculate the co-variance and that ate same, model is fit. Researcher Chi-square value will add to residual are estimate. Goodness of fit was formulated also (Hsueh, 2003).



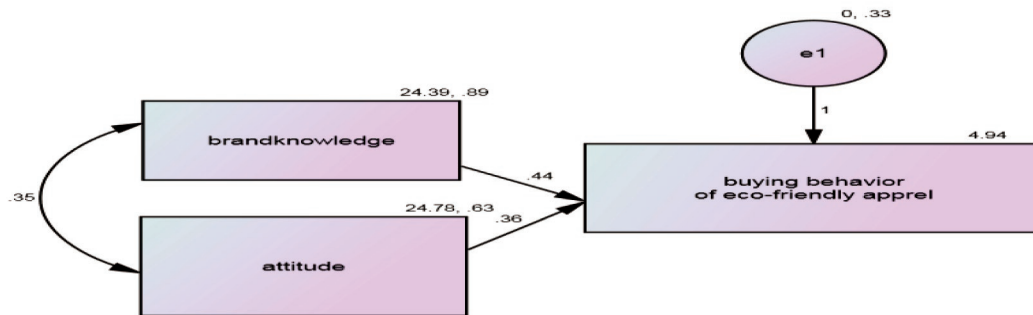


Figure 1

Table 2: Amos output showing model: goodness of fit

Model	NPAR	CMIN (x sq)	Df	P	x sq/df
Default Model	18	2.071	1	0.135	2.071
Saturated Model	19	.000	0		
Independence Model	2	702.224	15	.000	48.017

Table 2.1 Model fit statistics

Fit Statistic	Recommended	Obtained
x sq	-	2.071
df	-	1
x sq Significance	P<=0.05	0.002
x sq/df	<5.0	2.071
GFI	>0.90	0.92
AGFI	>0.90	0.94
NFI	>0.90	0.94
RFI	>0.90	0.96
CFI	>0.90	0.98
TLI	>0.90	0.99
RMSEA	<0.08	0.06
RMR	<0.10	0.09

FINDINGS

The outcome exposed Table 2 present an indication of the model fit, which comprise the figure of constraint, CMIN and Degrees of liberty values.

In SEM a little chi-square value chains the model with the intention to analysis. Model the Chi-square assessment is 2.071and minute evaluated to the exogenous model which is 702.224. This figure so as to the Chi-square assessment is good quality. It is also desirable to ensure the assessment of Chi-square separated by the level of freedom. It is alleged with the

intention of this metric should not exceed 5 for models with good fit. Therefore in the above reveal figure, the Chi-square valueis 2.it means suitable model. Model is fit based on the hypothetical model.

From the table 2.1 show the statistic we must know the Chi-square is mentioned basically equal and there is degree of freedom. Model if absolutely fit in the data.GFI Value is 0.90 which is greater than the 0.9. so it means model is fit . AGFI indicates 0.94 which is greater than 0.9. It denotes goodness of fit.NFI indicates 0.94 that is also greater than 0.90 value. RFI,CFI and TLI are 0.9 6, 0.98,0.99 all the three also >0.9 than value. Model is goodness of fit. RMSEA Value is within the suggested value only that is 0.06.RMR indicates limited to the model. Overall model is fit.

CONCLUSIONS

This article examine the determinants of customer behaviour towards eco-friendly apparel structural equation models (SEM) with experiential and hidden variables. Model indicates the attitude towards the customer also influence the buying preferences with the help of brand knowledge. Brand knowledge increases the awareness about the products and it increases the brand loyalty also. Based on the Partial TRA model actual purchase with the help of brand knowledge . When the consumer is aware about the eco-friendly apparel. They are ready to purchase the green apparel.

To assess customer knowledge of eco-friendly apparel innovative and green marketing brand knowledge focused on how to choose the apparel brands, which products divided eco-friendly apparel, customer knowledge of manufacturers that bring eco-friendly apparel items. Based on the SEM recommended customers knowledge of eco-friendly apparel increase the demand and customer gets motivated to seek out and they ready to prefer green apparel. Attitude towards eco-friendly apparel also determinant. Mainly attitude focuses on eco-friendly apparel also find in this study. This study find the attitude towards eco-friendly purchase of apparel increase, Finally buying behavior was calculated to see respondents to buying eco-friendly apparel

This study also recommended that the respondents are more interested to buy eco-friendly apparel in the market. Majority of the customer strong influence attitude towards eco-friendly apparel. Retailer and Manufacturer also increase the awareness towards thr eco-friendly apparel to the consumer. Model also proved goodness of fit based on TRA model. The study was limited to young consumers in Tanjore districts only, it can be improve to other districts also .

**Ethical Clearance:** The article was return based on my own perspective and initiative in understanding the buying behavior in eco-friendly apparel. This paper is based on relevant literature taken from International and Indian Context. I admit that all ethical standards have been followed and confirm that this article is my own work.

**Source of Funding-** Self

**Conflict of Interest -** Nil

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# Prevalence of ABO and Rhesus Blood Groups in Blood Donors: A Study from a Multispecialty Hospital of Western Uttar Pradesh

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## ABSTRACT

**Background-** ABO and Rhesus (Rh) blood group antigens are genetically controlled and inherited in Mendelian fashion. These are helpful in genetic studies, in resolving paternity issues and for safe blood transfusion.

**Aims-** This study was designed to determine the prevalence and distribution pattern of the ABO and Rh blood groups among the donors in Western Uttar Pradesh.

**Material and method-** The study was conducted in Super specialty hospital, Meerut U.P. on 15600 blood donors for a period of two years i.e. from January 2014- December 2015. This was a retrospective study. Blood bank records were analyzed and evaluated for the required information. ABO and Rh typing was done using slide agglutination method with antisera ABO and Rh. Doubtful cases were confirmed by tube agglutination method and reverse grouping using pooled A and B cells. The age group, gender, results of agglutination tests were entered in data sheet.

**Results-** The predominant donors were males. (94.42%). Most common age group of donors was 20-39 years of age (66.38%). Most donors were replacement donors (87.98%) in comparison to voluntary donors (12.02%). Most common blood group found was 'B' group. Least common group was 'AB' group. Most donors were Rh positive and only 3.43% donors were Rh negative. Blood group frequencies for ABO, Rh positive and Rh negative blood groups were B>O>A>AB.

**Conclusion-** Proper knowledge of frequencies of the different blood groups is crucial for blood bank services so that significant contribution can be given in National health system.

**Keywords-** ABO, Agglutination, Blood groups, Rhesus, Transfusion

## INTRODUCTION

Human red blood cells contain a series of glycoproteins and glycolipids on their surface, known as

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blood group antigens. These are genetically controlled and inherited as per Mendel's law of inheritance. They appear very early in life and remain lifelong. [1] International Society of Blood Transfusion has described nearly 700 RBCs antigens and divided them into 30 blood group systems. Among them ABO and Rh blood group system is most important.[2]

ABO system was the first blood group system to be discovered in 1901 by Landsteiner.[3] Later in 1941 Landsteiner and Wiener discovered Rh blood group [4].

Together these two systems are most important for blood transfusion purposes. This discovery opened the gate for the advancement in techniques in the field of immunohematology, legal medicine, anthropology, diagnosing unmatched pregnancy and led to the discovery of various other blood group systems. [5]

On the basis of presence or absence of A and B surface antigens, the ABO blood group antigens are divided into four blood group types. The blood groups are ABO and AB. ABO blood group system is important because of the fact that A and B are strongly antigenic and anti-A and anti-B are naturally occurring antibodies present in the serum of persons lacking the corresponding antigen. In case of mismatch transfusion, these antibodies are capable of producing intravascular hemolysis. [6]

Rh antigens are strongly immunogenic in nature. D antigen is most significant among 49 different Rh antigens. Anti-D is produced, if D-negative individuals are exposed to D-antigen through transfusion or unmatched pregnancy. This encounter may result in hemolytic transfusion reactions, or hemolytic disease of fetus and newborn. Thus it is mandatory to determine Rh status in blood donors, transfusion recipients and in mothers-to-be. [7]

The ABO and Rh blood groups are also helpful in resolving many medicolegal issues e.g. disputed paternity etc. Moreover, this knowledge is useful in demographic clinical studies, genetic studies, population migration patterns. [8]

The incidence of ABO and Rh groups varies in different races, ethnic groups, and societies in different parts of the world. [9]

Knowledge of different blood groups is of crucial importance for efficient delivery of blood bank services. Keeping this in mind the present study was designed to study the distribution of blood groups in Western Uttar Pradesh, India.

## MATERIALS AND METHOD

The present retrospective study was carried out at blood bank of KMC Multispecialty hospital, Meerut. The data of present study corresponded to period of two years i.e. January 2014 to December 2015 and included in-house voluntary and replacement donors. Replacement donors were those who donated for their

patients and were close relatives, family members and friends of the recipients.

The donors were first required to fill up a registration form having all the required details about personal information, demographic details, occupation and medical history. Hemoglobin estimation was performed and donors with hemoglobin below 12.5 gm% were rejected. Donors were then screened as per the donor selection criteria and guidelines given by NACO and drug and cosmetic act.

After donation, ABO and Rh typing was done by antigen antibody agglutination test by commercially available standard antisera i.e. anti-A, and anti-B and Anti D after validation at blood bank. Blood groups were done by slide agglutination method. Doubtful cases were confirmed by tube agglutination method and reverse grouping was done using known pooled A and B cells. All weak D groups were considered as Rh positive. Data on frequency of ABO and Rh blood groups were reported in percentages.

### Inclusion criteria-

The voluntary donors on the records of the blood bank during the specific mentioned time-period of study.

### Exclusion criteria-

Any repeat donor

The donors before or after the mentioned specific time-period of study.

## OBSERVATION AND RESULTS

The present study was done on the basis of blood bank records of 15600 donors were done. The predominated donors belonged to age group between 30-39 years of age followed by 21-29 years of age. (Table 1) Male donors were more than female donors, i.e. 14730 (94.42%)(TABLE 2) Among the donors the replacement donors were 13728 (87.98%), while voluntary donors were 1872 (12.02%)(TABLE 3)

The most common blood group on the basis of ABO grouping was 'B' and least common being 'AB' blood group. In the Rh blood group, Rh positive donors were 15064 while Rh negative donors were only 536. (TABLE 4) Blood group frequency with respect to ABO and Rhesus positive was found to be shown in the

descending order-

ABO grouping	B>O>A>AB
Rh positive	B>O>A>AB
Rh negative	B>O>A>AB

**TABLE 1: Distribution of age groups among study population (n=15600)**

AGE GROUP	NUMBER OF DONORS	PERCENTAGE
20-29	4125	26.44%
30-39	6230	39.94%
40-49	3354	21.50%
50-59	1741	11.16%
60 and above	150	0.96%

**TABLE 2: Distribution of donors according to gender**

NUMBER OF DONORS	MALE DONORS	FEMALE DONORS
DISTRIBUTION OF DONORS	14730	870
PERCENTAGE	94.42%	5.58%

**TABLE 3: Distribution of Voluntary and replacement donors**

NUMBER OF DONORS	VOLUNTARY DONOR	REPLACEMENT DONORS
DISTRIBUTION OF DONORS	1872	13728
PERCENTAGE	12.02%	87.98%

**TABLE 4: Distribution of ABO and Rh blood group among study population (n=15600)**

BLOOD GROUPS	A	B	O	AB
ABO distribution	3588	5850	4077	2085
Rh POSITIVE	3511	5562	3980	2011
Rh Negative	77	288	97	74

## DISCUSSION

The present study revealed a large number of male donors as compared to female donors. These results are in accordance to most Indian studies. [10, 11, 12, 13] Garg P. et al also found that male: female ratio being 352:1. [14] In our study we found that 94.42% donors were male. The main reason behind is that India is a developing country and many areas are still under-developed. Social inhibition, lack of motivation and fear related to blood donation keep females away from voluntary blood donation. Moreover pre-donation screening rejected many female donors due to anemia. Reasons for anemia were found to of variable etiology. Most common causes were diet deficient in nutrients, parasitic infestations, recurrent pregnancies, abortions, menorrhagia etc. Females are first required to be health conscious, only then they can be suitable for blood donation.

The most active working group of society is between 18-40 years of age. Naturally this age group is the back-bone of the society. In our study we found most common blood donating age group being 20-39 years of age (66.38%). These results are also comparable to other studies. [12, 14, 15] The least number of donors belonged to above 60 years of age group i.e. only 0.96%. Most donors above 60 years of age were screened and rejected on clinical backgrounds e.g. hypertension, anemia, ischemic heart diseases etc.

Number of voluntary donors in the present study was 1872 (12.02%). This percentage is low. A study from Kumaon region of Uttarakhand showed only 0.91% of voluntary donors. [14] Ours results were better than this study but study from Shimoga institute of Medical Sciences, Shivamogga showed 37.30% of voluntary donors which was a good percentage. [11]

Number of voluntary donations should be encouraged. This will prove to be a great help in the need of emergency. Moreover there is reduced risk of transfusion transmitted diseases. Safe blood donation is the need of hour.

In the present study, the frequency and distribution of ABO and Rh group in the region of Western Uttar Pradesh were studied. The observations and results were compared with the similar studies from different parts of India and outside. In our study most common blood group was 'B' and the least common was 'AB'. This was in concordance to study by Garg P et al. [14] while

many studies showed that the most common group was 'O'.<sup>[11, 15, 16, 17]</sup> This gave a rough idea regarding the geographic distribution of blood groups. Studies from Northern, Western and Central India showed 'B' as the most common blood group while studies from Eastern and Southern India showed 'o' as most common blood group. Blood group 'O' was more than blood group 'A'.

Rh negativity in our study was in 536 donors i.e. 3.43%. Study from Uttarakhand revealed 'Rh' negativity in 5.51% donors.<sup>[14]</sup> Many studies go with similar results.<sup>[18, 19]</sup>

It is of crucial importance that the society must have a record of ABO and Rh typing of the individuals. It is of importance in maintaining blood bank records, and effective transfusion services. There lies utility in population genetics study, researching the population migration status, medicolegal cases. Studies have confirmed that certain blood groups have predilection for certain diseases e.g. Persons with 'A' blood group are more prone to coronary heart diseases, while it is low risk for 'O' group persons.<sup>[8, 20]</sup>

Individuals with 'O' blood group have 14% decreased risk for squamous cell carcinoma as compared to non-O group.<sup>[21]</sup> 'B' group individuals have risk for ovarian cancer.<sup>[22]</sup> Gastric carcinoma is common in 'A' group individuals.<sup>[23]</sup> Early independent studies showed association of rectal, cervical, leukemia, pancreatic, breast, ovarian, gastric cancers among individuals with A, AB or B more likely to have elevated risk of pancreatic carcinoma than individual belonging to blood group 'O'.<sup>[24]</sup> Thus regional blood group studies are necessary for better transfusion deliver services.

### CONCLUSION

The present study concluded that the most common blood group came to be 'B' followed by 'O' in Western Uttar Pradesh. Records from all the blood banks are to be accumulated and combined results should be devised to get a broader vision and accurate frequency and distribution of ABO and Rh status among individuals. Most donors are Rh positive. Blood donation by females is still low. Most donations are replacement donations. Voluntary donations are needed to be encouraged.

**Conflict of Interest:** None

**Source of Funding:** Self

**Ethical Clearance:** Not applicable, as it is not an experimental or interventional study. This is the study on the Blood bank data records. Patients names and identity is not disclosed. Permission from the managing Director of KMC Multispeciality Hospital was taken.

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# Psychosocial Level of Patients Undergoing Solid Organ Transplantation

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## ABSTRACT

**Introduction:** Organ transplantation has been developed over past 100 years. It is a process which is challenging for patients and his/her family members. It requires lifelong commitment which results in psychosocial distress. Hence along with the clinical evaluation of the patient psychosocial assessment is also important.

**Purpose:** The objectives of the study were to identify the psychosocial level of patients undergoing solid organ transplantation.

**Materials and method:** A quantitative descriptive study was done among 50 patients who were planned for undergoing solid organ transplantation at AIMS, Kochi. A standardized questionnaire, Stanford Integrated Psychosocial Assessment Tool was used for assessing the psychosocial level along with the questionnaire for socio demographic and clinical variables.

**Results:** The study results shows that among 50 subjects 36(72%) were males and 14(28%) were females. Majority 47(94%) of them had good social support .Out of 50 subjects 37(74%) are waiting for kidney transplantation and 13 (26%) are waiting for liver transplantation. With regard to psychosocial levels 68% were belongs to category of good candidates. The mean score of the study was 16.14. There was statistically significant association were found between education and monthly income ( $p < 0.005$ )

**Conclusion:** The patients who are undergoing organ transplantation or on transplantation treatment are connected with long term emotional tension, experiencing strong anxiety, depressive disorders and so on. Hence the psychosocial assessment is very essential for transplant patients to cope up with the life after transplantation.

**Keywords:** Patients, psychosocial assessment, psychosocial level, solid organ transplantation.

## INTRODUCTION

Organ transplantation has become a standard treatment for the end-stage organ failure. It is a continuum of different phases, each associated with

its own individual, social and economic problems. End stage organ disease is the patient's worst clinical state with failed organ function. As a matter of life and death, it marks the beginning of organ transplantation. The various psychosocial issues among organ transplant patients include acceptance and adjustments to the patient role, Waiting for a donor, Financial issues, Family issues, Psychiatric and psychological disorders, Substance abuse, Physical rehabilitation and return to work etc. Issues like fear and anxiety about failure of surgery fear of death and so on. Psychiatric disorders are common among transplant patients which has a strong

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influence on post-transplant morbidity and mortality [1, 2].

According to U.S Department of Health and Human Services, more than 1, 23,000 men, women and children currently needed life-saving organ transplants every 10 minutes and another name is added to the national organ transplant waiting list. In 2014, more than 8500 deceased donors made possible approximately 24,000 organ transplants. In addition, there were nearly 6000 transplants from living donors. In India, nationally with a population of 1.2 billion people, the statistics stands 0.08 persons as organ donor populations. Mrithasanjeevani, Kerala network of organ sharing which began in 2012, also states that the need for organ transplantation is high as the patients in waiting list is increasing day by day who requires organ transplantation.

A cross-sectional, observational, descriptive study (2014) conducted by Roberto Sanchez et al on 'Psychosocial evaluation of heart transplant candidates' at, Barcelona, among 125 adult patients included consecutively from the waiting list for heart transplantation. The result shows that, primary insomnia 7.2%(n=9); major depressive disorders 3.3%(n=4); panic disorders 2.4%(n=3); adjustment disorders with anxiety 1.6%(n=2); acute stress disorders 0.8%(n=1); And obsessive-compulsive personality disorders 0.8% (n=1). The mean score of the whole transplant was 11.52 (SD=6.3) with a mean score of 6.54 (SD=3.8) in anxiety subscale and 4.97 (SD=3.3) in depression subscale; 31.2% of the sample (39 patients) were treated with psychopharmacological drugs at the time of inclusion in the waiting list<sup>[2]</sup>.

A descriptive study by R. Santos Junior et al (2008) on 'Patients undergoing liver transplantation: psychosocial characteristics, depressive symptoms and quality of life' among 30 adult patient undergoing liver transplantation at Brazil. The result shows that the characteristics of the sample (n=30) were for gender (n=20 men), age (mean age 51.96), education (elementary and middle school) and aetiology (viral hepatitis). A significant number of patients were not able to maintain their professional activities: prior to transplantation (n=18). Significant depressive symptoms (n=6) were experienced in patients who were undergoing liver transplantation [3,4].

Organ transplantation is a challenging process to patients, care givers and even the medical professional.

It is associated with substantial emotional stresses with tremendous life style changes and psychological as well as social stresses. A psychosocial evaluation is a gate pass for transplantation and carries a great significance. These assessments are meant to identify patients at risk, poor outcome and provide guidelines for their management<sup>[5,6]</sup>.

## **Materials and methods**

### **Design**

Non experimental descriptive design

### **Sample**

A sample of fifty adult patients who were in waiting list for solid organ transplantation was conveniently selected. Each patient fulfilled the inclusion criteria which includes the adult individuals who were undergoing solid organ transplantation of age limit 20-65yrs and who were in waiting list. A signed informed consent was taken from each sample before the data collection. The study was approved by the ethical committee board of the institution.

### **Data collection Instruments**

The data was collected using two instruments. The first instrument included section A and section B which assessed the socio-demographic variables and clinical variables. The second instrument was a standardized tool, Stanford Integrated Psychosocial Assessment for Transplantation which was developed by Jose Maldonado and Yelizaveta Sher of Stanford University California. The patient is evaluated under 4 psychosocial domains. The domains are the patient's readiness level (5 items), social support system (3 items), psychological stability (5 items), and Psychopathology and life style effects of substance use (5 items). The scoring and interpretation was done on the following basis: 0-6( Excellent candidates), 7-20 (Good candidates), 21-39 (Minimally acceptable candidates), 40-68 (High risk candidates, significant risk identified), >69(Poor candidates).

**Ethical Clearance:** The research proposal and tools were presented before the Research committee of Amrita College of Nursing and was approved. After getting the permission from the Ethical Committee of AIMS, the study will be conducted at AIMS, Kochi during the month of October-November, 2015. Informed consent

will be obtained from the subjects before the study.

## RESULTS

### Section A: Sample characteristics

**Table 1: Distribution of subjects based on demographic variable**

**n= 50**

Variables	Category	Frequency (f)	Percentage (%)
Age	20-35	11	22
	36-45	14	28
	46-55	19	38
	> 55	6	12
Gender	Male	36	72
	Female	14	28
Religion	Hindu	38	76
	Christian	7	14
	Muslim	5	10
Education	Primary	3	6
	Secondary	27	54
	Graduate	16	32
	PG	4	8
Employment status	Working	19	38
	Not working	31	62
Self-work details	No employment	28	56
	Self employed	10	20
	Govt. Employed	6	12
	Private employed	6	12
Type of family	Nuclear	32	64
	Joint	18	36
Monthly income	No income	1	20
	< 5000	2	4
	5000-10000	25	50
	10001-15000	14	28
	15001-20000	3	6
	> 20000	5	10
Type of housing	Pucca	48	96
	Kaccha	2	4
Area of residence	Urban	24	48
	Rural	26	52
Availability of social support	Available	47	94
	Not available	3	6

The above table shows that 19(38%) belongs to the age group of 46-55yrs, 36(72%) were males, 38(76%) were

Hindu, 27(54%) have primary education, 31(62%) of subjects were not working, 32(64%) were belongs to nuclear family, 25(50%) had monthly income within 5000-10000/-, 48(96%) had pucca house, 26(52%) residing in rural area and 47(94%) had social support.

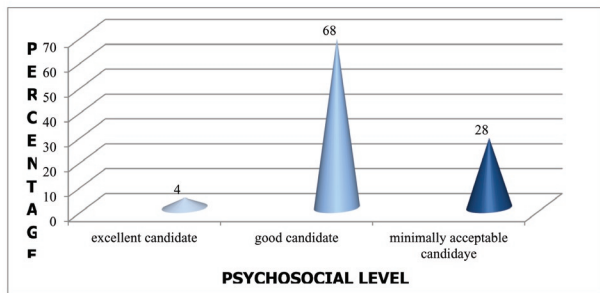
**Table 2: Distribution of subjects based on clinical variable**

**n=50**

Clinical Variables	Category	Frequency (f)	Percentage (%)
Duration of illness	< 1 year	15	30
	1-3 years	21	42
	3-5 years	14	14
	5-7 years	4	8
	Above 7 years	3	6
Number of hospital admission in last one year	3	15	30
	4	35	70
Co-morbidities	Yes	42	84
	No	8	16
Organ transplanted	Kidney	37	74
	Liver	13	26

The above table shows that 21(42%) had duration of illness between 1-3yrs, 35(70%) had hospital admissions 4 or more, 42(84%) had co morbidities and 37(74%) candidates were waiting for kidney transplantation.

**Section B: Psychosocial level of patients undergoing solid organ transplantation**



**Fig 1: Bar diagram showing the psychosocial level of patients undergoing solid organ transplantation. n=50**

**PSYCHOSOCIAL LEVEL  
PERCENTAGE**

The above figure shows that 34(63%) of the subjects were belongs to category of good candidates.

**Section C: Association between psychosocial level and selected demographic variables**

The association between the psychosocial level and the selected demographic variables where analysed using chi square test. The result of the study was

out of 50 subjects analysed and there is a significant association **between** the education (p=0.023) and the monthly income (p=0.00).

**DISCUSSION**

The early researches regarding psychosocial aspects of transplants consisted primarily of case reports and descriptive reviews regarding the interpersonal issues. The number of transplantation is increasing day by day. Accordingly, most of the guidelines suggest that the pre-transplant screening process must include not only the medical factors but also a thorough psychosocial evaluation is necessary for success of transplantation. A minimal studies a found in the literature in this area.

**The first objective was to assess the psychosocial level of patients undergoing solid organ transplantation:**

The result of the study shows that among 50 subjects studied 34 (68%) were belongs to category of good candidates.

There are very limited studies regarding psychosocial level of patients undergoing solid organ transplantation. According to Engle D in his journal article from journal of psychology, 2001 on psychosocial aspects of organ donation experience: what has been establishes and what we need for future discussed how transplantation is not a cure for end stage organ disease

but an alternative form of treatment with both potential medical and psychosocial problems. The psychosocial problem includes psychiatric diagnoses, individual and family adjustments, relationship problems, sexual dysfunctions, compliance problems and variables related to non-compliance. The author suggests that the psychosocial problem of both donor and recipients remains underreported. If the psychosocial aspects of patients are being neglected, it can lead to problems like depression, post transplant graft rejection and so on. The article concludes with the recommendations about the need to switch research efforts towards interventions studies in problem areas.

According to a prospective cohort study conducted by Szeifert L, Gresham BLJ, Thumma J, Gillespie WB, Musci I, Robinson MB et al in their study on psychosocial variables associated with kidney transplantation in 2011 among 322 dialysis patients in Dialysis centre, UK who are in waiting list for kidney transplantation shows that the variables associated with lower odds of being in waiting list included are worse health related quality of life, more severe depressive symptoms, older age, fewer years of education presence of comorbidities etc. This study shows that every patients who are in waiting list for receiving organ transplantation are facing various issues especially psychological and social problems. Hence it is essential for a regular psychosocial assessment of patients receiving organ transplantation to identify the patients who need interventions. In the present study it shows that 68% were belongs to good category. As the patients had a good knowledge and readiness level, good social support system, good psychosocial stability and good lifestyle and a single setting had made the patients to be in the category of good candidates. The study results show that as all these domains mentioned above improves the psychosocial level of candidates undergoing transplantation also improves.

Even though the patients are in good category there is also a need for regular psychosocial assessment as the patients who are receiving organ transplantation are at greater stress. They need a good support for good prognosis and success of the transplantation. According to a prospective study conducted by Calia R, Lai C, Aceto P, Luciani M, Saraceni C, Avolio AW, agnes S et al on psychological risk factors for graft rejection among liver transplant patients in 2011 among 44 liver transplant patients shows that a psychological rejection was diagnosed when patients declared,

after transplantation, a refusal of new organ which caused psychiatric symptoms requiring medical and psychotherapy. Hence the research studies shows that the psychosocial assessments are essential in pre-transplant and post-transplant phase of organ transplantation.

**The second objective was to identify the association psychosocial level and selected variables:**

The result of the study was out of 50 subjects analysed the significant association between the education and monthly income ( $p < 0.05$ ) E. Vandenberg et al conducted a retrospective study in the year 2010-2011 on "Predicting Heart Transplant Outcomes: Do we have a reliable instrument to assess psychosocial risk?" at Washington, The result of the study shows that a significant association was found among the clinic appointments ( $p = 0.001$ ) and medications ( $p = 0.05$ )<sup>[5]</sup>.

The transplant process is extremely costly and most individual cannot afford the procedure without some form of assistance. According to Olbrich EM, Benedict MS, Ashe K, James LL et al in 2002 in a journal article on Psychosocial Assessment and care of organ transplant patients discussed that patients who are candidates of longer period find paying bills to be more stressful than do emergent patients as they have had more time to accrue and worry about medical costs. The high cost of medication and the financial difficulties may create pressure for patients to discontinue or reduce their immunosuppressant's placing them at higher risk of graft rejection. In the present study it shows a significant association between the education level and the monthly income of the patients. It shows that the psychosocial level of patients who are undergoing organ transplantation improves depends on their availability of support groups and their cognitive level. The data regarding intervention studies are lacking, the available data shows group therapy, good support systems are some of the useful strategies in alleviating distress among transplant patients.

According to an journal article by Rainer JP, Thompson CH, Lambros H suggest that in their article that there is an increasing need for empirically based psychotherapy interventions for individuals and their care giving system undergoing the solid organ transplant process. A research study suggests that the organ transplant recipients experiences an improvement in physical health and social functioning and return to

daily activities, but not consistently positive change in psychological health. The transplantation process leaves the recipient with the mixture of distressing and challenging experiences. Hence there is a need for regular psychosocial assessment of all patients receiving solid organ transplantation. There has been very little study of psychosocial aspect of patients undergoing solid organ transplantation. More studies are needed in this area which can make a difference. Although we have much to learn regarding psychosocial aspect of current modes of organ transplantation the field is rapidly changing. Hence, there is an emerging need of future researches.

### CONCLUSION

The psycho social assessment must be made as a routine part of the nursing process. These assessments are meant to identify patients at risk for poor outcomes, provide guidelines for their management and improve the post-transplant quality of life [6]. "Because donated organs are a severely limited resource, the best potential recipients should be identified. The probability of a good outcome must be highly emphasized to achieve the maximum benefit for all transplants" (OPTN/UNOS Ethics committee General Considerations in Assessment for Transplant Candidacy White paper-2010).

**Conflict of Interest:** There is no conflict of interest between the authors.

**Funding:** The source of funding is self.

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# Economic Burden of Cancer in India

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## ABSTRACT

**Background:** Incidence of cancer is increasing alarmingly in India. There are very few public funded cancer centers to cater to the needs of growing population of persons getting diagnosed and living with cancer. Insurance schemes or government funded schemes are few and sparse.

**Objective:** To analyze the economic burden faced by persons living with cancer and their families; both direct and indirect costs.

**Methods: Literature Search:** A comprehensive literature search was made in PubMed, CINAHL, Google Scholar, Proquest and Science Direct for retrieving the related studies. Data were analyzed according to the objective. Narrative analysis was adopted to write this review.

**Conclusion:** Persons living with cancer and their families experience significant economic burden. Burden is more in persons with advanced stage of the disease, people living in rural areas and those who belong to low socioeconomic status.

**Keywords:** Cancer, India, Economic burden.

## INTRODUCTION

Incidence of cancer is increasing in India. Around 2.5 million people live with cancer in India. Over seven lakhs new patients register every year and cancer mortality is around 5, 56,400 in a year. The two most common cancers among females are breast and cervical cancer and among men, oral cavity and lung cancer. These four cancers account for more than 50% of all cancer deaths in India<sup>1</sup>.

The government funded schemes for cancer patients include Prime Minister's National Relief Fund, (PMNRF), a part of which is allotted for treatments of diseases including cancer. Rashtriya Arogya Nidhi under Ministry of Health & Family Welfare gives financial assistance in the form of one time grant up to ₹ 1, 00,000 for patients living below poverty line for treatment at super specialty Hospitals/Institutes or other Government hospitals. Another scheme under Ministry of Health & Family Welfare is State Illness Assistance Fund (SIAF). As per this scheme, persons living below poverty line get

treatment for cancer or other life threatening illnesses if they undergo treatment at the government hospitals for costs not exceeding ₹ 1,50,000.

Under Central Government Health Scheme (CGHS), retired Central Government employees and dependents get treatment in one private hospital in Hyderabad and 10 Private hospitals in Delhi as per the rates of Tata Memorial Hospital for Cancer Surgery. They can also avail cancer treatment from any hospital at approved rates. Indian railways give free travel for cancer patients from nearest hometown station to the treating hospital and back and bystander needs to pay only 25% of the class II fare. Similarly cancer patients travelling by air for treatment/ checkup need to pay only 50% of the airfare.

Below Poverty Line families, Mahatma Gandhi National Rural Employment Guaranty Act (MGNREGA) job card holder families, Beedi Workers, Domestic Workers, Street Vendors etc. are eligible for Rashtriya Swasthya Bima Yojna under which cashless

hospitalization coverage is given for up to ₹ 30,000. Income tax relief is also provided for cancer patients. They get help from state governments and non-governmental organizations as well.<sup>2</sup>

Despite the schemes available, patients are compelled to spend from their pockets as the total expenditure for treatment is huge and exceeds the help from the schemes. India spends only around 4% of its total GDP for healthcare. Households with a cancer patient spend 36-44% more than households with similar demographics. The cost of cancer treatment has gone up because of increased need of sophisticated infrastructure, investigations requiring high technology, late presentations and costly drugs<sup>3</sup>.

### **Significance of the Review:**

Based on this background, the researchers have taken up a review to analyze the economic impact of cancer on Indian population. Few studies are done in this area with varied objectives and outcomes. The available studies are among patients with different types of cancers as well. This review combined the different aspects of economic impact cancer has on Indian society from the available literature.

### **METHOD**

A comprehensive literature search was made in Google Scholar, PubMed, Proquest, CINAHL, and Science Direct. The search terms used were economic burden, cost, expenditure, cancer and India. The related studies done between 2011 -2016 were retrieved. From the related studies, only those relevant for the objectives were analyzed. The selection criteria employed included publication in peer-reviewed journals, studies published in the last 5 years, studies with full-text available and written in English only and studies done on human beings. A total of 15,866 records were identified through data base searching. After the initial screening 15,860 records were avoided as they were not on economic burden of cancer. For the present review, six studies of original research are included.

### **RESULTS AND DISCUSSIONS**

The evidences regarding the expenditure towards cancer treatment summarized out of six scientific articles are given below.

### **Hospital Admission:**

Cancer patients in India go through repeated hospital admissions. A survey done among 74,000 households in 2004 reported that there is an additional of 15.8 to 17.3 hospital admissions per 100 members annually among households with cancer patients. They also made 5.6 to 7.6 outpatient visits per 100 members in the 15 days preceding the survey<sup>4</sup>.

### **Out-of-pocket health expenditures:**

People suffering from cancer get minimum financial support from government or non-governmental organizations. Such support is negligible owing to the mounting cost of cancer care. Thus many families end up spending from their savings. This is referred to as out-of-pocket expenditure. In Mahal et al.'s survey it was somewhere between ₹ 3,576 and ₹ 4,438 for inpatient expenditures and between ₹ 66 and ₹ 85 for outpatient visits among households with cancer patients. The survey was done in a public funded hospital in which the expenditures are relatively lesser compared to private institutions<sup>4</sup>.

Out of pocket expenditure was a source of financing for 91% of breast cancer patients in Punjab.<sup>5</sup>

In a survey done among the major cities of India, it was found that about one third of the cancer patients spent more than ₹ 50,000 as out-of-pocket expenditure. More patients from Kerala spent more than ₹ 50,000/- compared to patients from Bikaner. This figure may be misleading with reference to the country as a whole as the data is from surveys of public tertiary care facilities only.<sup>6</sup>

The national survey of 2004 reveals that the households having persons with cancer spend most of it out of pocket. Around 33.5% to 39.2% of them borrowed or sold assets for inpatient treatment and around 3.3% to 4.0% of them borrowed or sold assets for outpatient treatment in the year preceding the survey.<sup>4</sup>

### **Socio Economic Status:**

A survey done in All India Institute of Medical Sciences among patients with the most prevalent cancers like head and neck, cervix and breast reported that the average monthly per capita income of households was ₹ 1749. Half the households had monthly per capita income of less than ₹1000.

The income of patients from rural/semi urban area was ₹ 1,173 and from urban area was ₹ 2,205. Almost 20 percent of the patients lived in katcha or semi-pucca houses<sup>7</sup>.

Private hospital admissions were more among households with higher socio economic status. They also spend more per member on both outpatient and inpatient visits compared to patients from low socio economic status. Households with higher socioeconomic status borrowed less for treatment. Adult labor force participation was less both in higher and lower socioeconomic households compared to controls.<sup>4</sup>

In Nair et al.'s survey, 60% of the patients resided in rural areas. There were more illiterates (55%) among patients in Bikaner compared to those from Thiruvananthapuram (3%). 10.3% of them were government employees 30 % were housewives and 28% were agricultural/daily laborers. 29% belonged to families living Below Poverty Line. <sup>6</sup>

In the study done in Punjab<sup>5</sup>, more than half the patients were from rural areas. The households had many members (average size 6); most of them being dependent. Most of the participants were literate and the head of the households were self-employed. The mean annual income of the household was ₹ 442,262.44. The food expenditure was 47% and nonfood expenditure was 53% of the total income. The mean per capita income was ₹ 78,924.33.<sup>5</sup>

57% of the breast cancers were diagnosed at second stage and 58% had utilized private healthcare facility. The type of facility used was not dependent upon the income of the households or the place of residence. The lower and middle-income class patients had equally utilized private and public facility, but upper class patients had utilized private facilities more. Patients with third and fourth stage of cancer used public facility more than the patients with stage first and second.<sup>5</sup>

In a study done in Maulana Azad medical College (MAMC) among women with breast cancer, the median total direct cost among rural women was ₹ 5,200 and that of urban women was ₹ 4,750. The median total indirect cost was higher among urban (₹ 6,680) than among rural (₹ 5,800) population.<sup>8</sup>

### **Radiotherapy:**

Study done in All India Institute of Medical Sciences,

Delhi assessed the expenditure for radiotherapy. The radiotherapy for cancers like head & neck, breast and cervix are spread over six to eight weeks. The average cost estimated was ₹ 1,062 per week including treatment charges, transportation, food and lodging. The cost multiplied with the duration of the treatment in weeks. It was observed that more than half of the cost was for accommodation, food and transportation.<sup>7</sup> Nair et al.'s survey also revealed that indirect costs (transportation, lodging and food) were highest in Thiruvananthapuram and Mumbai.<sup>6</sup>

Cost was also different for varied treatment plans. The cost was lesser when the patient had only radiotherapy whereas adding chemotherapy to it increased the cost considerably, largely contributed by drugs. The report further states that the total cost estimated for the entire therapy of the cancer patient was ₹ 36,812 which was much more than the income of the families.<sup>7</sup>

### **Stage of the Disease:**

In India cancer is detected at late stages because the patients report late to the facilities. As the stage of the disease advances, more than one modality of treatment may need to be applied by which the cost increases. In Nair et al.'s survey about 18% of the cancers were detected at third or above stages. Another 18% delayed starting the treatment even after the diagnosis. For most of them, financial difficulties were the reasons for delaying treatment.<sup>6</sup>

The cost of treatment increased as the disease progressed and the average cost per day was more in private facilities (₹ 16,300.68) compared to public institutions (₹ 8,834.98).<sup>5</sup>

The median total direct cost (₹ 6,530) and median total indirect costs (₹ 7,500) were highest for stage 1 breast cancer patients in MAMC.<sup>8</sup> The author has not explained the reason for the increased expenditure which is otherwise expected to be low compared to treatment of advanced stages as the patients need not undergo all modalities of treatments in stage 1.

### **Health Seeking Behavior**

Around 45% of the patients approached private hospitals as the first point of contact and 42% of them approached tertiary or government run hospitals.



Referral to the cancer centers were also mostly from private practitioners except in Aizawl where 57% of cases were referred by primary health care facilities.<sup>6</sup>

In Pakseresht et al.'s study, out of the 172 breast cancer patients, 37 (21.5%) first went to private setup for consultation. The median direct expenditure was higher in the breast cancer patients who visited private setup before coming to government hospital (₹ 8,250) than those who came directly (₹ 4,500) to government hospital whereas the median indirect expenditure was higher in the patients who came directly (₹ 5,400 verses ₹ 3,350).<sup>8</sup>

#### Cost of Investigations and Treatment:

The cost of investigations varied widely between cities (₹16,739 in Mumbai to ₹ 37,670 in Thiruvananthapuram). Entire treatment was free for 33% of cancer patients whereas the average amount spent by others was ₹ 41,311.<sup>6</sup> These figures are from tertiary care facilities and can be deceptive compared to the expenditure (which runs into lakhs) in private hospitals offering cancer care.

In Punjab, cost of drugs contributed to 36.23% of the total cost of illness among breast cancer patients and cost of hospitalization including surgery contributed to 27.05% of the total cost. The major contributing factor towards direct cost was influenced by the cost of the drugs (45.7%) and towards indirect cost was productivity loss (64.9%).<sup>5</sup>

The median direct expenditure was ₹ 4,800 and that

**Table 1: Coping Strategies of Cancer patients in India**

	Sell assets	Borrowing	Spending savings	Financial Aids
Punjab	30 %	55%	85%	5%
Major cities of Kerala, Maharashtra, Rajasthan, West Bengal and Mizoram	12.4%	39%	37%	National Cancer Relief Fund - 28% and RSBY -26 %
National Sample Survey organization	51.4%			

#### Coping with Financial Distress:

In India, families of cancer patients cope with the financial distress by reducing the expenditure for other members or other aspects of life. The spending two weeks before a survey was as low as ₹ 27 to ₹ 85 per member. There was a decline of 16.4% in non-medical

of indirect expenditure was ₹ 6,300 among breast cancer patients from diagnosis to six months of treatment.<sup>8</sup>

The average unit cost per patient per bed day for in-patient chemotherapy was ₹ 5,725.12 among cancer patients in a tertiary care hospital of Srinagar. Out of this ₹ 5,725.12, ₹ 2347.30 (41.21%) was out of pocket expenditure.<sup>9</sup>

#### Subsidized Treatment:

Hospital in Bikaner provided subsidized or free chemotherapy treatment to 50% of patients. Other tertiary care facilities across cities in India also provided free or subsidized treatment to certain portion of people. The proportion of patients who received free investigation was relatively higher in Kolkata (72.6%) followed by Bikaner (36%).<sup>6</sup> Treatment was affordable to more number of people in Rajasthan compared to Kerala because of the free or subsidized treatment offered by Government of Rajasthan.<sup>6</sup>

#### Government Schemes:

Utilization of schemes (National Cancer Relief Fund by 28% and RSBY by 26%) were not common. The source of information on government schemes were family and friends rather than media. Among those who utilized health insurance schemes, only one fifth received the full payment.<sup>6</sup>

Only three breast cancer patients out of 172 had insurance for treatment in MAMC.<sup>8</sup>

expenditure for low socio economic households and a decline of 14.5% for high socioeconomic households compared to matched controls.<sup>4</sup>

30% of the households among 3230 households with breast cancer patients in Punjab had to sell assets for treatment.<sup>5</sup> Patients who sold properties for treatment

was 12.4% of 508 in the major cities.<sup>6</sup>

Borrowing was used by 55% in Punjab<sup>5</sup> and 39% in the major cities of India.<sup>6</sup> Hardly 9 % of the households managed the expenditure with the help of health insurances in Punjab and previous savings were spent by 85% of households.<sup>5</sup> 37% of patients used their own savings for treatment in the major cities of India.<sup>6</sup>

The few government schemes of India are for patients living below poverty line. The most hard hit will be the middle class just above poverty line who are neither eligible for government benefits nor have the resources to manage the expenditure. In Punjab, financial aids were received by only 5% and support from social nets was 55%.<sup>5</sup>

Many families adopted more than one coping mechanism to overcome the financial distress; the most prevalent of them being borrowing, social nets, savings, selling financial assets and delaying repayment of loans. Treatment facilities for cancer are very few in India compared to the increasing number of people getting diagnosed with cancer. Lack of access to cancer care facilities makes the people travel to distant places multiple times.<sup>6</sup>

84% of the breast cancer patients experienced catastrophic health expenditure (out of pocket expenditure  $\geq$ 40% of the total nonfood expenditure of the household). Patients with low income, admitted with second stage or above of breast cancer and patients from rural households were more prone to distress financing (taking loans from banks/ money lenders or selling economic productive assets to meet the expenses of treatment) in Punjab.<sup>5</sup> The households in Punjab adapted coping strategies like reduced expenditure on food, education and social events and premature entry into the labor market.

## CONCLUSION

Persons living with cancer and their families experience significant economic burden. The burden increases proportionately according to the stage of the disease, place of residence and socioeconomic status.

Burden is more in persons with advanced stage of the disease, people living in rural areas and those who belong to low socioeconomic status.

**Ethical Clearance** was not obtained as this is a review article.

**Conflict of Interest:** Nil

**Source of Funding:** Nil

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# Factors Associated with Events in Early Marriage in Banjar District

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## ABSTRACT

Early marriage is one cause of perinatal mortality, mothers who are too young are often emotionally and physically immature and mothers' knowledge of antenatal care is still lacking. National data of BKKBN in 2014 showed the percentage of early marriages in Kalimantan Selatan is 55,8 per 1.000 population exceeded the national average figure of early marriage at 40 per 1.000 population. The objective of this research is to describe factors associated with events in early marriage in Banjar district. This research is a quantitative using a case-control design. The results showed factors associated with early marriage is the attitude of girls (p-value=0,011), culture girls (p-value = 0.011) and exposure of pornography (p-value = 0.000). Therefore, it needs socialization maturation and increasing the age of marriage counseling program cares for teenagers in order to reduce the incidence of early marriage.

**Keywords:** Attitude, culture, exposure of pornography, girl, early marriage

## INTRODUCTION

Early marriage is a marriage performed by girls aged less than 21 years. This is contrary to the provisions of the marriage age set by the National Population and Family Planning (BKKBN) that the age of first marriages are allowed only if the woman reaches the age of 21 years and men 25 years. However, restrictions on the minimum age to get married do not have a positive impact on reducing early marriage in Indonesia<sup>1</sup>. Zai study (2012) showed that the high incidence of marriage in adolescents under the age of 20 years, are 48% at age 10-14 years and 41.9% at age 15-19<sup>2</sup>.

High prevalence of early marriage will lead to a high risk pregnancy rates at younger ages. Pregnancy at a very young age correlated with maternal mortality and morbidity<sup>3</sup>. Based on the Indonesian Demographic and Health Survey (SDKI) in 2012 showed, the girls aged 10-14 years old have 5 times the risk of dying during pregnancy or childbirth compared to the age group of 20-24 years, whereas the risk was increased two times in the age group 15-19 years. Meanwhile, the number of maternal deaths in 2012 was as much as 87 per 1000

population<sup>4</sup>.

Early married adolescents' risk of contracting diseases related to reproduction, bleeding during childbirth and cervical cancer. Anatomy of a teenager's body is not ready to contain and childbirth process, so that there can be complications such as obstructed labor and obstetric fistula<sup>5</sup>. Data from the United Nations Population Fund for Population Activities (UNPFA) in 2015, more than 2 million women in sub-Saharan Africa, Asia, the Arab region, Latin America and the Caribbean were estimated to be living with fistula, and 50,000 to 100,000 new cases developing each year. Women younger than 20 years are particularly vulnerable to obstetric fistula. Obstetric fistula can occur also as a result of sexual intercourse at an early age<sup>6</sup>.

Raharjo research results (2013) showed respondents with low education are at risk of early marriages 2.23 times greater compared with a high school education, while less knowledgeable respondents who have an increased risk of early marriages of 2.23 times greater than the knowledgeable good<sup>7</sup>. Meanwhile, the results of research Cahyani (2015) showed that there is a

relationship of economic condition of the family against child marriage age at 11.6%, the higher the economic condition of the family will be more mature anyway marrying age children<sup>8</sup>.

Indonesia is ranked 37<sup>th</sup> early marriages in the world and the 2<sup>nd</sup> highest in the ASEAN after Cambodia. SDKI results in 2012 showed that the median age at first marriage for women aged 25-49 years was 20.4 years<sup>4</sup>.

National BKKBN data in 2012 shows the percentage of early marriages in South Kalimantan amounted to 4.84%, exceeding the national average rate of early marriage of 40 per 1,000 population. In 2014 the percentage of early marriages in South Kalimantan has increased to 5.85%. One of the districts in South Kalimantan, with the percentage of early marriage on couples of reproductive age (PUS) was found in Banjar district. In 2014 the percentage of early marriages in Banjar district remains increased to 6.5%. Based on data from the Ministry of Religious Banjar Regency, early marriage figure is highest in Sub Martapura City with a total of 239 cases out of 850 marriages.

Early marriage is one cause of perinatal mortality, mothers who are too young are often emotionally and physically immature and mothers' knowledge of antenatal care is still lacking. So that babies born to unmarried mothers at risk of premature death<sup>9</sup>. This relates to the maternal mortality rate (AKI) is still high in Banjar district. In 2014 AKI in Banjar district ranked 1<sup>st</sup> in the province of South Kalimantan, with the number of cases as many as 25 cases of infant mortality rates (AKB) ranks 2<sup>nd</sup> highest total of 42 cases. As for 2015 Banjar district ranks 2<sup>nd</sup> highest AKI in South Kalimantan with a number of cases were 11 cases, but AKB this year ranked first with less number of cases were 112 cases.

### MATERIALS AND METHOD

This study design was observational analytic with case control design. The populations in this study were all girls. Samples were determined using the formula hypothesis testing for two proportions so that the sample of 70 people.

### FINDINGS

**Table 1: Results of univariate analysis**

No	Variable	Category	Frequency	%
1	Adolescent Attitude	Support early marriage	63	90
		Reject early marriage	7	10
2	Adolescent Culture	Support early marriage	47	67,1
		Reject early marriage	23	32,9
3	Adolescent Education	Low Education	37	52,9
		Higher Education	33	47,1
4	Adolescent Income	Low Income	58	82,9
		Higher Income	12	17,1
5	Adolescent Environment	Support early marriage	36	51,4
		Reject early marriage	34	48,6
6.	Exposures pornography	Exposures	44	62,9
		Unexposed	26	37,1

Based on Table 1, above it can be seen that the attitude of girls who favor early marriage is 63 respondents (90%) more than that does not support the marriage that is 11 respondents (13.8%). According to the table 1 is known as much as 47 respondents (67.1%) support marriage and 23 respondents (32.9%) do not support early marriage. Religion has also become part of the culture accept early marriage by respondents, so they will be reluctant to

dating but would prefer to marry. In table 1 shows the frequency distribution of education level of girls. A total of 37 respondents (52.9%) have low education (junior high school graduates), while the secondary education (high school graduates) as much as 33 respondents (47.1%). This is because the age range of respondents in this study is from 16-21 years, so it only consists of two categories of educational level.

Based on table 1 showed the frequency distribution of income more girls with low incomes as many as 58 people (82.9%). This is because the ages range of the respondents ranging from 16-21 years.

Girls who live in an environment that supports early marriage as many as 36 respondents (51.4%), while the girls who lived in the neighborhood who refused marriage as much as 34 respondents (48.6%). Based on the results of the questionnaire, there were 42 respondents (60%) agreed that early marriage is common in homes. In addition, early marriage is better than dating.

There are 44 respondents (62.9%) reported ever exposed to pornography. Based on the findings in the field girls are exposed to pornography more in case group (early marriage) of 30 respondents (85.7%) than those who do not marry early as 14 respondents (40%).

**Table 2. Analysis Bivariat**

Variable	Early Marriage				p-value	OR (95% CI)
	Early Marriage		Not- Early Marriage			
	n	%	n	%		
Adolescent Attitude					0,011	0,444
Support	35	100	28	80		
Reject	0	0	7	20		
Adolescent Culture					0,011	4,56 (1,51-13,72)
Support	29	82,9	18	51,4		
Reject	6	17,1	17	48,6		
Adolescent Education					0,632	0,708
Low	17	48,6	20	57,1		
Higher	18	51,4	15	42,9		
Adolescent Income					1,00	1,00
Low	29	82,9	29	82,9		
Higher	6	17,1	6	17,1		
Environment					1,00	1,00
Support	18	51,4	18	51,4		
Reject	17	48,6	17	48,6		
Exposures pornography					0,000	9,00 (2,81-28,80)
Exposures	30	87,5	14	40		
Unexposed	5	14,3	21	60		

According to the table 2, there 35 respondents who were married early are 28 respondents (80%), which supports early marriage. Fisher test results with a 95% confidence level to see the connection between the behavior of teenagers with early marriage, that p-value=0.011 (p<0.05), which means there is a relationship between the attitude of girls with the incidence of early marriage.

The results of chi-square test with 95% confidence level to see the connection between culture girls with the incidence of early marriage that p-value=0.011 (p<0.05), which means there is a relationship between the attitude of girls with the incidence of early marriage. Results OR of 4.56 which means that girls with early marriage culture support 4.56 times greater chance to perform early marriage.

There 35 respondents who were not married early, there were 20 respondents (57.1%) with low education and 15 respondents (42.9%) secondary education. The results of chi-square test with 95% confidence level to see the connection between education levels with the incidence of early marriage, that p-value=0.632 (p>0.05), which means there is no relationship between level of education and the incidence of early marriage.

Of the 35 respondents who did not do early marriages there were 29 respondents (82.9%) lower income and 6 respondents (17.1%) high income. At 29 respondents (82.1%) of the respondents with low incomes who are not married is because most respondents not constitute the workforce or have no job or are not looking for work (school and university students), housekeeping (mothers who are not women career) and receive income but is not

a direct reward for service work (dependent parent)<sup>19</sup>.

The results of chi-square test with 95% confidence level to see the connection between income teens to early marriage events that, p-value=1.00 (p>0.05), which means there is no relationship between income teens to early marriage events.

According to the table 2 is known from 35 respondents who were married early, there are 18 respondents (51.4%) are in an environment that supports early marriage and 17 other respondent (48.6%) are in an environment that does not support early marriage. The results of chi-square test with 95% confidence level to see the connection between the environment girls with the incidence of early marriage that, p-value = 1.00 (p> 0.005), which means there is no relationship between the environment girls with the incidence of early marriage.

According to the table 2, there 35 respondents who did not do early marriages, 14 respondents (40%) are exposed to pornography, whereas 21 respondents (60%) are not exposed to pornography. Meanwhile, from 35 respondents who did early marriage, 30 respondents (85.7%) exposed to pornography and only 5 respondents (14.3%) were not exposed to pornography. The results of chi-square test with 95% confidence level to see the connection between exposure to pornography by girls with the incidence of early marriage that, p-value=0.000 (p <0.05), which means there is a relationship between exposure to pornography by girls with the incidence of early marriage. With an OR of 9.00 which means that adolescents exposed to pornography at risk 9.00 times more likely to experience early marriage than those who are not exposed to pornography.

**Table 3. Results of Multiple Logistic Regression Analysis**

No.	Variabel	B	SE	Sig.	Exp (B)
1.	Culture	0,775	0,650	0,233	2,171
2.	Attitude	20,194	14636,617	0,999	5,893E8
3.	Exposures pornography	1,783	0,627	0,004	5,950

**Table 4. End of Model Multiple Logistic Regression Analysis**

No.	Variabel	B	SE	Sig.	Exp (B)
1.	Culture	1,072	0,620	0,084	2,921
2.	Exposures pornography	1,954	0,612	0,001	7,056

The results show only one variable that provides meaningful relationships that exposure to pornography. The results indicate that exposure to pornography is the most dominant factor related to the incidence of early marriage. OR value of 7.056 means known girls who are exposed to pornography 7.056 chances to perform early marriages than those who are not exposed to pornography.

## DISCUSSION

Attitude is a chain of perception, that the perception of girls about early marriage will affect the attitude of differences in one's perception of a stimulus caused by differences in socio-cultural and learning experience of the individual concerned. The experience and the environment are known, perceived, is believed to lead to motivation, intention to act, with the result that such a gesture of goodwill behavior. On the girls are still in a culture that supports early marriage, early marriage so that she believe it is a natural thing for him and their willingness to channel the emotional need through marriage considering they view marriage is better than dating. Based on research Rafidah (2009) which states that the respondents have a perception about marriage are less risk 4.6 times more likely to marry at age <20 years compared to respondents who have a perception of a good marriage<sup>10</sup>.

At respondents who did not favor early marriage, but still get married early, there is an important role by respondents' parents. According to Ahmad (2009), parents are still holding on to the old culture is to match and marry off their children at an early age because parents fear that their children are considered a spinster<sup>11</sup>. Thus, with the attitude that supports girls against early marriage did not rule out the girls will perform early marriages<sup>12</sup>. This study is in line with research conducted by Zuraidah (2016) with the results obtained p-value=0.050 which shows the relationship between culture with early marriage. Cultural influences have 29.83 times greater risk for the occurrence of a wedding in adolescents aged  $\leq 20$  years than saying no cultural influences<sup>13</sup>.

Family support and environment helped young people to understand the marriage. This is in line with research conducted by Priyanti (2013) which shows the p-value=0.195, which indicates there is no correlation between education girls with the incidence

of early marriage. These results indicate that the higher education does not specify the amount of information obtained about the impact of early marriage<sup>14</sup>.

At 29 respondents (82.1%) of the respondents with low incomes who are not married is because most respondents not constitute the workforce or have no job or are not looking for work (school and university students), housekeeping (mothers who are not women career) and receive income but is not a direct reward for service work (dependent parent). Notoatmodjo (2003) which states that the work is closely related to income is one part of the social factors that are dynamic. A specific social environment does not just give the same effect to each person, but the social habits will have no effect on health<sup>15</sup>. This is in line with research Desiyani IW (2015), showed the value  $\rho = 0,462$ . It mean that  $\rho > \alpha$ , so that there is no relationship between the work of the respondents to the incidence of early marriage<sup>16</sup>.

Environment of girls is affected by family communication, community and peers. Families who do not have a harmonious relationship will have an impact on behavior and shape the attitudes of children to receive early marriage. This is in line with research conducted by Desiyanti (2015) shows the p-value of 0.003 which shows there is a relationship between the role of olders people with early marriage. In families that have a low understanding of the family will consider that family life will create a relationship a good relationship, so the wedding is getting faster solution<sup>16</sup>.

According Loekmono (1988) pornographic content in turn can have sexual relationships outside the law on consensual and may result in unwanted pregnancies and will impact on early marriage<sup>17</sup>. Results of research by Raharjo (2015) showed that a statistically significant correlation between media with early marriage, P value=0.000 and OR = 5.53 (95% CI: 3.08 to 9.95

## CONCLUSION

1. There is a relationship between the attitude of girls with the incidence of early marriage (p-value=0.011)
2. There is a relationship between culture girls with the incidence of early marriage (p-value=0.011)
3. There is a relationship between exposure to pornography by girls with the incidence of early marriage (p-value = 0.000).

**Ethical Clearance:** this study approved and received ethical clearance from the Committee of Public Health Research Ethics of Medical Faculty, Lambung Mangkurat University, Indonesia. In this study we followed the guidelines from the Committee of Public Health Committee of Public Health Research Ethics of Medical Faculty, Lambung Mangkurat University, Indonesia for ethical clearance and informed consent. The informed consent included the research title, purpose, participants's right, confidentiality and signature.

**Source Funding:** This study done by self funding from the authors.

**Conflict of Interest:** The authors declare that they have no conflict interest.

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# Knowledge and Awareness of Carcinoma Cervix and HPV in Rural and Urban Women of Bangalore, Karnataka, India

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## ABSTRACT

A study was carried out to assess the awareness of carcinoma of cervix and HPV amongst the rural and urban women in and around Bangalore, Karnataka, India. Women of rural and urban, two hundred from each, visiting Gynecology department were selected as participants for this study. It was found that the socio-economic conditions, marital status, multiple sexual partners, early marriage and poor hygiene are playing most significant role between them. Lack of Knowledge regarding the screening and vaccine for cervical cancer was highly significant between rural and urban women. Rural women were not aware of the vaccine.

**Keywords:** Awareness, Knowledge, Cancer cervix, HPV virus, vaccination.

## INTRODUCTION

India has a population of 436.76 million women aged 15 years and older who are at risk of developing cervical cancer. As per 2012 estimates indicate that every year 122844 women are diagnosed with cervical cancer and 67477 die from the disease. Cervical cancer in India ranks as the 2nd most frequent cancer among women and the 2nd most frequent cancer among women between 15 and 44 years of age. Based on Indian studies done on HPV detection tests on cervical samples, about 5.0% of women in the general population are estimated to harbor cervical HPV-16/18 infection at a given time, and 82.7% of invasive cervical cancers are attributed to HPVs 16 or 18.

Lack of knowledge and disparities in screening, poor treatment are the responsible factors which

increases the susceptibility to this disease amongst the rural and low income women. In one study indicates that coverage of cervical cancer screening in developing countries is 19% compared to 63% in developed countries<sup>1</sup>. However, older and poor women who are at the highest risk of developing cancer are least likely to undergo screening. Cervical cancer is on the declining trend in India according to the population-based registries; yet it continues to be a major public health problem for women in India<sup>2</sup>. Knowledge and awareness about cancer cervix and HPV among the women in India helps them to take preventive measures. In the present study, an attempt was made to know the awareness and knowledge amongst the rural and urban women about cervical cancer and HPV in and around Bangalore, India.

## MATERIALS AND METHOD

The current study was carried out at the Akash institute of Medical sciences and research centre, Bangalore, India. It includes women attending the Gynecology OPD of the hospital. Each woman patient was explained in detail about the importance of cervical cancer and HPV and requested to answer the questionnaire. A structured 28 Items questionnaire was given to the entire study group which required a response

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depending on which knowledge and awareness to be assessed. The questionnaire included knowledge of risk factors, symptoms of carcinoma cervix and also about HPV per se and its vaccines. This study was done over a period of 4 months from January to April, 2016. The questionnaire was distributed to 450 women who attended to OPD. Out of respondents, 200 each from rural and urban background were included in the study. Another 50 were dropped from the study. All the results were subjected to statistical analysis by using SPSS version 18

### RESULTS

**Table.1: Status of participants of rural and urban women in and around Bangalore, Karnataka state, India**

S.No	Parameter	Rural (n=200)	% of Participation	Urban (n=200)	% of Participation	Chi square Test value	P value*
1	Education						
a)	Uneducated	100	50	00	00	232	0.000*
b)	Primary	66	33	20	10		
c)	Secondary	32	16	110	55		
d)	Higher	02	1	70	35		
2	Martial Status						
a)	Married	196	98	180	90	11.3	0.001**
b)	Single	4	2	30	15		
3	Economic Status						
a)	High income	4	2	30	15	147	0.000**
b)	Middle	46	23	149	70		
c)	Low income	150	75	30	15		

\*If P<0.05, then it is statistically significant; \*\* highly significant. The association between places (rural and urban), education and economic status is highly significant

**Table. 2: Awareness of symptoms of cervical cancer among the rural and urban women.**

Parameter		Rural (%)	Urban (%)	Chi square test value	P-value *
Aware of cancer cervix :	Yes	30	71	33.6	0.000**
	No	70	29		
Multiple sexual partners is risk:	Yes	30	71	33.6	0.000**
	No	70	29		
Early marriage/early sexual Activity is risk :	Yes	20	55	26.1	0.000**
	No	80	45		

**Cont... Table. 2: Awareness of symptoms of cervical cancer among the rural and urban women.**

Poor hygienic is risk	Yes	20	48	13.4	0.000**
	No	80	52		
Family history is risk	Yes	10	20	3.92	0.048
	No	90	80		
Ca cervix presents with bleeding per vaginum	Yes	30	50	8.33	0.004*
	No	70	50		
Ca cervix present with discharge per vaginum	Yes	30	50	8.33	0.004*
	No	70	50		
Ca cervix presents with post coital bleeding	Yes	5	10	1.80	0.179
	No	95	90		
Ca cervix presents with irregular bleeding	Yes	5	15	3.59	0.058
	No	95	85		
Ca cervix presents with weight loss	Yes	3	10	4.03	0.045
	No	97	90		

If  $P < 0.05$  is statistically significant. \*\* Highly significant

Overall 200 women, each of rural and urban of age group of 15 to 55 years were part of this study. The education status of the study group is divided as uneducated, primary, secondary and higher education which constitutes as 33, 16, 1, 0% for rural and 0, 10, 55, 35% for urban women respectively (Table-1). Other questionnaires like marital and economic status and their corresponding answers are presented in table-1. It was found that the marital and economic status playing a significant role between rural and urban women ( $P < 0.05$ ). Table 2 reveals the proportion of women participants answered correctly about the cervical cancer related statements. It was found that the answers concerning to the as awareness of HPV varies from questionnaire to questionnaire. For e.g. Heard of HPV and knowledge of HPV has no statistically significant. However, other questionnaires like sexual route of transmission and use of condoms have shown to be highly significance

between rural and urban women ( $P < 0.05$ ) (Table 2). The knowledge regarding the presenting features of cervical cancer varied significantly among the rural and urban women (Table-3). Multiple sexual partners, early marriage and poor hygiene are playing most significant feature between them (Table-3). Knowledge regarding the screening and vaccine for cervical cancer was highly significant between rural and urban women. Rural women were not aware of the vaccine.

## DISCUSSION

The majority of participants in our survey were the subjects of different background and different social status (Table 1) unable to recognize cervical cancer as a major public health problem. Only about one fifth (20.0%) of participants were able to correctly identify cervical cancer as being the most common gynecological

cancer (Table 2). Also, a quarter of participants identified cervical cancer as an important killer amongst gynecological cancers in women. This was on the contrary to the results of a study done in Thailand which showed that the majority of the respondents were aware of the burden imposed by cervical cancer on health system and had moderate level of knowledge regarding cervical cancer and HPV<sup>3</sup>.

Studies done on the knowledge about cervical cancer, HPV infection and its prevention in general population, showed inadequate information among participants on the concerned topic<sup>4,5,6</sup>. On the basis of these findings it can be expected that considering the knowledge about this disease among the rural and urban women population in and around Bangalore, India will be even less. Only few in the current study were aware that HPV infection can lead to cervical cancer. These results show that the women were not having sufficient knowledge of HPV infection being the cause of cervical cancer<sup>5</sup>.

Despite overall poor knowledge, the respondents who were able to correctly identify HPV infection as cause of cervical cancer (Table 3) were further assessed about their knowledge about infection and below 20% of participants were knowledgeable about the information that HPV is also responsible for other diseases like genital warts and symptoms of cancer cervix like post coital bleeding, irregular bleeding, weight loss and PAP smear as screening test (Table 3). This showed that the study subjects who were aware of HPV infection and its relation to cervical cancer had moderate knowledge about HPV infection itself. These results showed better knowledge about HPV infection in urban women as compared to rural women.

Risk factors for cervical cancer include early onset of sexual activity, multiple sexual partners, infection with HPV, poor hygiene, family history of disease the disease, smoking, high parity, low socioeconomic status, and prolonged use of oral contraceptives<sup>7,8</sup>. In our study women stated that unsafe sexual practices, infection, early onset of sexual practice as common risk factors that was in accordance with our literature search. In agreement with<sup>9</sup>, in the current study the most frequent symptoms at presentation selected by participants were postcoital bleeding, abnormal vaginal bleeding, vaginal discharge

Cervical cancer is readily preventable when effective programs are implemented to detect and treat its precursor lesions<sup>10</sup>. Underutilization of cervical cancer prevention services by women in the high-risk age group of 30–60 years can be attributed to health service factors such as lack of awareness about the screening tests and its guidelines, poor availability, poor accessibility, and poor quality of care provided, women's lack of information, and cultural and behavioral barriers<sup>11</sup>, reported that only 40% of the respondents were aware that Pap smear is the screening test for cervical cancer. Other studies done in developed and under developed countries showed higher prevalence of awareness about the screening test. It has been reported that the knowledge of availability of screening for cervical cancer amongst general population of Pakistan was only 5% and of the sample only 2.6% had ever received a Pap test<sup>12</sup>. One of the reasons for this finding could be the lack of knowledge of health professional themselves, who are responsible to educate general population.

## CONCLUSION

Women who have higher education and higher socio-economic status have more awareness and understanding about the cancer cervix and its impact on health. On the other hand, women who have no education and low socio-economic status had nil to low knowledge of this disease. This depicts the need of the health awareness programmes by Governmental and non-governmental organizations, media, hospitals and schools have to concentrate more on the rural women who were deprived of education and socio-economic status.

**Conflict of Interest:** None

**Informed Consent :** Duly followed

**Ethical Standards :** Duly followed

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# Socio-demographics and Clinical Profile of Patients with Lateral Epicondylitis

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## ABSTRACT

**Introduction:** Lateral Epicondylitis (LE), also known as tennis elbow refers to the chronic symptomatic degeneration of the tendons that attaches extensor muscles of the forearm to the lateral epicondyle of the humerus. The aim of the study was to explore the socio-demographics and clinical profile of patients with lateral epicondylitis. **Method:** A descriptive cross-sectional study was conducted at the orthopedic outpatient department of a tertiary care hospital at Mangaluru, Karnataka. Using a purposive sampling technique, 60 patients were recruited. Three instruments were used for the study. Socio-demographic characteristics were obtained using a Socio-demographic data questionnaire. The clinical profile was explored using; LE assessment proforma and a Patient-Rated Tennis Elbow Evaluation (PRTEE) questionnaire. The study was approved by the institutional ethical committee. **Results:** Majority of the participants were in the age group of 20 - 40 years (60 %). Fifty-three percent of the study participants were males. Ninety percent of the subjects were right-hand dominant. The various symptoms experienced by patients include tenderness (95%), swelling (13.3%) and elevated joint temperature (8.3%). All the participants had a positive result in Mill's test and Cozen's test, indicating the presence of lateral epicondylitis. The evaluation using PRTEE revealed that the mean (standard deviation) pain subscale score was 24.79 (5.75) and functional ability subscale score was 21.7 (5.20). The mean (SD) composite score of PRTEE was 46.48 (9.20). The study concluded that the lateral epicondylitis results in significant pain and functional disability.

**Keywords:** Tennis Elbow, Lateral Epicondylitis, Clinical Profile.

## INTRODUCTION

Lateral Epicondylitis (LE), also known as tennis elbow refers to the chronic symptomatic degeneration of the tendons that attaches extensor muscles of the forearm to the lateral epicondyle of the humerus<sup>1</sup>. It is one of the most common chronic musculoskeletal conditions affecting the elbow<sup>2</sup>. Approximately 40% of people experience LE at some point in their life<sup>3</sup>. The reported point prevalence of LE is 1-3 % within the general population<sup>4</sup>. In a population-based study by Sanders et al, the annual incidence of tennis elbow was reported to be 4.5 per 1000 people<sup>5</sup>. In another

population-based study conducted in Taiwan by Shiri et al, the prevalence of lateral epicondylitis was found to be 1.3%<sup>4</sup>. The peak incidence of LE is observed among adults aged 30-50 years of age. No obvious underlying cause can be identified for lateral epicondylitis. Any activity that involves the overuse of wrist extensors or supinator muscle can lead to lateral epicondylitis. Diagnosis of lateral epicondylitis is based on history and clinical examination. LE is typically diagnosed by the presence of radiating pain over the lateral humeral epicondyle. Pain is aggravated by palpation, gripping and with resisted movements of extensor muscles<sup>6</sup>. A wide range of surgical and non-surgical approaches are utilized in the management of lateral epicondylitis. Non-steroidal anti-inflammatory drugs, orthotic devices, exercise therapy, taping, physical therapy, acupuncture, steroid injections and surgical techniques are found to be effective in managing lateral epicondylitis<sup>7</sup>. In a

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cross-sectional study by Pienimäki et al, patients with LE reported a pain score of 7.5 on a visual analog scale<sup>8</sup>. Lateral epicondylitis results in significant pain, disability and leads to loss of productivity<sup>2,9</sup>. With this background, a study was designed to explore the sociodemographic attributes and clinical profile of patients with lateral epicondylitis.

## MATERIALS AND METHOD

A descriptive cross-sectional study was designed to investigate the socio-demographics and clinical profile of patients with lateral epicondylitis. A sample of sixty patients were recruited from the orthopedic outpatient department of a tertiary care hospital at Mangaluru, South India. Purposive sampling technique was adopted for the study. The inclusion criteria for patients in the study were; (a) adults of age group 20-60 yrs., (b) dominant side involvement of lateral epicondylitis (c) ability to read, write and understand Kannada (local language), or English (d) voluntary willingness to participate in the study.

The study was approved by the institutional ethical committee. Participants who met the inclusion criteria was approached by the researcher with a detailed explanation of the study. Participants were informed about their right to voluntarily accept or decline their participation in the study. From those who volunteered to be a part of the study, a signed, written informed consent was obtained. Anonymity and confidentiality of the participants were ensured. A pilot study was undertaken to ensure the practicability of the study. Minor amendments were made based on the pilot study. Participants of the pilot study were excluded from the main study.

### Data collection instruments

Three instruments were used for the study. Sociodemographic characteristics were obtained using a sociodemographic data questionnaire. Clinical profile assessment was undertaken using two questionnaires, an LE assessment proforma and a Patient-Rated Tennis Elbow Evaluation (PRTEE) questionnaire.

**Sociodemographic data questionnaire:** A sociodemographic data questionnaire comprising of nine items such as age, gender, duration of illness, family history, past history, height, weight, hand dominance and involvement in activities that demands repetitive arm

movements, was used to explore the socio-demographic characteristics.

**LE assessment proforma:** LE assessment proforma included six items pertaining to clinical features experienced by patients like; swelling, tenderness, elevated joint temperature, crepitus during joint movements, Mill's test, and Cozen's test.

**Patient-Rated Tennis Elbow Evaluation (PRTEE):** It is a 15 item brief, standardized questionnaire designed to measure perceived pain and disability in people with tennis elbow. The PRTEE has demonstrated sufficient clinical measurement properties as well as excellent test-retest reliability. The tool is divided into two subscales. A pain subscale of 5 items and function subscale of 10 items. Each of the items of the PRTEE is scored on a 0–10 scale, where 0 refer to 'no pain' or 'no difficulty' and 10 refer to 'worst ever' or 'unable to do'. People were asked to rate the pain and difficulty that they have experienced in the past week because of tennis elbow. The total score of PRTEE ranges from 0 to 100, where higher scores indicate greater pain and disability. Pain and function are equally represented in the total score<sup>10,11</sup>. Permission to use PRTEE was obtained. PRTEE was translated to Kannada (local language) and was subjected to pre-testing.

## FINDINGS

Descriptive statistical analysis was done to describe the socio-demographics and clinical profile of the patients. SPSS version 15 was used for data analysis.

### Socio-demographic characteristics

More than half of the participants were in the age group of 20 - 40 years (60%). Fifty-three percent of the study participants were males. Pain in LE may have insidious onset with no specific casual activity. Duration of illness was less than a year for 61.7% of study participants. A positive family history was present only in 16.7% of subjects, whereas significant past history of illness was present for about 23.3%. Seventy-three percent of the subjects belonged to the height group of 150-170 cms, and 66.6% of the subjects were within the weight category of 51-70 kg. Ninety percent of the participants had right-hand dominance. Workers involving in manual occupations that require a repetitive arm and wrist movement are at increased risk for L E. In this study, 58.3% of the subjects were involved in

activities (or occupations) that demanded repetitive arm movements. The sociodemographic characteristics of the subjects are explained in Table 1.

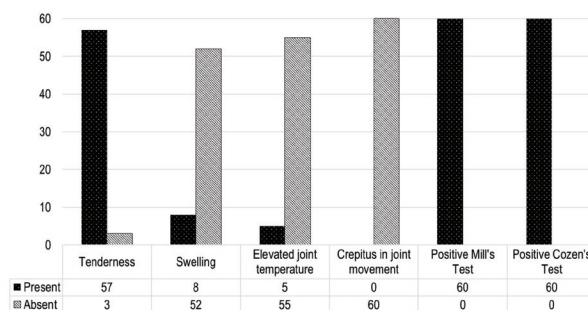
**Table 1: Socio-Demographic characteristics of patients with lateral epicondylitis (n=60)**

Variables	Frequency (f)	Percentage (%)
Age		
20-40 yrs	36	60
41-60 yrs	24	40
Gender		
Male	32	53.3
Female	28	46.7
Duration of illness		
<1 Year	37	61.7
>1 Year	23	38.3
Family history		
Yes	10	16.7
No	50	83.3
Past history of LE		
Yes	14	23.3
No	46	76.7
Height in cm		
150-170	44	73.3
>170	16	26.7
Weight in kg		
51-70 kg	40	66.4
>70 kg	20	33.3
Dominant hand		
Right	54	90
Left	6	10
Involved in activities demanding repeated arm movements		
Yes	35	58.3
No	25	41.7

**Clinical Profile**

Clinical features were explored using an LE assessment proforma. Tenderness over the lateral humeral epicondyle was present for 95% (n=57) of participants. Swelling of the affected elbow was present for 13.3% (n=8) of participants. An elevated joint temperature with respect to the rest of the arm was present in 8.3 % (n=5)

of participants. None of the subjects had crepitus on physical examination. All the participants had a positive result in Mill’s test and Cozen’s test, indicating the presence of lateral epicondylitis. The clinical features are depicted in figure 1.



**Figure 1: Clinical features of patients with lateral epicondylitis (n=60)**

**Patient-Rated Tennis Elbow Evaluation (PRTEE)**

Pain and functional disability in patients with lateral epicondylitis were tested using PRTEE. The tool is divided into 2 sections.

(1). Pain subscale score: Pain subscale has a total of 5 items. Three items rate; the pain at rest, pain experienced when carrying a grocery bag and pain experienced while performing a task with repeated arm movements. The other two items rate the intensity of pain in patients with lateral epicondylitis when it is at the least and at the worst. The maximum score for pain subscale is 50. Higher is the score, greater is the pain. The mean (standard deviation) pain subscale score was 24.79 (5.75) with 95% CI of 14-44, which denotes that lateral epicondylitis resulted in significant pain among patients.

(2) Functional ability subscale score: Functional ability subscale score has a total of 10 items. Items are divided into two subsections. A specific activity subsection and a usual activity subsection. Specific activity subsection comprised of six items evaluating the difficulty experienced while performing specific activities like; turning a door knob, carrying a briefcase by the handle, lifting a coffee cup to mouth, opening a jar, pulling up pants & wringing up a wet washcloth. Usual activity subsection comprised of 4 items pertaining to personal activities, household work, work and recreational activities. Total score for the functional ability subscale is 50 with higher scores indicating



greater functional disability. The mean (standard deviation) of function score was 21.7 (5.20) with 95% CI of 11-38, which denotes that lateral epicondylitis resulted in functional disability.

c) PRTEE Overall Score: Total score for pain & functional ability is 100. Higher is the score, greater

is the functional disability & pain. The mean (standard deviation) of the overall score was 46.48 (9.20) with a 95% CI of 30-74), which denotes that lateral epicondylitis results in functional disability & pain that make even daily activities of living difficult. Table 2 represents the PRTEE scores of patients with lateral epicondylitis

**Table 2: PRTEE Scores of patients with Lateral Epicondylitis** (n=60)

PRTEE (Pain Subscale Score)		PRTEE (Functional Ability Subscale Score)		PRTEE Overall Score	
Mean (SD)	95% CI	Mean (SD)	95% CI	Mean (SD)	95% CI
24.79 (5.75)	14 - 44	21.7 (5.20)	11 - 38	46.48 (9.20)	30 - 74

## DISCUSSION

The age incidence figures in the present study show that prevalence of lateral epicondylitis is highest between the age 20-40 years. Tennis elbow is reported to be four times more common in the fourth decade of life<sup>12</sup>. It is postulated that in midlife, deterioration in the elasticity of the tendons results in tennis elbow<sup>13</sup>. Fifty-three percent of the study participants were males, which is similar to the study results by Lapidus et al<sup>14</sup>. In the present study, participants with dominant hand involvement of LE were only included. Ninety of the participants were right-hand dominant. In an epidemiological study by Hamilton, the right-sided lateral epicondylitis was found to be twice more common than left sided lateral epicondylitis<sup>13</sup>. Workers in manual occupations involving repetitive arm movements and wrist movements are at increased risk for lateral epicondylitis<sup>15,16</sup>. Our study is on par with this statement, 58.3% of subjects in the present study were involved in activities (or occupations) that demand repetitive arm movements. In the present study, pain and functional disability were measured by PRTEE. Many randomized controlled trials use PRTEE to measure the change over time in measures of pain and function as an outcome of a particular intervention. In the current study, baseline mean (SD) pain & functional ability subscores were 24.79 (5.75) & 21.7 (5.20) respectively. The composite mean (SD) PRTEE score out of 100 was 46.48 (9.20). These findings were similar to the study findings reported by Gogia in which baseline scores corresponding to pain & function subscores were 21.8 (9.8) & 17.1 (3.4) respectively. Total composite PRTEE

score reported out of 100 was 39 (22)<sup>17</sup>.

## CONCLUSION

Lateral epicondylitis leads to significant pain and functional disability. Even, the day to day activities of patients with lateral epicondylitis are adversely affected due to the presenting symptoms like tenderness and swelling. The quality of life of patients with lateral epicondylitis is a less researched area. More studies focusing on quality of life, pain and functional disability of patients with lateral epicondylitis is highly recommended.

**Conflict of Interest:** The authors declare that they have no conflict of interest to disclose.

**Source of Funding:** Self

**Ethical Clearance:** The study was approved by the institutional ethical committee.

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# A Study on Knowledge and Practice of Hospital Waste Management among Nursing Staff of Tertiary Care Centre Hospital in Eluru, West Godavari District, A.P, India

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## ABSTRACT

**Background:** Hospital is one of the complex institutions which is frequented by people from every walk of life in the society. Hospital waste can potentially transmit diseases and present an additional risk to the staff of the healthcare facilities, patients and the community when the wastes are not managed properly. In developing countries, medical wastes have not received sufficient attention due to limited resources. **Objectives:** To study the knowledge and practice of hospital waste management among nursing staff of hospital and to determine the socio-demographic variables in relation to practice of hospital waste management. **Methodology:** This was a hospital based cross-sectional study conducted at tertiary care centre (ASRAM hospital) among different cadres of 165 nursing staff during the period from April 2013 to September 2013. Predesigned and pretested study questionnaire was filled and knowledge and practices were recorded. Data was entered and analyzed using Microsoft Excel 2007 and necessary statistical tests like simple proportions and chi square tests were applied. **Results:** 153(92.7%) of the nursing staff were aware of the definition of the hospital waste. 132(81%) were having good knowledge about accessibility of colour coding bins from nursing station. Good knowledge was seen in highly qualified B.Sc nursing staff regarding disposal of hospital waste. 149(90.3%) of the nursing staff has knowledge regarding storage time for infectious waste is less than 48 hours. **Conclusion:** Statistically significant association was noticed between qualification of nursing staff and hospital waste disposal. B.Sc nursing qualification people were having the better knowledge and practice about the hospital waste than ANM nursing group. Periodical sensitization programme on hospital waste management is required.

**Key words:** hospital waste, colour coding bins, nursing staff, storage time, nursing station

## BACKGROUND

'Hospital waste' refers to all wastes generated by hospitals, including infectious and non-infectious waste materials, hazardous wastes and chemicals, and other

nonhazardous wastes. According to Bio-Medical Waste (Management and Handling) Rules<sup>1</sup>. 1998 of India, "Bio medical waste" means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals, and including categories as mentioned in schedule<sup>2</sup>. Hospital is one of the complex institutions which is frequented by people from every walk of life in the society without any distinction between age, sex, race and religion. All of them produce waste which is

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increasing in its amount and type due to advances in scientific knowledge and is creating its Impact<sup>3</sup>. The hospital waste, in addition to the risk for patients and personnel who handle these wastes poses a threat to public health and environment<sup>4</sup>.

Healthcare and medical waste consists mainly of two types: Infectious wastes (cotton, gloves, syringes, and others) and pathogenic wastes, (sharps and pharmaceutical wastes, chemical wastes and pressurized containers). These are generated in wards, X-ray departments, operating theatres, pharmacies, and laboratories. Mohee R. (2005) found that around 90% of hospital waste consisted of general wastes that had properties similar to domestic waste. The remaining 10% was infectious and hazardous wastes<sup>5</sup>. Pruss et al. (1999) also found that “10-25% of healthcare waste was termed as infectious, pharmaceutical, radioactive or chemical, which may pose a variety of health and environmental risks”<sup>6</sup>. Henry and Heinke 1999 highlighted that inadequate waste management can lead to environmental pollution, unpleasant smell, growth and multiplication of insects, rodents and worms and may lead to the transmission of diseases like typhoid, cholera, hepatitis and AIDS through injuries from syringes and needles contaminated with human blood<sup>9</sup>. Bags and containers for infectious waste should be marked with Biohazard symbol. Cytotoxic wastes are to be collected in leak proof containers clearly labelled as cytotoxic waste<sup>10</sup>.

Proper training of health care establishment personnel at all levels coupled with sustained motivation can improve the situation considerably. They must be equipped with the latest information, skills and practices in waste management to reduce hospital acquired infections and protect their own health.

### OBJECTIVES

1. To study the knowledge about hospital waste management among nursing staff of the hospital.
2. To find the practice of hospital waste management among nursing staff of the hospital.
3. To determine the socio-demographic variables in relation to practice of hospital waste management.

### MATERIALS AND METHOD

This is a hospital based cross-sectional study

conducted at ASRAM hospital among different cadres of nursing staff during the period from April 2013 to September 2013. In the hospital 25 speciality centres are working, of which 6 departments were selected randomly and in each department all the nursing staff were included in the study. During the study period we interviewed 165 nursing staff of departments of surgery, OBGY, orthopaedics, nephrology, cardiology and casualty. Different qualifications of nurses were involved. Importance of the study was explained to the participants and informed consent was taken. Predesigned and pretested study questionnaire was filled and knowledge and practices were recorded.

**Statistical Analysis:** Data was entered and analyzed using Microsoft Excel 2007 and necessary statistical tests like simple proportions and chi square tests were applied

### RESULTS

**Table 1: Qualification of nursing staff in relation to awareness about definition of hospital waste**

Qualification	Awareness present	Awareness absent	Total
B.Sc Nursing	90(97.8%)	2(2.2%)	92(100%)
Staff Nurse	43 (89.6%)	5(10.4%)	48(100%)
ANM	20 (80%)	5(20%)	25(100%)
<b>Total</b>	<b>153(92.7%)</b>	<b>12(7.3%)</b>	<b>165(100%)</b>

Table-1 depicts 92.7% of the nursing staff were aware of the definition of the hospital waste.

**Table 2: Duration of experience of nursing staff in relation to correct definition written in English**

Duration(in years)	Correct definition	Incorrect definition	Total
<2 years	30 (78.9%)	8(21.1%)	38(100%)
2-5 years	37(59.6%)	25(40.4%)	62(100%)
5-10 years	19(51.4%)	18(48.6%)	37(100%)
>10 years	12(42.8%)	16(57.2%)	28(100%)
<b>Total</b>	<b>98(59.4%)</b>	<b>67(40.6%)</b>	<b>165(100%)</b>

Table-2 depicts that high knowledge was seen regarding correct definition written in English in nursing staff of experience <2 years i.e 78.9

**Table 3: Qualification in relation to knowledge about infectious waste and non-infectious waste**

Qualification	Knowledge present	Knowledge absent	Total
B.Sc Nursing	92(100%)	0	92(100%)
Staff Nurse	48(100%)	0	48(100%)
ANM	21(84%)	4 (16%)	25(100%)
<b>Total</b>	<b>161 (97.5%)</b>	<b>4 (2.5%)</b>	<b>165(100%)</b>

Table-3 depicts that high knowledge about infectious waste and non-infectious waste in nursing group of B.sc nursing and staff nurse.

**Table 4: Knowledge among nursing staff in different contents:**

Content	Knowledge among nursing staff		Total
	Yes	No	
Accessibility of colour coding bins	163(99%)	2(1%)	165(100%)
Status of labels on top of bins	165(100%)	0	165(100%)
Infectious wastes and non infectious waste	161(97.5%)	4(2.5%)	165(100%)
Occupational hazards	115(69.7%)	50(30.3%)	165(100%)
Correct disposal of injection waste	139(84.2%)	26(15.8%)	165(100%)

**Table 5: Qualification of nursing staff in relation to hospital waste disposal**

Qualification	Correct disposal	Incorrect disposal	Total
B.Sc Nursing	78 (84.7%)	14 (15.3%)	92(100%)
Staff Nurse	34 (70.8%)	14 (29.2%)	48(100%)
ANM	5 (20%)	20 (80%)	25(100%)
<b>Total</b>	<b>117 (70.9%)</b>	<b>48 (29.1%)</b>	<b>165(100%)</b>

chi-square = 40.0 , degrees of freedom = 2, probability = 0.000.

Table-5 depicts good knowledge was seen in highly qualified B.Sc nursing staff regarding disposal of hospital waste.

**Table 6: Knowledge about storage time for infectious waste in relation to qualification of staff**

Qualification	<24 hours	24-48 hours	>48 hours	Total
B.Sc Nursing	58 (63%)	31 (33.7%)	3 (3.3%)	92(100%)
Staff Nurse	20 (41.6%)	23 (47.9%)	5 (10.5%)	48(100%)
ANM	6 (24%)	11 (44%)	8 (32%)	25(100%)
<b>Total</b>	<b>84 (50.9%)</b>	<b>65(39.4%)</b>	<b>16(9.7%)</b>	<b>165(100%)</b>

Table-6 shows that, majority of the nursing staff has knowledge regarding storage time for infectious waste is less than 48 hours i.e 90.3%

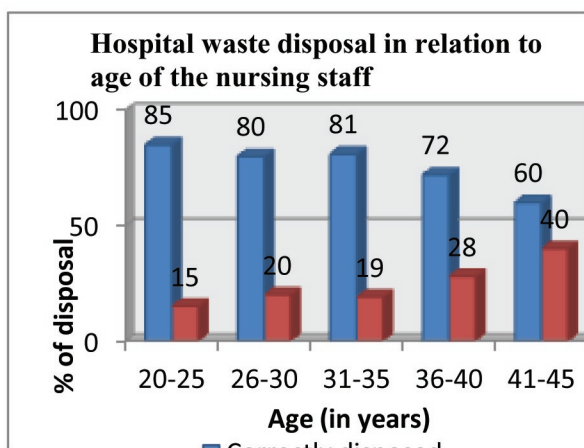


Figure 1: In figure 1, bar diagram depicts 85% of correct disposal of hospital waste was seen in the age group of 20 to 25 years. This shows correct disposal of hospital waste in the nursing staff decreases with increase of age.

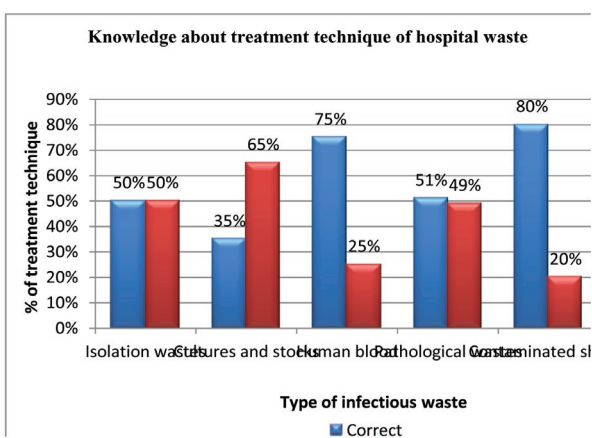


Figure 2: In figure 2, bar diagram revealed 80% of the nursing staff were having good knowledge regarding treatment technique of contaminated sharps and poor knowledge regarding isolation wastes and pathological wastes i.e 50%

### DISCUSSION

Pandit et al 2005 stated that among other health workers in hospitals, nurses play a key role in the management of health care waste, they need to segregate the waste and store it in the correct bins at the point of generation, in order for them to fulfill this function efficiently, it is important that they have adequate knowledge about the importance of segregation and how to distinguish the different containers and bins for the various types of health care waste, the health hazard of hospital waste, proper technique and methods of handling the waste, and practice of safety measures can go a long way toward the safe disposal of hazardous hospital waste and protect them, their patients, as well as the communities and the environment.<sup>16</sup>

The findings of the present study showed that almost 95% of nurses have good knowledge about infectious waste and non infectious waste. These findings are in correlation with Saini et al. (2005) who evaluated the biomedical waste management amongst staff of a tertiary level hospital in India, showed that 85% nurses had good knowledge about biomedical waste management.<sup>17</sup> Also, in many studies to evaluate the knowledge, attitude & practice of health care team regarding biomedical waste management methods, Nirupama et al. (2009) found that 95.8% of nurses had knowledge about the health hazards of biomedical waste management<sup>18</sup>, where as 69.7% of the nursing staff were having knowledge regarding occupational hazards of hospital waste in our study. While Sarma et al. (2011) showed that the nurses knowledge related to biomedical waste management rules was 60%.<sup>19</sup> In our study 91% correct disposal of discarded medicines, scalpels and blades according to colour coded bin and poor knowledge regarding disposal of lab cultures and vaccines i.e 70%. The findings of the present study revealed that 32% of the ANM staff written correct definition of hospital waste.

Furthermore, the WHO (2010) has emphasized that occupational health and safety committee and infection control committee should cooperate on the task to set-up, implement, and evaluate a comprehensive health surveillance program for the health care workers.<sup>20</sup> 70.9% of the nursing staff were practicing biomedical waste management rules regarding disposal of hospital waste in our study. Similarly Shafee et al. (2010) found that (50.5%) of nurses subjects collected waste into colour coded bags, segregation and separation of plastic waste was done better by the nurses (50.4%)<sup>21</sup>. Where as Nirupama et al. (2009) stated that 45.4% of nurses were practicing/following biomedical waste management rules<sup>18</sup>. While these findings disagree with Shafee et al. (2010) showed that all nurses (100%) were practicing health care waste according to the rules. In the same respect, Yadavannavar et al. (2010) mentioned that biomedical waste (BMW) collection and proper disposal has become a significant concern for both the medical and the general community.<sup>22</sup>

The present study findings revealed a statistically significant correlation between nurse knowledge and practice scores. Also, the knowledge & practice scores have statistically significant correlation with the unit of work, while there is a statistically significant correlation between the practice score and the educational

qualification. Also, Sarma et al. (2011) found that the nurses with good knowledge, however, practice percentage is also very high. The same author shows that nurses with a higher level of education have a greater awareness of the national and international activities on biomedical waste management.<sup>19</sup>

### CONCLUSIONS

Of the study population 92.7% of the nursing staff were aware of the definition of the hospital waste. Statistically significant association was found between knowledge and qualification of nursing staff. 99% of the nursing staff were having knowledge about accessibility of colour coding bins. Nursing staff has good knowledge of about 91% correct disposal of discarded medicines, scalpels and blades according to colour coded bin and poor knowledge regarding disposal of lab cultures and vaccines i.e 70%. Good knowledge was seen in highly qualified B.Sc nursing staff regarding disposal of hospital waste. Statistically significant was noticed between qualification of nursing staff and hospital waste disposal.

**Acknowledgement:** My sincere thanks to our ASRAM Management society for providing logistics and research atmosphere to take up this study and successful completion of the study. Special gratitude to our Director, Prof. (Dr.) K. Anji Reddy, M.S (Gen.Surgery) & M.Ch. (plastic Surgery) for his constant encouragement towards research.

**Ethical Clearance:** taken from Institutional ethical Committee

**Source of Funding:** None

**Conflict of Interest:** None

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# Ocular Morbidity in Geriatric Age Group: A Retrospective Study in a Tertiary Eye Care Centre

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## ABSTRACT

**Context:** Routine ocular examination was carried out in all geriatric patients visiting (indoor and outdoor) eye department of hospital. **Aims:** To assess the prevalence and causes of common eye disorders and visual impairment in tertiary eye care centre. **Settings and Design:** Descriptive cross-sectional. **Materials and Method:** Serial evaluation of all consenting geriatric patients (age > 60 years) presenting over 1 year was done after ethical clearance. Socio-demographic data were obtained. Baseline evaluation including visual acuity, anterior and posterior segment examinations, intraocular pressure (IOP) measurement and refraction were done. Disease was classified according to the World Health Organization ICD.10 (VII) (2016 revised). Descriptive analysis was carried out in SPSS software. **Results:** Out of all 8630 subjects-4349 males (50.39%) and 4335 females (49.61%)-participated. The commonest eye disorders were cataract 4662(54.04%), refractive error 648(7.5%), glaucoma 813(9.4%), posterior segment pathology 1345 (15.55%), corneal opacities 174 (2.01%). Total cases of blindness were 777, where cataract was the main cause 362 (46.58%), glaucoma 164 (21.1%), anterior segment 89 (11.45%), posterior segment 152 (19.5%). **Conclusions:** There is an urgent need to establish new out-reach facilities and strengthen the existing infrastructure to set up available, accessible and affordable eye care services, particularly for cataract, glaucoma surgery and refraction. This could reduce the occurrence of these vision-threatening disorders.

**Keywords:** geriatric ocular morbidity, blindness in elderly

## INTRODUCTION

According to a 2014 estimate, 39 million people are blind and 246 million people suffer from low vision, contributing the current number of people with visual impairment (both low vision and blindness) to be around 285 million worldwide<sup>4</sup>. India has acquired the label of “an ageing nation” with 8% of its population being more than 60 years old<sup>1</sup>. As per the 2011 census, the population of the elderly in India was 103.8 million

(out of 1210.6 million total populations) as compared with 76.6 million in 2001<sup>2</sup>. It has been projected that by the year 2050, the number of elderly people would rise to about 324 million<sup>3</sup>. There is a need to highlight the ocular problems that are being faced by the geriatric population in India, and strategies for bringing about an improvement in their quality of life also need to be explored.

Various studies estimating the burden of visual impairment and blindness in the geriatrics have been conducted in different parts of the country, but there is lack of appropriate Hospital-based data on the prevalence of common ocular morbidities in geriatric population especially in West Bengal. The study aims to determine the prevalence of common ocular morbidities

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in geriatric population in a Tertiary Care Hospital of West Bengal

## MATERIALS & METHOD

The present cross-sectional study was conducted in Department of Ophthalmology, Calcutta National Medical College & Hospital, for a period of one year, from 2015 January to 2015 Dec. All new patients who attended OPD aged 60 years and above were included after informed consent. Details about the presence of any complaints related to eye diseases, past history and family history were noted. All persons were screened with snellen's chart for presenting and best corrected vision acuity(BCVA). Examination of the anterior segment of the eye and ocular adnexa was carried out by torch light /slit lamp. Refraction (dry/wet as required) was done with retinoscopy using a streak retinoscope. Dilated fundus evaluation was done in all patients with direct/ indirect ophthalmoscopy/ 78/90 Diopter lens. IOP measurement was done by Schiotz /Applanation tonometry. Gonioscopy, visual field, pachymetry, optical coherence tomography was done as and when required.

The criteria for low vision 'presenting' VA of < 6/18, but  $\geq$  6/60 in the better eye, blindness 'presenting' VA of < 6/60 the better eye <sup>5,6</sup>

Cataract: Lens opacity accompanied by or capable of causing some level of visual loss.<sup>7</sup>

Corneal opacity: Loss of normal transparency of the cornea.

Glaucoma: A corrected intraocular pressure of more than 21 mm Hg accompanied by a horizontal or vertical cup-disc ratio difference  $\geq$  0.6 or a horizontal or vertical cup-disc ratio difference  $\geq$ 0.2 in the presence of a visual field defect.<sup>8</sup>

## RESULTS

The total number of patients was 8630. Table 1 shows the number of patients is 5437 in 60-70 years, 2674 in 70-80 years, 519 in >80 years. The study group consisted of 50.39% patients who were male and 49.61% who were female. The p values are not significant ( $p > 0.05$ ). Table 2 describes disease distribution in all the patients; cataract showing the bulk of the cases 4662 (54.04%), followed by posterior segment pathology 1345 (15.55%), glaucoma 813(9.4%), refractive error 648 (7.5%), corneal opacity 174(2.01%).

In this study, prevalence of cataract was 4662 (54.04%). Among these patients 36% had bilateral cataract; 6% and 2.5% presented with hypermature and some or other form of cataract related complications. Absolute number of cataract in both sexes is depicted in image 1.

Prevalence of corneal blindness in our study was 174 (2.01%). Among these patients, 7% cases had aphakic bullous keratopathy and 16% had pseudophakic bullous keratopathy requiring second surgery (cataract surgery complication attending our centre).

648 (7.5%) patients presented with refractive error. Eight hundred forty six patients (9.80%) patients suffered from dry eye and increased in incidence with age ( $p = 0.04, < 0.05$ ); 645(7.47%) patients suffered from diabetic retinopathy changes which also increased with age ( $p = 0.03, < 0.05$ ).

In our study, prevalence of blindness was 12% with presenting VA of <6/60 and 9% with vision of <3/60. We have analyzed the causes of blindness with NPCB criteria. The study also shows the prevalence of blindness increased with increase in age 9% in 60-70 years to 20% in >80 years.

Table 4a and & 4b shows causes of blindness in all age groups. Cataract is the main cause blindness in all age groups, though as the age progress relative percentage of different diseases causing blindness also increased (image 2).

## DISCUSSION

Our centre caters a large area and variable socio-demographic pattern. Among the ocular morbidity, cataract showed the highest number of the cases 4662 (54.04%), followed by posterior segment pathology 1345 (15.55%), glaucoma 813(9.4%), refractive error 648 (7.5%), corneal opacity 174 (2.01%). A study done by Pisudde et al<sup>9</sup> in cataract was present in 36.3%, glaucoma in 5.6%, age related macular degeneration (ARMD) in 6.6%, diabetic retinopathy in 8.9% study population. The difference can be explained on the basis that the previous study was community based study and the population composition was different.

In our study, prevalence of blindness was 12% with presenting visual acuity of <6/60 and 9% with vision of <3/60. Study by Singh et al, in the rural setting reported 12.2% (<3/60) blindness.<sup>10</sup> Study in Andhra Pradesh

by Dandona et al. found that prevalence of blindness was 1.84%.<sup>11,12</sup> Haq et al. in Aligarh reported a blind estimate of 5.4% (<6/60) and 3.6%.based on presenting visual acuity and BCVA respectively.<sup>13</sup>

In the current study, it is observed that the prevalence of blindness increased with increase in age 9% in 60-70 years, 16% in 70-80 years and 20% in >80 years. Dandona et al. found blindness was significantly associated with age with 5.06% of blind in age group 50-59 years, 11.11% in 60-69 years and 20.40% in >70 years.<sup>11,12</sup> Similar association was reported by Murthy et al.<sup>14</sup> Thulasiraj et al.<sup>15</sup> and Nirmalan et al.<sup>16</sup>

Fifty three patients presented with low vision in this study. Singh et al. found low vision (<6/18 to 3/60) was present in 32% of population,<sup>10</sup> 12.2% in a study in South Indian population<sup>17</sup>, 23.85% (<6/18 to >6/60) in Murty et al<sup>5</sup>, 30% in Thulasiraj et al<sup>18</sup>. The differences in magnitude of low vision varied widely across different studies across the country. It may be explained on the basis of differences in study setting and differences in socio cultural factors.

As per National Programme for Control of Blindness (NPCB) data main causes of blindness are as follows: - cataract (62.6%), refractive error (19.70%), corneal blindness (0.90%), glaucoma (5.80%), surgical complication (1.20%), posterior capsular opacification (0.90%), posterior segment disorder (4.70%), Others (4.19%).<sup>5</sup> In our study, cataract showed the bulk of the cases 4662, followed by posterior segment pathology 1345, glaucoma 813, refractive error 648, corneal opacity 174 . The difference can be explained on the fact data is taken from a tertiary care referral centre and not from community based sampling.

In our study, cataract was found in 54.04% of cases. The prevalence was 40.4% in Singh et al<sup>11</sup> 20.4% in APEDS<sup>16</sup>, 47.5% In ACES (Aravind Comprehensive

Eye Study)<sup>19</sup>, 21.7% in study by Haq et al<sup>13</sup>. These wide variation can be explained by nature if study, its population and difference of location.

In the present conducted study, prevalence of diabetic retinopathy was 7.47%. In Pisuda et al, the prevalence was 8.9%<sup>9</sup> and 1.78% by Dandona et al.<sup>20</sup>

In the present study, prevalence of glaucoma was present in 9.4% of study population. Different studies showing glaucoma prevalence to be 3.1% in Singh et al<sup>9</sup>, 3.6% in > 35 years Khandekar et al<sup>21</sup>. Khandekar et al<sup>21</sup> and Dandona et al<sup>22</sup> reported glaucoma to be significantly associated with the age, but not with gender. In our study, we found glaucoma causing blindness was more in females in 60-70 years and 70-80 years groups but not in > 80 years group.

## CONCLUSION

The study shows that cataract related visual impairment is still the leading problem in this age group, followed by refractive error, retinal disorders and glaucoma. The present study suggests that there is a high prevalence of cataract, posterior segment, glaucoma, refractive errors, and corneal opacity in the study population, all of which are treatable or preventable.

There is a need to highlight the ocular problems that are being faced by the geriatric population in India, and strategies for bringing about an improvement in their quality of life also need to be explored. There is, thus, a need to define the priorities for eye care services based on the current population-based data. We propose short-term emphasis should be placed on cataract and refractive errors, and long-term emphasis should include glaucoma and corneal diseases as well.

Eye health education programs should specifically target older age groups. The availability and accessibility of eye care services, particularly cataract surgery and refraction services should be increased.

**Table 1: Patients distribution according to age and sex**

Age in years	Male (%)	Female (%)	Total (%)	P
60 – 69	2503(29%)	2934(34%)	5437(63%)	>0.05
70 – 79	1553(18%)	1121(13%)	2674(31%)	
≥ 80	239(3%)	280(3%)	519 (6%)	
<b>Total</b>	<b>4349 (50.39%)</b>	<b>4335 (49.61%)</b>		

**Table no.2: Profile of Ocular morbidities in patients**

Ocular morbidity	Cases(n=8630)
Refractive error	648(7.5%)
Cataract	4662(54.04%)
Glaucoma	813(9.4%)
Posterior Segment pathology (Diabetic Retinopathy, HTR, ARMD, OA, Vascular Occlusion)	1345(15.55%)
Corneal Opacity	174(2.01%)
Adnexal disease	578(6.7%)
Others	414(4.8%)

**Table no.3: Presenting visual acuity in all patients**

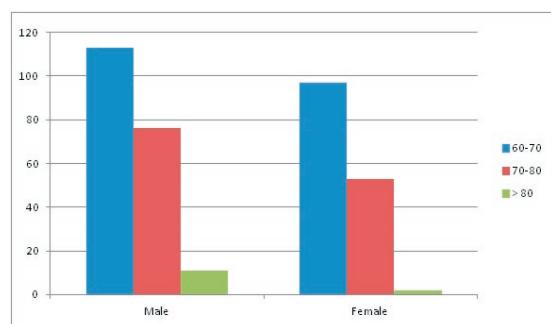
Visual status	
Normal	3020 (35%)
Low vision (< 6/18-> 6/60 in the better eye)	4575 (53%)
NPCB(< 6/60 in the better eye)	1035 (12%)
WHO blindness (< 3/60 in the better eye)	777 (9%)

**Table 4a: Age wise distribution of blind population**

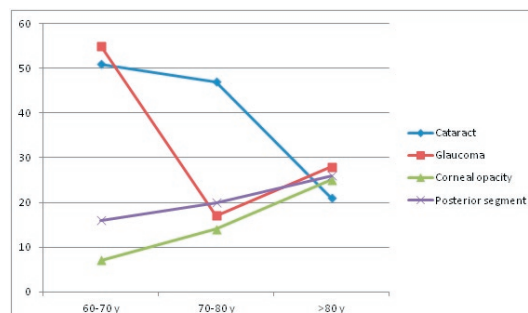
	60-70	70-80	>80
Total	5437	2674	519
Blindness	489 (9%)	443 (16%)	103(20%)

**Table 4b: Causes of blindness in different age and sex**

	60-70			70-80			>80			M+F
	M	F	P	M	F	P	M	F	P	
Cataract	136 (49.63%)	110 (51.16%)	>0.05	99 (53.52%)	163 (47.32%)	0.03	11(25%)	12 (21.05%)	0.09	531 (51.3%)
Glaucoma	50 (18.25%)	55 (25.58%)	0.04	33 (19.71%)	45 (16.96%)	0.03	15 (34.09%)	16 (28.07%)	0.06	214 (20.67%)
Corneal opacity	27 (9.85%)	15 (6.9%)	0.02	14 (8.45%)	37 (14.28%)	0.02	8 (18.18%)	15 (24.56%)	0.04	116 (11.20%)
Posterior segment	61 (22.26%)	35 (16.27%)	0.03	32 (18.30%)	20 (19.64%)	0.03	10 (22.75%)	16 (26.31%)	0.04	174 (16.81%)
Total	274	215		178	265		44	59		1035
M+F	489 (9%)			443(16%)			103 (20%)			



**Figure 1: Cataract in both sexes in absolute number**



**Figure 2: Causes of female blindness in different ages in geriatric population**

**Source(s) of support:** Self

**Presentation at a meeting:** None

**Conflict of Interest:** Nil

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# Factors Influencing Consumer's Intention to Adopt Digital Payment - Conceptual Model

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## ABSTRACT

E-payment usage depends on security and trust and therefore the increase in usage of e-payment depends on both. E-payment is a technology which doesn't involve physical cash here the payment is done through the electronic medium. Although Demonetisation prevailed a way for fillip to E-payment it has received acceptance throughout the world. But all the modes of e-payment are not used by all. It is an unavoidable fact that perceived risk is associated with the e-payment systems and it contributes to the decision factors in its usage. This paper is focussed to examine the Factors influencing consumer's intention to Adopt Digital Payment . The factors so revealed includes perceived use, perceived risk, perceived ease of use and trust. The findings based on various literature reviews recommends that consumer awareness, convenience, security, availability of e-payment tools, incentives and licit frame are the elements which can fillip the usage of e-payment system. Smartphone penetration, ubiquitous connectivity, biometrics, tokenisation, cloud computing and the Internet of Things are the various trends of transactions of consumers in future.

**Keywords:** Attitude, electronic payment system, Factors, security, trust.

## INTRODUCTION

The payment which is done through digital technique is known as digital payment. In this system the sender and receiver of the money both uses digital techniques to transact the money. We can call this type of payment as Electronic payment also. No physical cash is involved here. The transactions can be completed online or offline. Some of the factors which lead to the growth of digital payments in a country are ever-increasing penetration of smart phones, the entry of several non-banking institutions offering payment services, consumer readiness to adopt digital payments, progressive changes in the regulatory framework. Time saving, User friendly, convenient, faster services are offered by Digital payment system which makes it more advisable than manual systems.

## OBJECTIVES

1. To analyse the decision factors influencing Digital payments.
2. To develop a conceptual framework for factors influencing Digital payment system.

### Factors influencing Digital Payments

#### Perceived Risk

Noor Raihan Ab Hamid , and Aw Yoke Cheng<sup>[26]</sup> stated that Perceived risk is a valuation of predictions or inadequacy of information about the spreading of possible outcomes and the uncontrollability of outcome achievement March; JG<sup>[23]</sup> Vlek, C.,and Stallen.

Noor Raihan Ab Hamid, and Eaw Hooi Cheng<sup>[26]</sup> describes Perceived risk as a state of being unsure about something or absence of awareness about the circulation of possible end results and the state in which there is uncontrollability of end result achievement. In the case of e-payment services the consumers have the awareness that giving their credit card details as hazardous but there are no limitations on this. In their paper, they focussed

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on five selected risks namely physical risk, performance risk, psychological risk, time-loss risk, financial risk.

Schrank & Dubinsky<sup>[33]</sup> found that Consumers perceived risk rises with unpredictability and boost up by the associated nondesirable outcomes. In order to dwindle perceived risks, they use several strategies, such as brand loyalty, store image or word-of-mouth, either to confirm their purchasing decision or to curtail the uncertainty they feel about the decision.

Bauer<sup>[3]</sup> was the pioneer to introduce the concept of perceived risk to the marketing literature and pointed out that it is a risk-taking behavior when a consumer represents a purchase action.

Pavlou<sup>[30]</sup> said the perceived risk has a distinct feature to generate to hold back the consumers to participate in online shopping as it has high vulnerability of online shopping. As the dilemma in online shopping environment involves high perceived risk which in turn will result in reduction of consumers to shop online.

### **Perceived Usefulness**

Davis<sup>[8]</sup> has defined Perceived Usefulness (PU) as the degree to which an individual trusts that using a particular system would boost his or her job efficiency.

Hsin Hsin Chang<sup>[10]</sup> investigates about the Internet banking adoption among Taiwanese bank customers. He analysed the direct influence of two factors namely perceived usefulness and perceived ease of use. Under perceived usefulness it is a person's strong conviction that adopting a technology will fillip his outcomes. He then examined how much the perceived usefulness and perceived ease of use influenced behavioural intention. The study established perceived usefulness have predominance over the behavioural intention.

Özer et al.,<sup>[29]</sup> According to TAM(Technology Acceptance Model), perceived ease of use and perceived usefulness effect behavior developed by the handler towards information systems. This behavior networks the individual's intention and leads to adoption.

Pikkarainen et al.<sup>[31]</sup> applied TAM in Finland and they observed that perceived usefulness as a determinant of actual behavior which stimulated the consumer of the banking service to use adequate modern and comprehensible e-banking and it gives them greater independence in executing financial transactions, in

cataloguing on banking assistances, and in acquiring other financial products.

Lemuria Carter & France Bélanger et al.,<sup>[21]</sup> user's perception to the extent that the system can improve the user's place of work performance is explained under perceived usefulness. The significance of perceived usefulness has been widely recognized in the field of e-governance and e-banking.

According to Davis et al.<sup>[7]</sup>, perceived usefulness refers to consumers' perceptions regarding the outcome of the experience.

Koufaris<sup>[19]</sup>, have established the soundness of the requirements of perceived usefulness and it revealed to affect the intention of potential Internet shoppers.

### **Perceived Ease of Use**

Davis<sup>[8]</sup> has stated Perceived Ease Of Use (PEOU) as the level to which an individual trusts that using a specific system will be exertion free.

Hua, Guangying<sup>[14]</sup> in the study he explains perceived ease of use as any work which is done effortless. An experimental study was conducted to explore how user's perception about online banking is affected by the perceived ease of use and the privacy policy. They then came to a conclusion that perceived ease of use is of not as much of importance when compared with privacy and security.

Monsuwe, Dellaert, & Ruyter,<sup>[25]</sup> stated that Perceived ease of Use was not having direct effect on attitude intention but it affected more on indirect mediation factor from Perceived Use. Perceived ease of use mentions their insights regarding the process which leads to final output.

Lai Poey Chin and Zainal Ariffin Ahmad<sup>[20]</sup> the empirical outcomes from the study concluded that perceived ease of use is important to determine perceived usefulness and consumers' intention to use the single platform e-payment system. Perceived ease of use can be used as intermediary of perceived enjoyment. The users observe the single platform e-payment system as User-friendly, convenient, time saving and hence they would be more ready to adopt to the digital payment system.

Chung-Chi, S. and Jyh-Shen C. <sup>[6]</sup> The study



focussed the significance of perceived ease of use whether it depends on short term vs-long term transaction expectation, product type and whether security concern information is presented. The result of the studies suggested that when internet service is only for a short span transaction and when buyers have no concern of the security the perceived ease of use increases the intention towards digital services. Where as the sellers preference will be for using a digital service which requires comparatively high verification when the requirement of using digital service is for long term transaction.

### **Trust**

Mayer et al.,<sup>[24]</sup> Trust is stated as the consent of the people to be aware of the actions of another part based on the belief that the other will perform a particular action important to the trustor, regardless of the capability to observe or control that other party. Mayer et al.<sup>[24]</sup> insisted that he was uncertain whether trust comes before perceived risk or otherwise. Preceding studies has shown that perceived risk is a significant determinant of online behaviour, and there were diverse reviews on perceived risk and trust.

Hua, Guangying<sup>[14]</sup> in the study he referred trust as a significant factor for those pertaining to deal with finance related online services; moreover, the conclusion of the studies based on observations and experiments states that consumers make their online decisions based on the depth of trust they have. Inorder to gain that trust privacy and security plays a vital role.

Jean camp<sup>[17]</sup> his study concluded that the requirement of trust to make a rational decision can be done only with a gathering and they can come to a conclusion based on the collected reviews on whether to trust or not to trust.

Andert et al.,<sup>[2]</sup> in his work found that Trust is the empowering of assurance that anything can happen or may not happen in a foreseeable or sworn manner. The empowering of assurance is reinforced by identification, authentication, accountability, authorization, and availability.

Nooteboom et al.<sup>[27]</sup> stated that advanced perceived risk minimises the level of trust towards the companion.

Ýkram Daþtan Cem Gürler<sup>[16]</sup> The study investigated the factors effecting adoption of mobile payments.

The empirical findings point out that perceived trust, perceived mobility and attitudes positively affect the adoption of Mobile Payment Systems (MPS); perceived usefulness and perceived ease of use have no effect on adoption of Mobile Payment Systems. Perceived reputation is positively related to perceived trust and finally environmental risk is negatively related to perceived trust.

Channa de Silva<sup>[5]</sup> in his report suggested that trust on digital payment is not there in the consumers as a few fraudulent transactions which went viral among the public will create a feeling of insecurity and they will tend to move from digital payments to cash payments. Hence the banks and the Information technology industry has to ensure that the applications and the supporting technology back-end is secured adequately.

### **Intention to adopt e-payment:**

Ajzen<sup>[1]</sup> states intention as a person's tendency to choose to do or not to do any work.

Fusilier and Durlabhji<sup>[9]</sup> observed that there are two items to measure intention to statement of use, the first assumption is having access to mobile banking, and the second is after having access to mobile banking, customers are expected to use it.

Dr. J. Raja M Senthil Velmurgan A Seetharaman<sup>[10]</sup> concluded the cause of intention to transact as because of the easiness and cheaper use of electronic cash when compared to the physical cash and not only that it cannot be counterfeited and it can also be used in telecommunications and data networks for e-commerce with safeguard for the privacy of the consumers.

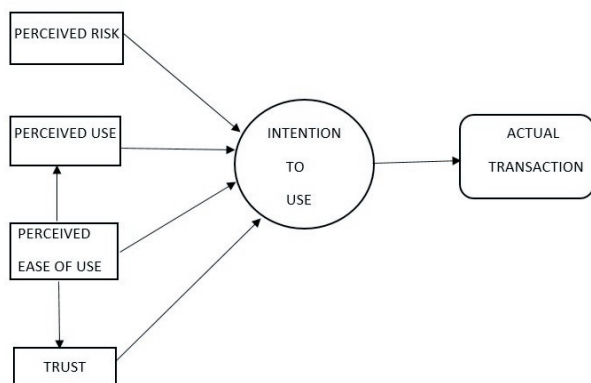
Junadi, Sfenriantob<sup>[19]</sup> stated the intention to transact on e-payment and the aspects they found out are increased efficiency, without place or time limitation and thereby reducing cost. A model of factors was placed and it was based on UTAUT(Unified theory of Acceptance and use of technology) to investigate the customer's intention to use e-payment technology . Internet Access, the consumer's experience in using computer and their level of education the technical protection, security statements, Government and Central Bank regulations, productivity in the transaction, speed, easiness and flexibility in the transaction, the reason that their dear and near recommends, supports and uses it these were the factors he put forth.

Chen, et al,<sup>[4]</sup> consumers' satisfaction influenced continuance intention, while the perceived usefulness, subjective norm (SN), perceived ease of use, and perceived behavioural control (PBC) apparently effected satisfaction.

### Actual Transaction

Oginni Simon Oyewole et al.,<sup>[29]</sup> focused on the actual transaction of cash and carry principle which came to a changeover to electronic payment system. Easiness, safety, quick access to funds were the factors which gave digital payments a significant position in Nigeria.

The Hindu In February 2016<sup>[14]</sup>, a report by Counterpoint Research stated that India has become the second largest smartphone market in the world with 220 million smartphone users. Hence it can be concluded that a mobile first/mobile ready platform is there for businesses. Payment system providers are now offering ready-to-integrate development kits for mobile app companies to deliver a native payment experience.



### Conceptual Frame Work

## DISCUSSIONS

The findings of this study suggest that in order to strengthen the E-payment system consumer awareness, convenience, security, availability of e-payment tools, incentives and legal framework are the factors which can fillip the usage. It is clear that customer have to move farther to get more acquainted with this system. More we use the new technology more it will be friendlier with us.

This paper presented a conceptual model of Decision factors affecting Digital payment system. The model formulated Perceived Ease of Use (PEOU), Perceived Usefulness (PU) and Perceived Risk (PR)

as the elements of trust in the acceptance of Digital payment system. Among the factors Perceived Ease of Use (PEOU) is found to be the most significant predictor. Conversely, customer attitude was found to have least significant effect on adoption of E-payment.

## CONCLUSION

Even though Digital payment system is flourishing extensively there has much more to be done to increase its usage. Still there are people who are reluctant to get accustomed to Digital payment and consequently most of the transactions are cash based. Hence the need to enlighten Digital Payment system is a necessity. Awareness can be created among public by conducting seminars, workshops, training programmes, debates and so on. Tech savvy Youths from colleges can be nominated to guide the folks who need assistance in digital payment system.

**Conflict of Interest:** Nil

**Source of Funding:** Nil

**Ethical Clearance:** Nil

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# The Relationship between Visual Working Memory with Motivational Beliefs and Cognitive and Metacognitive Strategies in Primary School Children

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## ABSTRACT

The purpose of the present study was to investigate the relationship between visual working memory and motivational beliefs and cognitive and metacognitive strategies in primary school children. This was a correlational study and the sample, which was selected from second grade students of a primary school, consisted of 64 subjects who took CORSI test after completing MSLQ. At first, the results showed that there are a significant positive relationship between cognitive strategies and visual working memory ( $r < 0.05$ ). Also, Pearson correlation test revealed a significant positive relationship between metacognitive strategies and visual working memory ( $r < 0.01$ ). The second part of analysis was performed at the regression level. Variables of motivational beliefs, cognitive strategies and metacognitive beliefs could predict and explain 26% of variance in visual working memory at the significant level of these three variables ( $p < 0.05$ ). The third part, the results showed that the highest interactional effect was achieved when cognitive strategies and motivational beliefs interacted to obtain metacognitive strategy, which could predict visual working memory ( $p < 0.05$ ). Overall, the effect of metacognitive strategies - through the interaction of cognitive strategies and motivational beliefs - on working memory was greater than other interactions.

**Keywords:** visual working memory, motivational belief, cognitive strategy, metacognitive strategy.

## INTRODUCTION

The concept of working memory represents a system of storing and preserving information for a short time that constitutes the foundation of human thinking process<sup>1</sup> and is at the heart of many theories and practice of thought control in cognitive psychology. Despite the disparity of opinions among scholars about a precise definition of working memory, the working memory system is conventionally perceived as the system responsible for active revision and maintenance

and manipulation of information in short periods<sup>2</sup>. Working memory consists of two visual and verbal parts<sup>3</sup>. The visual working memory enables us to retain visual information for a few seconds<sup>4</sup>, and is strongly correlated with general cognitive abilities<sup>5</sup>.

Metacognitive strategies are techniques to increase one's awareness of thinking processes and actions during task performance. They can be seen as representing three executive behavioral outputs<sup>6</sup>. Metacognition is a higher-level thinking, including active control, which involves more than thinking processes in learning. The definition of cognition is attributed to Flavell (1971) who defines it as recognition of cognition<sup>7</sup>. Furthermore, he describes cognition from the perspective of growth, which refers to the monitoring of cognitive processes and setting perception goals and active strategies<sup>7</sup>.

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The motivational strategies are utilized by teachers to enhance the motivation of students<sup>8</sup>.

The results of a study by Guilloteaueaux (2007) showed that motivational practices of teachers like creative activities were directly related to the increased learning motivation of learners<sup>9</sup>. Given the positive relationship between self-regulation and working memory<sup>10</sup>, it can be posited that learning self-regulation is defined as a strategy employed by students to regulate their cognition (using cognitive and metacognitive strategies)<sup>11</sup>. The study of Fiumara (2016) suggests that personal stimuli can increase the motivation and enthusiasm of learners<sup>12</sup>. The findings of Avery, Smillie & Fockert (2013) indicate that the concentration of motivation on the development of self-referential skills is heavily dependent on working memory, which plays a pivotal role in the pursuit of goals<sup>13</sup>. In the same vein, the study of Carretti, Borella, Zavagnin, & De Beni (2011) on the impact of cognition and motivation in the effectiveness of the strategic memory instruction revealed the importance of metacognitive attitude in memory training activities<sup>14</sup>.

Given the less studies on the relationship between working memory and motivational beliefs, cognitive and metacognitive strategies, the purpose of the present study is to investigate the relationship between visual working memory and motivational beliefs and cognitive and metacognitive strategies in primary school children.

## MATERIALS AND METHOD

This is a correlational study and the research population consisted of primary school students aged 8-9 years. The sample, which was selected from second grade students of a primary school, consisted of 64 subjects.

### Tools

1. Motivated Strategies for Learning Questionnaire (MSLQ): this questionnaire was developed by Pintrich and De Groot (1993). It is composed of 47 items divided into two parts of motivational beliefs and self-regulating learning strategies. Self-regulating learning subscales consisted of 22 items that measure three aspects of academic self-regulation including cognitive strategies, metacognitive strategies and resource management. Cognitive strategies constitutes 13 items of this scale as follows: Repetition and review (item

29, 37, 44); note making (item 34) summarizing (items 31, 45); organization including (items 26, 27, 39, 42, 47) and reading comprehension (items 32, 33) Metacognitive strategies and resource management constitutes four items of the scale as follows: Planning (items 38, 46); monitoring and control (items 28, 35, 41, 43); disciplining including efforts and persistence (items 36, 30), and disciplining activities (item 40). Motivational beliefs constitutes 23 items of the scale including four factors of goal orientation, self-efficacy, internal valuation and test anxiety as follows: Self-efficacy (items 2, 6, 9, 10, 12, 14, 19, 21, 22); goal orientation (items 1, 4, 11, 16, 24); internal valuation (5, 8, 17, 20) and test anxiety (3, 7, 13, 15, 18, 23, 25)<sup>15</sup>. Pintrich and De Groot (1990), showed that the reliability coefficients for subscales of self-efficacy, internal valuation, test anxiety and the use of cognitive and metacognitive strategies, as estimated by Cronbach's alpha, were 87.0, 75.0, 83.0, set 74.0 respectively<sup>15</sup>.

2. Corsi visual working memory task: CORSI task is one series of tests presented in PEBL. In this study, PEBL Ver.14 was used<sup>16</sup>. The primary goal of this software was to evaluate cognitive function deterioration pattern in the elderly with dementia. This neuropsychological test has been applied to various age groups repeatedly to investigate and compare cognitive functions<sup>17</sup>. In the past, especially in the 1970's this task was performed physically with the help of wooden cubes<sup>18</sup>. In the computer-based version adopted in this study, 9 blue squares are shown against a black background in a monitor in front of students. The squares turn yellow randomly with a particular sequence (according to the following figure). The subjects are asked to remember this sequence and try to imitate it by clicking on squares via a cursor. At first, only two squares are turned on and if the participant provides the correct response, the number of squares and consequently the difficulty level of the test are increased. The reliability and validity of this test have been evaluated in different studies and approved for application in clinical tasks<sup>19,20</sup>.

## DATA ANALYSIS

After collecting the questionnaire of self-regulation learning strategies and computer-based Corsi test, raw data were keyed in SPSS19 software and analyzed according to descriptive (mean and standard deviation) and inferential parameters (Pearson correlation and regression).

## FINDINGS

The mean total score achieved by students was 21 with a standard deviation of 11.67. The mean working memory capacity of these children was of 3.42. According to the descriptive results, the mean (standard deviation) of cognitive and metacognitive strategies and motivational beliefs were 30.05 (8.57), 19.21 (4.98) and 55.68 (10.49) respectively.

**Table 1. Correlation between Cognitive, Meta-Cognitive Strategies, Motivational Beliefs and visual working memory (VWM)**

Variable	Cognitive Strategies	Meta-Cognition Strategies	Motivational Beliefs
VWM	0.295*	0.333**	0.038

\*r value<0.05    \*\*r value<0.01

Pearson correlation revealed a significant positive relationship between cognitive strategies and visual working memory ( $r < 0.05$ ). That is, with an increase in the cognitive strategies of children, the significance level of visual working memory was enhanced. Moreover, Pearson correlation test revealed a significant positive relationship between metacognitive strategies and visual working memory ( $r < 0.01$ ). However, no significant relationship was found between motivational beliefs and visual working memory.

**Table 2. Regression results in Cognitive, Meta-Cognitive Strategies, Motivational Beliefs and visual working memory**

Enter Model	R	R square	Adjusted R square	Significant
VWM	0.54	0.29	0.26	0.000

**Table 3. Coefficients in Cognitive, Meta-Cognitive Strategies, Motivational Beliefs and visual working memory**

Model	Beta	T	Significant
Cognitive Strategies	0.105	0.582	0.563
Meta-Cognitive Strategies	0.886	3.677	0.001
Motivational Beliefs	-0.767	-3.883	0.000

The second part of analysis was performed at the regression level. At the entry level, variables of motivational beliefs, cognitive strategies and metacognitive beliefs could predict and explain 26% of variance in visual working memory at the significant level of these three variables ( $p < 0.05$ ).

At the level of the interactional effect, the cognitive strategy had the lowest effect, and was therefore unable to offer a significant prediction of working memory. However, in the case of the interaction of cognitive and metacognitive strategies, motivational beliefs could be a great predictor for visual working memory ( $p < 0.05$ ). Nonetheless,

the highest interactional effect was achieved when cognitive strategy and motivational belief interacted to obtain metacognitive strategy, which could predict visual working memory ( $p < 0.05$ ) with a Beta value of 88%.

## DISCUSSION

The aim of this study was to investigate the relationship between metacognitive and cognitive strategies, motivational beliefs and visual working memory. It investigated the visual working memory at two levels of correlation and regression, which were aimed at investigating the interaction between the variables of

cognitive and metacognitive strategies, motivational beliefs and visual working memory. At the correlation level, the findings of the research demonstrated a significant relationship between cognitive and metacognitive strategies and visual working memory. The study of Carretti, Borella, & De Beni (2007) revealed that repetition tasks had a positive effect on working memory<sup>21</sup>.

In another study, the findings of Autin, & Croizet (2012) showed that metacognitive strategies could improve working memory in children<sup>22</sup>. In a pilot study, Partanen Jansson, Lisspers and Sundin (2015) reported that metacognitive tasks and techniques could influence working memory<sup>23</sup>. In this context, the results of this study are consistent with the literature. In this study, no significant relationship was found between motivational beliefs and visual working memory.

Murayama and Elliot (2011) investigated the relationship between achievement motivation and memory in general, rather than in a special type of memory like working memory. The findings showed that motivation did not affect retrieval and memory<sup>24</sup>. The results of this study are in agreement with the findings of Murayama and Elliot (2011). A year later, however, Robinson et al (2012) reported that internal motivation was in a reverse relationship with spatial memory search error. That is, as the internal motivation increased, the memory errors declined<sup>25</sup>. The results are not in agreement with the findings of the present research. In another psychophysiological study undertaken by Szatkowska, Bogorodzki, Wolak, Marchewka & Szeszkowski (2008) on fMRI and 2-back WM areas, lateral orbitofrontal and dorsal lateral prefrontal were observed to be in a motivational relationship with verbal working memory<sup>26</sup>.

This focus of this study was on visual working memory, and the previous findings like the ones reported by Szatkowska et al (2008) on verbal working memory cannot be extended to this study<sup>26</sup>. Generally, there is a paucity of studies on the relationship between visual working memory, especially motivational and visual types.

As discussed earlier, the second part of this study investigated regression and the effect of interactions between cognitive and metacognitive strategies, motivational beliefs and visual working memory. In this regard, the novelty of this study is greater than most of

previous research. Previous studies had only explored the relationship at the correlational level but this paper considered the interactive effects with respect to three variables. The results of simultaneous regression demonstrated that variables of motivational beliefs and cognitive and metacognitive strategies could predict 26% of the variance in visual working memory.

However, given the role of interaction with regard to the weight of Beta effect, it was revealed that the interactive effect of cognitive strategies and motivational beliefs on metacognitive strategy was greater than other interactions and could provide a more accurate prediction of visual working memory.

Interestingly, the results of correlation study in the first part of this paper did not show any relationship between motivational beliefs and visual working memory, but if the interactive role of cognitive and metacognitive strategies on motivational beliefs was taken into account, this variable could exert a huge effect on the visual working memory. When studies are restricted to one variable, it is difficult to reach a definite conclusion about the strength of relationship. It is recommended to account for the interactive effects and even structural path in future researches.

Accordingly, it is suggested that future studies explore experimental designs, such as the inclusion of people with high and low cognitive and metacognitive strategies, and investigate visual working memory. This can provide deeper insights at the causal-comparative level for the community of cognitive psychologists.

One limitation of this research was restricted sample size and the adoption of available sampling method. As such, it is recommended that future studies explore greater experimental designs.

## CONCLUSION

Overall, the results of this study revealed a positive significant relationship between cognitive and metacognitive strategies and visual working memory. However, no significant relationship was observed between motivational beliefs and visual working memory. At the second part of this research, the findings of simultaneous regression indicated that these three variables could be a good predictor visual working memory. Moreover, at the interactive level, the effect of metacognitive strategies - through the interaction of cognitive strategy and



motivational belief - on working memory was greater than other interactions at the beta level of 88%.

**Conflict of Interest:** All of authors declare that have no conflict of interest.

**Source of Funding:** This study was self-funded.

**Ethical Clearance:** Taken from Alzahra university of Tehran committee.

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# Dynamic Life Table for Guwahati City: An Urban Set Up of North Eastern India

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## ABSTRACT

The period life table is based on the assumption that the mortality experienced by the population in a given period will remain substantially the same throughout their lives. However, the past records shows continuous decline in mortality, leading to the possibility of a case where the mortality rates does not remained the same. Although, India has experienced continuous decline in mortality rates since more than two decades, Assam is one of the underdeveloped state where mortality rates including infant mortality rate is found to be higher in comparison to other developing states of India. However, during recent years mortality declines have appeared to be more rapid in an urban area of Assam, Guwahati, which is also a premier city of North-Eastern India. This paper attempts to study the pattern of mortality along with life expectancy under dynamic scenario in Guwahati. Further, an attempt has also been made to formulate temporary life expectancy under dynamic consideration and thereby measures the differences between period and dynamic temporary life expectancies.

**Keywords:** *Dynamic life table, Expectation of life, Temporary expectation of life.*

## INTRODUCTION

The period life table is based on the experience of a population over a short period of time such as a year, during which the mortality has remained substantially the same<sup>[1]</sup>. As such the mortality data for period tables are taken as observed, they are not adjusted for future changes, and the tables are not forward looking in the sense that future improvement in mortality are not incorporated<sup>[10]</sup>. In other words, in a period life table constant mortality rates prevails over the years and does not allow for changes in mortality probabilities. However, the past records in both developed and developing countries showed a gradual decline in mortality and a continuous increase in life expectancies. In such case, an extension of the period life table has been proposed by Denton and Spencer (2011) which would explicitly allow for the possibility of further changes in mortality. This extension has been named as 'dynamic' extension of the period table that draws out the implications, for survivorship and life expectancy, of observed rates of change of death<sup>[6]</sup>.

The concept of dynamic tables arises from the need to incorporate the effect of the year of death (period) into the estimation of the measurement of mortality. These models incorporate the influence of the year of birth (cohort) into dynamic mortality tables, which in turn arise from the need to incorporate the historical evolution of mortality for each age<sup>[5]</sup>. In our context, the 'dynamic life table' is concerned with only those cohorts defined by the reference life table, and with death probabilities only for as long as there are any survivors of those cohorts<sup>[6]</sup>.

The Demographic scenario of India has been undergoing a change over the last many decades. However, the change in mortality conditions is not uniform in all the states. There is an evidence of convergence in mortality decline across the states in India. According to Sample Registration System (SRS) of India, death rate has declined from 14.9 per thousand population in 1971 to 7.0 in 2013. The infant mortality rate, which is an important indicator of health status of the country, has registered a significant decline from 129

per one thousand live births in 1971 to 40 in 2013<sup>[9]</sup>. It has been found from the SRS report of Registrar General of India (1970-75) that among the major states of India, the death rates were higher in the states of Uttar-Pradesh (21.5), Odisha (17.4), Assam (17.2) and Madhya Pradesh (17.1) and lower in Kerala (8.6) during 1970-75. These have been dropped substantially in 2013, with high death rates in Odisha (8.4), Madhya Pradesh (8.0), Assam (7.8), Uttar Pradesh (7.7) and Chhattisgarh (7.9), and low death rates in Manipur (4.0), Mizoram (4.3) and Nagaland (3.1).

As mortality has been declining in all parts of India, one may be interested to know whether the situation remains same in an urban area of underdeveloped region of India, Like North Eastern India. A major metropolis of North Eastern India and one of the fastest developing cities of India is Guwahati, which is also the largest city of the state Assam. The population of Guwahati has increased tremendously from 8.2 Lakhs in 2001 to 9.7 Lakhs in 2011, with nearly 18.29% decadal population growth rate<sup>[2]</sup>. The Crude death rate for Guwahati has declined from 7.1 in 1986 to 5.6 in 2012, while life expectancy at birth has increased from 63.56 (64.55) years to 71.51 (72.71) years in 1986-2011 for males (females). Expectation of life at birth has increased by 5.24 years and 5.92 years for male and female respectively in the period 1986-2001 which became 2.71 years and 2.24 years for male and female respectively in recent period 2001-2011 in Guwahati. Considering the above, we made an attempt to construct a dynamic life table for Guwahati city. The paper examines the pattern of mortality changes in the urban area of North Eastern India since 1986 to 2011 and attempts to ascertain which period has provided the more gain in life expectancy and to which age group and sex.

Further, a relatively simple measure to summarize mortality rates is life expectancy at birth<sup>[4]</sup>. The expectation of life at birth is the most widely used indicator for analysing mortality transition. It gives the number of years a new born is expected to survive, on average, given the prevailing age schedule of mortality<sup>[8]</sup>. Arriaga (1984) showed that the use of temporary life

expectancy (life expectancy between two specific ages) could avoid two types of problems in mortality analysis. First, mortality estimates at old ages may not represent the actual mortality of those ages in counties with unreliable statistics. Second, the effect of the limit of the human life span on possible change in life expectancies should be taken into account when interpreting the observed change in life expectancies<sup>[1]</sup>. As such the dynamic temporary life expectancies could be used to estimate the continuous changes in observed rates of mortality between two exact ages.

## OBJECTIVES

(i) To construct Dynamic life table for Guwahati city for the year 2011 based on the rate of change of probabilities of death over the previous 10 and 25 years.

(ii) To extend the formula for temporary life expectancy under dynamic consideration and shall apply to Guwahati city at different age groups (0-5), (5-15), (15-50), (15-60) and 60 & above for both sexes for above mentioned years.

### Data:

The mortality data used in the construction of period life tables are taken from the Birth and Death Registration, Office of the Guwahati Municipal Corporation (GMC) for the years 1986, 2001 and 2011. The GMC registers the deaths that occurred within Guwahati city with specified documents and cause of death certified by medical practitioner. Usually, deaths occur at hospital or any health institutions are clearly certified by physician as many of them are preceded by an illness and attended by medical practitioner. Even in the case of deaths for which cause is not medically certified, the medical registrars are able to give the best information on the cause leading to the death after probing from the relatives or persons who are reporting the death<sup>[3]</sup>. Further, the population age and sex structure of Guwahati city for the years 2001 and 2011 were taken from the census of India. For 1986, the population based data has been estimated.

## METHODOLOGY

### I. Dynamic Life Table

For constructing dynamic life table, we adopted the method as given by Denton and Spencer (2011). First two period life tables, which are  $t$  years apart, are taken. The more recent one is considered as the reference period. In our case 2011 will be the reference period. Then  $x$  to  $x+n$  stand for the period life between two exact ages  $x$  and  $x+n$ , and referred as initial age group. And  $y$  to  $y+n$  referred as subsequent age group, where  $y > x$ . Then the annual rate of change of probabilities of death for any age group  $x$  to  $x+n$  is calculated by

$${}_n r_x = ({}_n q_x / {}_n \bar{q}_x)^{1/t} - 1$$

Where,  ${}_n q_x$  is the probability of death for the age group  $x$  to  $x+n$  in the reference period table and  ${}_n \bar{q}_x$  is the corresponding probability in the earlier period table.

The cohort of the reference period is given by  $l_{xx}$  and  $l_{xy}$  is the population of initial age group  $x$  to  $x+n$  that survives to the age group  $y$  to  $y+n$ . The probability that a member of the  $l_{xx}$  cohort who has survived up to exact age  $y$  will die in the interval  $y$  to  $y+n$  is

$${}_n q_{xy} = {}_n q_y (1 + {}_n r_y)^{y-x},$$

Where,  ${}_n q_y$  is the probability of death in the age group  $y$  to  $y+n$  in the reference period,  ${}_n r_y$  is the annual rate of change of that probability, and  $y-x$  is the number of years between the subsequent age and initial age group.

After obtaining the dynamic probabilities of death, the rest of the columns of the life table are calculated in the usual manner as in the period life table. Thus, the sequence of  $l_{xy}$  is obtained by the relation

$$l_{x,y+n} = l_{xy} (1 - q_{x,y+n}).$$

The dynamic analogue of  $L_x$ , denoted by  $L_{xy}$ , gives the number of person years lived by the survivors of  $l_{xx}$

cohort in the age group  $(y, y+n)$ . Thus,  $L_{xy} = \frac{{}_n d_{xy}}{{}_n m_{xy}}$ , here  ${}_n m_{xy}$  are calculated using Greville's method and

${}_n d_{xy} = {}_n q_{xy} * l_{xy}$ . The values of  $T_{xx}$ , the total number of person-years yet to be lived by the  $l_{xx}$  cohort and  $e_{xx}$ , the dynamic life expectancy are obtained respectively as-

$$T_{xx} = \sum_{t=x}^m L_{xt} \text{ and } e_{xx} = \frac{T_{xx}}{l_{xx}}, \text{ where } m \text{ is the oldest age at which there are any survivors [6].}$$

**Temporary Expectation of Life (TLE)**

Temporary expectation of life is an index which not only helps in understanding variations in the age patterns but also facilitates comparison of different reasons for mortality [7]. Factors which affect mortality are differently associated with the different phases of life, and hence such a division is useful for analytical purposes. Following this we have taken the age ranges (0-5) as infancy and childhood phase as well as (5-15) as adolescence phase. The adulthood phase is divided into two age groups: (15-50) for the reproductive period of females and (15-60) for the working period of males. And lastly, the population aged 60 and above is taken for the old age group. The temporary expectation of life between the exact ages  $x$  and  $x + n$  is given by

$${}_n E_x = \frac{T_x - T_{x+n}}{l_x}, \text{ where } l_x \text{ is the radix of the life table,}$$

$T_x$  and  $T_{x+n}$  are the numbers of person-years lived after ages  $x$  and  $x+n$  respectively,

The dynamic temporary expectation of life between any two ages is then calculated using the same procedures as mentioned above and is given by:

$${}_n E_{xy} = \frac{T_{xy} - T_{x,y+n}}{l_{xy}}$$

Where  ${}_n E_{xy}$  is the average number of years that the survivors of  $l_{xx}$  cohort, alive at age  $y$ , will live from age  $y$  to  $y+n$  and  $T_{xy}$  is the number of person years yet to be lived by  $l_{xx}$  cohort.

**RESULTS AND DISCUSSION**

**TABLE 1: Sex-wise Period Life Expectancy at Birth for Guwahati for 2011 with the Corresponding Dynamic Life Expectancies at Birth:**

	Males			Females		
	T.L.E for 2011	Dynamic T.L.E based over 10 years	Dynamic T.L.E based over 25 years	T.L.E for 2011	Dynamic T.L.E based over 10 years	Dynamic T.L.E based over 25 years
${}_5 E_0$	96.4	96.6	96.4	96.4	96.4	96.4
${}_{10} E_{-5}$	99.8	99.9	99.8	99.8	99.8	99.8
${}_{35} E_{15}$	98.0	98.6	98.9	97.4	97.7	98.3
${}_{45} E_{15}$	96.3	98.3	98.4	96.0	97.1	97.9
$E_{60+}$	41.3	41.6	47.5	45.6	57.5	53.3

The change in dynamic temporary life expectancies (TLE) in Guwahati city was different in different phases of life. It is observed from table 2 that in infancy and childhood phase (0-5), there is no difference in the percentage of observed TLEs to maximum possible years under dynamic and usual consideration for both sexes. The situation is also same for adolescence phase (5-15) for both males and females. This shows that the pace of mortality decline in infancy and childhood phase and adolescence phase is almost stagnant during periods of 10 and 25 years. It is also seen that the dynamic TLEs for the age group 15-50 are almost same as the usual TLE for both males and females, except for females during the period of 25 years, where the dynamic TLE is slightly higher than the usual TLE. Apparently, it is seen that there is a slight variations in TLEs under dynamic and usual consideration for both males and females in the age group 15-60. Moreover, the effects of the dynamic calculations are mostly seen in the old age group. In Guwahati, the dynamic TLEs for the corresponding age group are higher than the usual TLE for both 10 and 25 years intervals.

Although, the level of TLEs among males and females in the city are same in the age groups 0-5 and 5-15, there variations are mostly seen in higher ages. For instance, in the age groups 15-50 and 15-60, the TLEs for males are better than their female counterpart under both dynamic and periodic considerations. However, it is found that both TLE and dynamic TLEs for females are higher than males in the age group 60 and above. This may be attributed to the fact that the mortality reductions at old ages among the females of are faster as compared to males.

### CONCLUSION

The analysis mainly focuses to bring out the implications on mortality scenario of the urban area of North Eastern India by incorporating the rates at which the probabilities of death have been changing over the previous years. This in turn have a significant effect on expectation of life at birth. Moreover, there has been continuous decline in mortality among the elderly persons of the city. As such, the dynamic temporary life expectancies for old age group are likely to be higher than the usual temporary life expectancies for both sexes. It is obvious that when the probabilities of death decrease, the life expectancy will increase.

**Ethical Clearance:** The data used the present paper

was secondary, so the case of *Ethical Clearance* may not arise.

**Source of Funding:** Self.

**Conflict of Interest:** Nil

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# An Assessment of India's Development in Healthcare in Comparison to Overall Development in LMIC Countries

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## ABSTRACT

Since beginning of this century a number of policy changes and initiative has been taken in healthcare sector of India and many other nation, that have affected and brought changes both in healthcare infrastructure and health status of the country. This gives an opportunity to assess India's achievements in healthcare in comparison to overall achievements by countries comparable to India.

The study attempts at looking into changes achieved in specific indicators of healthcare infrastructure and health status of India and comparing it with overall changes in all lower middle income countries (LMIC). At the same time the performance of its peer South Asian lower middle income countries (SA-LMIC) are also assessed to compare how India did in relation to them.

Using data from world bank's world development indicator, India and other SA-LMIC countries indicators were compared with overall LMIC indicators, for a period of last 15 year.

It was found that India has done better than overall LMIC in creating and developing healthcare infrastructure, but achievements in health status is not remarkably different than overall LMIC. Comparison with SA-LMIC shows that India's performance in comparison to overall LMIC is not exclusive and other SA-LMIC has also achieved similar to better results than India. Even after comparatively better achievements, the overall present status of health infrastructure is worse than overall LMIC and mixed in health status.

**Keywords:** *Healthcare; Indian Healthcare; Performance; Comparative Assessment; Achievements; Present Status; SA-LMIC; Indicators of Healthcare; Healthcare Infrastructure; ;Healthcare Status; India's achievements in healthcare; Lower Middle Economies Healthcare Healthcare since 2000; Improvements in healthcare.*

## INTRODUCTION

Background: India's current healthcare system and policy originated during the time of independence in 1947<sup>1</sup>. The philosophy was embodied in the landmark report on the health survey and development committee, commonly referred as Bhore committee report<sup>1</sup>. Report concluded India's healthcare situation as poor and

identified several architectural and policy changes to upgrade the same to an acceptable level. Since then through several 5 years planning the country has tried to improve the healthcare system and health of the nation. As per its constitution, healthcare largely is the responsibility of its states with central government providing policies and national strategic framework, financial education and medical education<sup>2</sup>. Although decentralized, in practice states are largely dependent upon central government for support both financially and technically<sup>3</sup>. Since last 2 to 3 decades multiple factors are driving the health system in country towards a change<sup>2</sup>.

In year 2000, India also committed itself to millennium development goal (MDG) in general

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assembly of United Nations. Out of 8 goals, in MDG, 4 are directly related to healthcare while remaining four influences health of the country<sup>4</sup>. Similarly, the Alma Ata declaration of “Health for all by year 2000” has been revised in 1998 with “Health for all in 21<sup>st</sup> century”. The declaration emphasizes on need for seeing health as central to sustainable human development<sup>5</sup>

Because of these international missions happening around the beginning of 21<sup>st</sup> century, most nation (especially WHO member nations), started making focused efforts to improve their health system and health status of the population. However, after 15 years since the beginning of new century there is a need to understand how India performed in its healthcare sector.

### OBJECTIVE

This paper attempts to evaluate the changes in healthcare situation of India, since beginning of 21<sup>st</sup> century. The objective is to understand whether or not India made significant improvements in healthcare sector and also to identify concern areas which the country needs to focus upon. Since, a very significant determinant of health outcome of any nation is its economy<sup>1</sup> and India, is categorised in Lower Middle Income Countries (LMIC)<sup>6</sup>, the Indian healthcare achievements has been compared with the averages of low and middle income countries.

### MATERIALS AND METHOD

#### Analytical Framework:

Improved health status of the population is the ultimate goal for any nation, for which every nation aims to develop adequate healthcare infrastructure and provide resources to meet the healthcare needs. Thus, by comparing the measures of achievements in health infrastructure and health status, with overall achievements and status of similar countries, over a period of time, an appreciation of the performance of healthcare sector of India has been attempted here.

The health of a nation is influenced by multiple uncontrollable factors characterizing a nation, out of which income of the country is one of the most important determinant<sup>7,8</sup>. Income of nation was used as a determinant to compare India’s achievement. India is classified under lower middle income countries (LMIC) along with 50 other countries as per 2015 listing<sup>6</sup>.

Along-with this India’s performance is also compared with 4 other South Asian, LMIC to understand about how the similar neighbouring countries performed in the same period.

It is also a well-accepted phenomenon that to bring a significant change in any sector, sufficient time is required for any nation. Draft 12<sup>th</sup> 5 year plan identifies 2-3 plan period for any reform to happen. Hence for assessing the changes in health status the time period of 10-15 years should considered as optimal.

#### Data:

The study utilizes secondary data retrieved primarily from World Bank Database on World development Indicators<sup>9</sup> and some missing data from Global health Observatory Data by World Health Organization<sup>10</sup>. No primary data, has been used for this study.

#### Selection of Indicator:

Since the method primarily relies upon the indicator values, selection of appropriate indicators has been done by from Global reference list of 100 core health indicators, 2015<sup>11</sup>. Out of these 5 indicators that that reflects healthcare infrastructure and 5 that reflects health status was chosen on the basis of the comprehensive reflection attribute and variability.

Indicators selected and method of arriving at its value is described below

#### A. Indicators related to healthcare infrastructure:

1. Per capita expenditure of health at PPP dollar value:
2. Out of pocket expenditure as a percentage of total private expenditure on healthcare
3. Physician density per 1000 population
4. Nurse and Midwife density per 1000 population
5. Hospital bed density per 1000 population

#### B. Indicators related to health status

1. Infant mortality rate (IMR)
2. Under 5 mortality rate (U5MR)
3. Maternal mortality ratio (MMR)

4. Adult mortality rate

**Comparison:**

5. Life expectancy at birth

Indicator values for each indicator were compared with the indicator values for overall LMIC and also with individual values of SA-LMIC. These findings were discussed to derive an understanding, which was used to draw conclusion.

For all indicators the definition and formula is taken as per World Bank.

**Calculation of indicator values of LMIC:** For LMIC overall value was calculated for all indicators by taking entire population in consideration and using the formula specified by World Bank.

**FINDINGS**

Table 1 and Table 2 documents the findings for each group of indicators

**Table 1: Findings Related to Health Infrastructure:**

S.N.	Indicator	Country	India	LMIC	Pakistan	Bangladesh	Sri Lanka	Bhutan
1	Per Capita Expenditure on healthcare	2000	89	99.3	80.6	29	148.7	192.7
		2013	215	233.5	126.3	95.3	304.1	275.5
		% Increase	142%	135%	57%	229%	105%	43%
2	OOP as percentage of total private expenditure of health	2000	91.8	79.3	81	97.4	80.8	100
		2013	85.8	76.6	86.7	93	82.9	97.1
		% reduction	6	2.7	-5.7	4.4	-2.1	2.9
3	Physician density (per 1000 population)	2000	0.54	0.84	0.64	0.23	0.42	0.05
		2012	0.7	0.79	0.82	0.35	0.68	0.25
		% Increase	29%	-6%	28%	54%	59%	408%
4	Nurse and Midwife density (per 1000 population)	2006	1.34	4.35	0.3	0.28	1.32	0.22
		2010	1.6	1.42	0.57	0.22	1.64	0.98
		% Increase	19%	-67%	90%	-21%	24%	345%
5	Hospital Bed density (per 1000 population)	2000	0.9	3.3	1.2	0.3	2.9	1.7
		2012	0.7	1.43	0.6	0.6	3.6	1.8
		% Increase	-22%	-57%	-50%	100%	24%	6%

Source: World Bank Data and Global Health Observatory Data by WHO

**Table 2: Findings Related to Health Status**

S.N.	Indicator	Country	India	LMIC	Pakistan	Bangladesh	Sri Lanka	Bhutan
1	Infant Mortality Rate	2000	66.5	<b>65.8</b>	87.9	64.4	14	58.9
		2013	41.4	<b>43.4</b>	69	33.2	8.2	29.7
		% Decrease	37.70%	<b>34.00%</b>	21.50%	48.40%	41.40%	49.60%
2	Maternal Mortality Ratio	2000	370	<b>384</b>	280	340	55	390
		2013	190	<b>235</b>	170	170	29	120
		% Decrease	48.60%	<b>38.70%</b>	39.30%	50.00%	47.30%	69.20%
3	Under 5 years age mortality rate	2000	91.4	<b>92.4</b>	112.6	88.1	16.3	79.4
		2013	52.7	<b>57.8</b>	85.5	41.1	9.6	36.2
		% Decrease	42.30%	<b>37.40%</b>	24.10%	53.30%	41.10%	54.40%
4	Adult Mortality Rate	2000	234.7	<b>233.9</b>	188.2	172.9	172.4	294.8
		2013	196.1	<b>195.23</b>	171.4	138	132.1	211.8
		% Decrease	16.40%	<b>16.50%</b>	8.90%	20.20%	23.40%	28.20%
5	Life expectancy at birth	2000	62.2	<b>62.8</b>	63.9	65.3	71.2	60.3
		2013	66.5	<b>66.6</b>	66.6	70.7	74.2	68.3
		% Decrease	6.90%	<b>6.10%</b>	4.20%	8.30%	4.20%	13.30%

## ANALYSIS AND DISCUSSION

Position of India:

If we position India's achievement and latest status in comparison to LMIC and to SA-LMIC we get an idea of how India fared in healthcare Infrastructure and health status. Table 3 and 4 present this picture..

Performance and Status in Healthcare Infrastructure:

**Table 3: Achievements and present situation of health infrastructure of India in comparison to overall LMIC and 5 South Asian LMIC**

Indicator	Achievements since year 2000		Present situation	
	Compared to overall LMIC	Position in 5 SA – LMIC	Compared to overall LMIC	Position in 5 SA – LMIC
Per capita healthcare expenditure (PPP)	Better	2 <sup>nd</sup>	Worse	3 <sup>rd</sup>
OOP as % of total Pvt. Exp. On health	Better	1 <sup>st</sup>	Worse	1 <sup>st</sup>
Physician density (per 1000 population)	Better	4 <sup>th</sup>	Worse	2 <sup>nd</sup>
Nurses and midwives density (per 1000 population)	Better	4 <sup>th</sup>	Better	2 <sup>nd</sup>
Hospital bed density (per 1000 population)	Better	4 <sup>th</sup>	Worse	3 <sup>rd</sup>

A remarkable achievement of India has been significant increase in *per capita healthcare expenditure*, which was higher than overall LMIC and other SA-LMIC except Bangladesh. From a status which was much below overall LMIC at beginning of the century, India is now better. But, still there is a long way to go. Sri Lanka and Bhutan has much better per capita expenditure in healthcare than India.

Similarly in *OOP share in total private healthcare expenditure*, although India is much below the overall LMIC, significant improvement in reducing is a good sign for future healthcare scenario in India. Most developed economies with better healthcare status, have OOP share between 20 to 50 percent (World Bank Data). Thus India should continue making efforts to reduce it further. Overall LMIC can serve as the near target for India in this indicator.

In physician density and nurse-midwife density, while there has been a remarkable decrease in overall LMIC, India could achieve positive results in both. While nurse and midwife density now fares better than overall LMIC and most other SA-LMIC, physician

density is something on which India needs more progress. Compared to global average of 2.5 per 1000 and WHO recommendation of 3.5 per thousand, India still has to make a lot more progress in this area

**Hospital bed density** actually reduced in overall LMIC since 2000. High increase in population in the period could be one of the reason of reduction in bed density. However, the reduction in India is lower than overall LMIC, indicating that India added comparatively more hospital beds. Private hospital seems to have played a major role in keeping up the bed density, by increasing its share of beds from 49% to 63%<sup>12</sup>. However, Bangladesh, Sri Lanka and Bhutan did a better job and India can take their achievement as benchmark in this indicator. Also the present bed density is less than half of overall LMIC and India should keep a feasible time limit by which the gap should be significantly reduced.

Overall it could be stated that in **health infrastructure**, while India is doing better than overall LMIC, it need to do a lot more to bring its status at par and to improve its position world-wide.

Performance and Status in Health Status:

**Table 4: Achievements and present situation of health status of India in comparison to overall LMIC and 5 South Asian LMIC**

Indicator	Achievements since year 2000		Present situation	
	Compared to overall LMIC	Position in 5 SA – LMIC	Compared to overall LMIC	Position in 5 SA – LMIC
IMR	Better	4 <sup>th</sup>	Better	4 <sup>th</sup>
MMR	Better	3 <sup>rd</sup>	Better	5 <sup>th</sup>
Under 5 Mortality Rate	Better	3 <sup>rd</sup>	Better	4 <sup>th</sup>
Adult mortality rate	Worse	4 <sup>th</sup>	Worse	4 <sup>th</sup>
Life expectancy at birth	Same	3 <sup>rd</sup>	Worse	5 <sup>th</sup>

Compared to the achievement of India in health infrastructure, its achievements in health status has been less impressive. In almost all indicators studied, India’s progress has been similar or slightly better to overall LMIC.

India’s marginally better reduction in IMR and U5MR than overall LMIC and SA-LMIC peer countries in general achieving better result indicates that India

could do more in this area. At present level, it also looks difficult that India would achieve related millennium development goals of IMR of 27 and U5MR of 42 by the year 2015<sup>4</sup>. Hence re-looking at the efforts of child health programmes is needed to boost these indicators further.

Achievements in MMR appears to be much better than overall LMIC but its present situation is worst

amongst all SA-LMIC. Similar to IMR and U5MR, MMR may also not be able to meet MDG target of 109 by year 2015. Hence along with child health, maternal health requires equal focus and efforts.

India's achievement in reducing adult mortality rate and increasing life expectancy at birth is also not impressive with slightly better values than overall LMIC. The present status also fares slightly poorer. Thus looking into the specific reasons needs to be done immediately.

A combined look at India's situation in healthcare infrastructure and health status gives a unique understanding. While comparative improvements have been achieved in both areas, it has been specifically better in healthcare infrastructure. This may ultimately lead to even better health status in near future.

The findings that India do not have remarkable edge over its SA-LMIC counterparts in achievements either in health infrastructure and health status (in some instances, it's is at 4<sup>th</sup> or 5<sup>th</sup> position) indicates that India could have done better.

## CONCLUSIONS, RECOMMENDATIONS AND LIMITATIONS

Based upon findings and analytical discussion the paper arrives at some arguable conclusion. Firstly, India has done better than overall LMIC in creating and developing healthcare infrastructure, but achievements in health status is not remarkably different than overall LMIC. Secondly, comparison with SA-LMIC shows that India's performance in comparison to overall LMIC is not exclusive and other SA-LMIC has also achieved similar to better results than India. Third, even after comparatively better achievements, the overall present status of health infrastructure is worse than overall LMIC and mixed in health status. Finally, India looks to be moving in right direction with good pace, but have to specifically focus upon few areas to maximise the results. Thus it is recommended that India continues its efforts in improving healthcare infrastructure and strategically take actions on improving health status further. Achievements by SA-LMIC and status of overall LMIC should be used as targets and benchmarks by India.

The study has its limitations. Only few selected indicators have been used to comment upon overall

healthcare infrastructure and health status. 2013 indicator values have been used to assess achievements and status, because the same was available. It is a possibility that the situation might have changed by 205 (at the time of writing this paper). Lastly, all interpretations have been done on the basis of values without subjecting to any statistical process.

**Conflict of Interest:** The study was independent and was requested or funded by any agency/organization. Thus I believe, there is no scope for conflict of interest with anybody through this study.

**Source of Funding:** Since the study is based on secondary data available in public domain no funding was required.

**Ethical Clearance:** Not applicable as no human or animal intervention was done and no primary data collected.

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# To Evaluate Relationship between Attendance and Academic Performance of Medical Students in Department of Ophthalmology

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## ABSTRACT

**Background:** Class attendance has long been subject of debate while measuring performance in examination so we need to identify the problems why Medical students don't want to attend lectures. Previous studies had stated controversial argument regarding this relationship. Students with good lecture attendance show higher scores in exams, whereas those with poor lecture attendance are at risk for poor performance,<sup>1</sup> whereas studies by *Riggs and Blanco*<sup>2</sup> showed a negative correlation. This study is an effort to find out the relationship of attendance and academic performance of medical students and also identify different factors responsible for low attendance in didactic lectures.

**Aim and Objectives:** "To find the relationship between academic performance and lecture's attendance and the factors responsible for low attendance of medical students"

**Methodology:** In this study total 96 students of final professional Part-1 (Ophthalmology) were enrolled. 9 students had been excluded from study (4 students who had not attended any class and 5 students who could not appear in one or both the semester). Examination scores of remaining 87 Students were recorded from assessments of both the semester held during this Professional & grouped into two categories- group 1 with >60% & group 2 with ≤60% of examination score. Attendance at the end of this session was recorded and categorized into four groups according to percentage of attendance of these students, group A- <60%, group B- 60-74%, group C- 75-90% and group D- >90%. Questionnaire was handed over to 48 students who have <75% of class attendance and asked them to fill it to find out the different reasons of absenteeism from the lectures.

**Results and observations:** The majority of distinction grades (>60%) were seen in students (25/39 students; 64.10%) with attendance rates ≥75% and the majority of lower grades (≤60%) occurred in students (43/48 students; 89.58%) with attendance rates <75%. The most common reasons had given by the students for missing lectures were sickness (64.58%), online availability of Course material (62.50%), Teachers didn't allow late entry in the class (60.41%).

**Conclusions:** This study shows direct impact of lecture's attendance on academic performance in medical students of final professional part 1 (Ophthalmology). The most common reasons given by the students for missing lectures were sickness, online availability of Course material, Teachers didn't allow late entry in the class.

**Keywords:** Attendance, Academic performance, Relationship, Medical students

## BACKGROUND

Class attendance has long been subject of debate while measuring performance in examination. Low attendance in lectures is not a new problem. It has also

been identified previously<sup>3</sup> and number of causative factors has been suggested including illness, transport problems, inconvenient lecture times, poor content of lectures and poor lecturing techniques<sup>4</sup>. With the

revolution in the electronic equipment<sup>5</sup> there are varieties of computer based soft ware to assist in making the lectures more presentable, interesting and interactive, thus making the traditional teaching effective<sup>6</sup>. Despite this development low attendance at lectures is still an issue. Absenteeism at higher education level affects the learning process of the students as well as the final result at the end of academic session<sup>7,8</sup>. Fiel NJ advocated that there is a direct relationship between these two variables and there has been abundant literature which demonstrated that significant learning occurs during the lectures<sup>9</sup>. Kamran Hafeez identified the problems why students don't want to attend lectures<sup>10</sup>. As in our institute low attendance in lectures is always a problem so most of the universities consider the percentage of class attendance before allowing a candidate to appear in the examination. Our university, Chaudhary Charan Singh University Meerut (UP) India considers minimum lecture's attendance of 75% during an academic session as eligibility to sit in the university examination.

This study was undertaken to find out the relationship of lecture's attendance & academic performance of both the semesters in ophthalmology (final professional part 1) among students of Saraswathi Institute of Medical Sciences and Hospital Hapur (U.P.)

### AIM & OBJECTIVES

#### **Aim:**

“To find relationship between lecture's attendance and academic performance; and to identify factors responsible for low attendance”

#### **Specific Objectives:**

- 1- To find out the lecture's attendance
- 2- To observe the performance
- 3- To find the relationship between lecture's attendance and academic performance.
- 4- To identify different factors responsible for low attendance

Among medical students of final year part-1 (Ophthalmology)

### METHODOLOGY

It is an institutional Quantitative and comparative

study. Medical students of same professional (final professional part 1- Ophthalmology) having variation in attendance and performance were compared to see the relationship between lecture's attendance and academic performance.

A total 96 medical students were enrolled for this study who have completed two and half years of MBBS course (final year part 1- Ophthalmology).

The attendance of all 96 students in didactic lectures of ophthalmology was collected from the attendance register of Ophthalmology Department. The marks obtained by them in the assessment of both semesters held during academic year (2015-2016) were recorded from register of Dean's office.

During collection of attendance in didactic lectures form register, 4 students were found who had not attended any class due to some reason and during review of assessment of both semester examinations 5 students could not appear in one or both the semester due to physical illness or some other problems. So these 9 students were excluded from this study. The attendance of remaining 87 students were reviewed and grouped into four categories according to their percentage, group A- <60%, group B- 60-74%, group C- 75-90% and group D- >90%. Assessment of both the semester of all 87 students were reviewed and grouped into two categories according to their academic performance, group 1 with >60% & group 2 with ≤60% of examination score.

Approval for the study was obtained from Ethical Board of Saraswathi Institute of Medical Sciences and Hospital Hapur (U.P.). Students were introduced about the framework of this study and consent was taken.

In order to find out reasons of low attendance we had asked open ended question from all the students present in the lecture to write down the common factors responsible for low attendance on its own, irrespective of their attendance. All the students had responded. After content analysis of student's responses open ended questionnaire was prepared from responses of the students & from literature<sup>[2]</sup> and handed over to students who had class attendance <75% to fill it without writing their name on sheet. Quantitative analysis of these responses was made.

### OBSERVATIONS AND RESULTS

The attendance over whole the academic year and



the obtained marks (%) of the all the students of both the semesters was collected and tabulated in table 1

**Table:1 Shows attendance of the students over both the semesters and the corresponding marks obtained in the exams**

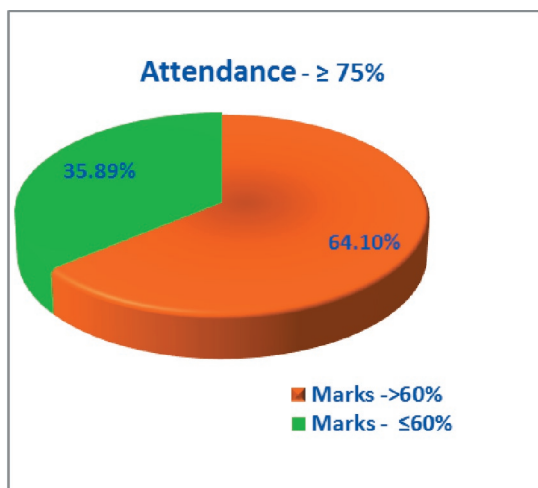
SN	Attendance	No of students	Performance	
			>60%	≤60%
1	>90%	5	3 (60.00%)	2 (40.00%)
2	75-90%	34	22 (64.70%)	12 (35.29%)
3	60-74%	26	5 (19.23%)	21 (80.76%)
4	< 60%	22	00	22 (100.00%)
		<b>Total - 87</b>		

As seen from the Table 1 above- Distinction grades ( overall score of >60%) were present in 60% of the students with attendance rate of >90%, 64.70 % of students who had attendance between 75-90% had scored >60% marks, 19.23% of students who had attended classes between 60-74% had scored >60% and no student could score >60% who had attendance < 60%.

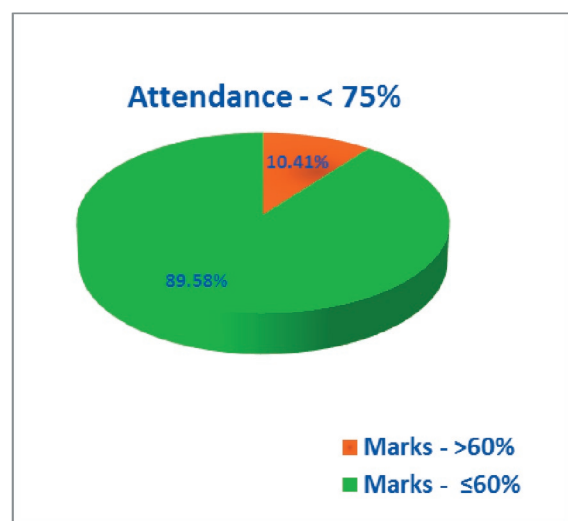
With reference to the table 1 the following observations are seen-

The majority of distinction grades (>60%) had occurred in students (25/39 students; 64.10%) with attendance rates ≥75% and the majority of lower grades (≤60%) had occurred in students (43/48 students; 89.58%) with attendance rates <75%.

**Pie Diagram: 1 & 2** Showing the relationship between attendance and academic performance.

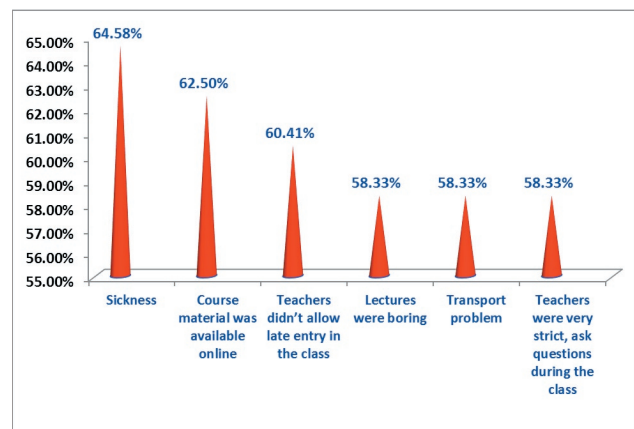


**Pie Diagram:1**



**Pie Diagram:2**

Analysis of above graph shows that class attendance during didactic lectures have direct impact on the academic performance of students and students with low attendance are at risk of poor performance in their examinations.



**Graph:1** Showing the common reasons of low attendance

## DISCUSSION

First analysis of the relationship between lecture's attendance and exam performance was done by *Romer* and he found that attendance had a positive and significant impact on academic performance<sup>[11]</sup>. The study by *Dhaliwal* shows that higher attendance was associated with better marks in the formative assessment and it was concluded that absenteeism may contribute to low achievement<sup>[12]</sup>. Our study also support the above studies as majority of the distinction grades occurred in students with attendance rates  $\geq 75\%$  and majority of lower grades occurred in students with attendance rates  $< 75\%$ .

Study by *Hammen and Kelland* had shown that regular attendance in classes during a human physiology course was helpful in a statistical sense. In this study the general rule was a decrease in the examination result score with increase in the number of absenteeism<sup>[1]</sup>. Our study also support this as majority of lower grades occurred in students with attendance rates  $< 75\%$ . A positive and significant relationship between class attendance and academic performance was also found by *Chan, Shum, and Wright* (1997)<sup>[13]</sup>. And then by *Rodgers* (2002)<sup>[14]</sup>. Our findings are in accordance with the previous finding and showing that class attendance during didactic lectures has a direct impact on the academic performance and students with low attendance are at risk of poor performance in their examinations.

*Hyde and Flour Moy* (1986) study concluded that those students who attended class more regularly were amongst the best students in their class<sup>[15]</sup>. Our study also shows that majority of distinction grades occurred in students with attendance rates  $\geq 75\%$ . Such arguments may hold intuitive appeal and are supported by Empirical literature which suggests a positive correlation between class attendance and student performance (*Park and Kerr, 1990*<sup>[16]</sup>; *Durden and Ellis, 1995*<sup>[17]</sup>; *Deva doss and Foltz, 1996*<sup>[18]</sup>; *Khan et al, 2003*<sup>[19]</sup>; *Stanca, 2006*<sup>[20]</sup>; *Andrietti et al, 2008*<sup>[21]</sup>; *Moore et al, 2003*<sup>[22]</sup>).

According to *Kamran Hafeez*, lectures are still one of the important modes of teaching in universities. The main purpose of lectures is to present the knowledge in a structured and efficient way<sup>[10]</sup>. Our study reports considerably low attendance in lectures; only 44.82% of students had 75% or more attendance in whole academic year so attempt was made to identify the regular absentee

and find out the causes of their absenteeism. It seems to be important to monitor the attendance of these students & encourage them to attend the classes regularly in order to strengthen the learning process in medical students.

*Billings-Gagliardi et al.* studied the student decisions regarding lecture attendance and they reported that presence of electronic learning materials will not affect the lecture attendance if the students think that the lecture content will contribute in their learning<sup>[23]</sup>. In our study 60.41% students thought that the teachers didn't allow late entry in the class, 58.33% reported that the lectures were boring and teachers were very strict, asked questions during the class. It appeared that if we try to change our attitude towards students, improve the quality of the lectures and present them in a more interactive way (Integrated teaching); it will have a positive impact on the attendance of lectures and definitely on academic performance.

*Dhaliwal U* (2003) reported association of higher attendance with better marks. There were number of causes as a cause of absenteeism including illness, family commitments, lecture topic and lecture time spent in clinical posting<sup>[12]</sup>. Our study also showed direct impact of class attendance on academic performance but reasons for low attendance were slightly different. Additional study of different batches & different subjects could have lent greater strength & depth to the conclusion of this study. Specially by analyzing other variables acting as confounding factors<sup>[24,25,26]</sup> like, utilization of teaching aids, teaching skill of the lecturers,<sup>[27]</sup> learning style,<sup>[28]</sup> learning ability and previous academic record of individual students. In particular using more elaborate methods of assessment of students,<sup>[29]</sup> rather than the simple failure rate could have made it more exploratory.

### Outcomes : What this study adds

This study confirms that lectures are still one of the important modes of teaching and showing that class attendance during didactic lectures has a direct impact on the academic performance and students with low attendance are at risk of poor performance in their examinations.

With this study we came to know the common reasons of low attendance so we shall try to change our attitude towards students, improve the quality of the lectures and presents them in a more interactive way

(Integrated teaching), it will have a positive impact on the attendance of lectures and definitely on academic performance.

#### **Limitations:**

- This was a small, single subject and single batch study.
- Questionnaire which may not be well organized so there is the possibility of leaving out some important reasons of low attendance.
- Here we include examination score of theory only, assessment of both practical and theory can provide much better results.

#### **CONCLUSIONS**

The result of this study shows that didactic lectures are helpful for the students and the class attendance has a direct impact on the academic performance of medical students of final professional part 1 (Ophthalmology) so conclusion of this study is that students with high attendance are directly related to better academic performance and students with low attendance are at risk of poor academic performance. The most prominent reasons given by the students for missing lectures were sickness, online availability of Course material, teachers didn't allow late entry in the class, lectures were boring, transport problem and teachers were very strict, asked questions during the class.

**IMPLICATIONS:** In this study 55.17% of students were with attendance < 75% and this study shows direct impact of lecture attendance on academic performance. Attempt was made to identify the regular absentee and find out the causes of their absenteeism to encourage them to attend the classes regularly & we also try to change our attitude towards students, improve the quality of the lectures and presents them in a more interactive way (Integrated teaching); it will have a positive impact on the attendance of lectures and definitely on academic performance.

**Conflict of Interest:** Nill

**Source of Funding:** Nill

**Ethical Clearance:** Taken

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# Assessment of the Level of Knowledge and Awareness of Dental Health Care Workers about Hand Hygiene - A Questionnaire based Study

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## ABSTRACT

**Background:** Hand hygiene is considered as an important measure to prevent cross-transmission of microorganisms and to reduce the incidence of health care-associated infections. Published literature reveals poor compliance with standard precautions among healthcare workers and students worldwide. Knowledge and competence in hygienic practices should be strongly established at the start of a nursing and a dental career. In this regard, many surveys were conducted to assess infection control and hand hygiene knowledge among nursing and medical healthcare workers by administration of anonymous questionnaires. But there is no such study conducted to assess the awareness, knowledge and attitude of dental healthcare workers. **Methods:** A cross-sectional study was conducted among 26 nurses, 73 post-graduate students and 51 teaching faculty at Manipal College of Dental Sciences, Mangalore, Manipal University. Knowledge and awareness were assessed using a questionnaire derived from the WHO questionnaire for hand hygiene and the Hand Hygiene Questionnaire developed for VA-3M Six Sigma Project. The p-value less than 0.05 were considered significant. **Results:** All participants were found to have good amount of hand hygiene knowledge. The post-graduate students were found to have better knowledge than the teaching faculty and the nurses.

**Keywords:** hand hygiene, hand washing, dental health care workers, basic education

## INTRODUCTION

Human hands are one of the most common source of microorganism transmission in patient care especially during surgical procedures.<sup>1</sup> The infectious microorganisms can be transferred from patients to surgical team members, surgical team members to patients or even patients to patients.

The organisms on surgical team members hands may be transferred to the patient's mucous membranes or into the patient's blood stream via injection sites or open wound created during surgical procedures and lead to surgical site infections.<sup>2</sup> These result in poor quality of life due to delayed wound healing, requiring longer hospitalization, re-admission to hospital or intensive care unit (ICU) treatment, increases use of antibiotic and additional cost.

Hand hygiene is recognized as the leading measure to prevent cross-transmission of microorganisms and to reduce the incidence of health care - associated infections.<sup>3</sup> To address this problem, continuous efforts are being made to identify effective and sustainable strategies. One of such efforts is the introduction of an evidence-based concept of "My five moments for hand

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hygiene” by World Health Organization. These five moments that calls for the use of hand hygiene include the moment before touching a patient, before performing aseptic and clean procedures, after being at risk of exposure to body fluids, after touching a patient, and after touching the patient’s surroundings.<sup>4</sup> This concept can be aptly used to improve understanding, training, monitoring, and reporting hand hygiene among health care workers.

Published literature reveals poor compliance with standard precautions among healthcare workers and students worldwide.<sup>5-7</sup> A variety of factors influence the compliance with healthcare associated infections prevention procedures, the most important being the quality of the basic dental/nursing education. It has been reported that significant deficits in the quality of hand hygiene related information in basic nursing educational programs correlate directly with the reported insufficient levels of hand hygiene knowledge and poor hand hygiene compliance by students during their training in clinical settings.<sup>1</sup>

Knowledge and competence in hygienic practices should be strongly established from the start of both a nursing and a dental training; moreover, some authors underline the necessity of continued infection control education.<sup>5,8-10</sup> The evaluation of knowledge among medical, dental and nursing healthcare workers plays a key role in any process aimed at improving the educational strategies and consequently the compliance with healthcare associated infection prevention.

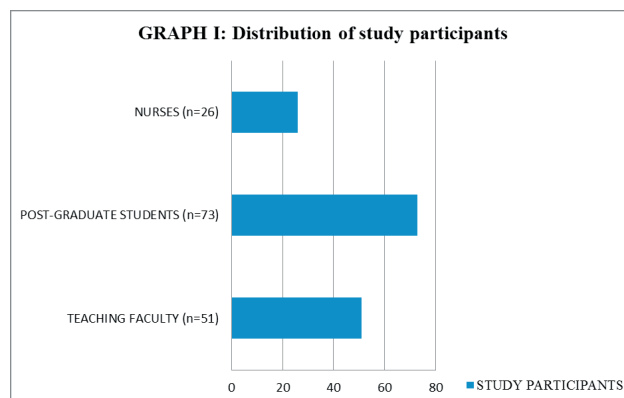
In this regard, many surveys were conducted to assess infection control and hand hygiene knowledge among nursing and medical healthcare workers by administration of anonymous questionnaires. There is no such study conducted to assess the awareness, knowledge and attitude of dental healthcare workers. Therefore this questionnaire based study is an attempt to understand the level of understanding of the importance of hand hygiene in dental practice by the dental healthcare workers.

## MATERIALS AND METHOD

This cross-sectional study was conducted at Manipal College of Dental Sciences, Mangalore, India. Ethical

clearance was obtained from the Institution Ethics Committee (ID no. MCODES/198/2014) at Manipal College of Dental Sciences, Mangaluru.

A self-administered questionnaire with 15 multiple choice questions was distributed to teaching staff, post graduates and nurses, which comprised of 162 participants. Out of the 15 questions, 7 questions testing the knowledge were adapted from WHO hand hygiene questionnaire<sup>4</sup> for health care workers whereas 8 questions assessing the awareness were obtained from the Hand Hygiene Questionnaire developed for the VA-3M Six Sigma Project.<sup>11</sup> Informed consent was obtained from the participants prior to questionnaire administration. Confidentiality was maintained throughout the study. The detailed distribution of study participants showed in (Graph I). The data was compiled and responses were analysed using statistical package for social sciences (SPSS) version 16.0 and descriptive statistics was calculated and association between responses to different groups was calculated using Chi-Square test. The p value was kept < 0.05 to assess statistical significance.



## RESULTS

A total 162 dental health care workers were provided with a structured questionnaire to answer. Completed questionnaires from 150 participants comprising 26 Nurses (17%), 73 post graduate students (49%) and 51 teaching faculty members (34%) were received. The non response rate was calculated to be 7.40%. (Graph I)

**TABLE I: Comparison of knowledge between teaching faculty, post-graduate students and nurses**

QUESTIONS (ANSWERS)	TEACHING FACULTY (n=51)	POST-GRADUATES (n=73)	NURSES (n=26)	CHI-SQUARE VALUE (P VALUE)
Which of the following is the main route of cross-transmission of potentially harmful germs between patients in a health-care facility? (Health-care workers' hands when not clean)	40 (50)	28 (35)	12 (15)	22.12 <b>(0.000)</b>
What is the most frequent source of germs responsible for health-care associated infections? (Germs already present on or within the patient)	35 (47.3)	20 (27)	19 (25.7)	37.45 <b>(0.000)</b>
Which of the following hand hygiene practices prevents transmission of germs to the patient? a. Before touching a patient-(Yes) b. Immediately after a risk of body fluid exposure-(Yes) c. After exposure to the immediate surroundings of a patient- (No) d. Immediately before a clean/aseptic procedure (Yes)	51(35.2) 51 (34) 36 (27.3) 21 (22.3)	70 (48.3) 73 (48.7) 71 (53.8) 61 (64.9)	24 (16.6) 26 (17.3) 25 (18.9) 12 (12.8)	3.43 (0.180) - 22.21 <b>(0.000)</b> 26.72 <b>(0.000)</b>
Which of the following hand hygiene practices prevents transmission of germs to the dentist? a. Before touching a patient -(Yes) b. Immediately after a risk of body fluid exposure-(Yes) c. After exposure to the immediate surroundings of a patient- (No) d. Immediately before a clean/aseptic procedure-(Yes)	42 (31.6) 51 (34) 32 (25.4) 23 (22.1)	71 (53.4) 73 (48.7) 73 (57.9) 66 (63.5)	20 (15) 26 (17.3) 21 (16.7) 15 (14.4)	10.96 <b>(0.004)</b> - 31.25 <b>(0.000)</b> 30.99 <b>(0.000)</b>
Which of the following statements on alcohol-based handrub and handwashing with soap and water are true? a. Hand rubbing is more cleansing than hand washing (False) b. Hand rubbing causes hand drying more than hand washing (True) c. Hand rubbing is more effective against germs than hand washing (False) d. Hand washing and hand rubbing are recommended to be performed in sequence (True)	19 (28.8) 39 (39) 10 (24.4) 42 (34.1)	32 (48.5) 41 (41) 20 (48.8) 62 (50.4)	15 (22.7) 20 (20) 11 (26.8) 19 (15.4)	2.92 (0.232) 7.06 <b>(0.029)</b> 4.46 (0.107) 1.832 (0.400)
What is the minimal time needed for alcohol-based handrub to kill most germs on your hands? (20 seconds)	36 (36.7)	48 (49)	14 (14.3)	5.55 (0.236)
Which of the following should be avoided, as associated with increased likelihood of colonisation of hands with harmful germs? (Wearing jewellery, damaged skin or artificial fingernails)	51 (34)	73 (48.7)	26 (17.3)	-

%age in parenthesis; P value ≤ 0.05 significant

In the present study questionnaire had knowledge and awareness components. The knowledge about hand hygiene was better among post graduates compared to teaching faculty and nurses, this result was found to be statistically significant ( $p=0.00$ ). Less than half of the post graduates and nurses were knowledgeable on main route of cross-transmission of potentially harmful germs between patients in a health-care facility and frequent

source of germs responsible for health-care associated infections. Regarding statements on alcohol-based handrub and handwashing with soap and water, 48% of post graduates commented on handrubbing is more effective than handwashing. The percentage of correct answer was more among teaching faculty and post graduates compared to nurses on minimal time needed for alcohol-based handrub to kill most germs. (Table I)

**TABLE II: Comparison of awareness between teaching faculty, post-graduate students and nurses**

QUESTION (ANSWERS)	TEACHING FACULTY (n=51)	POST-GRADUATES (n=73)	NURSES (n=26)	CHI-SQUARE VALUE (P VALUE)
Do you know the proper method of Hand washing? (Yes)	46 (37.1)	54 (43.5)	24 (19.4)	7.55 (0.02)
Is there a hand hygiene protocol in your dental hospital? (Yes)	22 (30.1)	30(41.1)	21(28.8)	18.50 (0.002)
Did you receive formal training in hand hygiene in the last three years? (Yes)	11 (25.6)	17 (39.5)	15 (34.9)	13.00 (0.002)
Do you routinely use an alcohol-based hand rub for hand hygiene? (Yes)	32 (37.6)	36 (42.4)	17 (20)	3.18 (0.204)
When you don't disinfect your hands (use soap or an alcohol hand-rub to kill microbes) when you should, what is the reason why?				9.788 (0.134)
a. Too busy	5 (62.5)	1 (12.5)	2 (25)	
b. Forget	38 (35.8)	50 (47.2)	18 (17)	
c. Unsure of need	-	-	-	
d. Out of product(s)	-	-	-	
e. Product(s) not in convenient location	8 (25.8)	19 (61.3)	4 (12.9)	
f. Don't like product(s) available	-	3 (60)	2 (40)	
When working with another care giver and you forget to disinfect your hands before touching a patient, what percent of the time does your colleague remind you? (71-100%)	15 (17.6)	51 (60)	19 (22.4)	32.024 (0.000)
When working with a colleague who forgets to disinfect his/her hands before touching a patient, what percent of the time <u>do you</u> remind them? (71-100%)	15 (19.2)	47 (60.3)	16 (20.5)	25.85 (0.000)
Please rate your satisfaction with the hand hygiene practices (including glove practices) currently used at your hospital-				
a. Dissatisfied	-	-	-	23.542 (0.001)
b. Somewhat dissatisfied	2 (40)	2 (40)	1 (20)	
c. Neutral	2 (66.7)	1 (33.3)	-	
d. Somewhat satisfied	25 (30.9)	51 (63)	5 (6.2)	
e. Satisfied	22 (36.1)	19 (31.1)	20 (32.8)	

%age in parenthesis; P value ≤ 0.05 significant

Majority of the post graduates were aware of proper method of hand washing and display of hand hygiene in the dental hospital. But less than 50% in all the three groups underwent formal training in the hand hygiene in the last



three years. When the participants were asked the reason why they are unable to follow hand hygiene practices most of them felt that they forget (70.7%). It was also found in the present study that maximum post graduates students were reminded by their colleague before touching a patient. Almost equal percentage of teaching faculty, post graduates and nurses were satisfied with the hand hygiene practices used in the hospital. (Table II).

## DISCUSSION

It is necessary to improve the understanding, training, monitoring, and reporting hand hygiene among healthcare workers.<sup>4</sup> Despite the relative simplicity of this procedure, compliance with hand hygiene among health care providers is as low as 40%.<sup>11</sup> The evaluation of knowledge among dental professionals and nurses plays a key role in any process aimed at improving the educational strategies and consequently the compliance with healthcare associated infection prevention. Many surveys were conducted to assess infection control and hand hygiene knowledge among the health care worker by administration of anonymous questionnaires.<sup>1,6-8</sup>

This study is one of the few studies to assess the level of knowledge among dental health care workers. In this study, all the three study groups had good knowledge on hand hygiene, which was a positive finding. Nair et al<sup>1</sup> conducted a cross-sectional study at a tertiary health care centre in Raichur, India to assess the knowledge, attitude and practice of hand hygiene among medical and nursing students. It was seen that both medical and nursing students had moderate knowledge and poor attitude towards hand hygiene.

The post-graduate students were found to have better knowledge among the three study groups. This was followed by the teaching faculty group and the nurses group. This could be attributed to the training imparted to the post-graduate students regarding hand hygiene and infection control. This was with other similar study conducted by M. Basurrah and T. Madani<sup>11</sup> also showed adherence to hand hygiene was seen in 70% of medical students, 18.8% of nurses, and 9.1% of senior medical staff.

The lower level of knowledge about hand hygiene in the teaching faculty and the nurses group may be due to the lack of proper training on hand hygiene and the lack of regular workshops to train the health care workers at the professional level. Pittet et al<sup>3</sup> conducted a cross-

sectional survey of 166 physicians practices, beliefs and attitudes towards hand hygiene at a large university hospital and found that adherence to hand hygiene guidelines was present in 57% of the total number of physicians surveyed.

The present study shows the importance of improving the current training programs targeting hand hygiene practices among dental and nursing staff. Hand hygiene training sessions may need to be conducted more frequently for dental health care workers.

## CONCLUSION

It is necessary to implement and validate new teaching approaches in particular with regard to hand hygiene and healthcare associated infections and to share practical training standards beginning at the undergraduate level till the professional level. In the present study the post-graduate students showed better knowledge than the teaching faculty and the nurses. Hand hygiene training sessions should be conducted more frequently for teaching faculty and the nurses with continuous monitoring and performance feedback to encourage them to follow correct hand hygiene practices.

**Conflict of Interest** – Nil

**Source of Funding**- Self

**Ethical Clearance** – Obtained (ID no. MCODES/198/2014)

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# The Impact of Life Enrichment and Promotion Program Training on the Prisoners' Aggression Who Suffer from Drug Abuse

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## ABSTRACT

The research has been carried out to investigate the impact of life enrichment and promotion program training on the prisoners' aggression who suffer from drug abuse. Methodology: the research plan was quasi-experimental with pre-test and post-test with control group. The statistical population of the research includes all the prisoners of Chenaran prison, who were 3000 people. Among these 3000 people, based on their aggression score in pre-test, 30 persons who has both input and output criteria were formed our statistical sample. These 30 people were categorized to two groups A and B randomly; group A will get Life Enrichment Adult Program (LEAP), and the other group B will act as a control group and will go in the waiting list. Before and after performing the program, the questionnaire were filled by the sample group. Results: covariance analysis showed that in post-test, the aggression of experiment group has been decreased significantly in comparison with the aggression of control group. Conclusion: the results of the study approved this fact that life enrichment and promotion program training leads to a significant decrease in the aggression of prisoners who suffer from drug abuse.

**Keywords:** *Life Enrichment and Promotion Training, Aggression, Drug Abuse*

## INTRODUCTION

An issue like addiction, threatens the societies more than everything else. Despite the dangers and side effects of addiction, everyday more people get involved with issue; and even witnessing terrible scenes related to this matter could not warn people especially the youth<sup>1</sup>. Drug abuse harms societies socially, economically, politically, culturally and hygienically. Harms such as: physical contagious diseases like Hepatitis and AIDS; mental-social diseases; increase in addiction-based crimes like theft and murder; self-immolation; unemployment;

domestic violence; child abuse; increase in separation rates and dropouts of the children with addicted parents. In Iran, the statistics show that the amount of damages of addiction and the cost of fighting drug smuggling is 4 thousands and 800 million rials (about 135000 USD) each year<sup>2</sup>.

The impact of addicts' imprisonment on their mental status, social and family relations is not deniable. An addict imprisonment will affect his social-mental compatibility and health<sup>2</sup>.

One of the psychological problems which is noticeable in prisoners who suffer from drug abuse and make their treatment hard is aggression. Anger and aggression are world-wide emotions which can be seen in every culture and are one of the most common behavioral problems which make other people sad and uncomfortable, and they disorder mental hygiene

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of family and society. Aggression is not an especial behavior; it points at those behaviors which lead to emotional, psychological or physical harms for others. On one hand, aggression is affected by situational and psychological factors; on the other hand, genetical and biological factors have major roles in creating and expanding it. Therefore, presenting an exact definition of aggression is a hard work. However, Baron and Richardson (1994) has explained aggression as behaviors whose goals are destroying and harming a creature's self and properties. A behavior which make the victim to show defensive reactions<sup>3</sup>.

So human aggression has its roots in a general structure which can be shown as anger, violence, physical and psychological aggression. The results of researches show that aggression is one of the major parameters of some mental disorders such as conduct disorder, hyperactivity disorder, antisocial personality disorder and eating disorder. Aggression also has a direct relation with depression, cocaine consumption, alcohol consumption and suicide<sup>4</sup>.

Aggression in the prisoners' who suffer from drug abuse is not only so common, but also it starts in the initial phase of treatment and will cause significant disorders in the process of treatment. Other studies show that aggression in drug users leads to low motivation for addiction treatment and other mental disorders; and in case in the process of treatment aggression is ignored, the treatment definitely will be unsuccessful and there will be a decrease in the compatibility of the addict with society<sup>5</sup>. So, considering the negative impacts of aggression on mental health of addict prisoners and their treatment process, investing this factor and recognizing the effective treatments on decreasing this factor is of high importance.

Now, there exists many theoretical views who want to decrease aggression in the addicts with different approaches. Among these approaches, we can point at behavioral-cognitive approach, intellectual- emotional, systematic, choice theory and interaction analysis.

Among various psychological views, life enrichment and promotion program training is very significant because of its theoretical depth, widespread application and its newness.

Life Enrichment Adult Program (LEAP) is an active and educational approach. It is a method for helping

people to control their drug abuse, aggression, and other destructive emotions by promoting life quality and increasing their happiness. This program investigates the nature of people's aims and activities and it also investigates the fact that how people can increase their opportunities to reach their goals<sup>6</sup>.

Life Enrichment Adult Program (LEAP) has been designed based on Systematic Motivational Counseling (SMC) principles. The aim of this program is helping drug abusers in these three fields: i) give them an understanding of how their drug use can affect their temper and emotional status; ii) teaching them how to reach their opportunities; and iii) leading a satisfactory life without dependency to drugs<sup>6</sup>.

Researches showed that anger management training and communicative skills is very effective to reduce aggressiveness but communicative skills training are more effective to reduce aggressiveness than anger management<sup>7,8,9</sup>. As well as Kazemeini and Abdekhodaei (2013) showed that Group therapy based Life enrichment and enhancement program can be an effective method in promotion of motivational structure, satisfaction with life and also reduction of temptation of drug abuse in men substance abusers who are under methadone treatment<sup>10</sup>. Abdolhoseini (2009) showed that Life Enhancement and Advancement Programme can be effective on Indices of Female Drug Abusers<sup>11</sup>.

Regarding the above mentioned points, it seems that life enrichment and promotion training program has significant effect on the aggression of addicted prisoners. However, till now there has not yet been a research in this field which investigates this issue. So the aim of the research is investigating the impact of life enrichment and promotion training program on the aggression of prisoners who suffer from drug abuse.

## **MATERIALS AND METHOD**

The research is applied research according to its goal; and it has been carried out quasi-experimentally, and it has pre-test and post-test with control group. In descriptive level, mode and deviation of the mean has been used for data analysis, and in inferential level, covariance analysis (ANCOVA) has been used.

Population, Sample, and Sampling Method: The statistical population of the research includes all the prisoners of Chenaran prison, who were 3000 people.

Among these 3000 people, based on their aggression score in pre-test, 30 persons who has both input and output criteria were formed our statistical sample. These 30 people were categorized to two groups A and B randomly; group A will get Life Enrichment Adult Program (LEAP), and the other group B will act as a control group and will go in the waiting list. It should be mentioned that this program has four sections which is performed in six sessions. These sections will help people in planning some methods for increasing their opportunities to reach their goals, decreasing stress, and increasing their happiness. Each section has some exercises as well. The sampling was random.

**Participants:** among the members of experiment group, 45% had elementary education, 30% secondary education, 20% high school education and 5% education in diploma level. Among control group members, 40% had elementary education, 25% secondary education, 30% high school education and 5% education in diploma level. The age range of the subjects of experiment group were 30 to 35 years, and the age range of the subjects of control group were 32 to 35 years.

### Tools

In the study in order to gather the required information, the below questionnaire has been used:

**Buss and Perry's Aggression Questionnaire:** this questionnaire which has been designed by Buss and Perry in 1992 has 29 questions. It evaluates four factors of verbal aggression (5 questions), physical aggression (9 questions), anger (7 questions), and violence (8 questions). The results of psychometric analysis of Buss and Perry's Questionnaire (1992) has shown that it has high internal consistency (89%). Also the validity of subscales of this questionnaire with each other and with the whole scale which is between 25% and 45% shows that this research tool has proper reliability (Mohammadi, 2007). Samani research (2008) has been done on 492 students of Shiraz University which

has been chosen via cluster sampling and random sampling, and they has evaluated with Buss and Perry's Aggression Questionnaire. The data has been analyzed with statistical tests such as correlation coefficient factor analysis and t Test. The validity of this questionnaire was 78% by pretesting. Factors high correlation with the whole score of the questionnaire, low correlation of factors with each other, and their coefficient amounts show the efficiency and adequacy this questionnaire for researchers in Iran. Mohammadi research (2007) which has been done on a sample of 209 people from students of Shiraz University which were chosen randomly; the credibility of aggression questionnaire has been analyzed by three methods Cronbach's Alpha, retesting and bisection method, and three amounts have been calculated 89%, 78%, and 73%. The reliability of this questionnaire has also been investigated by indices such as convergent reliability, concurrent reliability and factor analysis. The convergent reliability of aggression questionnaire has been approved through calculating correlation coefficient of its subscales with each other and the whole questionnaire, and these coefficients were meaningful between 37% and 78%. Concurrent reliability has also estimated through using mental harm scale, and its correlation coefficient (34%) was meaningful. The method of scoring is based on Likert Scale from 1 (it is completely against my personality) to 5 (it completely agrees with my personality). The score of question 24 and 29 is reversed. Total score is the sum of all questions' scores and its range is from 29 to 145. High score means more aggression<sup>12, 13, 14</sup>.

### FINDINGS

In this part, the information about the frequency, mean and standard deviation of the results derived from implementing aggression questionnaire on the addicted prisoners in experiment and control group in pre-test and post-test. Table 1 shows descriptive indices of data derived from using aggression questionnaire in pre-test and post-test in different groups.

**Table 1: descriptive indices of data derived from aggression pre-test and post-test**

Group	Variable	Number	Pretest		Post-test	
Experiment	Aggression	15	Mean 99.33	Standard Deviation 17.21	Mean 77.73	Standard Deviation 15.21
Control	Aggression	15	103.60	17.27	103.67	17.29

As it can be seen the mean of aggression of experiment group has noticeable decrease in post-test in comparison in with pre-test. This change cannot be seen in control group.

In order to evaluate the effectiveness of life enrichment and promotion program on the aggression of addicted prisoners covariance analysis is used. In covariance analysis, the difference of groups in one variable is calculated through controlling one or two other variables which may affect the results. So in order to compare the aggression scores of subjects of

two groups in post-test covariance analysis has been used, and the effects of pre-test were controlled as variable. Before performing covariance analysis test, homogeneity assumption of variances of aggression has been investigated. The results of this test show that Levene Test in aggression variable ( $F_{38.1} = 4.113, P = 0.069$ ) is not meaningful and this shows that variances are homogeneous. There covariance analysis test can be used. In table 2, the results of this test which compares the means of aggression scores of two groups' subjects in post-test have been shown.

**Table 2: Comparison of aggression post-test in two groups with controlling pre-test effect**

Change Resources	Df	F	P-Value	Impact Factor	Statistical Power
Pre-test	1	0.459	0.504	0.016	0.019
Group	1	19.013	0.00	0.404	0.383
Error	18				
<b>Total</b>	<b>20</b>				

As it can be seen, the results which were derived from comparing aggression post-test in two groups with controlling the effect of pre-test show that those addicted prisoners who has participated in life enrichment and promotion program has shown a significant decrease in their aggression in comparison with those prisoners who were placed in control group ( $F_{1.18} = 19.013, P < 0.0005$ ). So life enrichment and promotion program has been effective for prisoners who suffer from drug abuse.

### DISCUSSION

The research has been done with the primary aim of investigating the effectiveness of life enrichment and promotion program on the aggression of prisoners who suffer from drug abuse. The results show that participating in the sessions of life enrichment and promotion will lead to a decrease in their aggression. The findings of this study are in line with the research results of Lawrence and Bradbury <sup>15</sup>, and Hahlweg, Baucom, and Markman <sup>16</sup>.

On the other hand, other researches also proved the effectiveness of LEAP. In the study which has been done by Abdolhosseini <sup>11</sup> in order to compare the effectiveness of intellectual-emotional treatment and LEAP training, shows that the effectiveness of LEAP training on promoting temper and decreasing drug craving is higher than intellectual-emotional treatment.

In another research which has been carried out by Ashkani <sup>17</sup>, the effectiveness of both LEAP and REBT program in promoting the marriage satisfaction of wives of veterans.

These findings mean that life enrichment and promotion program, is a proper and efficient training program for addicted prisoners and can affect their anger control, and it has also increased their life satisfaction. This means that life enrichment and promotion program is based on motivational structure modification and completes systematic motivational counseling. It will help drug users to control their drug consumption through promoting their life quality and increasing their happiness. LEAP will investigate the nature of people's aims and activities, and help them to enhance their opportunities for reaching their goals. Because controlling emotions and life satisfaction depend very much on having satisfactory aims and success in reaching them. The researches which have been done about life well-being and meaning have shown that life satisfaction and good feeling have a relationship with people's understanding of having important goals in life and success. LEAP is a new approach to investigating people's aims. This program assumes that most of mental problems originate from motivational disorders. It means the ineffective methods based on which people follow their goals. This method also helps addicted prisoners to decrease their drug consumption

by fulfilling their lives emptiness.

This treatment for decreasing aggression is very new and has not many background. Generally speaking, this treatment can have significant effects on promoting people's interaction and mental health. And it has enough efficiency for investigating many of social harms.

**Conflict of Interest:** All of authors declare that have no conflict of interest.

**Source of Funding:** The present study was administered by the authors in the absence of any financial supports by any organization.

**Ethical Clearance:** Taken from department of psychology at Ferdowsi university of Mashhad committee.

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# Validity of Different Screening Tests for Detecting Visual Impairment in 3 to 6 Year Old Children

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## ABSTRACT

**Background:** Preschool vision screenings (PVS) are recommended for early detection and treatment of childhood visual disorders. At present, the vision screening protocols in childhood varies from country to country and even within countries

**Objective:** To determine the sensitivity and specificity of different screening tests used for visual impairment detection in the 3 to 6 year old children

**Method :** Ethical Committee approval and parental consent obtained. Each child was assessed with Lea symbol and E charts for vision, stereo acuity measurement with Randot preschool stereo test, photo refraction by Plus optix A09, cover tests, cycloplegic refraction and retinal evaluation. Visual impairment (VI) was defined as presenting visual acuity in better eye <6/12. Receiver Operating Characteristics Curve (ROC) was used for statistical analysis

**Results:** A total of 200 eyes (100 participants) were analysed. 52% were males and 48% females. 49.5% had visual impairment. The sensitivity and specificity of Lea symbol chart, Randot preschool and Plus optix A09 (spherical and cylindrical values) for detecting visual impairment were 91.8%, 56.2%, 51.8% ,81.8% and specificity were 91.9%,83.3%,50% , 68% respectively .

**Conclusion:** Lea symbol chart had high sensitivity to pick up visual impairment in 3 to 6 year old children.

**Key-words:** Preschool, vision screening, visual impairment, amblyopia, refractive error

## INTRODUCTION

Vision is one of the treasured senses and vision assessment in children works towards preventive health.<sup>1</sup> Timely childhood screening is widely endorsed for avoidable and correctable vision deficits, mainly

refractive error and amblyopia.<sup>2</sup> Wide range in prevalence of preschool vision disorders are reported in literature.<sup>3-5</sup> Cotter and colleagues attributed the success of amblyopia treatment to child's age.<sup>6</sup> Holmes et al reported children younger than 7 years were likely for added improvement in amblyopia therapy<sup>7</sup>. In a study by Hartmann et al, successful screening could be performed in 80% of cases for the 3 year olds and 94% in children aged 4 years.<sup>8</sup> Ying et al affirmed the need for providing vision care to preschool children irrespective of their ethnicity.<sup>5</sup> Strabismus, Amblyopia and Refractive Error in Young Singaporean Children study (STARS) reported rising myopia prevalence in urban Asian

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pre-schoolers.<sup>9</sup> The consequences of identifying visual deficits later in life may be permanent visual impairment which distresses the school performance, motor skills, self-image and productivity in adulthood.<sup>14</sup> Vision screening in pre-schoolers is of prime importance as there is usually no manifestation of the disorder.<sup>10</sup> It was reported that only 21% to 36% children below 6 years of age undergo eye examinations in United States of America (USA) despite endorsements of PVS, which further echoed the need for screening.<sup>11</sup> Moreover, the ocular problems were shown to be two times higher in children who were reluctant for preschool vision test.<sup>12</sup> There is lack of studies on preschool vision screening in India.<sup>13</sup> Enduring dispute exist concerning the specific test battery to be included for pediatric vision screenings.<sup>14,15</sup> Hence the objectives of the current study was to determine the sensitivity and specificity of different screening tests used for identifying visual impairment in children aged 3 to 6 years.

## MATERIAL AND METHOD

Ethical approval for conducting the study was obtained from Institutional Ethics Committee, Kasturba Hospital (IEC/312). The participants were recruited from the Out Patient Department (OPD) of Ophthalmology, Manipal for a 15 month period. The written informed consent was obtained from the parents and verbal assent from the children before commencing the study. Children with developmental delay, eye infections and who were hesitant to respond to the tests were excluded from the study. The objectives of the study were explained followed by comprehensive examination as per the study protocol. Visual acuity was checked monocularly with Lea and E charts for every participant. 4 out of 5 optotypes had to be correctly identified by the child to record the visual acuity of that line. Stereo acuity assessment was done binocularly at a distance of 40 cm using Randot preschool stereotest. Polaroid glasses were worn by the child and the figures had to be correctly matched or spelt out to record the values. Plus Optix A09 was held at 1 metre from the child and power readings of both the eyes were recorded simultaneously. If the child had squint, readings were recorded separately for each eye. Dry retinoscopy was performed and the refractive power of eye was determined. Squint measurement with prisms were recorded if needed. Anterior segment examination was done with Slit Lamp Biomicroscope. Homide 2% (Homatropine hydrobromide) was instilled 2 times within an interval of 10 minutes for mydriasis

and cycloplegia. Pupillary reaction was rechecked after 40 minutes to ensure cycloplegia and one more drop instilled if necessary. Cycloplegic refraction was performed by another examiner to reduce the bias. Retinal examination, diagnosis and management followed. The child was considered to have visual impairment if the presenting visual acuity in the better eye with E chart was < 6/12.<sup>16</sup> E chart was chosen for categorising visual impairment as it was the most common chart used for vision screening of pre-schoolers in developing countries.

## STATISTICAL ANALYSIS

The data was analysed using Statistical package for Social Sciences (SPSS) IBM version 15.0 (Armonk, New York, IBM Corporation). Continuous variables were tested for normality using Kolmogorov–Smirnov test. Descriptive statistics was employed. Mean (standard deviation) or Median (Q1, Q3) was computed. Receiver Operating Characteristics Curve (ROC) was used to determine the optimal cut off between the normal and abnormal and validity of the tests determined. A probability value,  $p < 0.05$  was considered statistically significant.

## RESULTS

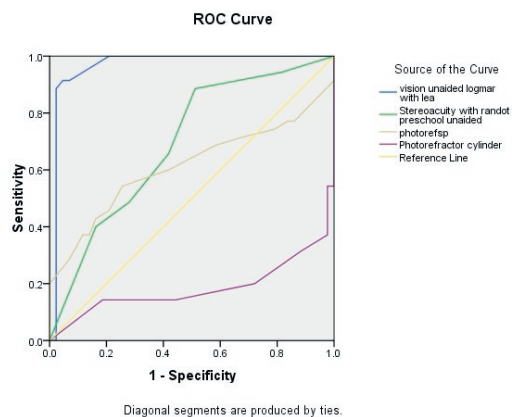
A total of 180 subjects in the age group of 3 to 6 years who visited Ophthalmology OPD were approached during the study period. 100 study subjects fitted into my inclusion criteria and were enrolled for the study.

A total of 200 eyes (100 participants) were used for analysis. 52% were males and 48% were females. Descriptive data on age, vision and stereo acuity is presented in (Table 1).

ROC curve showing the sensitivity of different screening tests is given below. (Figure 1) Sensitivity, Specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) and Area under the curve of all screening tests are reported in (Table 2). Lea symbol chart showed good sensitivity (91.8%), specificity (91.9%), PPV (91.8%) and NPV (91.9%) in detecting visual impairment in comparison to the other tests employed. Area under the curve (0.968) was also high for Lea symbol chart stressing its effectiveness as a screening tool.

**Table 1: Descriptive data on age, visual acuity and stereo acuity of study subjects**

Study variables	Median	(Q1,Q3)
Age ( months)	70	(54,73)
Visual Acuity (metric equivalent) • Lea symbol chart	6/12	(6/7.5 , 6/24)
Stereo acuity (sec of arc) • Randot preschool test	200	(60,800)

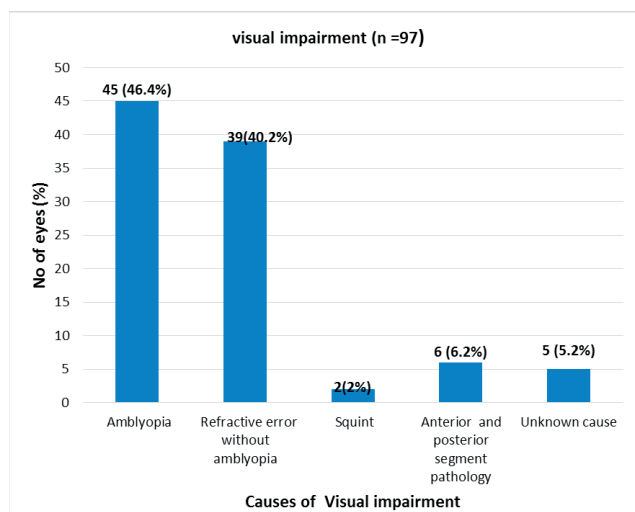


**Fig 1: ROC curve showing the sensitivity of different screening tests for visual impairment detection**

**Table 2: Validity of the different screening tests used for identifying visual impairment**

Screening tests	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	AUC	95% CI
Lea symbol chart	91.8	91.9	91.8	91.9	0.968	(0.922,1.013)
Randot preschool stereo test	56.2	83.3	87.8	47.2	0.638	(0.515,0.761)
Plus Optix A09 sphere value	51.8	50	70.2	31.2	0.596	(0.466,0.727)
Plus optix A09 cylinder value	81.8	68	62.1	85.4	0.195	(0.086,0.305)

\*PPV –positive predictive value, NPV-negative predictive value, AUC-Area under the curve, CI-Confidence Interval



**Fig 2 : Distribution of causes of visual impairment in the study eyes**

In two hundred eyes, 97 (49.5%) had visual impairment .The causes of visual impairments are shown in (Figure 2). Forty five eyes were amblyopic in which thirty nine had refractive, two had mixed and four had vision deprivation amblyopia. Amblyopia and refractive error accounted for 86.6% of the visual impairment .Eighty eyes (82.5%) were prescribed spectacles. On doing chi-square test, no association was observed between gender ( $\chi^2 = 2.1, p=0.345$ ) and age ( $\chi^2 = 0.21, p=0.802$ ) with the visual impairment in the participants .

## DISCUSSION

Braverman et al observed inconsistency in the precision of different screening tests used for refractive error screening in pediatric population. <sup>17</sup> A review article by Alley CL reported tremendous variation in

the preschool vision screening techniques and rates.<sup>18</sup> In her review, Anstice et al recommended Lea symbol, HOTV, Tumbling E for vision assessment of preschool children.<sup>19</sup> Randot Preschool Stereoacuity Test was reported to be the most unfailling stereo test in a study by Afsari and coworkers.<sup>20</sup>

Bertuzzi and colleagues reported the sensitivity, specificity, positive likelihood ratio (PLR) and negative likelihood ratio (NLR) of crowded Lea symbol to detect amblyogenic risk factors to be 96%, 83%, 5.7 and 0.05 respectively.<sup>21</sup> Vision in Preschoolers (VIP) Study Group found that the sensitivity for the Lea Symbol was 61% and HOTV was 46% for detecting  $\geq 1$  VIP Study targeted condition.<sup>22</sup> Omar et al reported that Lea symbol chart showed sensitivity of 97.5% specificity of 45% while Sheridan Gardiner had 57.1% sensitivity and 92% specificity to screen visual impairment in 4 to 5 year olds.<sup>23</sup> At 90% specificity, Lea Symbol test was reported to have 61% sensitivity according to the VIP study group.<sup>24</sup>

In our study, Lea symbol chart had the sensitivity, specificity, PPV and NPV of 91.8%, 91.9%, 91.8% and 91.9% respectively which was much higher than those reported in previous studies. It may be due to the difference in the personnel performing the screening tests, diagnostic conditions and the study settings. Population demographics may also have influence on the values.

Lee et al observed that Lang stereo test and Randot Preschool tests had higher sensitivity (100%) than Titmus (75%) and Randot stereo tests (75%) in children aged 2-3 years.<sup>25</sup> In a study conducted by Farvardin et al, the sensitivity of TNO, Titmus and Randot test were 55.5%, 48.4% and 44.4% in a screening set up. He underscored the fact that stereo tests employed were diverse across studies.<sup>26</sup> According to Ohlsson et al, the sensitivities of Randot E, Titmus and TNO stereo test for the detection of amblyopia were 36%, 38% and 46%.<sup>27</sup> Schmidt P et al reported 0.47% sensitivity and 0.90% specificity for Randot E test in screening refractive risk factors.<sup>24</sup>

We observed Randot preschool test to have sensitivity, specificity, PPV and NPV of 56.2%, 83.3%, 87.8% and 47.2% respectively. It may be due to the differences in the personnel who screened, age of study subjects, settings, visual deficits studied and different stereo tests employed. There is inconsistency in the results reported by various authors.

The Plusoptix A09 was found to have 89% sensitivity and 80% specificity for identifying amblyogenic risk factors (ARF) in a study by Silbert et al and reported it to be a reliable screening device.<sup>28</sup> Plusoptix A09 demonstrated 94%, 89%, 11% and 6% sensitivity, specificity, PPV and NPV for sensing ARF by lay screeners and had massive implications in community eye care.<sup>29</sup> Plusoptix A09 showed a sensitivity of 94.9% and specificity of 67.5% for spotting refractive amblyopia risk factors and 40.7% and 98.3% for strabismus detection in children aged 2 to 14 years in China.<sup>30</sup> In our study the sensitivity, specificity, PPV and NPV for Plus optix A09 (spherical and cylindrical values) were 51.8%, 50%, 70.2%, 31.2% and 81.8%, 68%, 62.1% and 85.4% respectively. It was less than the reported results. This might be because the values obtained in the instrument depended on the illuminance profile and its conversion to dioptres. Hence, it may vary based on different ethnicity and also the diagnostic condition used. Intra and inter subject variability in measurements reported by Shrikant et al may also be a contributing factor.<sup>31</sup> The age range of subjects were also varied across studies.

Our findings may not be generalizable as it was hospital based. It can benefit in designing population based studies in India to endorse the results and to determine the prevalence of visual impairment of pre-schoolers.

## CONCLUSION

Lea symbol chart was highly sensitive to pick up visual impairment of pre-schoolers in comparison with Randot preschool test and Plusoptix A09.

**Conflict of Interest :** Nil

**Source of Funding:** Partly supported by India Vision Institute and JSW Foundation

**Ethical Clearance** -Obtained from Institutional Ethics Committee, Kasturba Hospital, Manipal

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# Role of Intramuscular Injection of Prostodin in Cervical Priming in Cases of First Trimester Abortion

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## ABSTRACT

Suction evacuation is widely used method for MTP in first trimester. Mechanical cervical dilatation during this procedure is probably the most critical step. Difficult cervical dilatation causes incomplete evacuation, cervical laceration and uterine perforation. Prior cervical priming with pharmacological agents like prostaglandins, makes the procedure easier with reduced complication rate.

**Aim:** The purpose of present study is to evaluate the efficacy of intramuscular injection of prostodin on cervical priming prior to mechanical dilatation in first trimester abortion.

**Material and Method:** A Prospective study using intramuscular injection of prostodin which was administered to 100 patients and compared with 100 patients in which no injection was given prior to suction evacuation.

**Result and Discussion:** Most of the cases were in between 21 and 30 years of age (84% in both the groups). Maximum number of cases belonged to 2<sup>nd</sup> and 3<sup>rd</sup> order parity, i.e. 75% and 70% for study and control group respectively. 50% and 56% cases were of 6 to 8 weeks of gestation in study and control group respectively. Socioeconomic reason was main indication for MTP in both the study and control group (72% and 60% respectively). Mean cervical dilation was significantly more in study group (7.9mm) in comparison to control group (2.3 mm).

In 84% of study group cases only mild resistance was noticed. In control group 64% cases revealed severe resistance. Blood loss was minimal (<80 ml in 80%) in comparison to control group (80-120 ml in 64% cases).

Most of the cases in the study group required less than 10 minutes for operation (94%).

Postoperative complications were minimal in study group

**Conclusion:** The procedure of MTP can be made easy and more effective by preoperative intramuscular injection of prostodin as it causes easy and complete cervical dilatation with reduced duration of operation and minimal blood loss.

**Keywords:-** Prostodin, MTP, misoprostol, cervical dilatation.

## INTRODUCTION

Abortion is defined as termination of pregnancy before foetus has attained viability, that is before 20 weeks.

Cervical dilatation before suction evacuation is probably the most critical step of the procedure<sup>1</sup>.

In this procedure mechanical dilatation offers a lot of resistance. A method is thus required by which the

resistance offered by cervical os can be reduced during surgical evacuation.

Very often conventional rigid dilatation by metal or plastic dilators leads to injury. Natural hydrophilics like age old sea weed, laminaria degilation, dilapan MgSO<sub>4</sub> tent were used for cervical dilatation prior to surgical evacuation.

These tents have their own limitations and side effects like longer-hospital stay and increased chance of

ascending infection.

Our aim should be to achieve gradual atraumatic dilatation of cervix to the extent required and it should be reversible. The adjuvant helps in achieving all these benefits, reduction in cervical trauma, uterine perforation, reduction in duration of the procedure, thereby decreasing pain and blood loss. The method should be simple enough to be used with minimal staff and limited facilities available in small hospitals.

Prostaglandins are widely being used for their ability to initiate and maintain uterine activity at all stages of gestation. They have been tried by many routes, viz. intravenous, intramuscular, intraamniotic and extra amniotic, oral, vaginal, and suglingual. Prostaglandins alter the composition of collagen ground substance at the internal os thereby reducing the cervical resistance. Thus prostaglandins may be helpful for cervical priming prior to mechanical dilatation of cervix in first trimester abortion by initiating uterine contraction and dilatation of the cervix.

One of the most widely used prostaglandin synthetic analogue is Carboprost Tromethamine (15-methyl Prostaglandin F<sub>2α</sub>) commonly known as Prostodin. This drug is given intramuscularly for cervical priming<sup>2,3,4</sup>.

The purpose of present study is to evaluate the efficacy of deep intramuscular injection of Prostodin on cervical priming prior to mechanical dilatation in first trimester abortion.

### **AIMS AND OBJECTIVE**

The Present study “Role of Intramuscular Injection of prostodin in cervical priming in cases of First Trimester Abortion”, has been conducted with the following aims and objectives:

(1) To assess the efficacy of prostodin as safe and noninvasive agent to achieve cervical priming prior to evacuation in cases of first trimester abortion.

(3) To assess the role of prostodin as an adjuvant for safe and successful first trimester termination of pregnancy.

### **MATERIAL AND METHOD**

The present study “role of intramuscular injection of prostodin in cervical priming in cases of first trimester abortion”, was a prospective study, carried out in the

department of obstetrics and gynaecology in ‘Gajra Raja Medical College and Associated Kamla Raja Hospital from June 1995 to June 1996.

Participants for study were selected in two groups; one group consisting of 100 patients was selected as study group and another group of 100 patients served as control group.

**Inclusion Criteria:-**

(1) Patients with uterine size equal to or less than 12 weeks.

**Exclusion Criteria:-**

(1) Patients having malignancy.

(2) The patients having following diseases were excluded:

a. Epilepsy,

b. Acute PID,

c. Systemic diseases like cardiac, pulmonary, renal or hepatic.

(3) Patients having hypersensitivity to prostodin.

(4) Bronchial asthma.

After admission the patients were completely worked up in the form with detailed history including complaints, menstrual, obstetrical, family and personal history and complete examination including general, systemic, per-abdominal and per-vaginal examination.

Prostodin is a synthetic analogue of naturally occurring prostaglandins. F<sub>2</sub> chemically is tromethamine salt of 15-(S)-15 methyl PGF<sub>2α</sub>. Each ampoule of prostodin contains 250 microgram of carbaprost tromethamine salt and should be stored at 2-4° C.

The content of one ampule was drawn into a syringe and an optimal test dose of 0.4 ml of prostodin administered deep into the gluteal region after prior cleaning the area with a spirit swab to check for hypersensitivity.

If no hypersensitivity was observed, remaining dose of 0.6 ml of prostodin was also given 15 minutes later deep intramuscularly.

If the patient developed hypersensitivity reaction in

the form of breathlessness, sweating or palpitation then the remaining dose was not given and discarded.

Patients were observed for the following side effects:

- (1) Nausea, vomiting and diarrhoea.
- (2) Lower abdominal pain.
- (3) Per-vaginal bleeding.

Injection metoclopramide hydrochloride 10mg was administered intramuscularly half an before the Inj. Prostin to minimize nausea and vomiting. Tablet lomitol (Diphenoxylate hydrochloride 2.5 mg and Atropine sulphate 0.25 mg) was given whenever the patient had diarrhoea.

After 3 hours of administration of prostodin

injection termination of pregnancy was done by dilatation and evacuation under intravenous sedation.

Following observations were noticed in both study and control group.

- (1) Cervical dilatation.
- (2) Resistance offered during mechanical dilatation.
- (3) Time taken.
- (4) Amount of blood loss .

### RESULTS

Results were analysed according to Age, Indication of MTP, Preoperative side effects, Cervical dilatation, Resistance noticed, Blood loss, Time taken during operation, Postoperative complication

Following observations were made.

**TABLE 1-DISTRIBUTION OF CASES ACCORDING TO AGE**

Age Groups (in years)	Study Group		Control Group	
	Number	Percentage	Number	Percentage
<21	8	8	10	10
21-25	48	48	44	44
26-30	36	36	40	40
31-35	8	8	6	6
Total	100	100	100	100

In both the study group as well as control group percentage of cases in each age group was almost similar.

Most of the cases were in between 21 and 30 years of age. Youngest age recorded was 18 years and oldest age recorded was 35 y

**TABLE-2 DISTRIBUTION OF CASES ACCORDING TO GESTATIONAL AGE**

Gestational Age	Study Group		Control Group	
	Number	Percentage	Number	Percentage
4-<6 weeks	16	16	18	18
6-<8 weeks	50	50	56	56
8-12 weeks	34	34	26	26
Total	100	100	100	100



Cases with gestational age 8-12 weeks were 34% and 26% in study and control group respectively.

**TABLE-3 DISTRIBUTION OF CASES ACCORDING TO INDICATION OF MTP**

Indication of M.T.P.	Study Group		Control Group	
	Number	Percentage	Number	Percentage
Socioeconomic	72	72	60	60
Spacing	20	20	24	24
Contraceptive Failure	6	6	8	8
Illegal	2	2	8	8
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

In both the study and control group, in majority of the cases, MTP was done for socioeconomic reason. Next common indication was for spacing.

**TABLE-4 DISTRIBUTION ACCORDING TO PREOPERATIVE SIDE EFFECTS**

Preoperative Side Effects	Study Group		Control Group	
	Number	Percentage	Number	Percentage
Nausea	8	8	-	-
Nausea and vomiting	12	12	-	-
diarrhoea	2	2	-	-
Fever	Nil	Nil	-	-
Rashes	Nil	Nil	-	-
Bleeding	Nil	Nil	-	-
Pain in abdomen	6	6	-	-
Bronchospasm	Nil	Nil	-	-
Any other	Nil	Nil	-	-

The most common side effect observed after injection of prostodin was nausea and vomiting, i.e. 12%. Other side effect like only nausea in 8% of cases, diarrhoea in 2% and pain in abdomen in 6% of cases were observed.

**TABLE-5 DISTRIBUTION OF CASES ACCORDING TO CERVICAL DILATATION**

Cervical Dilatation(mm)	Study Group		Control Group	
	Number	Percentage	Number	Percentage
<4	4	4	92	92
4-6	10	10	8	8
7-8	56	56	-	-
9-10	18	18	-	-
11-12	12	12	-	-
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

Mean cervical dilatation was significantly more in study group (7.9mm) in comparison to control group (2.3 mm).

**TABLE-6 DISTRIBUTION OF CASES ACCORDING TO THE RESISTANCE NOTICED DURING OPERATION**

Resistance noticed	Study Group		Control Group	
	Number	Percentage	Number	Percentage
Mild	84	84	2	2
Moderate	16	16	34	34
Severe	Nil	Nil	64	64
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

In 84% of study group cases only mild resistance was noticed ,only 16% cases revealed moderate resistance while severe resistance was not felt in any case. In control group 64% cases revealed severe resistance.

**TABLE-7 DISTRIBUTION OF CASES ACCORDING TO AMOUNT OF BLOOD LOSS DURING OPERATION**

Amount of blood loss (in ml)	Study Group		Control Group	
	Number	Percentage	Number	Percentage
Upto 40	36	36	10	10
40-80	46	46	26	26
80-120	18	18	56	56
More than 120	Nil	Nil	8	8
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

Amount of blood loss was more in control group in comparison to the study group.

**TABLE-8 DISTRIBUTION OF CASES ACCORDING TO THE TIME TAKEN DURING OPERATION**

Time Taken (in min.)	Study Group		Control Group	
	Number	Percentage	Number	Percentage
<5	20	20	1	1
5-10	74	74	10	10
11-15	6	6	79	79
>15	Nil	Nil	10	10
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

In majority of the cases of study group time taken during operation was 5-10 minutes while in most of the cases in control groups time taken during operation was 11-15 minutes.

## DISCUSSION

With the legalization of abortion in many countries including India, the demand for therapeutic abortion has greatly increased and considerable research efforts are now being directed to determine the extent and nature of medical risks associated with cervical damage

which increases the risk of premature births, still births and spontaneous abortions in subsequent pregnancies, therefore the method of dilatation is more important in preventing the immediate and delayed complications of abortion than the method of evacuation.

Some of these complications e.g. cervical injury and uterine perforation are directly related to the mechanical dilatation necessary for the procedure<sup>5</sup>, where as other complications e.g. haemorrhage and incomplete evacuation of pregnancy may be due to insufficient or difficult dilatation. However these complications can be avoided by a method that allows natural and slow dilatation of cervix. The use of laminaria tent for gradual dilatation of the cervix has been practiced for years but is not without any drawbacks<sup>6</sup>. The insertion and removal is not always easy, and complications such as displacement of the tent inside the uterus and perforation of uterus may occur<sup>7</sup>.

The two medications misoprostol and inj carboprost are as effective as a surgical method in the first trimester<sup>8,9</sup>.

Thus intramuscular injection of prostodin a tromethamine salt of synthetic PGF<sub>2</sub> $\alpha$  was used to achieve cervical dilatation prior to surgical dilatation and evacuation.

In total 200 cases were taken, 100 cases comprising study group, one injection of intramuscular prostodin was given three hours prior to operation and another 100 cases were taken as control cases in which no injection was given prior to operation.

In the present study maximum number of cases studied in study group as well as control groups belonged to 21 to 30 years of age, i.e. 84% in each group, i.e. study and control group.

In a similar study by rita nayak et al<sub>10</sub> similar results with over 30% of women being in the age group of 20-30yr. This was corroborated by banerjee et al and shetty et al who also reported a high number of cases in the same age group and all being multigravid<sup>11,12</sup>.

In the present study maximum number of patient in both study and control group were belonging to gestational age of 6-8 weeks i.e. 50% and 56% respectively while 34% and 26% patients were of 8-12 weeks of gestational age in the study and control group respectively.

Krofta et al and munde et al<sup>13</sup> reported cases below 9 weeks of gestation.

In the present study in both the study and control group the indication for M.T.P. in maximum number of cases was due to socioeconomic reasons i.e. 72% and 60% respectively, while next common indication of M.T.P. was spacing, i.e. 20% and 24% cases respectively.

The most common side effect observed after injection of prostodin was nausea and vomiting, i.e. 12%. Other side effects like only nausea in 8% of cases, diarrhoea in 2% and pain in abdomen in 6% cases were observed.

S. Fussey et al (1990) studied 30 patients with period of gestation 8-12 weeks, the incidence of diarrhoea and of vomiting was 13.33% and 20% respectively.

In 92% cases of control group, cervical dilatation was less than 4 mm and in 8% cases 4-6 mm while in study group cervical dilatation was much more in majority of the cases i.e. 7-8 mm in 56%, 9-10 mm in 18% and 11-12 mm in 12% of the cases.

Similar to study by S. Fussey et al (1991) who reported this much dilatation in 93.3% cases<sup>14</sup>.

Mean cervical dilatation (7.9 mm) obtained in the study group of our study is more or less similar to that obtained by Mishra et al (8.0 mm) because of the fact that the patients used by both were of similar gestational age, i.e. 6-12 weeks and 6-14 weeks respectively<sup>15</sup>.

In majority of the cases of study group only mild resistance was felt for further dilatation during operation minimising the complications related to cervical dilatation.

While in control group, in 64% of cases severe resistance was felt.

Majority of cases in study group had blood loss less than 80 ml i.e. 82% (including 36% cases in those blood loss was less than 40 ml) while in control group most of the cases, i.e. 64% revealed blood loss 80-120 ml or >120 ml. Thus average blood loss was less in study group in comparison to control group.

Mean blood loss on our study was 52.8 ml in study group which was significantly less than the mean blood loss of control group i.e. 84.8 ml. Thus we observed

that the blood loss during operation gets significantly reduced after giving intramuscular prostodin injection 3 hours prior to operation<sup>16</sup>.

In the majority of the cases of study group the time taken for operation was between 5-10 minutes or less than 5 minutes while in control group the operation time was 11 to 15 minutes or more than 15 minutes in majority of cases, i.e. 89%.

### CONCLUSION

The procedure of M.T.P. can be made easy and more effective by preoperative intramuscular injection of prostodin so that easy and complete cervical dilatation can be achieved, duration of operation can be cut short or reduced with minimal loss of blood during the procedure.

**Conflict of Interest-** Nil

**Source of Funding-** Nil

**Ethical Clearance-** Taken From IEC.

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# A Study on the Prevalence of Alcoholism among Males in Rural Areas and its Impact

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## ABSTRACT

Alcoholic beverages have been a part of social life for millennia and it has been difficult for the societies to understand and restrain its use. Prevalence of alcoholism in India shows wide variations. Although the prevalence is comparatively low, the signature type of drinking prevailing among Indian males is the frequent and heavy drinking, preferably spirits. Alcohol use results in various medical, psychological and social consequences apart from giving enormous economic burden to the drinkers. Mere estimation of the alcoholics in a community is not warranting without assessing the social, psychological menace it creates and measuring the economic burden it gives to the individual, family and in turn the entire nation. This prompts the importance of taking up this study which will be an eye-opener for the public to get the awareness regarding the real burden of the alcoholism and to the policy makers, public health leaders and government agencies regarding the importance of focusing on the intervention and prevention strategies of alcoholism.

**Keywords:** Prevalence of Alcoholism, Indian Males, Psychological Menace, Social Consequences.

## INTRODUCTION

Alcohol consumption has undergone improvisations and sophistication close in lines with social and economic changes in a community starting with consumption of native liquor to establishment of international trading alliances for alcohol worldwide. This classifies alcohol consumption from being a cultural habit to social drinking to alcohol addiction and dependency. Long-term alcohol consumption is linked to a wide variety of social problems such as family disruption, marital disharmony, impact on children, deprivation of the family, work absenteeism, growing rates of crime and violence, etc. and health problems such as cirrhosis of the liver, road traffic injuries, cancers, suicides etc <sup>1</sup>. Nation-wide prevalence of alcohol use was documented by the National Survey of Drug Use in India and the prevalence of alcoholism among adult males was found to be 21% <sup>2</sup>. The recent analysis of prevalence of alcoholism by National Family Health Survey (NFHS) -3 reveals a prevalence of 43.8% in Tamil Nadu<sup>3</sup>.

One of the studies done in rural south India among 180 women revealed 95% of the women attributing

alcohol consumption to domestic violence <sup>4</sup>. Such studies can be a useful indicator of the magnitude of a health care problem and how that problem compares with others. The economics of alcohol has a multidimensional approach looking from the consumption patterns both at the national level, the stake-holders level and at the individual level. The objectives of the present study are, to estimate the prevalence of alcoholism and various types of alcoholism among males in a rural area and to assess the association between the socio-demographic characteristics and alcoholism.

## PREVALENCE OF ALCOHOLISM IN INDIA

In India, alcohol use has been a growing public health problem with immense ramifications to the individual and the society. In a National Household Survey carried out of non-institutionalized males in 24 states between the ages of 12-60 years covering both urban and rural population, 21.4% were current users of alcohol <sup>5</sup>. It estimated that there were approximately 62.46 million alcohol users in this age group. The trends of alcohol consumption among the younger generation shows that alcohol is consumed more for the pleasure

and psychological effects produced. The pattern of consumption reveals increased drinking for intoxication and binge drinking. The gender related implications of alcohol use have been largely neglected during the recent times. In India, the direct measures of estimating the alcohol intake among women have been unyielding.

**Alcohol-Related Problems**

New evidence underscores the need to recognize alcohol use as one of the risk factors for many communicable and non-communicable diseases as well as for accidents, injuries domestic and social violence. There is also growing emphasis on different patterns of drinking influencing the type of outcomes, e.g. long-term, high quantity drinking (dependence) causing liver damage, while acute intoxication (binge drinking) is linked to accidents and injuries. There is a lack of information regarding the prevalence of various types of alcoholism and problem drinking along with the psychosocial and economic aspects of drinking, especially in this part of the region. To highlight these problems, the present study was carried out.

The study was conducted in the area of Nemam which is one of the field practice area of Sri Ramachandra Medical University. Separate sampling frame for each panchayats were made by enumeration of the males in the voters list. Males of 18 years and above in each panchayats were given unique numbers. From these unique numbers, the required numbers of males calculated as per Probability Proportion to sampling method were chosen by the computer generated table of random numbers. From this unique identification numbers, individual samples were picked using Simple Random Sampling method by the computer generated table of random numbers by the “Stat-trek-Random number generator”. Similar method of selection was applied for all the other panchayats in the study area. Males of 18 years or more, residing in the study area for a minimum of 6 months were included in the study. Sampling frame was obtained from the voters list. The study population was selected by simple random sampling method. The sample size required was 545. Hence 568 men were contacted since 23 men refused consent for the study. The 545 men who gave signed informed consent were included in the study.

**DEMOGRAPHIC CHARACTERISTICS**

The mean age of the study population was 41.9 ±

15.4 years. In this study, 25% men were in the age group of 35-44 years, followed by 19.4% and 19.1% men in the age group of 25-34 and 45-54 respectively. Majority of the study population were Hindus 81.7%, followed by Christians 15.0% and Muslims 3.3%. Among the study subjects, 67.2% men were married as compared to unmarried 28.4% and widower 4.2%. As per the type of the family, 55.6% of the study populations were in nuclear family, followed by 29.4% and 15% in extended nuclear and joint families respectively. (Table.1)

**Table 1: Demographic characteristics**

Characteristics	Number of men (N=545)	Percentage (%)
Age in years		
18-24	84	15.4
25-34	106	19.4
35-44	135	25.0
45-54	104	19.1
55-64	57	10.5
65 and above	58	10.6
Religion		
Hindu	445	81.7
Muslim	18	3.3
Christian	82	15.0
Others	0	0
Marital status		
Unmarried	155	28.4
Married	366	67.2
Widower	23	4.2
Separated/Divorcee	1	0.2
Type of family		
Nuclear	303	55.6
Extended Nuclear	160	29.4
Joint	82	15.0

**SOCIOECONOMIC CHARACTERISTICS**

In this study, 12.7% men were illiterate whereas 87.3% were literate. Among the literates, 24% men had an educational qualification of higher secondary or diploma, followed by high school 22.8%, primary school 11.9% and graduates 11%. In this study, 91.9% men were employed. Based on the United Kingdom

Registrar General Occupational Classification<sup>6</sup>, majority of this men were employed in semiskilled occupation (33.6%), followed by skilled (29.9%) and unskilled (17.4%) occupations. The socioeconomic status of the study population was classified based on the Modified Prasad's Classification of per capita income of rural people into 5 classes<sup>7</sup>. As per the calculated values for modified Prasad classification, majority of the participants (51.6%) belong to class II socio economic status, followed by (41.5%) and (6.1%) men in class I and III respectively. The mean monthly per capita income of the study participants was 3072 ± 1697 INR. Majority of the participants have a high SLI (50.8%) based on the Standard of Living Index. (Table.2)

**Table 2: Socioeconomic characteristics**

Characteristics	Number of participants (N=545)	Percentage (%)
Educational qualification		
Illiterate	69	12.7
Primary	65	11.9
Middle school	88	16.1
High school	124	22.8
Higher secondary/Diploma	131	24.0
Graduation	60	11.0
Post graduate	8	1.5
Occupation		
Unemployed	44	8.1
Unskilled	95	17.4
Semi-skilled	183	33.6
Skilled	163	29.9
Semiprofessional	55	10.1
Professional	5	0.9
<b>Socioeconomic status *(Modified Prasad's classification)</b>		
Class I	226	41.5
Class II	284	52.1
Class III	33	6.1
Class IV	2	0.4
Class V	0	0
Standard of living index		
Low	64	11.7
Medium	204	37.4
High	277	50.8

\* I: INR above 3041, II: 1470-3040, III: 870-1469, V: < 450. Calculated from –

Consumer price index for rural Tamil Nadu – 617 INR, Correction factor – 30.41.

## DISCUSSION

This cross sectional study was done to find out the prevalence of alcoholism and various risk levels of drinking among rural males and its psychosocial and economic impact. As far the problem drinking, there are no studies in the state of Tamil Nadu assessing the psychosocial problems of drinkers at the community level rather than assessing in the hospital setups. Rural males of age 18 years and above were included in the study as it is the legal age for drinking in the state of Tamilnadu. The mean age of the study population was 41.9 ± 15.4 years, with 87.3% literates, 67.2% married and 51% doing unskilled and semi-skilled occupations. The mean monthly per capita income of the study participants was 3072 ± 1697 INR with 50.8% of them having high standard of living.

### Prevalence of Alcoholism

The prevalence of alcoholism among rural men in this study, assessed using AUDIT was found to be 37.8%. Similar findings were reported by Pillai et al., (2013) with a prevalence of 39% among rural males in Goa<sup>8</sup>. Sundaram et al., (1984) had reported that 36.1% of rural males were alcoholics in the Ajmer district of Rajasthan<sup>9</sup>. Hazarika et al., (2000) had reported a prevalence of 39.4% among rural men in north-eastern states of India<sup>10</sup>. Prevalence studies by Dhupdale et al., (2006) and Sampath et al., (2007) revealed a prevalence of 49% and 25.7% respectively among rural males<sup>11,12</sup>. John et al., (2009) had reported 34.8% in Kaniyambadi in Tamilnadu<sup>13</sup> whereas Kavita et al., (2010) had a finding of 45% prevalence in the rural areas near Bangalore<sup>14</sup>.

Majority of the alcoholics were adults and middle aged men with 27.2% in the age group of 25-34 years followed by 24.8% in the age group 35-44 years. This alarming finding proves the transition of mind-set prevailing in the society especially among the younger generation that drinking is no longer a sinful act. Around 60% of the alcoholics had education less than middle school, with 22.8% having primary level education and 17% being illiterates. The poor educational background among these drinkers had indeed prevented them to overcome the clutches of the drinking menace. Another finding is the high prevalence levels among the semi-skilled workers (38.3%) and unskilled workers (36.4%).

Drinkers doing these manual labours (semiskilled and unskilled) were found to be at a greater risk for alcoholism compared with drinkers doing skilled and professional jobs (odds ratio [OR] 4.3). This is indeed a major concern as in our country most of the unskilled and semiskilled labourers are daily wagers or being paid on weekly basis. So if these workers have the drinking habit it will wallop their major share of income for drinks and will seriously hinder their family economically, further keeping them in poverty.

### Alcohol dependence

In this study, 14.3% of the rural men were found to be alcohol dependents. Similar findings were reported by Ghosh et al., (2012) with 14%, and D'Costa et al., (2007) with 15% as alcohol dependents<sup>15,16</sup>. Kavitha et al., (2010) reported a prevalence of alcohol dependents to be 12.9% whereas Chavan et al., (2007) had a finding of 13%<sup>14,17</sup>. Jagajeet Singh et al., (2000) had a finding of 17.2% alcohol dependents among rural males<sup>18</sup>. Majority of alcohol dependents were in the young and middle age group, with 33.3% and 21.8% in the age groups of 35-44 and 25-34 years respectively. With a fair-share of the productive age group reeling as alcohol dependents, it is a major concern to the society, apart from already affecting his family. Majority of the alcohol dependents (57.7%) were unskilled workers showing that these men, who were already in a rather poor state economically, further deplete themselves by spending much for their drinks. With one-sixth of the rural men found to be alcohol dependents, leading them to a host of familial, social and health problems, it will indeed break the back bone of the Indian economy which is predominantly a rural-based one.

### CONCLUSION

The prevalence of alcoholism was found to be 37.8%, with 14.3% were alcohol dependents. Current drinkers were 58.7% which included 20.9% of normal drinkers. Problem drinkers were 21.8% of the rural males with 18% having liver cirrhosis, 17% having spousal problems, 5% lost their jobs, 5% caught for drunken driving and 3.9% had been arrested for their drunken behavior. Majority of the drinkers (79.1% of alcoholics and 94.1% of problem drinkers) concurrently used tobacco and alcohol. Doing manual labour (OR 4.3; 95% confidence interval [C.I.] 2.9-6.4) and having low standard of living (OR 18.2; 95% C.I. 8.9-37.1)

were found to be at higher risk for alcoholism. This study gave an opportunity to assess the various levels of drinking prevailing in a rural community and also portray the psycho-social and economic burden faced by the drinker. The magnitude of the alcohol menace among rural men assessed by this study will in turn be an eye opener for the public to get the awareness regarding the real burden of the alcoholism and to the policy makers, public health leaders and government agencies regarding the importance of focusing on the intervention and prevention strategies of alcoholism. To effectively combat the alcohol-related problems, it is high time we need to formulate a public health approach in such a way that it must amalgamate new generation screening technologies and low-cost early intervention strategies.

**Conflict of Interest:** Authors declares that he/she has no conflict of interest not received any fund for this work. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee.

**Informed consent:** Informed consent was obtained from all individual participants included in the study. Written informed consent in Tamil was obtained from the study participants prior to the interview. After obtaining the informed consent, the participants were interviewed using the questionnaire. After collecting the demographic and standard of living index of the individual participant, data regarding pattern of drinking, place of health care for treating alcohol-related problems and the economic cost of alcohol use were obtained from them. The participants were individually briefed and created awareness about the harmful effects of alcoholism and its economic burden. Alcoholics and the problem drinkers were referred to the nearby Primary Healthcare Centre for further evaluation and management.

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# Mitigation of Perceived Stress and Enhancement of Quality of Life among Female Adolescents Using Meditation on Twin Hearts

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## ABSTRACT

**Background:** Stress among adolescents is one among top health concerns in the world. To de-stress a 20 minutes guided Meditation on Twin Hearts (MTH) is introduced for female adolescents and its effects are being studied.

**Aim:** The present study aimed to understand the efficacy of MTH on perceived stress and QOL among female adolescents.

**Setting and design:** This study included 163 female adolescents of age group 15 to 19 years, with a mean age of 15.91. Among them 79 subjects were allotted to the experimental group, while the remaining 84 in the control group.

**Method:** Questionnaires were used to assess the perceived stress (Cohen's perceived stress scale) and QOL (KINDL-R) of subjects before and after meditation practice for a period of one month. Also, an open ended questionnaire was administered to record meditative experiences.

**Statistical analysis:** Descriptive statistics and inferential statistics were employed.

**Results:** A significant decrease in the perceived stress levels, a significant increase in the overall QOL were observed in the experimental group compared to the control group. Changes were also seen in the various domains of QOL after meditation practice.

**Conclusion:** MTH was found to be useful in improving female adolescent mental health and QOL.

**Keywords:** *Meditation on Twin Hearts, Quality of Life, Perceived stress, Adolescents.*

## INTRODUCTION

Stress is a common negative outcome associated with interpersonal conflicts, role strains and issues with self-esteem<sup>[1]</sup>. Stress among adolescents is one among top health concerns in the world. It has been attributed to various separation-individualisation processes that take

place, during disengagement from family dependencies in pursuit of becoming a more functioning member of the greater society<sup>[2]</sup>. The impact of these conflicts displays itself through low self-esteem and inadequacy to handle interpersonal relationships<sup>[1]</sup>.

According to the UNICEF, late adolescent girls tend to be at greater risk than boys of negative health outcomes, including depression. These risks were found to be often magnified by gender based discrimination and familial relationships dependency<sup>[3]</sup>. Students in hostels face issues which are sometimes unidentified. Even though these issues get resolved within a few

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months, some of the students may find difficulty in adapting to the new environment. This may bring down their QOL, their attention to everyday activities and increase their levels of stress.

Meditation and Pranayama can quickly bring the mind to the present moment and reduce stress<sup>[4,5]</sup>. Meditation is known to be a medium to self-regulate the mind, which emphasize relaxation, concentration, an altered state of awareness, and maintenance of self-observing attitude<sup>[6]</sup>. During meditation, the practitioner is fully alert, aware, and in control of one's faculties without any unwanted thought activity experience<sup>[7]</sup>.

Meditation on Twin Hearts or (MTH) is a form of meditation technique developed by Master Choa Kok Sui. It aims at achieving cosmic consciousness or illumination using loving kindness<sup>[8]</sup>. The twin hearts refer to the heart chakra, the centre of the emotional heart, and the crown chakra, the centre of the divine heart. Chakras are very important constituents of energy body. The chakras interpenetrate and extend beyond the visible physical body. MTH helps in activating the chakras or energy field of the body. With this meditation practice, a person's major chakras become developed in balance, making the person harmoniously balanced. Regular practice of MTH makes one's major chakras and auras larger in size, making the body stronger and more dynamic. MTH helps to improve positive thinking & human relationship, which translates into effectiveness and productivity at work<sup>[8]</sup>.

When an individual meditates on the twin hearts, the crown chakra receives the divine energy from where it is distributed to all other parts of the body. The prayer of St. Francis of Assisi which uses many states of positive experiences such as love, joy, pardon, forgiveness, hope, faith, empathy and gratitude is also included in the meditation. When practitioner engages in these positive experiences, a positive state of being is briefly established. A temporary expansion of practitioner's major chakras and inner aura happens with the descent of the divine energy, but with daily practice the expansion may become permanent which also manifests in greater healing, wellness, inner strength and tranquillity<sup>[8]</sup>.

Benefits of MTH have been reported by few researchers. Experienced meditators, practicing MTH showed increased gamma activation in regions related to empathy and focused attention when compared to

novice meditators using sLORETA analysis. Pre-post meditation scores after MTH for experimental groups showed more robust changes in anxiety reduction and increase in happiness<sup>[9]</sup>. Reduction in stress levels of students practicing MTH using an electroencephalogram (EEG) analysis has been reported<sup>[10]</sup>. The present study highlights the importance of practicing MTH on daily basis by female adolescents to overcome stress. It will help us to understand the effect of meditation on the psychological wellbeing of female students through their QOL, and perceived stress levels.

## METHOD

### Research design

A pre-test and post-test design was used. Perceived stress and QOL among the subjects were measured before the implementation of the study and after one-month MTH practice. The experiences of the participants, during and after the meditation were recorded and analysed.

### Operational definitions

**Health Related Quality of life (HRQOL).** HRQOL is understood as a multidimensional construct covering physical, emotional, mental, social, cultural and behavioural components of well-being and function as perceived by an adolescent<sup>[11]</sup>.

**Perceived stress.** An individual's perception of stress, from a variety of recently experienced events and hassles occurring in three important academic, family, and social domains during college life.

### Sample

The sample consisted of 163 female adolescents (15 to 19 years) residing in a Government hostel in Mysuru, with a mean age of 15.91 years, of which 79 subjects were chosen as experimental group, while the remaining 84 were included in the control group.

### Tools

**Socio-Demographic Form.** The self-prepared form was used to gather all the necessary information of the participants, to filter the candidates based on the inclusion and exclusion criteria of the study.

**KINDL (R), Ravens-Sieberer, U. & Bullinger, M. (1998)** was used to assess the quality of life of the

subjects. Cronbach's alpha reached values of around .70 for most sub-scales, while the overall scale displayed a consistency coefficient of over .80<sup>[12]</sup>.

**Cohen's Perceived Stress Scale (1983)** was used to assess the stress among considered for the study. This scale has 14 items totally. Cronbach's alpha of the PSS-14 was >.70, the test-retest reliability value of >.70 and the exploratory factor analysis for the PSS-14 indicated that a two-factor structure was more dominant than a one-factor structure<sup>[13]</sup>. Open ended questionnaire was administered to record participants' experiences during and after MTH.

### Procedure

Permission was taken from the Post-Metric hostel authorities and Social Welfare Department, Government of Karnataka to conduct the study for a period of one month. Female adolescents from the hostel were briefed about the study and were randomly allocated to two groups using the fish bowl technique. The MTH meditation theory and the procedure were next introduced to the experimental group<sup>[8]</sup>. A demonstration of the practice was given and they were supervised till they could do the practice on their own, using an audio system. The Experimental group participants were asked to practice physical exercises for 5 minutes followed by MTH for 20 minutes, 5 days a week. The Control group participants were asked to practice physical exercise for 5 minutes followed by book study for 20 minutes. After one month the post test data was collected from both the experimental and the control groups and analysed. Repeated measure ANOVA and chi-square tests were used to assess the data. SPSS version 20.0 software was used for data analysis.

### RESULT

The results of MTH on perceived stress and QOL among the participants before and after the meditation are provided in Table 1. The various responses were coded into physical, psychological and bioplasmic domains, and chi-square test was used to check the significance level.

The table shows that there has been a differential effect on both groups after a period of one month. After practicing meditation, the experimental group recorded a significant decrease whereas the control group experienced an increase in perceived stress

scores ( $F=4.639$ ,  $p=.033$ ). Similarly, the experimental group showed a significant improvement while the control group recorded a decrement in the overall QOL ( $F=8.177$ ,  $p=.005$ ). In comparison to the control group, the experimental group had a significant improvement in the self-esteem ( $F=16.229$ ,  $p=.000$ ) and the family ( $F=4.557$ ,  $p=.004$ ) domains.

Various experiences during meditation given by the participants are shown in Table 2. The experimental group participants' physical responses of feeling energised, feeling of warmth and sensation of energy flowing were significant. The experimental group participants recorded significant psychological responses of feeling of happiness and enthusiasm, feeling of peacefulness and an improved relationship with all. On the bioplasmic domain, feeling of a magnetic force, feeling of energy flowing to the earth, and a tingling sensation were significantly experienced by the experimental group participants.

The major findings of the study indicate that MTH meditation decreased the perceived stress levels, significant improvements were observed in self-esteem, family subdomains and overall QOL for the experimental group. In the case of experimental group, 29.1% of the participants felt significantly energised, 83.5% of them felt happy and enthusiastic, 78.5% significantly experienced sense of peace, 78.5% expressed feeling of magnetic force, 77.2% of them experienced feeling of energy flowing to the earth while blessing and 20.3% experienced tingling sensation during the meditation. In contrast, the control group experienced an increase in perceived stress levels and a decline in Overall QOL.

### DISCUSSION

The present study results revealed that after practice of meditation for a month, the experimental group recorded a significant decrease against an increase in perceived stress levels among the control group. Sufficient evidence supports that meditation reduces anxiety, depression, stress leading to increased mental health-related quality of life<sup>[14]</sup>. Significant correlations were observed between amount of mindful meditation practice and innate immune and behavioural responses to psychosocial stress<sup>[15]</sup>. There has been a profound effect of MTH on perceived stress levels among the participants in the experimental group as the meditation inhibits the areas responsible for fear, aggressiveness

and rage, and stimulates the rewarding pleasure centres in the median forebrain and other areas leading to a state of bliss and pleasure. Such inhibition decreases anxiety, blood pressure, and cardiac output in students practicing yoga and meditation<sup>[16,17]</sup>. Further, negative mood and the perceived stress in healthy adults can be reduced by a simple meditation technique<sup>[18]</sup>. Individuals with high possibility to experience negative emotions may benefit the most from the intervention. An 8-week yoga and compassion meditation program proved to be an effective intervention on anxiety, depression, perceived stress, and salivary cortisol levels in familial caregivers<sup>[19]</sup>.

In the current study, the experimental group showed a significant improvement while the control group showed a decline in overall QOL. Further, there has been significant improvement in the sub domains of QOL, mainly self-esteem and family, in the experimental group. The present study results are supported by an earlier study where the QOL and functional health of long-term meditators was compared to that of the normative population in Australia. Results revealed that Six SF-36 subscales were significantly better in meditators compared to the national norms<sup>[20]</sup>. Similarly, majority of results (78.9%) in a meta-analysis of the effect of

meditative practices on HRQOL favoured statistically significant improvements in HRQOL<sup>[21]</sup>. Study of the effect of cyclic meditation on QOL and perceived stress in female adolescents indicated significant improvement in QOL and significant changes in perceived stress levels after 30 days of intervention<sup>[22]</sup>.

Participants in the present study expressed feeling energised, lightness in body, energy flowing from the hand, heaviness in hand during the meditation. Similar results were found in an exploratory study to understand the Pranic Energy Perception and Impact of psychological wellbeing. More than 50% of the participants felt energised on absorbing air Prana. They experienced lightness in their body, and energy flowing out of their hands<sup>[23]</sup>. All these experiences are suggestive of enhancement and flow of prana in their energy bodies or the bioplasmic field. In a study, participants experienced feelings of calmness, peace, good feeling, happiness and enthusiasm. Some even expressed observing improved relationship with family and friends. Regular practitioners of meditation experienced recurring immovable inner calmness, even when they were engaging in a dynamic activity outside<sup>[24]</sup>. MTH can bring major changes in relationship, and can help the individual experience feelings of love, joy and peace<sup>[8]</sup>.

**Table 1: Perceived stress and QOL before and after meditation**

Variable	Group	Pre-test		Post-test		Change	Test statistics
		Mean	SD	Mean	SD		
Perceived Stress	Experimental	17.08	4.99	15.89	4.84	-1.19	F=4.639
	Control	18.69	4.48	19.38	5.33	+0.69	<i>p</i> =0.033
Overall QOL	Experimental	89.15	10.02	91.75	9.64	+2.6	F=8.177
	Control	86.68	9.06	84.37	8.17	-2.31	<i>p</i> =0.005
QOL-Self esteem	Experimental	12.92	3.20	14.30	2.44	+1.38	F=16.229
	Control	12.32	3.28	11.46	3.07	-0.86	<i>p</i> =0.000
QOL Family	Experimental	16.34	2.37	17.41	2.18	+1.07	F=4.557
	Control	16.33	2.51	16.51	2.40	0.18	<i>p</i> =0.004

**Table 2: Sensations experienced during meditation**

Sensations experienced during meditation		Number Percentage	Total	Chi square ( $\chi^2$ )
Physical	Warm feeling in palms	F	21	17.329*
		%	26.6	
	Energised	F	23	13.785*
		%	29.1	
	Energy flowing from hands	F	10	44.063*
		%	12.7	
Psychological experience	Peaceful	F	62	25.633*
		%	78.5	
	Happy/Enthusiastic	F	66	35.557*
		%	83.5	
	Improved relationship	F	26	9.228*
		%	32.9	
Bio-plasmic experience	Magnetic force	F	62	25.633*
		%	78.5	
	Colours	F	53	9.228*
		%	67.1	
	Energy flow country /earth	F	61	23.405*
		%	77.2	
	Tingling	F	16	27.962*
		%	20.3	

\* =  $p < .05$

**CONCLUSION**

The present study has proved that MTH can improve perceived stress levels and QOL among adolescents. The participants have reported that MTH improved their relationships, mental and physical health issues. Adolescence being a very crucial stage of development in one’s life, spiritual techniques like MTH can go a great way in helping an individual deal with his or her changing life and environment.

**Conflict of Interests :** All the authors reports no conflict of interests

**Funding:** World Pranic Healing Foundation, India funded the study.

**Ethical Clearance:** Permission is obtained from Social Welfare Department, Government of Karnataka to conduct the study for a period of one month

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# To Evaluate Diagnostic Utility of FNAC for Palpable Thyroid Lesion and Comparison with Ultrasound and Thyroid Profile

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## ABSTRACT

**Objective:** To study the advantage of FNAC over ultrasound finding in thyroid lumps by comparing the diagnostic accuracy in term of sensitivity, specificity, positive and negative predictive values considering the histopathological diagnosis of thyroidectomy specimen(either total/ subtotal / partial) specimen as the gold standard.

**Material and method:** A prospective study of 64 patients with thyroid lump was conducted in the Department of Pathology of tertiary care teaching hospital of northern part of India. All the patients with palpable thyroid lump were randomly selected, irrespective of their age, religion, marital status, occupation or social status for FNAC and USG thyroid following a thorough clinical check-up during the period of January 2015 to February 2016 were included. All of these patients were followed with thyroidectomy with subsequent histopathological findings.

**Results:** Results of FNAC thyroid and USG Thyroid were reported according to standard reporting format And then their results were compared with each other in term of sensitivity, specificity, positive and negative predictive values considering the histopathological diagnosis of thyroidectomy specimen (either total/ subtotal / partial) specimen as the gold standard. Sensitivity of FNAC was 92.1875 & Sensitivity of USG was 85.9375; Specificity of FNAC in diagnosing malignant lesion was 100%. Specificity of USG in diagnosing malignant lesion was 100%; Positive Predictive Value for FNAC was 100%; Positive Predictive value for USG was 100%; Negative Predictive Value for FNAC was 94.545% and Negative Predictive Value for USG was 90.909%.

**Conclusion:** In the present study, we had concluded that FNAC is found to be the most useful line of investigation than other investigations like ultrasonography (USG), and thyroid function test (TFT).

**Keywords:** *Fine Needle Aspiration Cytology (FNAC), USG, First-line diagnostic, Sensitivity, Specificity, Positive Predictive Value and Negative Predictive Value.*

## INTRODUCTION

Fine Needle Aspiration Cytology (FNAC) of the thyroid gland is a well established first-line diagnostic test for the evaluation of diffuse thyroid lesions as well as thyroid nodules with the main purpose of confirming

benign lesions and thereby, reducing unnecessary surgery. Superficial location of the thyroid gland allows excellent visualization and evaluation of its normal anatomy and pathologic condition by high resolution real-time grey scale sonography. It is also well known that high resolution ultrasound is useful diagnostic imaging modality for detection of thyroid nodule. But FNAC is found to be the most sensitive line of investigation than other investigations like ultrasonography (USG) and thyroid function test (TFT). FNAC leads to early diagnosis and aids in the treatment of thyroid lesions.

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FNAC has good amount of accuracy up to 97% in the preoperative diagnosis of various thyroid lesions. This has been claimed by various authors<sup>1-7</sup>. Correlation of cytopathological diagnosis is possible with USG diagnosis or with histopathological diagnosis if surgical excision is performed. The aim of the present study was to compare between fine needle aspiration cytology and ultrasonographic findings of thyroid lesions and to find out the accuracy of FNAC in the diagnosis of thyroid pathology.

## MATERIALS AND METHOD

Prospective study of minimum 64 cases was randomly selected who had attended Cytology Department of IGIMS, Patna; Palpable thyroid lesions during the period of January, 2015 to February 2015 were included. All the patients were recorded for their demographic features, that is, age, sex, and address. History of present illness with regard to symptoms and duration was recorded. They were examined for the signs related to the thyroid swelling. FNAC was performed at cytology clinic using a 22-gauge needle attached to a 10 ml syringe<sup>8-14</sup>. Cytological diagnosis was categorized into three groups: Benign thyroid lesions Indeterminate (suspicious) for malignancy, Positive for malignancy<sup>20</sup>.

On the basis of FNAC finding 64 patients attending the pathology department for FNAC in IGIMS hospital were selected keeping in mind the criteria mentioned below:

### A. Inclusion Criteria

- a. Age between 10 and 70 years.
- b. Palpable thyroid lump of variable duration.

### B. Exclusion Criteria

a. Patient not willing (written informed consent taken)

b. Lack of complete information of patient.

c. The nondiagnostic or unsatisfactory cases on FNAC were excluded from our study... This category applies to specimens that were unsatisfactory owing to obscuring blood, overly thick smears, air drying of alcohol-fixed smears, or an inadequate number of follicular cells. For a thyroid FNA specimen to be satisfactory for evaluation, at least six groups of benign follicular cells are required, each group composed of

at least 10 cells. Published data suggest inadequate sample range between 2% and 20%<sup>14</sup>. In our study the inadequate sample rate was 7.1%.

d. The cancer relapses or metastases of thyroid neoplasm were omitted from the study

Ultrasonography was performed on selected 64 cases. Ultrasound variables included location, size and number, echogenicity of a nodule in regard to the peripheral tissue, and the presence or absence of micro-calcification by considering the distal shadow. A benign etiology was suggested with a hyper echoic or extensively cystic nodule (over two thirds of the nodules), presence of a complete halo, multiple lesions, absence of hypervascularity, or absence of lateral cervical lymphadenopathy. Features proposing a malignant process include a solitary hypoechoic nodule, micro-calcification, ill-defined margins, incomplete halo, cervical lymphadenopathy, and central hypervascularity. On the basis of above criteria USG findings were also categorized into 3 Groups- Benign/non neoplastic, indeterminate/suspicious for malignancy, positive for malignancy<sup>15-16</sup>.

Comparison had made between cytological and ultrasonographic findings of 64 cases in the headline of above 3 groups. All routine investigations and serum T3, T4, and TSH levels were performed by Radioimmunoassay (RIA), (normal range of T3, 2.5–5.8 pmol/L, T4, 11.5–23.0 pmol/L, and TSH, 0.2–4.0 mIU/L)<sup>17</sup>.

## RESULTS AND DISCUSSION

Thyroid gland is unique among endocrine organs as it is the largest endocrine gland in the body and the first to develop in fetal life. Even after 100 years, thyroid gland has been the subject of intense research and considerable attention due to the vast array of developmental, inflammatory, hyperplastic and neoplastic disorders which are exceedingly common in clinical practice<sup>18</sup>. The workup of any patient requires full and appropriate clinical evaluation (Biochemical, Immunological, USG, Radioisotope and Imaging evaluation) before the decision to perform thyroid cytology is undertaken. Thyroid cytology can provide a definite diagnosis of malignancy, with tumor type, enabling appropriate therapeutic surgery in one stage. FNA cytology is the most accurate and cost-effective method of evaluating thyroid nodules, although ongoing

research is being done on variable methods including genetic studies<sup>16-18</sup>. In our study regarding comparison between USG findings and FNAC of thyroid lesions following were the results.

**Age distribution:**

**Table – 1: Distribution of cases in different age groups (n= 64)**

Age groups (in years)	No. of cases	Percentage of cases
Less than 20	14	21.875
21-30	20	31.25
31-40	14	21.875
41-50	8	12.5
>50	8	12.5

In the present study, the maximum number of 20 cases (31.25%) was found to be within age group of 21-30 years, followed by 14cases (21.875 %) in the age group of less than20 years& 31-40 yrs.Prevalence increases with age, with spontaneous lesions occurring at a rate of 0.08% per year beginning early in life and extending into the eighth decade. Thyroid lesions are found in 5% of persons aged an average of 60 years<sup>19</sup>.

**Gender distribution:**

**Table – 2: Sex distribution of thyroid lump**

	No. of cases	% of cases
Male	14	21.53
Female	50	78.125
<b>Total</b>	<b>64</b>	<b>100</b>

In the present study,14patients (21.53%) were male and 50 cases (78.12%)were female.The male to female ratio was 0.28%.In study by I.S. Nam Goong, et al. <sup>19</sup>, 78% patients were females and 22% males which were comparable to our study.Thyroid lesions are more common in females than males.The female predominance suggests that hormonal factors may be involved.The literature also says that there can be biological changes occurring during pregnancy may increase the risk of thyroid carcinoma<sup>18-19</sup>.

**Thyroid profile distribution:**

**Table -3: Distribution of subject by thyroid profile**

	No. of patients	%age of patients
Hypothyroid	52	81.25
Euthyroid	8	12.5
Hyperthyroid	4	6.25

Among adult people in India, the prevalence of hypothyroidism has been recently studied. In this population-based study done in Cochin on 971 adult subjects, the prevalence of hypothyroidism was 3.9%<sup>21</sup> the prevalence of hyperthyroidism has been studied in several studies. In an epidemiological study from Cochin, subclinical and overt hyperthyroidism was present in 1.6% and 1.3% of subjects participating in a community survey<sup>18</sup>.

**CYTOLOGICAL DIAGNOSIS**

**Table – 4: INCIDENCE OF DIFFERENT TYPES OF LESIONS ON FNAC**

	No. of patients	%age of patients
Colloid Goitre	30	46.875
Colloid goitre with cystic degeneration	9	14.0625
Lymphocytic thyroiditis	5	7.81
Hashimoto’s thyroiditis	1	1.56
Deqervens’ thyroiditis	2	3.12
Hyperplastic nodule	5	7.812
Hurthle cell neoplasm	1	1.56
Papillary carcinoma thyroid	2	3.12
Follicular neoplasm	3	4.648
Anaplastic carcinoma thyroid	1	1.56
Indeterminate	5	7.81

As in other literature, the benign cases represented the majority of cases (73.35%). The incidence of specific histology in the benign and malignant group

showed no difference from other reports<sup>19</sup>.The incidence of FLUS cases in our study was 7.812%, which is higher than the reported figure of 3–6% in literature<sup>22</sup>. This could be explained by the subjective nature of the cytomorphological diagnostic features of this category between different cytopathologists interpreting the cases in our unit where we are recently introducing the Bethesda system<sup>20</sup>.

Out of 64 cases, 81.162% were benign and other lesions,10.88% were malignant,and 7.81% were indeterminate.

**USG diagnosis:**

Radiologically78.12% cases were diagnosed as benign thyroid lesion, 7.81% as malignant and 14.06% were diagnosed as indeterminate. Study done by Frates MC, et al.<sup>20</sup> noted that the presence of any calcification within nodule raises the likelihood of malignancy. In particular micro calcification in a predominantly solid nodule is associated with approximately three-fold increase in cancer risk as compared with solid nodule without calcification<sup>23</sup>.

**Table-5: Distribution of patients according to USG Diagnosis.**

	No. of case	%age of cases
Benign	50	78.12
Indeterminate	9	14.06
Malignant	5	7.81

Comparison of FNAC and USG with final Histopathological Diagnosis:

**Taable-6: Histopathological examination & its comparison with FNAC &USG**

	FNAC	USG	Histopathology
Benign	52	50	54
Indeterminate	05	09	00
Malignant	07	05	10

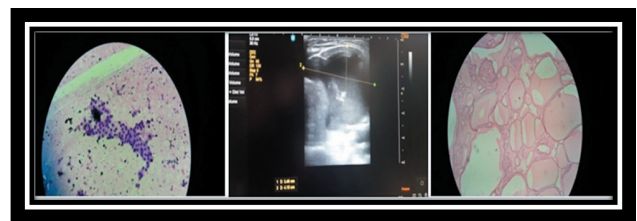
Sensitivity of FNAC was(59/64x100) 92.1875 & Sensitivity of USG was (55/64x100)85.9375; Specificity of FNAC in diagnosing malignant lesion was 100% (52/52+0x100=100%), Specificity of USG in diagnosing malignant lesion was 100% (50/50+0x100=100%);

Positive Predictive Value for FNAC was 100% (7/7+0x100=100%); Positive Predictive value for USG was 100% (5/5+0x100=100%);

Negative Predictive Value for FNAC was (52/52+3X100)94.545% and Negative Predictive Value for USG was (50/50+5X100)90.909%.

In our series, analysis of data revealed a sensitivity of 92.1875% and a specificity of 100%, a PPV of 100%, and a NPV of 94.545%. Our results were comparable with published data where FNAC of thyroid is reported to have a sensitivity ranges from 65% to 98%, a specificity of 72% to 100%, a positive predictive value of 34% to 100%, and a negative predictive value of 83% to 100%<sup>24</sup>. The determinant factor for such a wide range of difference may be due to differences in number of cases, the included diagnostic categories, and how the Cytopathologists classify ‘suspicious’, FLUS, as well as false positive and negative samples. Some authors include follicular lesion in the neoplastic group, whereas others exclude them from the calculations<sup>24</sup>.

Sensitivity of USG was 85.9375% and specificity of USG in diagnosing malignantlesion is 100%. Watters et al. (1992) found that the sensitivity and specificity of USG in suggesting a malignant lesion were 74% and 83% respectively.They emphasized that the USG has added advantage of allowing the whole gland to be examined rather than the dominant nodule but was limited by the fact that no features were pathognomonic for malignancy so that it should be regarded as a complementary rather than an alternative investigation to FNAC in the management of solitary thyroid nodules. Jones et al. found that the sensitivity and specificity were 75% and 61%<sup>24</sup>. It has been observed that for a thyroid nodule to be detected by palpation, it must be at least 1 cm in diameter while USG can detect nodules as small as 3 mm in diameter<sup>16</sup>.



**Fig.:1. Showing FNAC,USG,& HPE of Colloid Goitre**

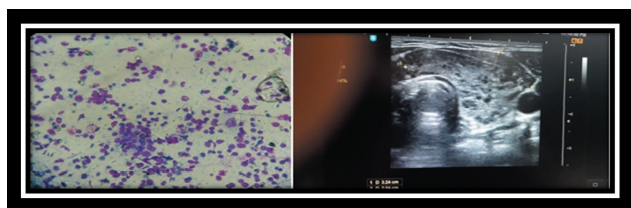


Fig.2 .showing FNAC & USG of Lymphocytic thyroiditis

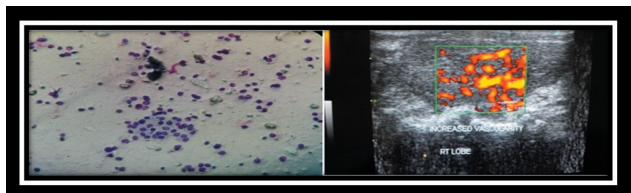


Fig 3. Showing FNAC & USG of Hashimoto thyroiditis

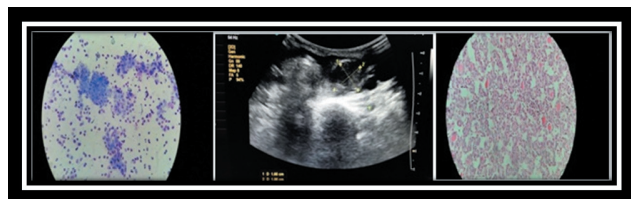


Fig.4.showing FNAC, USG&HPE of Follicular Neoplasm

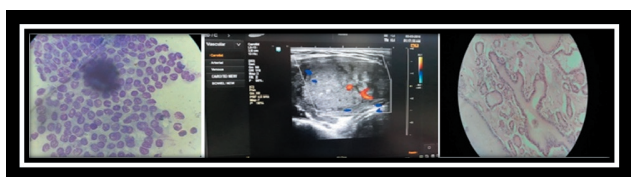


Fig.5. Showing FNAC, USG&HPE of Papillary carcinoma thyroid

### CONCLUSION

Ultrasonography is effective in diagnosing a lesion with high diagnostic accuracy, whether solid, cystic or mixed and help to differentiate a lesion whether malignant or benign. So it should be used as a valuable adjunct to clinical examination and should be offered to all patients presenting with palpable thyroid nodules. It also has added advantage of being safe, reliable, reproducible, cheaper and most important technique without radiation hazard. USG has some limitations that we can't subtype benign and malignant lesions accurately. From the present study we can conclude that FNAC is the gold standard and first line of investigation in thyroid swellings which almost accurately guides for further management of thyroid swellings excluding the need for unnecessary other investigations and the most important from the treatment point of view the need of surgery in selected cases only because the majority of thyroid swellings are benign. Majority of thyroid swellings were due to goitre and thyroiditis and which are most prevalent in adolescent young patient and in females in reproductive age group. Bethesda

system of Reporting thyroid cytology is very helpful for maintaining effective communication among pathologist, endocrinologist and other treating clinicians providing vital guidance for further management so it is highly recommended to follow it.

**Conflict of Interest-** None

**Ethical Clearance-** Taken from the competent authority.

**Source of Funding-** None

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# Spectrum of Histopathological Findings in Liver Biopsy

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## ABSTRACT

The significance of abnormal liver function tests in the absence of diagnostic serology is unclear. The aim of this prospective study is to report liver biopsy findings in a large group of patients with unexplained abnormal liver biochemistry and correlate them with the clinical features to assess the severity of these diseases. Percutaneous liver biopsy is a relatively safe and accurate method of diagnosing liver disease and should be considered in such cases. A total of 63 liver biopsies were studied for a period of 18 months from June 2012 to December 2013, of which, 34.92% (n=22) hepatic tumors, 20.63% (13) glycogen storage disorders, 4.7% (n=03) cirrhosis, 4.7% (n=03) fatty liver and 4.7% (n=3) viral hepatitis, 4.7% (3) Non alcoholic steato hepatitis were seen. Further, 01.58% case (n=1) each of extra hepatic biliary atresia, amyloidosis, miliary tuberculosis, liver abscess, and liver cell dysplasia were also observed. Liver biopsy was non specific in 6.34% (n=4) and inadequate in 11.11% (n=7) cases. The role of histopathological examination of liver biopsy is highlighted in this paper.

**Keywords:** Liver biopsy, histopathological examination, Hepatic tumours, Cirrhosis.

## INTRODUCTION

Percutaneous needle biopsy of liver contributes greatly to the understanding of liver diseases at clinical level<sup>1</sup>. The lack of diagnostically specific liver function tests and the ease as well as relative safety of procedure has made it a standard procedure for the investigation and management of patient with liver diseases<sup>1</sup>. Liver biopsy becomes essential especially in abnormal liver tests, not explained by other methods, in evaluation and staging of chronic liver diseases, in diagnosing space occupying lesions of liver, in patients with unexplained hepatomegaly and / or mild hepatic dysfunction and in cases of pyrexia of unknown origin<sup>2</sup>. Thus, histopathological study of liver biopsies continues to be most important procedure in the diagnosis and assessment of severity in various liver disorders.

## MATERIALS AND METHOD

This prospective study of 63 liver biopsies was

carried out at JSS Medical College Hospital, Mysore during the period June 2012 to December 2013. The clinical details and liver function tests in all cases were noted. Haematoxylin and eosin stained sections from liver biopsy specimens were examined for various microscopic features. Special stains like Masson trichrome (MT), reticulin and Periodic acid -Schiff (PAS) were used wherever necessary.

## RESULTS

**Table 1: Age & Sex distribution in liver diseases**

Age group	Male	Female	No of cases
0-10	6	3	9(14.28)
11-20	1	1	2(3.17)
21-30	1	2	3(4.7)
31-40	1	2	3(4.7)
41-50	1	2	3(4.7)
51-60	12	5	17(26.98)
61-70	10	5	15(23.80)
71-80	8	3	11(17.46)
<b>Total</b>	<b>40</b>	<b>23</b>	<b>63(100)</b>

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**Table 2: Incidence of different type of liver diseases**

Sr No	Liver disease	No of Cases
1	Hepatic tumour	22(34.92%)
2	Glycogen storage disorder	13(20.63%)
3	Cirrhosis	03(4.7%)
4	Fatty Liver	03(4.7%)
5	Non alcoholic steato hepatitis	03(4.7%)
6	Viral hepatitis	03(4.7%)
7	Extra Hepatic Biliary Atresia	01(1.58%)
8	Amyloidosis	01(1.58%)
9	Miliary tuberculosis	01(1.58%)
10	Liver abscess	01(1.58%)
11	Liver cell dysplasia	01(1.58%)
12	Non specific	04(6.34%)
13	Inadequate	07(11.11)
	<b>Total</b>	<b>63(100)</b>

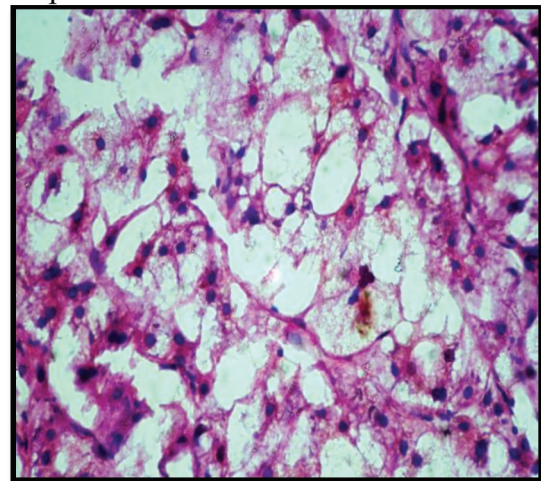
Non specific liver histology was noted in 06.34% (n=4) of patients, while 34.92%(n=22) cases of hepatic tumors and 4.7% (n=03) cases of cirrhosis were seen. Other diagnosis include fatty liver and viral hepatitis, non alcoholic steato hepatitis , extra hepatic biliary atresia, amyloidosis, miliary tuberculosis, liver abscess, and liver cell dysplasia were observed. Patient management was directly altered in 33.85% of patients due to liver biopsy findings and two families were entered into screening programmes for inheritable liver disease.

### DISCUSSION

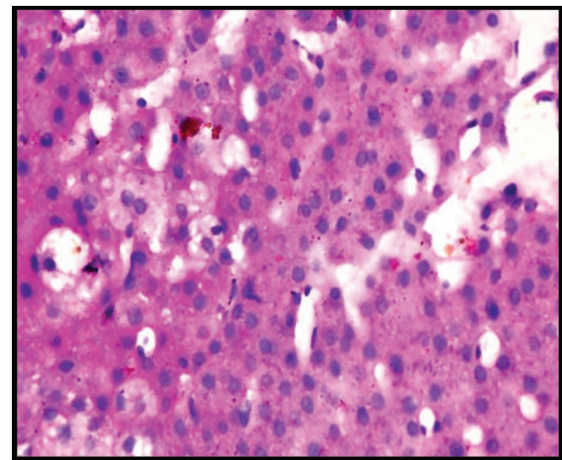
Out of 63 cases, 63.49% (n=40) were males and 36.50% (n=23) were females. The highest incidence 26.98% (n=17) of cases were reported in the sixth decade of life with preponderance in males (**Table 1**). This is most probably due to alcohol intake which is highest among middle aged males all over the world. MacSween and Scott (1973) reported increase in incidence of cirrhosis in the last 40 years largely due to increased intake of alcohol especially among females<sup>3</sup>. Alcohol is particularly toxic to liver cells leading to hepatic decompensation<sup>4</sup>. Moreover, viral hepatitis, especially hepatitis B is more common in third to fifth decades with cirrhosis and malignancy seen about 10

years after development of viral infections<sup>5,6</sup>. The next highest incidence was seen in seventh and eighth decade most probably due to a higher incidence of both primary and metastatic malignancies seen in older age group<sup>1</sup>. The incidence of liver disease in males was found to be three times commoner than females probably due to higher incidence of alcohol usage by males than in females<sup>5,6</sup>.

The common presenting symptoms were pain abdomen, abdominal distension, yellowish discoloration of eyes and dark urine, and fever. Clinical findings included hepatomegaly, anemia, jaundice, splenomegaly and ascites with varying combination of symptoms and signs in each case. Liver biopsy done on these patients yielded a diagnosis in most cases while it showed non specific changes in 6.34% (n=4) cases.



**Fig 1:Microscopic picture of Hepatocellular ca**



**Fig 2:Microscopic picture of Glycogen storage Disease**

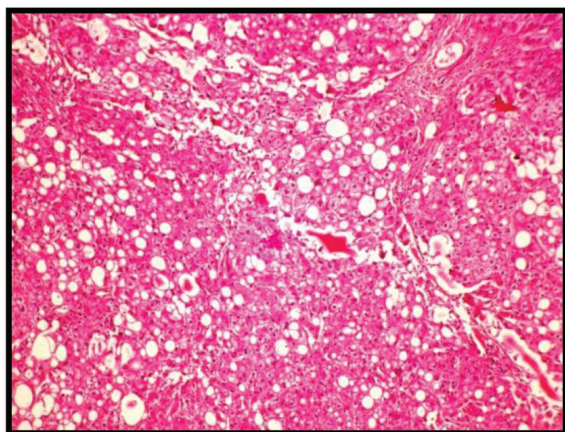


Fig 3: Microscopic picture of Liver cirrhosis

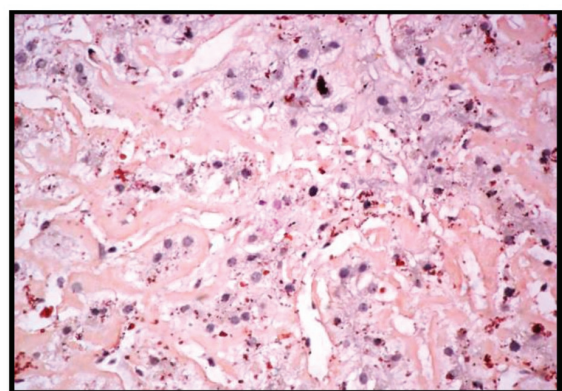


Fig 4: Microscopic picture of Liver amyloidosis.

In the present study 34.92% (n=22) of the cases of hepatocellular carcinoma observed were the most common lesion found probably due to high alcohol intake and hepatitis B viral infection in early age. Of the 22 cases, history of alcohol abuse was found in 15 (68.18%) whereas 7 (11.11%) cases were positive for Australia antigen. This is in concordance with the findings of Jhala *et al.* (2007) who found an association of hepatitis B surface antigen (HBsAg) with hepatocellular carcinoma in 27% cases seen in India<sup>7</sup>. Histologically, in all cases, tumor cells were arranged in sheets, pseudoacinar pattern, nesting pattern, trabecular pattern and/or cords having abundant eosinophilic cytoplasm and pleomorphic hyperchromatic nuclei showing intranuclear vacuolations in the 7 cases positive for HbsAg (Fig. 1). However, none of our patients with primary liver cancer showed evidence of concurrent cirrhosis. Metastatic involvement of liver is far more common than hepatocellular carcinoma. Most common primaries producing hepatic metastasis are those of breast, lung and colon but eventually, any cancer in any site of body may spread to the liver including leukemias

and lymphomas<sup>8</sup>. In the present study three cases of metastatic adenocarcinoma were observed with primary tumor in stomach and prostate respectively and one case of metastatic squamous cell carcinoma was seen with the primary being in oesophagus. Glycogen storage disease in 20.63%(n=13) was found to be the next common lesion. Koshy *et al*<sup>9</sup> reported 17 cases of glycogen storage disease from Southern India & indicated it may not be rare in India. Fig 2 shows microscopic picture of glycogen storage disease.

Liver cirrhosis observed in 4.7% (n=03), probably attributable to increased alcohol intake or viral hepatitis and in one case of Wilson disease, as well as the fact that it is the end stage of many hepatic diseases<sup>3,10</sup>. Other causes of Cirrhosis viz. malnutrition, primary and secondary biliary cirrhosis, congestive cardiac failure, and haemochromatosis were not seen. This incidence correlates well with the findings of MacSween (1973) who reviewed the incidence of cirrhosis in different geographical areas and found the rate of cirrhosis in necropsy to be between 0.6-29.1%. Whereas, Gall *et al* (1960) studied liver biopsies over a period of 25 years and found an average incidence of cirrhosis to be 6%<sup>10</sup>. Fig 3 shows microscopic picture of Liver cirrhosis.

In the present study, steatosis was seen in 4.7% (n=03). Though a high incidence of alcohol intake is the most common cause of this pathology, none of our cases gave history of alcohol intake and were thus considered as NASH, which has been described as an alcohol like liver disease noted in nonalcoholic patients<sup>11</sup>. It is usually seen in association with a variety of conditions like jejunoileal bypass, obesity, diabetes mellitus, extensive small bowel resection and consumption of drugs like estrogen and steroids<sup>12</sup>.

Hepatotropic viruses produce a number of clinicopathological syndromes varying from acute asymptomatic infection to acute anicteric or icteric hepatitis to chronic hepatitis and fulminant hepatitis<sup>8</sup>. The present study includes two cases each of acute and one case of chronic hepatitis.

A 21 years old male who presented with jaundice, dark urine and generalised itching with 3 previous episodes of jaundice in the past was diagnosed as benign recurrent intrahepatic cholestasis. The presenting episode of jaundice was of 2 months duration. This is in accordance with the findings of Bijleveld *et al* (1989)



who have reported the -age of onset of first episode of jaundice between 1 and 36 years and duration of each episode lasting between 2 weeks to 2 years<sup>13</sup>.

One case of extrahepatic biliary atresia in precirrhotic stage was found in a 2 months old male infant with presence of jaundice since birth. Extrahepatic biliary atresia is a panbiliary disease affecting infants in first three months of life and consists of a progressive necroinflammatory destruction of bile ducts with maximal involvement of part or all of the extrahepatic duct system<sup>1</sup>. Miliary tuberculosis involving liver was observed in a 45 year old male who presented with fever, jaundice, dark urine and pain abdomen. Patient was a known case of rheumatoid arthritis, diabetes mellitus and hypertension on treatment with multiple drugs. Liver

function tests revealed mildly increased aminotransferase and significantly high alkaline phosphatase levels. Chest Xray showed bilateral basal cavitating lesions suggestive of tuberculosis. On liver biopsy, hepatocytes displayed feathery degeneration, portal inflammation consisting of eosinophils and neutrophils and ill formed granulomata with few scattered epithelioid cells. The patient fully recovered after antitubercular treatment.

Most common causes of granulomatous hepatitis are due to sarcoidosis, infections such as tuberculosis, leprosy, brucellosis, fungal and protozoal infections like histoplasmosis and schistosomiasis and drug induced granulomas which are seen with phenylbutazone, chlorpropamide, sulfonamides, allopurinol, methyldopa, carbamezepine etc<sup>14</sup>.

**Table 3: Present study in comparison with other studies.**

Author & Year	Chawla et al(2013) <sup>15</sup>	Abdo et al(2006) <sup>16</sup>	Ugaigbe et al(2013) <sup>17</sup>	Present study
Highest incidence of cases	5 <sup>th</sup> decade	Fourth decade	Fourth decade	Sixth decade
No of cases	65	574	80	63
Males	75.38	58.6	62.5	63.49
Females	24.62	41.4	37.5	36.50
Most common lesion	Hepatocellular carcinoma	Chronic Hepatitis(Hep C)	Inflammatory lesion	Hepatic Tumours
Second common lesion	Cirrhosis	Hepatocellular carcinoma	Hepatocellular Carcinoma	Glycogen storage disease

In present study single case of amyloidosis, liver abscess and liver cell dysplasia seen.

Extracellular amyloid infiltration o parenchyma was observed. (Fig 4).

**Conflict of Interest** - No,

**Source of Funding**- Self

**Ethical Clearence** - Taken from college committee

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# Idiopathic External Cervical Root Resorption: Review with a Case Report

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## ABSTRACT

The extracanal invasive resorptive process begins in the gingival attachment or the periodontal ligament. It can be considered as a form of external resorption. It is usually asymptomatic and the patient may realise the condition only when the teeth develop mobility or colour change.

**Keywords:** Resorption, Idiopathic, Cervical.

## CASE REPORT

A 25 year old male patient reported with a complaint of an exfoliated tooth and mobile lower front teeth since six months. He had consulted a dentist who had performed oral prophylaxis with an ultra sonic scaler. The patient however did not have any relief in the symptoms and the mobility increased with time until one day a tooth spontaneously and painlessly exfoliated. The patient was alarmed regarding some serious condition and decided to have a second opinion.

Intra oral examination showed a root stump of mandibular left first pre molar (34) of which the exfoliated crown was brought by the patient (Fig 1). The gingival tissues exhibited marked swelling but there was no bleeding on probing (Fig 2). Mandibular anterior teeth exhibited grade I/II mobility from pre molar to pre molar region. However it was realized that the mobility was restricted to the crowns and the roots were not mobile. When a No. 23 explorer was used, the moon shaped end went deep inside at the level of CEJ (Fig 3).

IOPA Radiographs showed:

- a) Deep resorptive defect in 33 and beginning of resorption in 35 with root stump of 34 (Fig 4)
- b) Deep resorptive defect in 33,32,31,41,42 (Fig 5)
- c) No significant findings in the maxillary anterior region (Fig 6)

d) OPG confirmed the findings and it was noted that the resorption was limited to mandibular anterior region (Fig 7)

The patient was advised to get blood work up for Serum Calcium, Phosphorus and Para Thyroid hormones which were found to be under normal levels.

A clinical diagnosis of Idiopathic External Cervical Root Resorption was made.

The patient was further advised scanning by CBCT and explained the treatment options of:

1. Endodontic treatment followed by crown lengthening, post and core and crowns.
2. Endodontic treatment followed by over denture.
3. Extraction followed by conventional/ Implant supported partial denture.

However the patient refused any further diagnostic tests did not return for follow up.

## DISCUSSION

Root resorption is the loss of hard dental tissues i.e. dentin and cementum as a result of odontoclastic action [1]. It might occur as physiologic or pathologic phenomenon as intra radicular or apical according to the location in which the condition is observed. Root resorption might be classified by its location in relation to the root surface i.e. internal or external resorption. 1



Fig: 1



Fig: 2



Fig:3

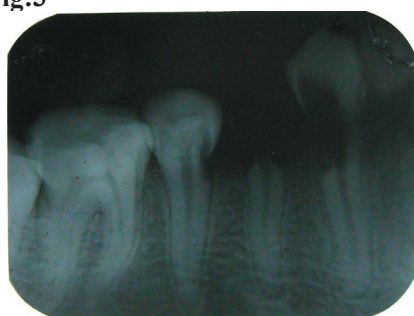


Fig: 4

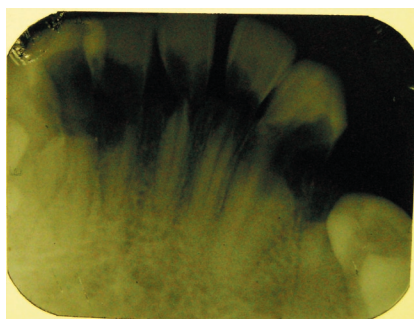


Fig: 5

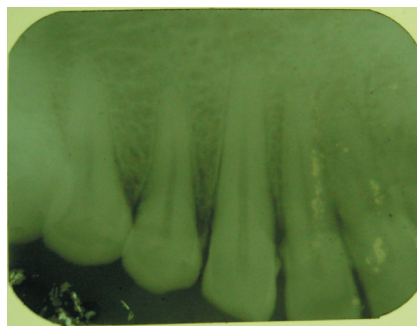


Fig: 6

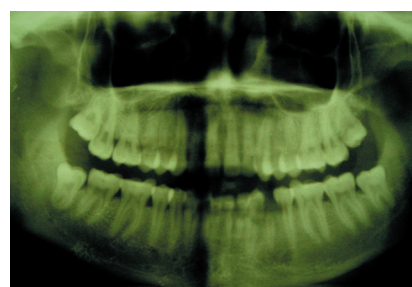


Fig: 7

Internal resorption is an inflammatory condition that results in progressive destruction of the intra radicular dentin. The resorbed spaces are filled by granulation tissue only or in combination with bone like or cementum like mineralised tissue. A high prevalence of the condition has been associated with teeth that had undergone specific treatment procedures like auto transplantation <sup>[1]</sup>.

External resorption can be further classified as surface resorption, external inflammatory resorption, external replacement resorption (ankylosis), external cervical resorption and transient apical breakdown. Other terms used to describe ECR include odontoclastoma, peripheral cervical resorption, peripheral inflammatory root resorption, extra canal invasive resorption, supra osseous extra canal invasive resorption and sub epithelial external root resorption <sup>[3]</sup>.

ECR usually occur immediately below the epithelial attachment of the tooth at the cervical level. The remnants of the epithelial sheath surround the root like a net, thus imparting a resistance to resorption and subsequent ankylosis. The cementum and predentin covering on dentin are essential elements in resistance to resorption.

Thus in order for root resorption to occur, two things must happen <sup>[11]</sup>:

1. Loss or alteration of the protective layer

Damage to the protective layer occurs directly, due to trauma or indirectly, when inflammatory response occurs in pulp or periodontium. If the periodontal ligament cells are allowed to dry out before replantation will provide a stimulus for an inflammatory response.

2. The inflammatory response

A. *The destructive phase:*

This is the first phase in which active resorption occurs with multinucleated giant cells. It continues as long as the stimulus is present. It will continue till either the entire root is resorbed or the stimulus is removed.

B. *The healing phase:*

The critical factor in determining the outcome after an injury is the type of cells that repopulate the root surface during the healing phase. If cementoblasts are able to cover the damaged root surface, a type of healing termed as cemental healing or surface resorption will occur and the outcome is favorable.

**Hiethersay's Classification** [3]:

**Class 1:** early lesion which may show a slight irregularity in the gingival contour.

**Class 2:** in this class there might be pink discoloration of the crown while the radiographic picture shows extensive irregular radiolucency extending from the cervical area into the crown and projected over the canal outline..

**Class 3:** in this class the resorptive process has extensions into but not beyond the coronal third of the root. Clinically the crown may show a pink discoloration and there might be a cavitation of the overlying enamel.

The radiographic image shows an irregular moth eaten image and the outline of the canal may be seen as a radiopaque line demarcating the canal from the adjacent irregular radiolucency.

**Class 4:** this class includes invasive process that has extruded beyond the coronal third of the root while the crown shows a pink discoloration in the cervical region.

Clinical signs:

1. Located in the cervical region of the tooth.
2. Pink spot is usually seen.

3. Tooth usually responds positively to thermal tests until pulp is involved.

Radiographic signs –

1. Detected as chance radiologic findings because tooth is usually asymptomatic.

2. Varies from asymmetrically located radiolucency with irregular margins in cervical/proximal region of tooth to uniformly round radiolucency centered over the root.

3. Early lesions are usually radiolucent in appearance.

4. Advanced lesions might have mottled appearance because of fibro-osseous nature of the lesion.

5. Root canal should be visible and intact (indicating lesion is external) [10]

Multiple resorptions can occur, particularly when there has been a history of orthodontic treatment and a full mouth radiographic examination is essential. [7]

Cervical external resorption occurs immediately below the epithelial attachment of the tooth. As a result, it must be noticed that the location is not always cervical but related to the level of the marginal tissues and the pocket depth. In particular, teeth with cementum deficiencies related to previous trauma or a cemento-enamel disjunction (10%) due to histological variations an unprotected, locally destroyed or altered root surface which has become susceptible to resorbing clastic cells during an inflammatory response of the periodontal ligament to traumatic or bacterial stimulus, maintained by infection in the adjacent marginal tissues. [9]

**Other types of root resorption:**

**Pulp space infection-**

Apical periodontitis with apical root resorption:

The predominant cause is a bacterial challenge through caries. When the pulp defenses are overcome and the pulp is necrotic and infected, the inflammatory stimulators will contact the surrounding periodontal attachment. The periodontal inflammation is accompanied by slight resorption of the root at the cement-dentinal junction. [2]

Lateral periodontitis with root resorption:

When the root loses its cemental protection, lateral periodontitis with root resorption can result the periodontal infiltrate consists of granulation tissue with lymphocytes, plasma cells, and polymorphs nuclear leukocytes.<sup>[8]</sup>

### **Sulcular infection-**

The progressive external root resorption, which is of inflammatory origin, occurs immediately below the epithelial attachment of the tooth, usually but not exclusively in the cervical area of the tooth it is referred to as sub epithelial external root resorption. Causes of the root damage immediately below the epithelial attachment of the root include orthodontic tooth movement, trauma, non-vital bleaching and other less definable cause. The pulp plays no role in cervical root resorption and is mostly normal in these cases.<sup>[5]</sup>

### **Internal (root canal) inflammatory resorption –**

This type of resorption might occur in any area of the root canal systems. It is characterized by the radiographic appearance of an oval shaped enlargement within the pulp chamber resulting in a perforation or symptoms of acute or chronic apical periodontitis after the entire pulp has undergone necrosis and the pulp space has become infected. It involves a progressive loss of intraradicular dentin without adjunctive deposition of hard tissues adjacent to the resorptive sites. It is frequently associated with chronic pulpal inflammation, and bacteria might be identified from the granulation tissues.<sup>[10]</sup>

### **Internal (root canal) replacement resorption-**

Internal root canal replacement resorption is characterized by an irregular radiographic enlargement of the pulp chamber, with discontinuity of the normal canal space. Because the resorption process is initiated within the root canal outline of the original canal appears distorted. The enlarged canal space appeared radio graphically to be obliterated by a fuzzy-appearing material of mild to moderate radio density. This form of resorption is typically asymptomatic to be caused by a low grade inflammation of the pulpal tissues such as chronic irreversible pulpitis or partial necrosis.

Resorption of the intraradicular dentin is accompanied by subsequent deposition of a metaplastic

hard tissue that resembles bone or cementum instead of dentin. Variant of internal root canal replacement resorption previously been reported as “*internal tunnelling resorption*”. This entity is usually found in the coronal portion of root fractures but might also be seen after luxation injuries. The resorption process tunnels into the dentin adjacent to the root canal, with concomitant deposition of bonelike tissues in some regions. These bone-like tissues have the appearance of cancellous bone instead of compact bone<sup>[4]</sup>

### **Causes of Root Resorption:**<sup>[3][12]</sup>

**1. Orthodontic Treatment:** Excessive orthodontic forces at the cervical region of the tooth might result in tissue necrosis adjacent to exposed root dentin.

**2. Trauma:** ECR is a recognized complication of luxation and avulsion injuries. Dental trauma might cause developmental defects in the cervical region on the unerupted permanent successor teeth as a result of direct trauma of the root apices on the unerupted successor.

**3. Intracoronal Bleaching:** Hydrogen Peroxide might denature dentin and provoke an immunologic response. In addition, the pH at the root surface of teeth is reduced to about 6.5 by intracoronal placement of a “walking bleach” paste.

**4. Surgery:** Surgical procedures removal of adjacent partially or fully erupted third molars or supernumerary teeth, transplantation of canine teeth, the surgical exposure of an unerupted canine, and periodontal surgery for root amputation.

**5. Other Factors:** Bruxism and intracoronal restorations. Developmental defects such as hypoplasia or hypo mineralization hyperoxaluria and oxalosis could cause root resorption. This is due to an increased concentration of oxalates in blood caused by kidney failure, resulting in precipitation of crystals in hard tissues, which the author claims could initiate the root resorptive process.

### **Molecular aspects of Root Resorption:**<sup>[8][12]</sup>

Osteoclasts are multinuclear cells responsible for resorption of bone; while odontoblasts are corresponding cells resorbing dental hard tissues. Mononuclear odontoclasts can also actively resorb dental hard tissue, although during progressive resorption most cells have several nuclei.

Resorption of teeth results from the activation of clastic cells, RANK (receptor activator of nuclear factor  $\kappa$  B) signaling network in osteoclasts. The factor which have been analyzed include a family of biologically related tumor necrosis factor (TNF), tumor necrosis factor receptor (TNFR)/TNF-like proteins: osteoprotegerin (OPG), RANK and RANK ligand (RANKL).

#### **Diagnosis:** <sup>[7]</sup>

As its name suggests, ECR is usually found at the cervical region of the tooth. This discoloration is a result of the highly vascular granulation (resorptive) tissue within the tooth become visible through the thinned out (resorbed) dentin and translucent overlying enamel differentiate ECR from sub gingival caries, which will feel sticky on probing and does not present with the pink spot. The base of an ECR defect will feel hard and also result in a scraping sound when probed. Probing the ECR defect and/or the associated periodontal pocket will cause profuse bleeding of the underlying highly vascular resorptive tissue. The edges of the cavity usually appear sharp and narrow. Teeth with ECR will respond positively to sensitivity testing because the pulp only becomes involved in very advanced cases of ECR.

Use of Cone Beam CT (CBCT) is very helpful in accurately diagnosing the condition.

#### **Treatment:** <sup>[13]</sup>

Treatment directed at avoiding or minimizing the severity of the initial inflammatory response.

**1. Prevention:** In athletics, the mouth guard is a proven protective device against traumatic damage to the teeth.

**2. Minimizing Additional Damage after the Injury:** The extraoral dry time must be minimized by placing the tooth in an appropriate storage medium. Practical alternatives include sterile saline or saliva (vestibule of the mouth). Water, is an unsuitable medium for the storage of avulsed teeth. However, newer specialized media such as Hank's Balanced Salt Solution (HBSS), which is a common culture medium, or Via Span<sup>TM</sup>, a liver transplant medium, can be used.

**3. Pharmacological Manipulation of the Inflammatory Response:** Tetracycline has been widely used in the treatment of periodontal disease

because of its sustained antimicrobial effects. Topical dexamethasone was found to be useful while systematic usage was not. Ledermix, a drug combining tetracycline and corticosteroids may be helpful.

**4. Stimulate Cemental Healing:** The supernatant of cultured gingival fibroblasts, if used as a storage medium, might contain a number of biologically-active factors that might promote periodontal ligament regeneration and repair Emdogain<sup>TM</sup> may be extremely beneficial in teeth with extended extra oral dry time.

**5. Slow Down 'Inevitable' Osseous Replacement:** When the periodontal ligament on the root surface is definitely destroyed and osseous replacement of the root with bone.

Root canal disinfection removes the stimulus for the peri-radicular inflammation and the resorption will stop. Favorable healing with cementum will occur but, if a large area of root is affected, osseous replacement may result by the mechanism described earlier. In cases where the pre-radicular inflammation is stimulated by pulpal infection, bone resorption is usually extensive.<sup>[6]</sup>

#### **1. Internal Approach:**

A. Maintain the vitality of the pulp. If the pulp is vital, the canal will be free of bacteria and, thus, this type of external inflammatory root resorption will not occur. In severe injuries where vitality has been lost it is possible, under some circumstances, to promote revascularization of the pulp space. Prevent root canal infection by root canal treatment at 7-10 days. In teeth with closed apices, revascularization cannot occur. These teeth should be endodontically treated within 7-10 days of the injury before the ischemically necrosed pulp becomes infected, a creamy mix of calcium hydroxide is placed. Calcium hydroxide can be applied long-term (upto 6 months) to ensure periodontal health prior to filling the root canal with gutta-percha.

B. The elimination of pulp space infection. When root canal treatment is initiated later than 10 days after the accident or if active external inflammatory resorption is observed, the preferred antibacterial protocol consists of a chemo mechanical preparation, followed by long-term dressing with densely packed calcium hydroxide.

In situations when the root canal wall has been perforated, Mineral Trioxide Aggregate (MTA) or

BioDentin™ should be considered for repair. A hybrid technique might also be used to obturate canals; the canal apical to the resorption defect is obturated with gutta-percha, and then the resorption defect and associated perforation are sealed with MTA or BioDentin.

## 2. External Approach:

A. When the resorptive defect extends apically, remove the entire root cementum surface adjacent to the granulomatous tissue in the dentin. The defect and denuded root surface is covered with a spacer (freeze-dried bone), and the entire area covered with a Gore-Tex™ membrane.

B. Force eruption entrance of the defect into the root can now easily be found and the defect cleaned and restored. Reshaping of the 'raised' bony contour then allows an ideal architecture to remain in place.

C. Forced eruption/re-intrusion: After the repair is complete the tooth can be orthodontically moved into its original position.

D. Intentional replantation: It is the last resort to manage the tooth failing which extraction is required.

**Conflict of Interest:** Nil

**Source of Funding:** Self

**Ethical Clearance:** Not required

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# Barriers To Pre-eclampsia Incidence Reduction among Women of Somaliland - An Implementation Imbedded Qualitative Research 2016

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## ABSTRACT

**Background:** Preeclampsia is one of the top three leading causes of Maternal death in Somaliland.

**Objectives:** To explore challenges facing the existing monitoring and evaluation system including, preeclampsia case definition, guidelines, indicators and information flow. **Methods:** An in in-depth interview using purposive sampling was conducted to collect data from program managers, M&E officers and health system experts in all the six regions of Somaliland. In addition, we reviewed several documents including M&E reports, policy and strategy documents and other relevant documents. **Analysis:** Of the 50 target participants, 45 of them responded. Majority of the interviewees (36 out of 45) reported no specific pre eclampsia related indicators exist both in M&E tools and routine data and only few of interviewees had standardised case definition based on WHO guidelines. There is a clear linkage between data for action and quality improvements of Preeclampsia services (32 out of 45). No regular dissemination of pre-eclampsia data (34 out of 45). Majority of the participants cited that Pre-eclampsia not integrated within broader HIS and there is no political at national and sub-national levels to ensure smooth functioning of M&E for preeclampsia (44 out of 45). All the participants cited that there is no standardized protocols, guidelines, tools and instruments for preeclampsia exist. All interviewees reported that the routine reporting system has no standardized schedules for data flow and feedback at all levels and lacks standardized coding system. 38 out of 45 said that there are no M&E manuals, guidelines and protocols for data collection, processing, training and quality assurance in place. The data collection system is paper-based across the country while the reporting system is electronic at district and regional level.

**Conclusions:** To tackle pre-eclampsia barriers the government should develop a well-functioning information flow and feedback mechanisms at all levels and train RH managers, M&E and HMIS staff on standard case definition of pre-eclampsia, and harmonising information follow and feedback mechanism, proper routine recording and reporting system, analysis and interpretation of the findings.

**Keywords:** M&E system, Reproductive health system, Health system expert, pre-eclampsia.

## BACKGROUND AND OBJECTIVES

Somaliland has one of the worst maternal mortality ratios in the world, estimated to be 1044-1400 per 100,000 live births<sup>2</sup>. According to the latest WHO data published in April 2011 life expectancy in Somalia is Male 47.7,

female 52.0 and total life expectancy is 49.8 which gives Somalia a World life expectancy ranking of 185<sup>8</sup>. Maternal mortality is the leading cause of death among women of reproductive age in Somaliland. It is caused mainly by haemorrhage, puerperal sepsis, preeclampsia and obstructed labour. Women in Somaliland have a one in 15 at risk of dying of maternal-related causes<sup>2,8</sup>. There are about 100 doctors and less than a 100 of midwives in the country both in public and private sector and about the same number of registered midwives. In the public sector in 2011, there were 15 general and

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specialized hospitals, 87 Maternal and Child Health clinics (MCH) and 165 health posts in the country<sup>3</sup>. All these health indicators reflect the seriousness of the health situation in Somaliland. The prevalence of preeclampsia in developing countries ranges from 1.8% to 16.7%<sup>2</sup>, and this depends on how the health system is responsive to the problem. Although there is no specific M&E framework for maternal and child health including preeclampsia in Somaliland a health Sector Strategic Plans (HSSPs) and M&E framework has been developed to operationalize the strategic orientation provided for comprehensive monitoring and evaluation in HSSP<sup>1</sup>. M&E aims at informing policy makers about progress towards achieving targets as set in the HSSP<sup>2</sup>. There have been no systems for performance monitoring and evaluation in place during the development of the HSSP and there are enormous challenges. There are many factors in the M&E system that can affect preeclampsia included in the broader M&E system. M&E system is characterized by fragmentation; duplication, weak co-ordination, lack of a clear results chain, lack of specific M&E frameworks poor definitions, tracking and reporting of outcomes and results, use of different formats and approaches with no common guidelines and standards, inadequate feedback and poor sharing of results across the sector, lack of national ownership, poor sharing of results across the sector, existence of pre-eclampsia indicators, leadership and political will, type of data collection and reporting system, existence of Coding procedures, processing and analysis of data, information use, lack of instructional manuals, guidelines and protocols for data collection, processing, training and quality assurance, lack of coaching and training for M&E team and health managers<sup>4</sup>. The main overall objective of this research is to outline the challenges facing the existing monitoring and evaluation system including preeclampsia case definition and guidelines, indicators and information flow.

### **Specific research objectives**

- To explore challenges within the monitoring and evaluation system regarding pre-eclampsia as well as information flow and feedback mechanisms in the health system
- To explore ways of including preeclampsia data within the M&E health system of the health sector

## **METHOD**

The objectives of this study were achieved through conducting a qualitative study. The study utilized an in-depth interviews, document and M&E data review. An in-depth interview review data was collected from program managers, M&E officers and health system experts in all the six regions of Somaliland. The data collected is about existence of M&E systems, the challenges in the system, information flow and feedback systems and ways to better address the problem. Furthermore several documents including M&E reports, policy and strategy documents and other relevant documents were reviewed.

### **Sampling method**

A purposive sampling was employed to collect data from different sources including M&E officers, program managers and Health systems experts. Health systems expert are senior reproductive health program managers and M&E coordinators and reproductive health consultants with at least 10 years' experience in the field.

### **Tools and data collection procedure**

Before the developments of the tools, a small scale formative research was conducted to help design the in-depth interview guiding questions. The interview lasted about one hour and half, the voice of the majority of the interviewee was recorded while some of them refused voice recording probably for job security purposes, during the course of all sessions notes were taken by the note taker. Data was transcribed and analysed using both narrative and content analysis. The following documents were reviewed to look for existence of standards case definitions and pre-eclampsia indicators, types of data collected, reporting system, existence of guidelines and protocols of pre-eclampsia, procedures for coding, processing and analysis of data. Documents included: National health policy edition 2, Expanded Primary Health Score cards (2009), Health Sector Strategic Plan (2013 - 2016), M&E framework and plan (2014 - 2016), Revised Health Management Information System registers and tools (2011), Revised supervision checklists and manual (2014), M&E reports (2014 - 2015), HMIS report (2013 - 2014).

## **FINDINGS**

**Specific indicators:** Most of the interviewees (36

out of 45) mentioned that there are no certain indicators -such as number of women with oedema, and number of women with hypertension- as part of the routine health management information and in the M&E tools. "There are no specific indicators set for preeclampsia in the M&E system and in the routine health management information system, nor the overall M&E framework of the health sector, because the system usually focuses the outcome management which is the eclampsia, and if we set indicators for preeclampsia I think it will give an overall picture of the situation" Reproductive Health expert.

"I think the reason of not giving attention to this problem could be that the system does not consider pre eclampsia as a serious case to have indicators to measure against it". M&E officer.

"Pre eclampsia indicators to be in the system we need to be included in the tools and mechanisms that are required to collect, interpret and use data for both routine and M&E systems, for example the routine data collection registers, monitoring tools, score cards and evaluation tools do not capture any specific indicator or information related to pre-eclampsia". Senior data manager.

Although such indicators do not exist, such information would have been useful for maternal health planners, RH program managers, service providers and other stakeholders.

"We don't have such indicators in our data collection systems, but having this information would have an effect on planning and decision-making, if such information is available it would influence policy makers, planners and service providers to make evidence-based decision", HMIS senior officer.

"Indicators like number of pregnant women with pre-eclampsia, number of pregnant women presenting typical pre-eclampsia signs and symptoms and number with pre-eclampsia treated should appear in the M&E system which is so useful for planning". HS expert

#### **Pre eclampsia case definition**

The study found that there is no standard case definition available in the health facilities and in maternal health guidelines and this variation is due to that interventions are widely dispersed and there

are many actors in the field whose staff don't have health backgrounds. Majority of the interviewees have common definition. "It is one the pregnant women in the third trimester has high blood pressure , protein in the urine and swelling at the hands, face and the feet". Very few knew the standardised definition based on WHO guidelines. "If the pregnant women with systolic blood pressure equal or more than 140 mm Hg or diastolic blood pressure equal or higher to 90 mm Hg on two different occasions". HS expert.

#### **M&E data for action and the quality improvement of pre eclampsia services**

Practically, there is a clear linkage between M&E data for action and quality improvements of Preeclampsia services. "sometimes we collect information on pre eclampsia and send to the central HMIS, but no apparent action against the increasing incidence of pre eclampsia, of course if M&E data is used for action we can improve the quality of delivery of pre eclampsia" M&E officer

#### **Use and Dissemination of pre eclampsia data**

With regard to the dissemination of preeclampsia related data and accessibility to the stakeholders, community and users of the system, few members reported dissemination of some pre eclampsia data occasionally through meetings. "This is because mainly the interventions are donor driven and jealousy between donors is apparent, they don't want to share such information which can adversely affect their projects". RH officer.

#### **Integration of PE within HIS and political will**

It seems that Pre eclampsia data generated is not well integrated within the broader HIS as said by a great number of respondents. There is no strong leadership and political will at the national and sub-national levels to ensure smooth functioning of M&E capable of including PE in the system.

#### **Pre-eclampsia audits and reviews**

In addition, all interviewees reported that there are no clinical audits and review systems carried out periodically and verbal autopsies at health facility. "Here, we do not have trained staff able to perform clinical audits even at national level and periodic reviews not carried out at all". HMIS officer.

### **Availability of standardized protocols, guidelines and tools for data capturing**

The study found that there are no standardized protocols, guidelines, tools and instruments developed for the collection of data related to preeclampsia. We might gather some data relevant to pre eclampsia on daily basis in some registers but when we are compiling the data we omit its information from compiled data". HMIS officer

### **Types of data collection and reporting systems**

The data collection system is paper-based across the country while the reporting system is electronic at district and regional level. "In remote areas we use paper-based for both data collection and reporting and send them to the district and regional HIS officer through a car, at district and regional level we use electronic system for reporting and data compilation. Probably making system electronic across the country including remote areas will ensure timely availability and accessibility of data and reduce problems associated with storage of paper-based records" HS expert.

### **M&E Data flow and feedback mechanism**

The study showed that not all health facilities send reports to the district health office on time and has no standardized schedules for data flow and feedback at all levels. "Since the systems not emphasizing the pre-eclampsia data, we don't inter the pre eclampsia related data on registers and sometimes there are few staffs here in our health centers, staff cannot serve for the patients and complete the registers at the same time and they usually complete the forms at the end of the shift, when M&E data is collected when don't get any feedback on how our system is working". M&E officer

### **M&E Data Procedures for coding and analysis at all levels**

The research revealed that data are transmitted from district to the region in paper forma but unfortunately this does not capture pre-eclampsia data. Furthermore we found that M&E data is regularly analysed and does not focus on disparities, for example do not give special attention to the poor, marginalized and the underserved people.

**Trainings:** The study showed that there are no M&E training for data collection, processing, and

quality assurance in place. "Occasionally M&E officers and data collectors receive trainings for quality improvements of data, but we don't have guidelines and standardized manuals". M&E officer

## **DISCUSSIONS**

The findings of this study showed that there are no indicators of pre –eclampsia in the M&E system. This is because although the problem is apparent but there is no political. This result is consistent with the findings of the review, where we found that there is no even single indicator for pre eclampsia in the broader M&E system <sup>1-7</sup>. Pre eclampsia case definition is not harmonized and only few members of the participants provided better definitions based on WHO guidelines<sup>8</sup>. The poor training of the staff and lack of political will and donor driven interventions contributed to this matter. Generally there is a clear linkage between well-functioning M&E systems and improvements of health services quality. Our result is consistent with this fact, where majority of the subjects (32 out of 45) supported this point. Furthermore we found that pre-eclampsia is not included in the M&E systems and not stated in the National Health Policy <sup>1,2</sup> indicating absence of political will.

Findings displayed that there is no M&E data dissemination plan at national and district levels where we found no written documents containing M&E data dissemination plan, data follow and feedback mechanisms and the use of information to inform decision-making is weak at all levels of the health-care systems though on the demand side, potential users of information – such as policy-makers, program managers, donors, global agencies and organizations exist <sup>1,2</sup>. We found that all those working on Maternal Health programs need information on pre-ecalmpsia cases for the purpose of case incidence reduction and program planning. The study also found that there is no standard coding system in place <sup>2,4</sup> and data is analysed at national level and occasionally at regional level and not usually focus on disparities such as poor and underserved people <sup>6</sup>. We also found that there are no M&E training manuals for data processing and quality assurance and clinical audit to verify best practices does not exist <sup>1,3</sup>.

**Conflict of Interest :** We have read and understood Indian journal of public health research and development

policy on declaration of interests and declare that we have no conflicting interests.

**Source of Funding:** WHO in collaboration with University of Hargeisa is the funding agent of the project among other projects, for publication the faculty of medicine, UOH is responsible in terms of logistics and publication in an international journal.

**Ethical Consideration:** Ethics clearance was obtained from both WHO and the ethics clearance committee of the Ministry of Health of Somaliland, and consent of the participants were taken before the interview.

### RECOMMENDATIONS

- Organize policy briefs to sensitize policy makers and managers on the importance of having quality, reliable, timely and accurate information to determine the status of pre-eclampsia and design appropriate interventions to address the situation;
- Develop and include peer reviewed, reliable and valid indicators in the routine HMIS tools, supervision checklists, M&E framework and tools;
- Establish a well-functioning information flow and feedback mechanisms at all levels;
- Train RH Managers, M&E and HMIS staff on standard case definition of pre-eclampsia, proper routine recording, reporting system, analysis and interpretation of the findings;

- Develop partnerships with medical, nursing and midwifery schools to provide pre-service and in-service training to health workers on standard case definition as well as proper recording and reporting of pre-eclampsia.

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# Effect of Soy Supplements on Systemic Blood Pressure among Post-menopausal Women- A Systematic Review

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## ABSTRACT

**Objective:** To clarify the effect of soy supplements on systemic blood pressure in post menopausal women. **Method:** Random control trials, Cross over design that investigated the effect of soy on systemic blood pressure in post menopausal women were included in the systemic review by researching MEDLINE, EMBASE up to July 2016. As the soy studies were very heterogeneous concerning interventions and outcome measures, meta-analysis could not be performed and trials were systematically assessed in a structured approach. **Results:** The present systemic review found that soy significantly changes the blood pressure. Four of these randomized controlled trials and cross over design were positive, suggesting soy preparations are beneficial for controlling blood pressure. Two were negative. **Conclusions:** There is some evidence for the efficacy of soy preparations for controlling blood pressure. However, the heterogeneity of the studies performed to date means it is difficult to make a definitive statement.

**Keywords:** Soy supplements, Systemic blood pressure, Post menopausal women, Heterogeneous

## INTRODUCTION

Menopause is the end of women's reproductive period. During this period various physiological and biochemical changes occur in the body due to drop in the level of estrogen<sup>1</sup>. Menopause was also defined as a natural phenomenon consisting of follicular atresia and decrease in ovarian hormonal secretions<sup>2</sup>.

Post menopause as the time after menopause and lasts more than one third of women's life. Women's health problem during this period, change the life style of patient in various ways like physical, emotional, social and financial quality of life. Hence it needs to ensure that the special support and special treatment<sup>3</sup>. In the developed countries the management of menopause is routine practice<sup>1</sup> but in India this practice is limited and still demanding for more improvement in the quality of life of women.

When estrogen production drops in the body, it increases the risk of metabolic syndrome and cardiovascular disease in menopausal women's. Estrogen depletion can also promote cardiovascular disease, pre existing diabetes and hypertension<sup>4</sup>. The prevalence of metabolic syndrome in postmenopausal women in some studies includes 33.5% in china, 55% in India and 34.7% in Brazil<sup>5-7</sup>. Soy is rich in natural phytoestrogen and it creates a new dimension in the treatment of various menopausal health problems.<sup>8</sup> Most studies have used soy extract isoflavones, isolated soy protein, dietary soy to prove the effect on systemic blood pressure<sup>9,10</sup>. The present study reviewed the effect of soy supplements on systemic blood pressure in post-menopausal women from various studies.

## OBJECTIVES

To review the effect of soy supplements intake on systemic blood pressure

Study selection:

Study selection Random control trials and cross over

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design that investigates the effect of soya on systemic blood pressure control among post-menopausal women were included in the systematic review. Trials had to be original data from randomized controlled trials (RCTs) regarding the effect of soya on metabolic changes among post-menopausal women. Randomizations by clusters or individuals were acceptable. We used no language or publication status restrictions.

#### Inclusion and exclusion criteria:

Studies were included for systematic review if they met all of the following criteria:

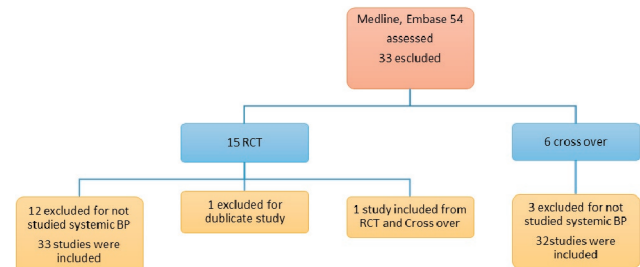
- Included participants of menopausal (Peri- or/ and postmenopausal) women;
- Evaluated intervention of dietary and extracts of soy supplements;
- Contained at least one relevant pair-wise comparison of intervention arms (i.e., dietary soy vs other therapeutic diet. Soya isoflavones vs placebo, soya protein vs non soya proteins, soya protein vs placebo, Soya isoflavones vs non soya protein),
- Random control trial cross over design study design was included
- Studies done within 10 years (from 2006 to 2016) were included
- Duplicated reports of the primary study were excluded.

#### Searching strategy for identification of studies:

We searched MEDLINE, and EMBASE. The data of the last search was august 2016. We designed a comprehensive and exhaustive search strategy for MEDLINE, and EMBASE to identify all relevant studies. To determine the studies for further assessment, two independent authors reviewed the titles, abstracts and keywords of all records retrieved to determine whether the studies were relevant to this review. Where the title and abstract did not provide adequate information, we assessed the full study and contact the authors of the study if additional information was required for further clarification. Disagreement was resolved by discussion. A total of 54 articles were identified, 15 RCTs and 6 cross over study design regarding soy were included. But 1 study were excluded due to duplicate publications studies 14 studies were excluded as it does not study

the systemic blood pressure. Finally, we yielded RCTs regarding soy. By contracting the related authors of two studies to supplement the missing data, data from one article were obtained, and others were not response or failure to contact. Two independent reviewers independently extract data.

Finally 6 studies were included



**Figure-1: Steps of review of literature**

## RESULT

An experimental study approach with randomized clinical trial and cross over study design were used to for the review studied. The target population was post-menopausal women. Study setting was Tehran, Boston, Iran and China. An overall 757 samples were included in 6 studies. A period of studies varies from 3 weeks to 6 months. Intervention group received soy in various form like Soya protein, soya nut, soy isoflavone, soy flour, and soy daidzein. Whereas the control group received placebo like dash diet, therapeutic lifestyle change diet, low-fat milk powder, milk protein and placebo. No serious adverse events were reported in the included studies. The outcomes of all the 6 studies were to assess systemic Systolic and diastolic BP, lipid profile, adhesion molecules and inflammatory markers and endothelial cytokines. This review is focused on effect of soy on systemic blood pressure changes among postmenopausal women. Over all the study group and sub group analysis showed that four out of six study results indicates that soy has effect on controlling and reducing blood pressure at significant level and 2/6 studies showed that soy has no significant changes in systemic blood pressure. In Randomized control design out of 3 studies 2 studies revealed the effect of soy on reducing blood pressure. In cross over design with or without RCT out of 3 studies 2 studies revealed the effect of soy on blood pressure in post menopausal women. There is some evidence for the efficacy of soy preparations for controlling systemic blood pressure.

## DISCUSSION

These studies attempted to assess the effect of soy on metabolic changes especially blood pressure and lipid profile among post-menopausal women. The systematic review is focusing on blood pressure changes over soy intake among post-menopausal women.

The study 1 has two intervention groups and one control group. The intervention group has received soy protein and soy nut. Control group received dash diet. Neither soy-protein nor soy-nut consumption had significant effects on systolic or diastolic blood pressures compared with the control diet. (Table-1)

Study 2 has showed that Compared with the TLC diet alone, the TLC diet with soy nuts reduced systolic and diastolic BP 9.9% and 6.8%, respectively, in hypertensive women (systolic BP $\geq$ 140 mm Hg) and 5.2% and 2.9%, respectively, in normotensive women (systolic BP $<$ 120 mm Hg). Further subdivision of normotensive women showed that systolic and diastolic BPs were reduced 5.5% and 2.7%, respectively, in prehypertensive women (systolic BP of 120-139 mm Hg) and 4.5% and 3.0%, respectively, in normotensive women. . (Table-1)

Study 3 showed that Women with Metabolic syndrome on the soy diet, had significant reductions in diastolic BP (7.7%; P=0.02), was noted among equol producers compared to levels on the TLC diet. No significant changes were noted in equol nonproducers. Similarly, in women without Metabolic syndrome, only equol producers had significant reductions in diastolic BP (3.3%, P=0.02). . (Table-1)

Study4showedthatSoy isoflavonesupplementation had a slight reduction in systolic and diastolic blood pressure. It was recorded in the experimental group, indicating the beneficial effect of soy isoflavones on regulating blood pressure. . (Table-1)

Study 5 showed that soy protein and isoflavones had no significant difference in the change and percentage change of BP among the three study groups. At the same time subgroup analysis among 130 pre and hypertensive women suggested that soy protein and isoflavones significantly reduced SBP [-4.25%, 95% confidence interval (CI) -7.9 to -0.6%, P = 0.02]. . (Table-1)

Study 6 showed that Soy flour (whole soy group),

low-fat milk powder+63 mg daidzein has no significant difference in parameters of ABP in both primary and subgroup analysis. (Table-1)

## CONCLUSION

Metabolic changes are commonly expected among menopausal women. Osteoporosis, pre hypertension, dysglycemia, central obesity and dyslipidemia lead to experience so many cardio vascular problems. In the modern world people need readymade solutions like hormones to prevent or treat those problems but which has so many complications too. Presently soy is taking new dimension in treating the menopausal problems in the place of hormonal therapy. The whole soy with therapeutic diet has significant effect on the lowering the blood pressure when compared to soy extracts or individual whole soy supplements. This present review study infers that soy supplementation with therapeutic diet may be a effective alternative therapy to control blood pressure in post-menopausal women. However, the heterogeneity of the studies performed to date means it is difficult to make a definitive statement.

## RECOMMENDATION

The present study reveals that whole dietary soy has beneficial effect in controlling the blood pressure. Dietary soy is more feasible, more practical and safe to incorporate into the diet in order to improve the quality of life than the hormonal therapy as which has risk to menopausal women.

**Ethical Clearance-** Taken from Saveetha university Institution of Human ethical committee, Chennai.

**Source of Funding-** Self

**Conflict of Interest –** None.

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# Relationship between Mental Rumination, Cognitive Emotion Regulation, Physical- Social Anxiety and Sleep Disturbance in People with Depression

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## ABSTRACT

The aim of this research is to study the relationship between mental rumination, cognitive emotion regulation, and social-physical anxiety and sleep disturbance in people with depression in Ahvaz city in 2016. The target population has included all the people with depressive disorder in Ahvaz city, a sample of 150 patients with depression who have referred to psychiatric clinic of Golestan hospital of Ahvaz city has been selected. The research design is correlational and sampling method is purpose covariance sampling. In order to collect the data, the mental rumination scale of Nolen Hoeksema, Marow (1991), cognitive emotion regulation questionnaire of Garnefski (2001), physical- social anxiety of Hart, Larry and Rjsky (1989), and Kerningen sleep questionnaire (1990) have been used. The analysis of the data by using Pearson correlation has shown that at the level of 0.05 there is a significant relationship between mental rumination, cognitive emotion regulation, physical- social anxiety and sleep disturbance in people with depression. Also according to the regression analysis it has been shown that among the predictive variables, the variable of physical-social anxiety and mental rumination are respectively better predictors for the sleep disturbance criterion variable.

**Keywords:** *mental rumination, physical - social anxiety, cognitive emotion regulation, sleep disturbance, depression*

## INTRODUCTION

Depression disorder is one of the emotional disorders that its main component is sadness<sup>1</sup>. One of the factors that are associated with depression is the amount of sleep or sleep disorders. Sleep has several definitions, sleeping is a special state of mind and body in which the body is placed deeply at rest, metabolism is minimized and the mind is closed towards what is happening in the outside world<sup>2</sup>. Sleep disorders are the disorders that disrupt the normal sleep regulation, increase or decrease the sleep or create the abnormal states of sleep, and the person will get upset because of these problems<sup>3</sup>. The research

of Ford and et al has shown that there is a relationship between depression and poor quality of sleep and people who suffer from insomnia compared to those who have a normal sleep pattern have a greater risk for developing depression. Depression is the most powerful predictor of sleep disorder and poor quality of sleep. Another factor that is associated with sleep disturbance in people with depression is mental rumination. Mental rumination is one of the unwanted thoughts in emotional disorders. These opinions are passive and have a repetitive aspect and they are focused on symptoms and results and prevent to adaptively solve the problem and lead to an increase of negative thoughts<sup>4</sup>.

In fact we can adjust our excitement on the different levels such as psychological and empirical<sup>3</sup>. These strategies can also be considered as a form of awareness and attention. There is a positive relationship between cognitive emotion regulation and sleep quality; the inability to regulate the emotion leads to the increased

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nightly arousal and insomnia. Using negative excitement strategies especially mental rumination and catastrophic thinking will reduce the quality of sleep in patients with depression<sup>4</sup>. This point has been proven in the researches of Ariana Kia et al (2015)<sup>5</sup>, cool and et al (1994)<sup>5</sup> and Raes and et al (2006)<sup>6</sup>.

Another factor that is associated with sleep disturbance in people with depression is physical-social anxiety. Physical-social anxiety at first has been proposed by Hart, Liry and Rigeski (1989)<sup>6</sup>. This concept means the anxiety that people experience because of the other's evaluation of their body and their appearance. People who have high levels of social anxiety avoid the situations in which their body is evaluated by others. These people are unhappy and sad with their current appearance and body shape, and they make a great effort to achieve their desired body and appearance, so they use some traumatic and harmful methods to lose weight (Kortes, 2008)<sup>3</sup>. The most important factor of sleep disorder is anxiety. When the depressed person gets stressed despite the fact that he wants to sleep, due to the mental rumination and intrusive thoughts he will constantly review the events and focuses his mind on the factor that triggers anxiety. This finding is proved in the researches of Hart and et al (1989)<sup>6</sup>, Koaleski et al (2006)<sup>6</sup>, Jankos et al (2008)<sup>4</sup>, and Kortes and et al (2008)<sup>2</sup>. According to the above mentioned facts, in the present research it has been tried to study the relationship between mental rumination, cognitive emotion regulation, and physical-social anxiety and sleep disturbance in patients with depression in Ahvaz city.

## METHOD

The statistical population in this study has included all the people with depression in Ahvaz city in 2016. The sample has been consisted of 150 patients with depression in the Ahwaz city that have been selected by purposive covariance sampling method. For this purpose, the treatment centers have been determined and one hospital has been chosen among them, and based on the number of cases in the hospital that have been considered as the depression by a doctor, the secretary has contacted with the patients and after making an appointment with them the test has been performed. It should be noted that the patients who were able to perform the test have been selected.

## Research Tools

**Mental Rumination response scale (RRS) of Nolen Huksoma and Moro (1991):** Nolen Huksoma and Morrow (1991)<sup>7</sup> have prepared a self-test questionnaire that has evaluated the four different types of reactions to the negative mood. Response Style Questionnaire (RSQ) is consisted of the ruminative response scale (RSS) and scale of misleading answers of the attention (DRS). RSS has 22 sentences that respondents will be asked to grade them from 1 (never) to 4 (very often) (Treyner, Gonzales, and Nolen Huksoma, 2003)<sup>8</sup>. Cronbach's alpha coefficient is ranging from 0.88 to 0.92. Various studies have shown the test-retest reliability of 0.67 for RSS. In the present study, by using Cronbach's alpha the reliability of the questionnaire has been obtained 0.85.

**Cognitive emotion regulation questionnaire CERQ:** This questionnaire is made by Garnefski and Kraaij (2001)<sup>9</sup>. It has 36 items and its 9 cognitive emotion regulation strategies are distinguished on the theoretical and empirical basis; each of these strategies refers to something that the person will think about them after experiencing threatening or stressful events. In Iran, the alpha and retest coefficients for the CERQ subscales have shown the reliability of this questionnaire. Also, the correlation of the extracted subscales from the CERQ with the total scores of depression, anxiety, stress (DASS) indicates the convergent and divergent validity of this questionnaire. In this study, the Cronbach's alpha of this questionnaire is 0.84.

**Physical- Social Anxiety Scale:** Physical-social anxiety scale is a self-report tool that has 12 questions. For the first time, it has been developed by Hart, Larry and Rjsky (1989)<sup>10</sup>, (Moradian, Naderi, 2009). In this questionnaire, the 5 Likert scale has been used. The total score is between 12 and 60. Hart, Larry and Rjsky (1989) by using the Cronbach's alpha method have reported the reliability of 0.90 and validity of 0.80 for its initial version<sup>10</sup>. For the first time in Iran, Moradian and Naderi (2009) have studied the Social Physique Anxiety Scale (SPAS). In order to determine the concurrent validity, they have implemented the social Physical anxiety scale with Fisher body image questionnaire and the correlation coefficient has been obtained ( $P < 0.001$ ,  $r = 0.73$ )<sup>11</sup>. In the present study, by using the Cronbach's alpha, the reliability coefficient of 0.75 has been obtained.

**Sleep quality test of Kerning:** This scale is an

insomnia self-report questionnaire in which Kerningen (1990)<sup>12</sup> provides a rapid assessment of insomnia based on the 4DSM and CDS criteria of (American board of sleep). This questionnaire has 15 items and it is answered with the options of correct, wrong and somewhat. The maximum score on this scale is 42 and the minimum score is zero. To determine the reliability

of the Sleep Quality scale the two Cronbach's alpha and split-half methods have been used and they have respectively obtained 0.74 and 0.72 which indicate that the coefficients are acceptable; also, in an Iranian population an acceptable reliability has been reported for this questionnaire. In the present study, by using the Cronbach's alpha, the reliability coefficient of 0.77 has been obtained.

### FINDINGS

**Table 1: Mean and standard deviation of the questionnaires**

Variables	Mean	SD	N
Mental rumination	50.12	14.32	150
Physical-social anxiety	32.37	10.6	150
Cognitive emotion regulation	110.40	9.33	150
Sleep disorder	9.45	5.16	150

**Table 2: simple correlation between predictor and criterion variables**

Criterion variable	Predictor variables	r	p
sleep disorder	Mental rumination	0.833	0.0001
	Physical-social anxiety	0.849	0.0001
	Cognitive emotion regulation	0.285	0.0001

As the value of the correlation coefficient can be seen in Table 2, there is a significant relationship between the variables of mental rumination, physical-social anxiety and cognitive emotion regulation and sleep disorder. Therefore, the first, second and third hypotheses have been confirmed.

**Table 3: Regression analysis with entry, and stepwise methods (dependent variable: sleep disorder)**

Predictor variables		R	R	F	Sig	Beta	t	Sig
Mental rumination		0.902	0.813	211.275	0.000	0.456	8.456	0.000
Physical-social anxiety						0.516	9.600	0.000
Cognitive emotion regulation						-0.018	-0.467	0.641
Model	Predictor variables	R	R	F	Sig	Beta	t	Sig
1	Physical-social anxiety	0.849	0.720	381.502	0.000	0.849	19.532	0.000
2	Physical-social anxiety	0.901	0.812	318.497	0.000	0.513	9.637	0.000
	Mental rumination					0.452	8.493	0.000

### DISCUSSION AND CONCLUSION

In this section, according to the general purpose that is to evaluate the relationship between mental rumination, cognitive emotion regulation and physical-

social anxiety and sleep disturbance in people with depression, and by considering the statistical results the scientific findings have been explained.

**First hypothesis:** there is a relationship between

mental rumination and sleep disorder in people with depression.

As can be seen in Table 2, the correlation coefficient between the two variables of mental rumination and sleep disorder is 0.833; so the first hypothesis is confirmed and there is a significant positive relationship between the two variables of mental rumination and sleep disorder. In other words, by increasing the level of mental rumination, sleep disorder will be increased. The results of this hypothesis are consistent with the findings of Bagherinezhad et al (2010)<sup>13</sup>, Bahrami et al (2009)<sup>14</sup>, and Khosravi et al. (2008)<sup>15</sup>. In order to confirm the results of this hypothesis it can be said that the relationship between mental rumination and sleep disorder in people with depression can be explained. In the case of the emergence of mental rumination causing factors, the level of person's sleep regulation will be weakened. But if this weakening or reduction of sleep gets severe, it may lead to more negative consequences for the person. Thus, at the same of the sleep quality loss people try to looking for a way to get out of the condition that creates the mental rumination. According to the above explanations we can conclude that when there are fewer mental rumination factors, people will have less sleep disorder and thereby the person's sleep disorder will be improved.

**Second hypothesis:** there is a relationship between cognitive emotion regulation and sleep disorder in people with depression.

As can be seen in Table 2, the correlation coefficient between the two variables of cognitive emotion regulation and sleep disorder is 0.285; so the second hypothesis is confirmed and there is a significant positive relationship between the two variables of cognitive emotion regulation and sleep disorder. In other words, by increasing the level of cognitive emotion regulation, sleep disorder will be increased. The results of this hypothesis are consistent with the findings of Ariana Kia et al (2015)<sup>5</sup>, Cool and et al (1994)<sup>16</sup>, Raes et al, (2006)<sup>5</sup>, Karami et al (2015)<sup>3</sup>. In order to confirm the results of this hypothesis it can be said that the relationship between cognitive emotion regulation and sleep disorder in people with depression can be explained. Thus, against the social injustice people ruminate the feeling of guilt, anger or embarrassment. Also, people often use some strategies to increase the positive arousal.

**Third hypothesis:** there is a relationship between physical- social anxiety and sleep disorder in people with depression.

As can be seen in Table 2, the correlation coefficient between the two variables of cognitive emotion regulation and sleep disorder is 0.285; so the second hypothesis is confirmed and there is a significant positive relationship between two variables of cognitive emotion regulation and sleep disorder. In other words, by increasing the level of cognitive emotion regulation, sleep disorder will be increased. The results of this hypothesis are consistent with the findings of Hart et al. (1989)<sup>10</sup>, Koaleski et al, (2006)<sup>16</sup>, Jankos et al(2008)<sup>16</sup>, Kortess et al (2008)<sup>12</sup>. In order to confirm the results of this hypothesis it can be said that the relationship between cognitive emotion regulation and sleep disorder in people with depression can be explained. Therefore, when the physical-social anxiety in people with depression increases, after assessing the situation people try to deal with the condition of physical- social anxiety in different ways; such as not appearing in situations that others may evaluate their body shape. According to the above explanations we can conclude that when there are fewer factors of physical-social anxiety, people will have less sleep disorder and thereby the person's sleep disorder will be improved.

**Fourth hypothesis:** there is a multiple relationship between mental rumination, cognitive emotion regulation and physical- social anxiety, and sleep disturbance in people with depression.

As can be seen in Table 3, according to the significant level and the value of F, the regression of the prediction of sleep disorder through the variables of mental rumination and physical-social anxiety is significant, and the fourth hypothesis is confirmed. The results are consistent with the findings of Bagherinezhad et al (2010)<sup>13</sup>, Khosravi et al. (2008)<sup>15</sup>, Hart et al. (1989)<sup>10</sup>, and Garnefski et al, (2001)<sup>9</sup>. In explaining the results we can say that, mental rumination is the occurrence of intrusive, conscious and disgusting thoughts. These thoughts are unwanted and they interfere with the normal function of the person. People who deal with disturbing events are involved with the thoughts of these events and will be engaged with mental rumination for a long time, and they consider them catastrophic and terrible and they will be passively surrounded by them. The sleep quality will get worst and the person will experience

more negative emotions. So we can say that the increase of mental rumination and physical-social anxiety will increase the sleep disorder in people with depression.

**Ethical Clearance:** is adhered all ethical interests: (The ethics of recording data, the right of respondents to end involvement in the research, the disclosure by respondents of sensitive material, the ethics of ethnographic fieldwork, the ethics of the research interview, and ethics in the use of questionnaires).

**Conflict of Interest:** The authors declare that they have no competing interests.

**Source of Funding:** Not reported

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# Epidemiological Features of Dengue Cases Treated in SGRDIMSAR Amritsar

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## ABSTRACT

**Introduction:** Dengue is a mosquito-borne viral disease that has rapidly spread in all regions of WHO in recent years. Study conducted on confirmed dengue cases reported in district Amritsar from the years 2009 to 2013 showed that no dengue case was reported in infants, maximum number in the age 21-31 years, higher number of males and peak of cases in October. Similar observations were found in another study conducted in year 2013 in SGRDIMSAR, Amritsar. **Material and Methods:** Epidemiological data of confirmed cases of dengue treated in SGRDIMSAR, Amritsar in year 2015 were collected, analyzed and valid conclusions were drawn. **Findings:** Maximum number of cases 69 (32.2%) was found in age group 21 to 30 years. Higher number of males and urban cases was found. The cases were reported from the months of August to December with peak in October. The mean time gap between date of admission and testing of cases was 6.17 days. Maximum cases, 157 (73.4%) were found positive by NS-1 Ag. **Conclusion:** The number of dengue cases, 214 reported in year 2015 was higher than 73 reported in year 2013. Dengue cases reported in year 2015 has shown shifting of disease in lower age, Higher percentage of male cases found might be due to the reason that the less number of the females come to the hospitals for seeking the treatment. Changing trend of spread of dengue from rural to urban areas might be due to more urban patients visiting this institution now. Reporting of cases in months of August to December, with its peak in October resembles previous studies. Thus all prevention and control measures should be taken well before the onset of dengue season; and use of NICD Coolers should be promoted.

**Keywords:** dengue/DHF/DSS/NVBDCP/*Aedes aegypti*/*Aedes albopictus*/Suspected case/Confirmed case.

## INTRODUCTION OR BACKGROUND

Sri Guru Ram Das Institute of Medical Sciences and Research (SGRDIMSAR), Amritsar is a tertiary health care institution. Dengue is a mosquito-borne viral disease that has rapidly spread in all regions of WHO

in recent years. Dengue virus is transmitted by female mosquitoes mainly of the species *Aedes aegypti* and, to a lesser extent, *Ae. albopictus*. This mosquito also transmits chikungunya, yellow fever and Zika infection. Severe dengue (also known as Dengue Haemorrhagic Fever) was first recognized in the 1950s during dengue epidemics in the Philippines and Thailand. Today, severe dengue affects most Asian and Latin American countries. There are 4 distinct, but closely related, serotypes of the virus that cause dengue (DEN-1, DEN-2, DEN-3 and DEN-4).

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Global burden of dengue

The actual numbers of dengue cases are

underreported and many cases are misclassified. One recent estimate indicates 390 million dengue infections per year (95% credible interval 284–528 million), of which 96 million (67–136 million) manifest clinically (with any severity of disease). Another study, of the prevalence of dengue, estimates that 3.9 billion people, in 128 countries, are at risk of infection with dengue viruses.<sup>1,2</sup>

Man develops disease after 5-6 days of being bitten by an infective mosquito. It occurs in two forms: Dengue fever and dengue haemorrhagic fever (DHF). Dengue fever is a severe, flu-like illness and is a more severe form of disease, which may cause death. Signs & symptoms of dengue fever are: Abrupt onset of high fever, severe frontal headache, pain behind the eyes which worsens with eye movement, muscle and joint pains, loss of sense of taste and appetite, measles-like rash over chest and upper limbs, nausea and vomiting. Dengue cases and deaths in the country since 2009 have shown a rising trend with the intervening fluctuations. Total number of cases and deaths in India, in the years 2009 to 2014 is as follows: 2009 (15535 cases and 96 deaths), 2010 (28292 cases and 110 deaths), 2011 (18860 cases and 169 deaths), 2012 (50222 cases and 242 deaths), 2013 (75808 cases and 193 deaths), 2014 (40571 cases and 137 deaths). In the state of Punjab the number of cases and deaths in the years 2009 to 2014 are as follows: 2009 (245 cases and 1 death), 2010 (4012 cases and 15 deaths), 2011(3921cases and 33 deaths), 2012 (770 cases and 9 deaths), 2013 (4117 cases and 25 deaths), 2014(472 cases and 8 deaths).<sup>3</sup>

A study conducted in the district Amritsar in year 2010 showed the reporting of 196 suspected cases and 1 death. All the cases reported were residing in the urban area only. Maximum number of cases was reported in the age group of 16 to 50 years and there was no case among infants. Higher number of cases in males was reported. Majority of cases 149 (76.02%) were reported in the months of October and November.<sup>4</sup> Study on trends of dengue cases in district Amritsar from the year 2009 to 2013 shows that suspected cases of dengue found positive by Ig G and Ig M tests were reported till 2008 and after that confirmed cases of dengue found positive by Ig M Mac Elisa and NS-1 Ag Elisa Kits have been reported from the year 2009 to 2013. A rising trend of dengue was observed in these years except for the year 2012. No dengue case has been reported in infants. Maximum number of cases 161 (28.9%) have been reported in the

age group 21-31 years. There were 215 (38.6%) female cases and 342 (61.4%) male cases. The difference of sex wise distribution was insignificant statistically. Out of the 557 cases 291(52.2%) were reported in October and 200 (35.9%) in November with the month wise difference highly significant statistically.<sup>5</sup>

Cement water tanks, water coolers, plastic containers and tyres are the preferred breeding habitats of *Aedes* mosquitoes. Coconut shells and latex cups are important breeding sites in Kerala and Lakshadweep Island. National Centre for Disease Control (NCDC) has developed a modified cooler with a covered water tank which prevents breeding of mosquitoes. Use of this cooler can be very helpful in preventing vector breeding and thus contribute towards control of dengue as a public health problem particularly in urban areas.<sup>6</sup> National Research Development Corporation of India found that in India about 60 to 70% of the mosquito breeding occurs in coolers in the urban areas and about 40% in rural areas.<sup>7</sup>

A study conducted in the Department of Community Medicine, SGRDIMSAR, Amritsar showed that in year 2013 there was 1 case of dengue haemorrhagic fever (DHF), no case of dengue shock syndrome (DSS) and death. The maximum numbers of cases were found in the adult age groups and no case in infants and under five year children. Higher number of male cases and rural cases was found. The maximum number of cases was found in month of October followed by November and September. From 4 districts of Punjab, the cases of dengue got treatment from this institute and the maximum number of cases belonged to district Amritsar.<sup>8</sup>

Hence the present study was focused to assess the epidemiological features of the confirmed dengue cases reported in SGRDIMSAR in year 2015.

## **MATERIAL AND METHOD**

Separate wards of dengue were established in SGRDIMSAR in its Medicine, Paediatrics departments and its city hospital. These beds were covered with bed nets to prevent the spread of dengue infection from the dengue patients admitted in these wards to other patients, visitors, and staff of the institute by the mosquito bites.<sup>8</sup> The epidemiological data of the confirmed cases and deaths due to dengue were collected in the Department of Community Medicine, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar 2015. The



study population included the patients having symptoms and signs resembling dengue and their serum samples were got tested for confirmation of dengue by NS1 Ag and IgM Mac Elisa done in Government Medical College, Amritsar. Data collected were analyzed and the valid conclusions were drawn.

### FINDINGS

There were 214 confirmed cases of dengue reported and treated in the year 2015 in SGRDIMSAR, Amritsar and no death was found among these cases.

#### Age

The mean age with SD of the cases was  $33.96 \pm 1.56$  years. Only one case aged 9 months was below the age of 1 year. The maximum age found was 85 years. Table 1 is showing the age wise distribution of confirmed cases of dengue. It shows that maximum number of cases 69 (32.2%) was found in age group 21 to 30 years. This is followed by 34 (15.9%) in each age group of 14 to 50 and above 50 years. The agewise difference in the number of cases found in different groups has been found significant statistically.

**Table 1. Agewise distribution of confirmed cases of dengue**

Age in years	No.	Percent
< 1	1	5.0
6-10	7	3.3
11-20	30	14.0
21-30	69	32.2
31-40	39	18.2
41-50	34	15.9
> 50	34	15.9
<b>Total</b>	<b>214</b>	<b>100.0</b>

$$X^2 = 98.7 \quad \text{d.f.} = 6 \quad P < 0.05$$

#### Sex

Table 2 is showing the sex wise distribution of confirmed cases of dengue reported. It shows that there were 137 (64%) males and 77 (36%) females. The sex wise difference in the number of cases has been found highly significant statistically.

**Table 2. Sexwise distribution of confirmed cases of dengue**

Sex	No.	Percent
Male	137	64.0
Female	77	36.0
<b>Total</b>	<b>214</b>	<b>100.0</b>

$$X^2 = 16.8 \quad \text{d. f.} = 1 \quad P < 0.01$$

Table 3 is showing the area wise distribution of confirmed cases of dengue reported. It shows that there were 186 (86.9%) cases reported from the urban and 28 (13.1%) from the rural area. The area wise difference in the number of cases has been found highly significant statistically.

**Table 3. Area wise distribution of confirmed cases of dengue**

Area	No.	Percent
Urban	186	86.9
Rural	28	13.1
<b>Total</b>	<b>214</b>	<b>100.0</b>

$$X^2 = 116.6 \quad \text{d. f.} = 1 \quad P < 0.01$$

Table 4 is showing the blockwise distribution of confirmed cases of dengue reported from the rural area. The highest number of cases, 7 (25%) was reported from the block Verka followed by Manawala 6 (21.4%) and the minimum 2, (7.1%) from the blocks Ramdas and Tarsika each. The reporting from the remaining blocks is shown in the table. The rural block wise difference in the number of cases found has been found insignificant statistically.

**Table 4. Rural blockwise distribution of confirmed cases of dengue reported from rural area**

Rural block	No.	Percent
Baba Bakala	4	14.3
Lopoke	3	10.7
Manawala	6	21.4
Ramdas	4	14.3
Tarsika	2	7.1
Threawal	2	7.1
Verka	7	25
<b>Total</b>	<b>28</b>	<b>100.0</b>

$$X^2 = 5.5 \quad \text{d. f.} = 6 \quad P > 0.5$$

Table 5 is showing the monthwise distribution of confirmed cases of dengue. It shows that the dengue cases were reported during the months from August to December only. The peak of cases, 105 (49.1%) was found in the month of October and minimum cases 4 (1.9%) were found in the August. Rising trend of the reporting of cases had been observed from August to October and there was a declining trend from October to December. The month wise difference in the number of cases found has been found highly significant statistically.

**Table 5. Monthwise distribution of confirmed cases of dengue**

Month	No.	Percent
August	4	1.9
September	35	16.4
October	105	49.1
November	60	28.0
December	10	4.7
<b>Total</b>	<b>214</b>	<b>100.0</b>

$X^2 = 159$                       d. f. = 4                      P < 0.01

Table 6 is showing the time gap between the date of admission and date of testing of confirmed cases of dengue. This shows that the mean and standard deviation of time gap found was 6.17 days ± 3.38 days. The maximum time gap found was 21 days and the minimum was zero day I. e. the test was done on the same day.

**Table 6. Time gap between date of admission and date of testing of cases**

Value	Time gap in days
Mean	6.17
Standard deviation	3.38
Minimum	0.00
Maximum	21.00

Table 7 is showing the testwise distribution of confirmed cases of dengue. It shows that the maximum cases, 157 (73.4%) were found positive by NS-1 Ag, followed by IgM Mac ELISA, 54 (25.2%). Three

(1.4%) were found positive by both NS-1Ag + IgM Mac ELISA. The test wise difference in the number of cases found positive has been found highly significant statistically.

**Table 7. Testwise distribution of confirmed cases of dengue**

Test name	Positive	Percent
NS-1 Ag	157	73.4
IgM Mac ELISA	54	25.2
NS-1Ag + IgM Mac ELISA	3	1.4
<b>Total</b>	<b>214</b>	<b>100.0</b>

$X^2 = 172.3$                       d. f. = 2                      P < 0.01

**CONCLUSION**

The total number of confirmed dengue cases, 214 reported in SGRDIMSAR in year 2015 was much higher than 73 cases reported, in the same institution in year 2013.

The age wise distribution of dengue cases in year 2015 has shown the shifting of disease in lower age as one infant had been reported in the present study against no case reported in the year 2013 in this institution. The remaining results are similar to the study conducted on trends of dengue cases in district Amritsar from 2009 to 2013 and study conducted in 2013 in SGRDIMSAR. <sup>5,8</sup>

The sex wise distribution also resembles the previous studies i. e. higher percentage of male than the female cases which might be due to the reason that the less females come to the hospitals for seeking treatment. <sup>3,5</sup>

The urban rural area wise distribution of cases has shown the changing trend of spread of dengue from the rural to urban areas in SGRDIMSAR. In the previous study of 2013 only 37 (39.78%) cases treated were residents of the urban areas and 56 (60.22%) cases were residents of rural areas, while in the present study higher number of dengue cases 186 (86.9%) were reported from the urban area than 28 (13.1%) in the rural area which might be due to more urban patients visiting this institution now. <sup>8</sup>

Month wise distribution of dengue cases in this study resembles previous studies showing the reporting of cases in August to December, with its peak in October.<sup>5,8</sup>

Maximum cases, 157 (73.4%) were found positive by NS-1 Ag, followed by IgM Mac ELISA, 54 (25.2%) and 3 (1.4%) by both NS-1Ag + IgM Mac ELISA respectively.

Thus all prevention and control measures like establishment of separate dengue wards in hospital having beds covered with bed nets, availability of materials for early diagnosis, appropriate and prompt treatment of dengue cases should be taken well before the onset of dengue season; and use of NICD Coolers should be promoted.

**Acknowledgements:** Nil

**Conflict of Interest:** Nil

**Source of Funding:** Self

**Ethical Clearance:** Not needed as the study is based on the records.

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# Spectrum of Systemic Autoimmune Diseases Associated in Patients with Interstitial Lung Disease in a Tertiary Care Centre in Eastern India

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## ABSTRACT

**Introduction:** The available data on the epidemiology of connective tissue disease associated interstitial lung disease (CTD-ILD) from India is sparse. Hence, the present study was undertaken with the aim to analyze the demographic profile and clinical, radiological and pathological characteristics along with physiological parameters of various subgroups of CTD-ILD patients.

**Material and method:** We retrospectively studied 70 patients diagnosed with CTD-ILD during the years May 2013 to April 2016 at Pulmonary Medicine Department at our Institute.

**Results:** Mean age at presentation was 44.81 years; females comprised 82.8% of the patients. Prior to presentation at our centre, 10% patients had been treated with anti tubercular therapy due to misdiagnosis of tuberculosis. In the pool of CTD-ILDs analyzed, systemic sclerosis (28.5 %) was found to be the most common subgroup, followed by mixed connective tissue disease (MCTD)(25.7%).

Cough (85.7%) was the most common presenting symptom; exertional dyspnoea was found in 71.4% of patients. The most common pattern on chest roentgenogram was reticular/reticulo-nodular pattern (50%) and on HRCT Non specific Interstitial Pneumonitis (NSIP) (85.7%).

**Conclusions:** We found systemic sclerosis followed by MCTD, NSIP to be the most common CTD-ILDs in eastern India. ILDs are still frequently misdiagnosed as TB, and increased awareness, education and diagnostic facilities are required to diagnose CTD-ILDs at an early stage.

**Keywords:** *Connective tissue disease, Interstitial lung disease, Non specific Interstitial Pneumonitis*

## INTRODUCTION

The term interstitial lung disease (ILD), or diffuse parenchymal lung disease (DPLD), encompasses a number of clinical disorders that involve the alveolar structures, pulmonary interstitium and small airways <sup>[1, 2]</sup>. Some of these diseases are benign and self-limiting; others are chronic, progressive, irreversible and even fatal. All ILDs, however, have certain common clinical, radiological, pathological and physiological features that should be recognized.

In a developing country like India, with a high prevalence of tuberculosis (TB), ILDs are often initially misdiagnosed as TB. Data on ILDs has been limited to just a few dispersed studies <sup>[7-15]</sup>. The largest ILD series

published from India comprised just 274 patients <sup>[14]</sup>. Also, most of the previous studies on ILD from India lacked any computed tomography (CT) evaluation.

The lung is a common site of complications of systemic connective tissue disease (CTD), and lung involvement can present in several ways. Interstitial lung disease (ILD) and pulmonary hypertension are the most common lung manifestations in CTD. Although it is generally thought that interstitial lung disease develops later on in CTD it is often the initial presentation ("lung dominant" CTD). ILD can be present in most types of CTD, including rheumatoid arthritis, scleroderma, systemic lupus erythematosus, polymyositis or dermatomyositis, Sjögren's syndrome,

and mixed connective tissue disease. Despite similarities in clinical and pathologic presentation, the prognosis and treatment of CTD associated ILD (CTD-ILD) can differ greatly from that of other forms of ILD, such as idiopathic pulmonary fibrosis. Idiopathic pulmonary fibrosis (IPF) is associated with usual interstitial pneumonia (UIP), poor survival and limited treatment options.<sup>[3]</sup> Interstitial lung disease (ILD), most typically presenting as non-specific interstitial pneumonitis, is a leading cause of death in systemic sclerosis (SSc)<sup>[4]</sup> and a prominent clinical feature of other connective tissue diseases (CTDs), including idiopathic inflammatory myopathy (IIM) and Sjögren syndrome. UIP is also found in rheumatoid arthritis (RA) and IIM<sup>[5,6]</sup>.

This retrospective study was, therefore, undertaken with the aim to study the spectrum of CTD-ILDs presenting to a tertiary care centre. The demographic profile and clinical, radiological characteristics along with physiological parameters of these CTD-ILD patients were retrospectively analyzed.

## MATERIALS AND METHOD

### Study design

A single-centre, retrospective study

This study includes 70 patients diagnosed to have CTD-ILD during the years May 2013 till April 2016 at Pulmonary Medicine Department in Kalinga Institute of Medical sciences, Bhubaneswar, Odisha, India. Since it was a retrospective study from hospital records, no ethical clearance was necessary.

The records of the patients were retrospectively reviewed for clinical presentation, and radiological findings along with their pulmonary function test at presentation. The final diagnosis of CTD-ILD was based on evaluation for underlying connective tissue disease as per the disease specific classification criteria.

The American Thoracic Society/European Respiratory Society International Multidisciplinary Consensus Classification of Idiopathic Interstitial Pneumonias 2011 updated guidelines were used in the diagnosis and classification of ILD<sup>[16]</sup>.

A detailed record of the medical history and examination at the time of initial presentation was analyzed. Laboratory investigations such as hemogram, chest radiograph, electrocardiogram and sputum smear

examination for acid-fast bacilli (AFB), Mantoux test and pulmonary function test (PFT) were recorded. All serological investigations such as serum anti-nuclear antibody (ANA), extractable nuclear antibody (ENA), serum calcium, serum angiotensin converting enzyme (ACE) levels, cytoplasmic antineutrophil cytoplasmic antibodies (c-ANCA), perinuclear anti-neutrophil cytoplasmic antibodies (p-ANCA), anti topoisomerase I antibody (Scl-70) rheumatoid factor (RF), anti-cyclic citrullinated peptide antibodies (anti-CCP), anti double-stranded DNA (anti-dsDNA), along with other relevant investigations such as 24-hour urinary calcium, serum creatine phosphokinase (CPK), aldolase were obtained.

Patients with raised muscle enzymes (creatinine phosphokinase or aldolase) were evaluated for evidence of myositis using magnetic resonance imaging of the thigh, electromyography, or muscle biopsy (or a combination thereof).

Chest radiograph and high-resolution computed tomography (HRCT) findings were analysed.

A six-minute walk test (6MWT) was performed in patients wherever indicated and desaturation of > 4% from baseline was considered as significant.

## RESULTS

The study included 70 patients diagnosed with interstitial lung disease associated with connective tissue diseases on the basis of clinical radiological and pathological characteristics along with underlying rheumatic disease diagnosed based on various classification criteria.

The overall mean age at presentation was 44.81 years. Of the 70 CTD-ILD cases there were 58 (82.8%) females. The overall mean duration of symptoms at diagnosis was 4.2 years. Cough in 60 (85.7%) patients was the most common presenting symptom; exertional dyspnoea was found in 50 (71.4%) of patients. Fever in 35 (50%) and skin involvement in 42 (60%). Dysphagia was observed in 35 (50%) cases, all belonging to the systemic sclerosis and mixed connective tissue disease subgroup.

On examination, Chest crepitations were present in 60 (85.7%) of all patients. Prior history of anti-tuberculosis treatment due to misdiagnosis as tuberculosis was present in 7 (10%) cases of ILD. All patients were

sputum smear-negative for acid fast bacilli.

The most common pattern on chest roentgenogram was reticular/reticulo-nodular pattern 35(50%) and on HRCT –Non specific Interstitial Pneumonitis (NSIP) 60(85.7%).

The distribution of various connective tissue disease is as below in Table 1.

**Table 1: Showing underlying etiology for connective tissue disease associated interstitial lung disease**

Disease	N=70
Systemic Sclerosis-Diffuse Cutaneous (SSc-dc)	20 (28.57%)
Mixed Connective Tissue Disease(MCTD)	18 (25.7%)
Rheumatoid arthritis(RA)	07 (10%)
Dermatomyositis(DM)	06 (8.5%)
Overlap Connective Tissue Disease	05 (7.14%)
Primary Sjogren’s Syndrome(SS)	03 (0.4%)
Undifferentiated Connective Tissue Disease	04 (5.7%)
Sarcoidosis	03 (4.28%)
Microscopic Polyangitis	02 (2.57%)
Systemic Lupus Erythematosus (SLE)	01 (1.4%)
Eosinophilic Granulomatosis with Polyangitis	01 (1.4%)

### DISCUSSION

The true burden of ILD in India is not clearly known due to under recognition, attributed to lack of awareness, paucity of diagnostic facilities as well as to the huge spectrum that this entity encompasses. Reports from western literature show an increase in the prevalence and incidence of ILD in recent decades [18]. However, data on clinical presentation and diagnosis of the spectrum of ILDs from India is limited. The previous Indian studies on ILDs did not have uniform diagnostic case definition and classification criteria of ILDs and did not have computed tomography evaluation in all studies. Evaluations for underlying connective tissue disease were not done systematically in previous studies. To the best of our knowledge, the present study is the first study of CTD-ILD epidemiology on an Indian population, with defined criteria of diagnosis and classification.

In our study, the mean age at presentation was

greater than 40 years; finding is similar to previous studies from India [7-15] as well as western literature [17, 18]. The present study observed increased prevalence in females as compared to male patients. Similar observations have been reported in other Indian studies [8, 10, 13, 14]. This can be explained by the fact that the majority of our subject population consisted of patients with nonspecific interstitial pneumonia (NSIP), which are female preponderant connective tissue diseases.

Another important observation is that almost 10% of cases of ILDs had a history of anti-tubercular treatment. This might be due to radiological similarities between ILD and pulmonary tuberculosis and a lack of awareness and paucity of diagnostic facilities in many centers.

Majority patients diagnosed with connective tissue disease CTD-ILD had a classifiable CTD at the time of diagnosis of ILD; only in 4(5.7%) cases clinical and serological findings suggest, but are not entirely diagnostic of, a classifiable CTD. Of 70 cases diagnosed as CTD -associated interstitial lung disease (CTD-ILD), systemic sclerosis (28.5 %) was found to be the most common subgroup, followed by mixed connective tissue disease (MCTD)(25.7%).

### CONCLUSION

The current study describes the spectrum of CTD-ILDs prevalent in eastern India. Diagnosis of connective tissue disease in patients with ILDs at an early stage is paramount to prevent and hence delay progression to irreversible damage to the lungs, especially in treatment-responsive ILDs. Hence, in a developing country like India, with high prevalence of pulmonary tuberculosis, education and awareness of general practitioners, pulmonologist and physicians about CTD-ILDs deserves special attention.

**Conflict of Interest – Nil**

**Source of Funding- Nil**

**Ethical Clearance –not required** as it was a retrospective study from case records

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# An Epidemiological Study of Knowledge Attitude and Practice of Nutritional Status of the Elderly in Rural Population of Ambala District, Haryana

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## ABSTRACT

**Background:** Geriatric population is a potentially vulnerable group for malnutrition as per 2011 census of the World Health Organization.

**Objectives:** To estimate the knowledge attitude and practice of malnutrition in elderly population

**Materials and Method:** This community-based cross-sectional study was carried out in rural field area of MMIMSR Mullana Ambala Haryana, India among 300 elderly individuals aged  $\geq 60$  years during July 2015 to July 2016 by applying a questionnaire. Elderly individuals were interviewed after obtaining informed verbal consent.

**Results:** showed elderly people had good knowledge about malnutrition but poor score was found in attitude and practice part

**Conclusion and Recommendation :** Growth chart monitoring of elderly should start and a programme should start at Govt. Level for the nutrition of elderly like mid day meal started for children.

**Keywords:** Knowledge attitude and practice of malnutrition, in Ambala Haryana India.

## INTRODUCTION

The elderly are a precious asset for any country. With rich experience and wisdom, they contribute their might for sustenance and progress of the nation. Their special health and economic issues differ from those of the general population. The United Nations Principles address the independence, participation, care, self-fulfillment and dignity of older persons as an ensure the priority.<sup>1</sup> Ageing is a universal process and it affects every individual, family, community and society. It is a normal, progressive and irreversible process. Sir James Sterling Ross commented “you do not heal old age, you protect it, you promote it and you extend it.” These are in fact the principles of Preventive Medicine. Ageing is generally defined as a process of deterioration in the functional capacity of an individual that results from structural changes, with advancement of age.

The ageing of population is an inevitable consequence of process of demographic transition and creates an imbalance in the age structure over a period of time. The term demographic transition refers to a process whereby a society moves from a situation of high fertility and mortality to one of lower rates.<sup>2</sup> This transition is characterized first by decline in infant and childhood mortality as infectious and parasitic diseases are controlled. Re-education in fertility implies a decline in proportion of young in population. Re-education in mortality means a longer life span due to control of epidemics and life threatening diseases. Whole population begins to age when fertility rate decline and mortality rates at all ages improves. Therefore, “population ageing” involves a shift of society from high mortality and high fertility to low mortality and low fertility. Due to process of demographic transition, older persons are growing steadily.<sup>3</sup>



In some countries the share number of people entering older ages will challenge national infrastructures, particularly health system.<sup>4</sup> This population ageing can be seen as a success story for public health policies and for socioeconomic development, but it also challenges society to adapt, in order to maximize the health and functional capacity of older people as well as their social participation and security.

Ageing is not merely a matter of accumulating years but also a process of “adding life to years, not years to life.” The world health day theme in 2012 was *Ageing and health* with the theme “Good health adds life to years”. The focus is how good health throughout life can help older men and women lead full and productive lives and be a resource for their families and communities. Ageing concerns each and every one of us — whether young or old, male or female, rich or poor - no matter where we live.<sup>5</sup>

In 2000, there were 600 million people aged 60 years and above; there will be 1.2 billion by 2025 and 2 billion by 2050. Today, about two thirds of all older people are living in the developing world; by 2025, it will be 75%. In the developed world, the very old i.e above 80 years is the fastest growing population group. Women outlive men in virtually all societies; consequently in very old age, the ratio of women/men is 2:1.<sup>4</sup> According to projections by the UN Population Division, there will be two elderly persons for every child in the world by 2050. This implies that the aged 60 and above population will account for 32 % of the population by 2050.<sup>6</sup>

The gender dimensions in ageing and its relative aspects also are very different. The life expectancy of females is higher than that of males, with low literacy and low income, with high incidence of widowhood all adds to the vulnerability of elderly women in a gender segregated society like India.<sup>7</sup>

From the beginning to the end of 20<sup>th</sup> century, human life expectancy at birth has almost doubled in developed countries with the increased life expectancy and so the percentage of elderly people is also increasing worldwide.<sup>8</sup> This has been especially true in the case of developing countries like India. Thus, India is an ageing society with the rate of growth of ageing population exceeding the general population.<sup>9</sup> There is no United Nations standard numerical criterion but the UN agreed cutoff is 60+ years when referring to the elderly population<sup>10</sup>. In India, the elderly account for 7% of the

total population of which two-thirds live in villages and nearly half of them in poor conditions.<sup>11</sup>

## MATERIAAL AND METHOD

**STUDY AREA** -The study will be conducted in rural area of Ambala district of Haryana state  
**STUDY PAPULATION**- Elderly people above 60 years age residing in study area –

**STUDY PERIOD**- January 2016 to December 2016

**STUDY DESIGN**- Cross –sectional Study.

**SAMPLE SIZE** -Sample size is calculate by using the formula -  $n = \frac{4pq}{L^2}$  where; n=required sample size p=prevalence q=100-p ,L=permissible error in estimate of “p

**“INCLUSION CRITERIA**- 1 All people above 60 years age. 2 people aged above 60 years who are willing to participate

**EXCLUSION CRITERIA**- 1 people aged above 60 years but not willing to participate. 2 people above 60 years aged who are not available even after three visits.3 Bed ridden elderly people.

**SAMPLING TECHNIQUE** -Multistage sampling method was used to cover the required sample size. Three primary health centers are located in rural area of Ambala viz RHTC Barara, Phc Mullana and Phc Nahoni which are under the administrative control of department of community medicine MMIMSR Mullana (Ambala). Each centre was covering a population of (48107 Barara, 49913 Mullana and 39229 Nahoni). Total villages covered by these centers are Barara which include 23villages, Mullana which include 31 villages and Nahoni which include 30 villages. One centre was selected by lottery method. Villages of the selected centre were listed and six villages were selected randomly. The list of elderly people of these villages were prepared by head count method and fifty elderly were included in the study to complete the sample size.

**STUDY TOOL**- questionnaire including A suitably designed and validated KAP questionnaire was administered to General population of Ambala, Haryana. [ Study population sample was selected by lottery method. The questionnaire was pretested and verified for errors. The questionnaire covered

three areas: knowledge, attitude and practice towards malnutrition. There were a total of 19 questions, with 8 questions related to knowledge about malnutrition, 5 questions to assess the attitude of the patient towards the disease, and 6 questions regarding practices. This questionnaire was filled in at a face-to-face interview with the investigator. In scoring method, 19 was the maximum possible score in which each correct answer was carry one point and incorrect or unsure answer was carry no point. The interviewer did not in any way try to improve the knowledge of respondents. Hindi or English version of questionnaire was provided as per requirement of individual.

**STUDY STRATEGY-** The study was conducted by employing house to house survey technique. The data was collected by interviewing the elderly persons above 60 years age after taking an informed consent.

**RESULTS**

**Table 1** - A total of 300 elderly subjects were included in the study, of which 161 were men and 139 women. Mean age for men was 69 years [standard deviation(SD) = 7.5] and for females 70 years (SD = 6.3). Among the subjects, 70.% were illiterate and 20% had education only up to primary level. Majority (94%) of the subjects lived in joint family. According to the modified BG Prasad Scale, only 5% belonged to Class I status, and majority were from Class III (70%), Class IV (20%), SES Of the 300 elderly subjects, 270 were married and the rest were widow/widower. Majority were financially dependent (77.4%) on other family members, whereas 17% were partially dependent. Only 5.5% subjects were financially independent.

**TABLE-2** Good knowledge is found among the elderly about the disease. They knew about the BMI, malnutrition, undernutrition, Overnutrition.

**TABLE-3**

We observed poor score in attitude part of questionnaire and only 45.2% had positive attitude towards exercise.

**TABLE -1: Demographic details**

Variables		%
Gender	Male	54
	Female	46

	Total	100
Marital status	Married	96
	Unmarried	4
	Total	100
Educational status	Illiterate	70
	Primary school	20
	Secondary school	7
	Graduate	3
	Total	100
Age (years)	<60	-
	60-70	70
	71-80	20
	81 or above	10

**TABLE 4:** We observed poor score in practice part also only 40% want to reduce fat and junk food in their diet 36.2 think that regular chacking of BMI is required.

**TABLE -2: Knowledge questions**

Sr No	Questions	%
1	Do you know malnutrtion is a disease?	98.1
2	What are the complications of malnutrtion?	61
3	What is the normal level of BMI ?	24
4	Is the diet rich in fat causes overnutrtion?	82.4
5	Is the jung food is harmful for men?	81.2
6	What are the symptoms of malnutrtion?	40.2
7	Is obesity associated with malnutrtion?	80.4
8	Is exercise having beneficial role in Malnutrtion?	63.6 1

**TABLE -3: Attutde questions**

Sr No	Questions	%
1	When was your BMI checked last?	20.6
2	When was your last visit with your physician?	43
3	When was your weightcheckede?	10
4	When did you have yourdiet assessment done last?	6.2
5	When was your blood (Hb) checked last?	16.8
6	When did you have gone for exercise last?	19.6

**TABLE - 4: Practice Questions**

Sr No.	Questions	%
1	Should we reduce fat and jung food intake intake to prevent malnutrtion?	40
2	Do you think regular checking of your BMI level I good ?	36.2
3	Should we keep in touch with physician regularly?	28.4
4	Do you think regular diet control is important in malnutrtion?	72
5	Should we exercise regularly for healthy life?	45.2

### DISCUSSION

Previous study conducted in western Rajasthan showed a highprevalence of malnutrition and risk of malnutrition among the rural elderly comparedwith the urban elderly (11% and 62% vs. 2% and 36%,respectively).[12] Compared with the results from a large studyamong rural elderly of Bangladesh,[13] we found a similar highprevalence of malnutrition and risk of malnutrition among ourpopulation (29.4% and 60.4%, respectively). A large studyconducted in Spain showed much lower rates of malnutritionand risk of malnutrition (4.3% and 25.4%, respectively) than our study.[14]Our results showed more elderly to be at risk of malnutrition-dwelling elderly from India and other parts of the world.

### CONCLUSION

Result shows that almost 60% elderly had low scores. Considering the high knowledge about the disease poor score in attitude and practice part among elderly more focus on diet and possible nutritional interventions are required. Lower income group should receive particular attention to meet their special needs. The promotion and implementation of low cost, prevention-based

### RECOMMENDATIONS

Growth chart monitoring of elderly should start at govt. level. Infact a programme should start at govt. level for nutrition suplliments like mid day meal programme in children.

**Ethics Consideration:** Study was approved by Institutional ethics committee. All the subjects was

fully informed about the purpose of the study, informed consent was taken in local language they understand and assurance regarding confidentiality was given. The study was impose no financial burden on the participants

**Source of Funding-** Self

**Conflict of Interest-** Nil

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# Effectiveness of Behaviour Change Communication on Reduction of Overweight and Obesity in Urban School, Bangalore

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## ABSTRACT

**Background:** Overweight and obesity in children with their consequences has been as major public health problem worldwide. Prevention is only an indispensable strategy to tackle global epidemic of obesity. Schools are a primary focal point in educating children on proper nutrition, increased exercise, and an overall healthier lifestyle.

**Objectives:** 1. To assess prevalence of overweight and obesity and its determinants in an urban school, Bangalore.

2. To assess the effectiveness of Behaviour Change Communication [BCC] on reduction of overweight and obesity among these children.

**Materials and Method:** An interventional study using a simple random sampling method was conducted in an urban school, Bangalore city. A total of 596 children aged between 10 – 15 years were included in the study. Nutritional status was assessed by anthropometry and clinical examination. Intervention was done in the form of Nutrition education, and life style modification. Follow up was done by assessing BMI of these children once in 3 months for a period of one year.

**Results:** The prevalence of overweight and obesity during initial assessment was 7.05% and 2.18% respectively. After intervention the prevalence of overweight was reduced to 6.37%, at the third and fourth quarterly, but obesity reduced to 2.01%, 1.51%, 1.17%, and 0.8% at first, second, third and fourth quarterly respectively. The reduction in BMI was statistically significant at second, third and fourth quarterly. Factors significantly associated with childhood obesity were frequency of snacks, lack of physical activity and duration of television viewing.

**Conclusion:** Nutrition education and life style modification sessions with continuous supervision by parents and teachers helps to overcome overweight and obesity.

**Keywords:** BMI; Educational intervention; Overweight; Obesity.

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## INTRODUCTION

Childhood obesity is one of the most serious public health challenges of the 21<sup>st</sup> century. The problem is global and is steadily affecting many low- and middle-income countries, particularly in urban settings.<sup>1</sup> Morbidity

related to childhood obesity include Hypertension, type 2 diabetes mellitus, dyslipidaemia, left ventricular hypertrophy, non-alcoholic steatohepatitis, obstructive sleep apnoea, orthopaedic problems psychosocial problems, early or menarche, eating disorders such as anorexia and bulimia, skin infections, asthma and other respiratory problems. Obesity is estimated to be one of 3 risk factors that contributes most to the global burden of disability – adjusted life year lost (DALYs).<sup>1</sup>

Overweight and obesity are the fifth leading risk for global deaths. Overall, more than 10% of the world's adult population was obese. <sup>2</sup> WHO has warned “the growth in the number of severely overweight adults to double that of underweight during 1995-2025” (WHO 1998). <sup>3</sup> From existing data it has been projected that by the year 2030 levels of obesity could be as high as 50-80% in the USA, between 30-40% in Australia, England and Mauritius and over 20% in some developing countries.<sup>4</sup>

Childhood obesity is an important risk factor for obesity in adulthood and up to 80% of obese children become obese in future adult life. <sup>5</sup> Studies on urban Indian school children from selected regions also report a high prevalence of obese and overweight children.<sup>6-11</sup>

Establishing healthy behaviors during childhood is easier and more effective than trying to change unhealthy behaviors during adulthood. In this regard a school play an important role in promoting the health and safety of children and enables them to establish lifelong healthy behavior patterns.

## OBJECTIVES

1. To assess prevalence of overweight and obesity and its determinants in an urban school, Bangalore.
2. To assess the effectiveness of BCC in reduction of overweight and obesity among these children.

## MATERIALS AND METHODOLOGY

An interventional study involving overweight and obese children was done for a period of one year from January 2011 – December 2011.

After obtaining approval from Institutional Ethical committee of VIMS &RC, the study population was randomly selected from the schools in the urban field

practice area of Bangalore. Sample sized

A total of 596 school children studying in 5th to 10th standard aged between 10 to 15 years who regularly attended school were enrolled after obtaining consent from the school authority and the parents through school authorities who arranged parent meeting. Verbal assent was taken from the children for anthropometric examinations and counselling. Children suffering with chronic illness, endocrinal problems, physical and mental defects were excluded from the study.

The data collection was done with pre tested semi-structured questionnaires. The children were interviewed in detail regarding family history of obesity, eating habits, junk food habits, and about their physical activity/ exercise, time spent on watching television playing computer or video games, and duration of time spent on homework and mode of transport to school.

The information regarding parents educational status, occupation, total income, their weights, birth weight of the child were obtained from the parents. Clinical examination and anthropometric measurements were done for all the children.

The Body Mass Index (BMI) was calculated by measuring the height and weight of all children in the study. The children were classified according to K.N Agarwal classification <sup>12</sup>, where children with BMI of 85th to 95 th percentile were considered as overweight and 95th percentile and above were obese with respect to age and sex. The children greater than 85th percentile formed the study group for intervention and rest formed the comparison group.

The periodical health education counselling was done to all overweight and obese children at an intervals of 3 months followed by anthropometric measurements. The change in BMI was noted down and health education intervention for Behavioural change communication was intensified. The data was analysed statistically by Propotions, chi-square, Multiple logistic regression, and Paired-T test using Microsoft Excel, Epi-info, and SSPS version 16.

## RESULTS AND DISCUSSION

Out of 596 children, 299(50.18%) were boys and 297(49.82%) were girls.

Majority 440(73.83%) were Hindus and

450(75.50%) were from nuclear family and belonged to socioeconomic class of I and II according to Kuppusuamy's classification (updated 2009). Majority (60.4%) had a birth weight of 2.5 to 3.5 kilograms by proforma Anthropometric assessment and K.N. Agarwal classification revealed that prevalence of overweight was 42(7.02%) and obesity was 13(2.18). Maximum children 304(51.01%) had mixed diet, 321(53.86%) had meals 3 times daily. The majority of overweight /obese children 35(11.82%) were girls and 89(11.32%) belonged to 15 years. Distribution of overweight/obese children 11(20.01%) were more among 15 years children.

Maximum of overweight/obese children 49(89%) had snacks >2times; 50(90.90%) travelled to school by bus/autorikshaw; 48(87.22%) watched television > 2 hours; 50 (90.90%) had physical activity < 1hour and 48(87.27%) did home work > 1 hour in a day. These determinants were statically significant ( $p<0.05$ ). Majority of 33(60%) of overweight children had mixed diet, which was not statistically significant.

The prevalence of overweight/obesity in snacking frequency is 48.44 times higher in those who had more than 2 times per day (OR: 48.44; CI: 15.645-149.99), 0.14 times higher in those who did not play more than 1 hour per day (OR: 0.14; CI:0.004-0.45), 1.03 times more with children who travelled by bus/autorikshaw (OR: 1.038; CI:0.254- 4.234), 2.68 times higher in those watching television >2 hours per day (OR:2.681;

CI:0.757-9.497) and 4.39 times more in those children who were spending > 1hour per day in doing homework (OR: 4.398; CI: 1.059-18.266).

It was observed that during initial to first quarterly assessment there is no statistical significance ( $p>0.05$ ). During the subsequent assessment there was statistical significance ( $p<0.01$ ) between first and second, second and third, and third and fourth quarterly assessments.

**Table 1: Distribution of Socio-demographic factors in study subjects**

Sl.No	Characteristics of study subjects	Numbers	Percentages
1.	<b>Age</b>		
	10 yrs	100	16.78%
	11 yrs	98	16.44%
	12 yrs	101	16.95%
	13 yrs	97	16.28%
	14 yrs	102	17.11%
2	<b>Sex</b>		
	Males	297	50.18%
	Females	299	49.82%
3.	<b>Religion</b>		
	Hindus	447	73.83%
	Muslims	84	14.09%
	Others	72	12.08%
4.	<b>Socio-economic status</b>		
	Class I	163	27.35%
	Class II	384	64.43%
	Class III	44	7.38%
	Class IV	5	0.84%
	Class V	0	0.00%
5.	<b>Type of family</b>		
	Nuclear family	450	75.50%
	Joint family	85	14.26%
	Three generation family	61	10.23%
6.	<b>Birth weight</b>		
	<2.5kgs	26	4.36%
	2.5-3.5kgs	360	60.40%
	>3.5kgs	210	35.23%
7.	<b>Type of diet</b>		
	Mixed	304	51.01%
	Vegetarian	292	48.99%
8.	<b>Physical activity</b>		
	<1 hr	28	6.38%
	1hr	216	36.24%
	1-2hr	228	38.26%
	>2hr	114	19.13%
9.	<b>Nutritional status(acc. To KN Agarwal classification)</b>	541	90.77%
	Normal weight(85th percentile)	42	7.05%
	Overweight(85-95 <sup>th</sup> percentile)	13	2.18%
	Obesity(>95 <sup>th</sup> percentile)		

**Table 2: Comparison of determinants among normal weight ,overweight/obese children.**

Sl no	Variable	Normal weight	Overweight/obese	Significance
1	Sex			$\lambda^2=4.13$ P<0.05
	Boys	280(51.75%)	209(36.36%)	
	Girls	261(48.24%)	35(63.63%)	
2	Diet type			$\lambda^2=1.58$ p>0.05
	Vegetarian	270(49.9%)	22(40%)	
	mixed	271(50.0%)	33(60%)	
3.	Snacking habits			$\lambda^2=193.4$ P<0.05
	<2 times per day	479(88.53%)	6(11%)	
	>2 times per day	62(11.46%)	49(89%)	
4	Physical activity			$\lambda^2=1.99$ P<0.001
	<1 hr per day	63(11.64%)	50(90.90%)	
	>1 hr per day	478(88.35%)	5(9.10%)	
5.	Transport to school			$\lambda^2=5.77$ P<0.05
	Walk/bicycle	132(24.39%)	5(9.10%)	
	Bus /autorikshaw	409(75.60%)	55(90.90%)	
6.	Tv watching/video games playing			$\lambda^2=12.22$ P<0.05
	<2 hr per day	202(37.33%)	74(12.22%)	
	>2 hr per day	339(12.22%)	48(87.72%)	

**Table : 3 - Full Model Logistic Regression Comparing The Overweight Group**

**(N=55) To The Non-Overweight Group (N=54)**

Variable	B	SE	OR(95 <sup>TH</sup> CI)	P VALUE
<b>Diet</b> Mixed/veg	0.163	0.525	1.177(0.421-3.293)	0.756
<b>Snacks</b> <2 times/>2 times	3.880	0.577	48.442915.645-149.992	0.000
<b>Physical activity</b> <1 hr/>1 hr per day	-4.264	0.5960	0.014(15.645-149.992)	0.000
<b>Travel</b> walk/bicycle/auto/bus	0.037	0.718	1.038(.254-4.234 )	0.959
<b>Television/computer video games</b> <2 hr/>2hr per day	0.986	0.645	2.681(.757-9.497)	0.127
<b>Homework</b> <1 hr/>1hr per day	1.481	0.727	4.389(1.059-18.266)	0.041



**Table 4 : Nutritional status of children according to BMI for age and sex (KN****Agarwal classification) during initial, first, second, third and fourth quarterly assessment**

ASSESSMENT OF BMI	OBESE	OVERWEIGHT	NORMAL WEIGHT	TOTAL
INITIAL	13(23.64%)	42(76.36%)	0(0%)	55(100%)
FIRST	12(21.82%)	43(78.18%)	0(0%)	55(100%)
SECOND	9(16.36%)	43(78.18%)	3(5.45%)	55(100%)
THIRD	7(12.73%)	38(69.09%)	10(18.18%)	55(100%)
FOURTH	5(9.09%)	38(69.09%)	12(21.82%)	55(100%)

**Table 5: Paired Samples Test**

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	INITIAL - FIRST	-.056	.731	.099	-.253	.141	-5.669	54	.572
Pair 2	FIRST - SECOND	.591	.541	.073	.444	.737	8.092	54	.000
Pair 3	SECOND - THIRD	.534	.453	.061	.411	.657	8.738	54	.000
Pair 4	THIRD - FINAL	.593	.470	.063	.466	.720	9.364	54	.000
Pair 5	INITIAL - FINAL	1.662	1.163	.157	1.347	1.977	10.594	54	.000

## DISCUSSION

A cross sectional study by Dr. Biswajit Mohanty et al, found Overweight/obesity prevalence in urban boys and girls population as 5.5% and 5.9% respectively according to WHO, IOTF criteria.<sup>7</sup> The School Children of South Karnataka by Kotian et.al showed that overall prevalence of overweight among adolescents was 9.9% and obesity was 4.8%.<sup>8</sup> Mahajan et al,<sup>9</sup> AND Kaur et al<sup>10</sup> showed the prevalence of overweight ( $\geq 85$ th percentile) among children was 4.41% and prevalence of obesity ( $>95$ th percentile) was 2.12%. Cherian, et al, study revealed that, the prevalence of obesity (7.5%) and overweight (21.9%) were highest among high income group and lowest (1.5% and 2.5%) among low income group.<sup>11</sup> A study conducted in 1990 amongst 3,861 school children by Kapil, et al, prevalence of obesity as 7.5% amongst affluent adolescents in Delhi.<sup>13</sup> Aggarwal, et al,<sup>14</sup> revealed overall incidence of obesity in the study

group was 3.4%, with no significant difference between boys and girls. In a study done by Goyal, et al.<sup>15</sup> showed age-adjusted prevalence of overweight was found to be 14.3% among boys and 9.2% among girls where it was 2.9% in boys and 1.5% in girls. In another study by Sharaswathi, et al,<sup>16</sup> and Iyer et al<sup>17</sup> overweight and obesity were found to be 8.75 percent in urban schools and 0.8 percent in rural area. This study is consistent with present study, where the prevalence is 9.25 percent. The study by Marwaha RK et al,<sup>18</sup> was comparative with prevalence of overweight and obesity based on different standards, Gender variation in prevalence rates was not seen, except in case of those computed using CDC standards. According to a report from urban South India, 21.4% of boys and 18.5% of girls aged 13-18 years were overweight or obese.<sup>19</sup>

The results of the present study is consistent with the Vedavathi et al.<sup>20</sup>

A study by Shah p et al, found that significantly higher improvement was observed in younger children (aged 8-11 years) as compared with those aged 12-18 years, in females compared with males and in government schools Compared with private schools which was statistically significant. There were gaps on health and nutrition-related knowledge and behaviour of urban Asian Indian children, parents and teachers.<sup>21</sup>

A meta analysis study by Kamath et al,<sup>22-23</sup> observed regarding target behaviors with regard to physical activity ,dietary habbits were improved with health education .

Laxmaiah et al<sup>24</sup> reported that the overall prevalence of overweight was 6.1% [ 95% confidence interval (CI): 4.2, 8.0] among boys and 8.2% among girls (CI: 6.0, 10.4).

In the present analysis the overall statistical significance was present for increased frequency of snacking and physical activity and duration of homework (  $p < 0.05$ ) but there was not much statistical significance for other variables (travel, television viewing, computer/ video games playing) . The logistic regression analysis revealed that the prevalence of overweight was 4 times higher among the adolescents of high socioeconomic status [ odds ratio (OR): 4.1;

CI: 2.25, 7.52] , 3 times higher in those not participating in outdoor games (OR: 2.75;

CI: 1.56, 4.72), and 1.92 times higher in those watching television 3 h/d (OR: 1.92; CI: 1.16, 3.18).<sup>25</sup>

### CONCLUSION

Therefore there is need of high priority and warrants effective prevention and early intervention. Introduction of ‘nutrition and physical education’ in school curriculum. These activities should become compulsory and /or a ‘scoring subject’ with marks to be added to total grades. Training of teachers and Introduction of ideal school meals or provision of canteens offering only healthy options based on Indian foods. With Regulating advertisements aimed at children and insist on food labelling. Considering taxation on ‘fatty food’ and junk foods. All these measures complemented by other approaches such as parental and family involvement will lead to prevention at earliest.

**Source of Funding-** Self.

**Conflict of Interest -** Nil

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# To Study the Emergency Department Patient Process Flow in Hospital

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## ABSTRACT

Growing spectrum of disease and population has resulted in an increasing public demands and with the drive towards effective service delivery, continuous performance and process improvements are essential to the vitality of any Healthcare organization.'

Outpatient services have become an important component of health care. By hidebound thinking, the medical profession emphasized that a physician's time is more valuable than a patient's time. This is no longer valid in today's consumer oriented society. Long waiting times for treatment in the outpatient department followed by short consultations has long been a complaint. Nowadays, customers use waiting time as a decisive factor in choosing a service provider. Therefore, idle time of both parties must be considered in designing a proper OPD patient process flow although these two objectives are contradicted to each other.

Healthcare process mapping is a new and important form of clinical audit that examines how we manage the patient journey, using the patient's perspective to identify problems and suggest improvements. We outline the steps involved in mapping the patient's journey, as we believe that a basic understanding of this versatile and simple technique, and when and how to use it, is valuable to clinicians who are developing clinical services.<sup>2</sup>

This research aims to provide a study of the major causes of OPD- Patient Flow Process for medical treatment in tertiary hospital and also provide recommendation on the best strategy to improve OPD process flow so that can maximize the effectiveness and efficiency of resource and capacity.

**Aim:** To Study the OPD- Patient flow process in Hospital and its Importance.

**Objectives:** 1. To know about the current work flow in Emergency department.

2. To understand the gaps if any, in the Emergency department.
3. To implement the interventions to eliminate/minimize the gaps.
4. To evaluate the benefits post implementation.

Limitation: Time is constraint: study was for 3 months (from 08May to 08 Aug)

**Keywords:** OPD, Emergency Department(ED) Process charts, performance measurement, healthcare systems.

## INTRODUCTION

Customer satisfaction has become a serious concern in service sector. On Healthcare industry, a number of

initiatives have been introduced to enhance customer satisfaction. The healthcare industry providers globally are experiencing increasing pressure to concurrently reduce cost and improve the access and quality of care they deliver.

Any healthcare institutions are confronted with long waiting times, delays, and queues of patients. Typical questions challenging hospital managers include: How

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should they optimally allocate their limited resources? How much exam rooms do they need? How much physicians and supporting staff do they need? If they increase or decrease the amount of exam rooms and/or staff, how would this effect patient waiting time, the length of a medical treatment and the total time spent in clinic by patient?

To improve patient satisfaction, the performance of key processes has to be improved<sup>3</sup>. There is no doubt that healthcare institutions need to become high performers. If they increase or decrease the amount of exam rooms and/or staff, how would this effect patient waiting time, the length of a medical treatment and the total time spent in clinic by patient?. To improve patient satisfaction, the performance of key processes has to be improved<sup>3</sup>. There is no doubt that healthcare institutions need to become high performers.

Practical issues such as the ease of use of the appointment system, or implications on modifying physicians' behavior need to be considered in order to achieve the ultimate goal of improving "real systems". It may also be interesting to determine what are the most commonly used patient flow process in practice.<sup>4</sup>

Effectively managing patient flow in an outpatient unit is a key to achieving operational excellence as well as ensuring clinical quality. It is especially so for an outpatient department in a large hospital as it handles very large volume of patients with a diverse case mix.

Medical care is a program of services that should make available to the individual, and thereby to the community, all facilities of medical and allied services necessary to promote and maintain health of mind and body. This program should take into account the physical, social and family environment, with a view to the prevention of disease, the restoration of health and the alleviation of disability.<sup>5</sup>

Hospitals deal with the life and health of their patients. Out Patient Department (OPD) Services is one of the important aspects of Hospital Administration. It is also called Ambulatory Care Services. It is a shop window for patient.<sup>5</sup>

OPD is the mirror of the Hospital, which reflect the functioning of the hospital being the first point of contact between the patient and the hospital staff.

Out Patient and Emergency Department:

Outpatient department is that section of the hospital which is staffed and equipped and has scheduled working hours to provide "Diagnostic, Therapeutic, Preventive and Rehabilitative" care to those patients who are not registered as in patients while receiving the service.<sup>6</sup>

Process mapping allows us to "see" and understand the patient's experience by separating the management of a specific condition or treatment into a series of consecutive events or steps (activities, interventions, or staff interactions). The sequence of these steps between two points (from entry of patient to exit of patient) can be viewed as a patient pathway or process of care.

The process by which patients move through a hospital or other health care setting—can be improved the safety and quality of care.

## LITERATURE REVIEW

A Hospital is an integral part of a social and medical organization, the function of which is to provide for the population complete healthcare, both curative and preventive and whose outpatient services reach out to the family and its home environment the hospital is also a center for the training of health workers and bio-social research.<sup>6</sup>

Outpatient services are the most important services provided by all the hospital as it provides services to a large number of patients at a low cost. Successful and efficient management of OPD can lighten the burden on the patient wards.<sup>7</sup>

The importance of the outpatient department lies in the following:

1. An OPD is the first point of contact with the hospital and the entry point into the healthcare delivery system.
2. It is an inseparable link in the hierarchical chain of healthcare facilities.
3. It contributes to the reduction in Morbidity and Mortality.
4. It's a stepping stone for health promotion and disease prevention.
5. It help reduce the number of admission to inpatient wards, thus, conserving scare beds.

6. It acts as a filter for inpatient admission, ensuring that only those patients are admitted who are most likely to benefit from such care.

7. It's the "SHOP WINDOW" of the hospital.

In OPD, improving the patient pathway involves the coordination of multidisciplinary practice, aiming to maximize clinical efficacy and efficiency by eliminating ineffective and unnecessary care. The data provided by process mapping can be used to redesign the patient pathway to improve the quality or efficiency of clinical management and to alter the focus of care towards activities most valued by the patient. \* Process mapping has shown clinical benefit across a variety of specialties, multidisciplinary teams, and healthcare systems.

Flow of Patients:

On outpatient visits, patients flow is in a predictable manner usually from Enquiry to Registration to Waiting to Examination room to Investigation facilities, although there are many exceptions to this. Nevertheless, it is beneficial to draw a flowchart of activities and movements in the outpatient department to guide the planning process for location of various facilities and their relationship with one another.

OPD workflow in Emergency Department:

The ED is organized into three areas: Major medical/trauma, Minor Medical/Trauma and ED Walk-in. Each has a separate physical area (Figure 1-3). Each also serves a different set of patients.

When a patient enters the ED, he or she first sees a triage nurse, who determines the severity of the patient's condition. Immediately afterwards, the Patient Flow System (PFS) assigns a Unique Health Identification Number (UHIN) if the patient is new to the hospital. With the help of the patient's name, date of birth and mother's maiden name, PFS checks in the information system for previous medical records. In some cases a duplicate ID is created, but this is rare. Patients generally have previously received an ID card, which shows their UHIN and their financial situation regarding hospital reimbursement.

The ED is extremely busy and crowded, and suffers long waits. This is due in part to waits for admission to inpatient beds. When inpatient beds are unavailable the ED patients often must wait in ED beds until then can

be moved ("borders"). Also, processes are slowed in ED due to limited accessibility of certain ancillary services. Radiology, for example, is on a different floor and ED patients must sometimes be moved up to that floor for diagnostic services and then moved back down to the ED.

After the patient's condition has been stabilized, each patient is assigned one PFS worker who asks questions, enters data into the information system, takes printouts and puts this info next to the patient's bed for the doctor to see them. If the patient needs to be admitted into an inpatient bed, he/she is seen again by PFS. At the end of the ED visit, or if additional service is needed, such as admission to an inpatient bed, then the patient receives "financial screening" from PFS.

## METHODOLOGY

Study Design:

The research design used in this study is both Descriptive and Exploratory.

Study Population:

All patients who came for ED visit at, tertiary clinic.

**Sample Size:** - 200 ED Patients.

**Technique:** - Convenient Sampling.

**Observations & Analysis:**

The study conducted in the ED showed the various bottlenecks which cause to reduce the patient satisfaction in hospital.

1. Crowd management was not proper because of less manpower.
2. Long Patient waiting time.
3. Patient waiting area is insufficient.
4. Medical Record data of patients were not properly maintained.
5. Proper signage were not there in the hospital.
6. Less availability of rooms.

Analysis:

1. Understanding Patient arrival Patterns

Patient arrival patterns drive systems for scheduling staff and other resources. The patterns were somewhat predictable. Hospital scheduling controlled most of the other arrivals.

The following time of day graphs for the 12 noon and 10.30 pm (Figures 1) show a strong peak early in the day. The arrival pattern is somewhat different in 1350, with a peak in the evening hours, from about 5:00 p.m. until 9:00 p.m., which may reflect the severity and incidence of injuries resulting from accidents and violence.

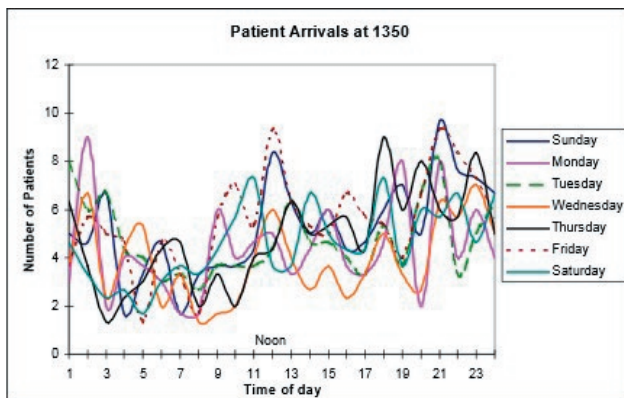


Figure 1: HOURLY ARRIVALS IN MAJOR MEDICAL/TRAUMA

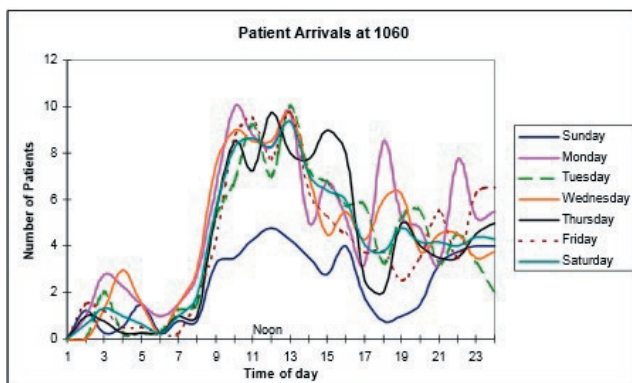


Figure 2: HOURLY ARRIVALS IN MINOR MEDICAL/TRAUMA

ED arrival time has regular patterns over the typical day and week. However, all of these measures may be influenced by the ED being over busy (possibly on diversion) and by long waiting time in the less acute area of the OPD, discouraging additional patient arrivals. Typically, during the course of a week, Monday and Tuesday were busiest, and Sunday was the least busy, in the total ED (Figure 2).

## RECOMMENDATIONS

1. Improvement Process by creating motivated, knowledge and empowered individuals to make needed

changes related to patient flow.

**2. Hospital Portal** - Patient appointments and referrals are received by the hospital at a variety of points. This complicates the scheduling process and harms patient satisfaction through a lack of consistency and control. A single centralized point of access and a strengthened CSC would support a more efficient hospital operation and improve customer service.

**3. Patient Tracking System and ID** - By enforcing a system with a clear patient ID, costs can be avoided. Many computerized patient tracking systems, such as those the hospital is considering, have capabilities in electronic tracking. Operational data related to patient flow requires a clear, consistent and efficient patient identification system. A variety of alternatives are available, such as bar-codes and radio frequency ID, which will save operating costs and offer very useful data on patient flows.

**4. Appointment/Scheduling Systems Using Simulations** Tools such as computer simulation and an optimized scheduling system will support better decisions. Scheduling requires complex tradeoffs and such decisions should be based on forecasts and determination of their likely impact before they occur.<sup>8</sup>

5. Including a step where nurse take all the required readings like temperature and blood pressure, this will substantially reduce the consultation time with doctor.

6. Introduction of Doctor's checklist to ensure that Doctor's come on time, as a result of which the time wasted in patient waiting for Doctor to come would be substantially reduced.<sup>9</sup>

7. Performance measurement should be embedded in continuing operation of the system, so that the key decision are influenced and evaluated, according to the established objectives.

## CONCLUSION

- Clinicians and administrators can form collaborative to reduce health care delays. Success depends on an ability to understand health care as a system, including the many interactions between patients, clinicians, support services and other resources.

- Success also depends on an ability to pinpoint the bottlenecks and system failures, particularly with respect to interactions among departments as patients flow through the system<sup>10</sup>.

- Reviewing the patient journey is always beneficial, and therefore a process mapping exercise can be undertaken at any time. However, common indications include a need to improve patients' satisfaction or quality or financial aspects of a particular clinical service.

- The tools can be used, provided that hospital management is committed to improvement, and that it carries that message to its staff<sup>11</sup>.

There is no Conflict of Interest. Not funded by any organization.

The study was conducted as a part of Summer Internship Program, for the students of MBA (Health & Hospital Management), to study the managerial issues in Emergency Department of a Tertiary Care Hospital. There was no actual intervention in the patient care & hence no Ethical issues were involved.

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# Management of Complex Intercondylar Fractures of Lower End of Femur by Extensile Anterolateral Approach Using Tibial Tuberosity Osteotomy

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## ABSTRACT

**Background:** Complex intercondylar distal femoral fractures with significant comminution in sagittal and coronal plane are highly unstable and offer a challenge for achieving congruous reduction and stable fixation. The recent use of LCP with biological fixation has emerged as a very good alternative management for these fractures. A technique that combines the advantages of direct reduction of intra-articular fractures and biological fixation of metaphyseal segments is an attractive option. We describe a lateral femoral approach with osteotomy of tibial tuberosity to access the intraarticular comminution and facilitating direct reduction of articular fragments.

**Material and method:** We present this hybrid technique for anatomic and stable reduction of type C3 distal femoral fractures by locking plate construct and present a series of X cases those who were managed with this combination of approach and internal fixation.

**Results:** Mean radiological healing time was 22.3 weeks and all cases had sound radiological healing with satisfactory results. One patient developed delayed skin necrosis for which skin flap was mobilized to cover the defect. Two cases had limited range of motion of knee.

**Conclusion:** use of this approach facilitates anatomical reconstruction of complex intraarticular fractures of distal femur with less complication rate and satisfactory clinical outcome.

**Keywords:** Tibial tuberosity, osteotomy, complex, intercondylar, femur.

## INTRODUCTION

The incidence of distal femur fractures is approximately 37 per 100,000 person-years. And accounts for 7% of femoral fractures.<sup>1</sup> Muller et al classified these fractures according to their location and pattern.<sup>2</sup> These fractures have a classical bimodal age of presentation. The first peak is seen around fourth decade and more commonly in males, where the metaphysis is strong and injury usually results from high velocity trauma. The second peak is seen in elderly age group where due to osteoporosis the quality of bone is compromised more so in females and injury is result of low velocity trauma.<sup>3</sup> In high velocity injuries usually there is severe axial loading with varus /valgus or rotational force which usually happens in road traffic accident or fall from height. Fractures of the lower end

of femur tend to displace leading to femoral shortening, posterior angulation and posterior displacement. In case of intra-articular fractures there is often rotational malalignment of condyles due to separate attachments of gastrocnemius muscle to each condyle, leading to gross articular incongruity. These strong dynamic deforming forces do not allow indirect reduction of fracture fragments. In both the cases i.e. the comminution in young individuals and osteoporosis in old individuals resulting compromised bone stock adding another challenge for stable fixation with conventional implants. Above all the conventional lateral approach used for fixation of fractures of lower end of femur doesn't allow satisfactory exposure in comminuted intra-articular fractures (AO/OTA C3 type injuries). So there is need of an extensile approach to the knee for direct and

accurate reduction of these fractures. We have used tibial tuberosity osteotomy with quadriceps apparatus reflection for management of AO/OTA B3 & C3 fractures.

### MATERIAL AND METHOD

This study was conducted on 15 patients with complex fracture pattern out of 35 patients with fracture distal end femur who presented to department of orthopaedics, Nehru hospital, BRD Medical College, Gorakhpur from January 2009 to Jan 2012. All the patients gave the informed consent prior being included into the study. The study was authorized by the local ethical committee and was performed in accordance with the ethical standards of the 1964 declaration of Helsinki as revised in 2000. The cases were carefully examined and assessed properly according to prefixed protocol prior to subjecting them to a definitive line of management. Most of the patients were in the age group of 15 yrs to 55 yrs. Most of the injuries were the result of road traffic

accident and about 30 % were from other mode of injury like fall from height or agricultural injuries. Most of the patients were males. After radiological evaluation by antero-posterior and lateral radiograph, the fractures were classified as per AO/OTA classification at the time of admission. The 15 patient of AO/OTA type B3 & C3 were operated by extensile anterolateral approach by using tibial tuberosity osteotomy. Rest of the patients, operated by conventional lateral approach and were not included into the study. All the patients were assessed for distal neurovascular status and the patients with vascular compromise were not included in the study. Surgical toilet and debridement was done within first 24 hrs of the injury for compound fractures. Most of the patients had associated injuries as summarized in **table 1**. All the surgeries were performed in elective OT under full asepsis, as multi systemic trauma care facilities were not available in our hospital. Most of the simple injuries were operated in the first week of injury and in case of compound injuries the interval was 2 to 3 weeks.

**Table 1: Associated injuries**

Associated injuries	No of patients	Percentage
Head injuries	2	13.33
Chest injuries	7	46.67
Fracture patella	3	20.0
Fracture pelvis	2	13.33
Fracture distal radius	2	13.33
Fracture both bone forearm	1	6.67
Hand / metacarpal fracture	3	20.0
Foot / metatarsal fracture	2	13.33
Stable spinal injuries	3	20.0
Fracture proximal end or shaft of tibia	4	26.67

### Surgical technique

Most of the patients were operated under spinal anaesthesia. The patient was laid supine on orthopaedic table with sand bag under the ipsilateral hip and pillow under the knee to allow 90° flexion. Incision is given parallel to femoral shaft along a line extending from tip of greater trochanter to the lateral aspect of patella in distal third of thigh and extended distally obliquely through parapatellar region to the point around 5 cm below the tibial tuberosity. The deep fascia is also cut along the oblique incision line in parapatellar and proximal leg exposing the tibial tuberosity.



**Figure 1: Intraoperative photograph showing right sided multiplaner comminuted C3 type fracture with reflected patella.**

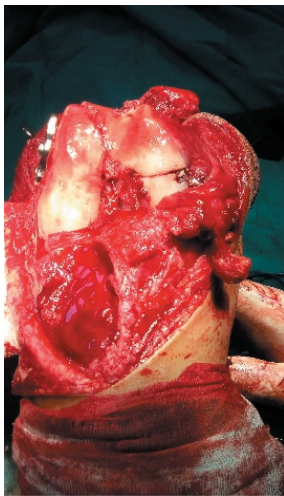


Figure 2: intraoperative photograph of same patient after assembly of the distal end of femur and fixation

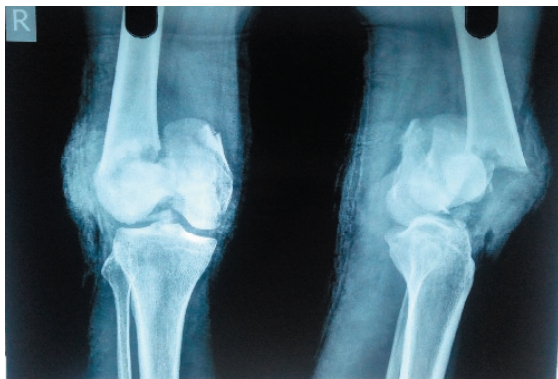


Figure 3: AP and Lateral radiograph showing comminuted intercondylar fracture distal end of right femur AO/OTA type C3 in 21 yr old male patient.



Figure 4: Immediate post op radiographs showing reconstruction of distal end of femur with interfragmentary screws and lateral distal femoral locking plate. Osteotomy fixed with two predrilled 4.5 mm cortical screws.

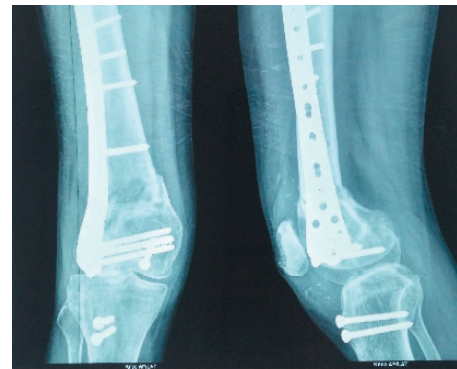


Figure 5: six months post op Radiograph of same patient showing radiological healing of fracture in slight valgus with excellent healing of the tibial tuberosity osteotomy without loosening of implant.

Now one or two drill holes are made on anterior aspect of tibial tuberosity in central portion with 3.2 mm drill bit. Two 4.5 mm cortical screws are placed partially in these holes for later repair of osteotomy site. Now trapezoidal shaped osteotomy (5x2.5x2.5 cm) which has thicker central portion and shallow periphery, is made with electric saw and completed with osteotome. Now osteotomy along with quadriceps apparatus is reflected anteromedially and articular surface along with lower end of femur is very well exposed (Figure 1). Direct reduction is done and main condylar fragments are initially held with condylar reduction forceps, small intra-articular fragments are reduced and held with 1.5/2.0 mm K wires. Integrity of femoral attachment of cruciate ligament is ascertained and managed. Now condylar fragments are secured with 6.5 mm cancellous screws while small fragments can be secured with 4.0 mm cancellous screws. Condyles are reduced to distal femoral metaphysis and whole of construct is secured with locked compression plate (Figure 2, 3 &4). The wound is irrigated with normal saline. The osteotomy is reduced and fixed with 4.5 mm cortical screws. The periosteum around osteotomy is stitched and closure is done in layers over suction drain. Post operatively the limb was placed on Pierson Thomas splint, mobilization by continuous passive machine started after stitch removal and active knee mobilization was started in third week of surgery.

## RESULTS

Majority of patients were in the range of 30-50 yrs of age and male to female ratio was about 5:1 (29 males and 6 females)). Most of the patients were having fracture distal end of femur as a result of high velocity trauma and the most common mode of injury was road

traffic accident and only 30% patients had fracture as a result of fall from height and other cause. Among these patients 54.3% patients had compound fracture. AO/OTA type C fractures are more common than type A&B fractures (Type A- 7, B-9 and C-19). About 57% patients were anaemic and 13.3% patients had cardiovascular ailment.

For compound fracture wound debridement and irrigation of wound was done initially followed by traction on bohler braun splint. Majority of patients were operated mostly in 2nd to 3rd week following injury as most of the patients had laceration and abrasion around fracture site or other comorbidities. Fifteen patients with AO/OTA type C3 distal femoral fractures were taken for reconstruction of articular surface by extensile anterolateral approach using tibial tuberosity osteotomy. Autologous bone graft from iliac crest was used in 6 cases and in one case fibular bone graft was used to fill the defect as a result of bone loss. The patients were kept on assisted/active exercises as soon as pain subsided and were encouraged for non weight bearing exercises at 6 weeks. Full weight bearing was allowed only after the sound radiological union was achieved (Figure 5). Mean radiological healing time was 22.3 weeks. Clinically, three cases (20%) had excellent results, six cases (40%) had good results, four cases (26.7%) had fair results and two cases (13.3%) had poor results. The unsatisfactory (fair and poor) results were due to restricted range of movement at knee in six of them and walking disability in four of them.

Three patients developed superficial infection which subsided after aggressive antibiotic coverage. One patient developed delayed gaping of suture line of knee at 4 weeks while on physiotherapy, for which mobilization of flap and closure was done. None of our patient developed non union of tibial tuberosity osteotomy. Mean duration of tibial tuberosity osteotomy healing was 11.1 weeks and no case had hardware failure, loosening or non union. The two cases (13.3%) with severe restriction of knee range of motion were advised quadricepsplasty.

Statistical analysis was done and P value < 0.05 was considered statistically significant.

## DISCUSSION

Despite the advances in techniques and the improvements in surgical implants, treatment of

distal femoral fractures remains a challenge in many situations. Long-term disability can still occur in patients with extensive articular cartilage damage, marked bone comminution and severe soft tissue injury.<sup>4,5</sup>

Studies done in the 1960s documented better outcomes for patients treated non operative measures than for those treated operatively.<sup>6,7</sup> In the 1970s, the AO principles and the use of the angled blade plate revolutionized the treatment of these injuries.<sup>8,9</sup> It is now recognized by most orthopaedic surgeons that distal femoral fractures are best treated with reduction and surgical stabilization. However there are limitations of implant or surgical approach for stabilization of these complex fractures.

Olerud described his extensile approach with Y shaped skin incision for these difficult injuries, and in spite of skin healing problems, use of ordinary lateral angled blade plate, infection in four cases and single screw fixation of the tibial tuberosity osteotomy, he reported satisfactory overall clinical outcome in his study. Sanders et al. added a medial buttressing plate to manage these fractures for their nine cases, and in spite of their rigid fixation and early rehabilitation, three patients had < 90° flexion and in six patient range of motion limited between 90° and 100°.

Khalil AE and Ayoub MA did internal fixation in twelve cases with dual plating through modification of extensile Olerud approach, in which V shaped skin incision precluded the wound edge necrosis and dehiscence encountered by Olerud with the Y shaped incision, and the rigid fixation of tibial tuberosity osteotomy by two screws and tension band wiring. All cases had good radiological healing despite unsatisfactory results in 5 cases due to restricted knee motions.<sup>10</sup>

Baker et al concluded that computed tomography is extremely helpful for characterization of complex intraarticular fractures of the distal femur and in diagnosis of missed Hoffa fractures.<sup>11</sup> However we could not get tomographical evaluation of most of the patients because of non availability of facility at our institute and non affordability of our patients. The patients with Hoffa fractures were accompanied with less satisfactory results; this may be due to large articular defect following the countersinking technique, which could not be covered completely by regenerated fibrocartilage.

Borse et al. advised use of headless compression screws to reduce this fixation problem.<sup>12</sup>

We used extensile anterolateral approach using tibial tuberosity osteotomy, which facilitates good exposure of distal articular surface of femur, reduction of fragments and provisional fixation with multiple kirschner wires followed by definitive fixation with multiplaner lag screws and lateral distal femur locking plate. However, our study had limitation of not using medial buttress plate which could have facilitated better fixation and early mobilization. We also used two screws to stabilize tibial tuberosity osteotomy in contrast to Olerud technique.

Reviewing the literature, there are limited reports strictly on the approach and management of complex C3 type distal femoral fractures.<sup>10</sup> However, some authors used tibial tuberosity osteotomy to facilitate reduction and fixation of these complex injuries.<sup>13-15</sup>

Although distal femur lateral locking plate has been gold standard during the last decade, most recent works reported high rates of defective callus formation, delayed union, nonunion, malrotation and implant failure, especially in complex distal femoral fractures despite use of a single ordinary or mini-invasive lateral or anterolateral approach.<sup>16-18</sup> This could be due to a mechanical problem related to application of this plate, particularly in the absence of fragment compression and primary bone grafting.

In this study, the lateral distal femur locked plate was applied in all cases, with union in all cases, which could be attributed to the easily applied isolated multidirectional compression lag screws and primary bone grafting.

In spite of the small number of cases as a shortcoming of this study, we found that the extensile approach using tibial tuberosity osteotomy is a useful alternative approach for complex C3 type distal femur fracture when single or double separate medial or lateral approaches without osteotomy are not sufficient for anatomical reconstruction of these difficult fractures. It had the advantage of complete and anatomical reconstruction of articular surface, provisional k wire fixation from all directions around the distal end of femur, preservation of the whole suprapatellar pouch, ideal fixation of medial and lateral Hoffa fracture, primary grafting of bone defects at all location, lower incidence of suprapatellar

area adhesions and uncomplicated wound healing. We believe that tibial tuberosity osteotomy either by anterolateral or modified Olerud approach is a good option for excellent exposure of complex intraarticular fractures, however long term outcome of procedure has to be established.

**Conflict of Interest:** None

**Source of Funding:** Self

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# Relationship between Cooperative Learning and Test Anxiety with Self-efficacy and Academic Performance in Student

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## ABSTRACT

This study aimed to investigate the relationship between cooperative learning and test anxiety with self-efficacy and academic performance of high school second grade girl students of Ahvaz city. To this aim according to review of literature and with using multiple-steps random sampling 150 girl students of second grade of middle school of region 4 of Ahvaz city that were studding during years 2015-16 were selected. To collect data from standardized questionnaires were used. Collected data were analyzed with using canonical analysis method, correlation method, and regression. Results of this study revealed that there is a significant positive relationship between cooperative learning and self-efficacy; and also there is a significant negative relationship between test anxiety and self-efficacy of girl students of second grade of middle school; and there is a significant positive relationship between cooperative learning and students' academic performance of girl students of second grade of middle school; and there is a significant negative relationship between test anxiety and students' academic performance of girl students of second grade of middle school.

**Keywords:** cooperative learning, test anxiety, self-efficacy, academic performance.

## INTRODUCTION

An important subject for every society is development of its people, and it is obvious that the necessary factor for having a good society is having thinker, reviewer and creative people. In order to getting the correct decisions another factor for having great society is fulfillment planning. So, dynamic education is necessary for having a perfect planning. There are some factors that affect learning new subjects like changing the learning methods and using dynamic new methods. Cooperative learning is a factor that students can use to learn lessons with together. cooperative learning consist of a set of teaching methods that prepare students for collaborative small group and help them to learn more and better<sup>1</sup>.

Students can find the importance of the collaborative and they can improve their science performance by it<sup>2</sup>. The findings show that the problems in cooperative learning are less than in traditional methods. Wiker (1997)<sup>3</sup> and Kagan (2004)<sup>3</sup> believed students are very active in cooperative learning and they are working together till getting their ends. In cooperative learning every participant must be active<sup>4</sup>. Scot said when students are learning new matter in the cooperative learning, they can have good understanding of problems and ethical problems in society and the world. Scot (1998) and Keramati (2011) did a study that was about the relation between cooperative learning and academic performance among male students in the first level of the junior school in the city of Tehran, and they found there is a meaningful relation between cooperative learning and academic performance<sup>5</sup>.

A different study that was done by Baghcheghi et al (2011), was about the examination of competitive learning environment and collaborative on the stable learning among nurses in Arak university and there is a positive and meaningful relation between cooperative learning and stable learning<sup>6</sup>. There was another project

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by Bown (2000) in school and university and there was a positive and meaningful relationship between cooperative learning and academic performance. When students have stress during exam, it makes them fail in learning material at the excited environment self-control and it makes a bad excited reactive<sup>4</sup>.

The study that was done by Yazdani (2010) between nurses students in Azad Najaf Abad University, showed there was a negative relationship between having stress during exam and academic performance. Shokri (2007) stated there is a negative meaningful relationship between having stress during exam and academic performance. There was another study among junior school's students in Zahedan by Lashkari Pour (2005) that showed almost every student has stress during exam, in the other words there is a negative meaningful relationship between stress during exam and academic performance. Dadsetan & Danesh Paju (1995) did the study about relationship between stress during exam and academic performance among Humanities students in the third grade in the city of Tehran, they used Sarasun stress and Kettel stress questionnaire, the results showed there is relationship between stress during exam and self-character's stress factors, the level of stress has meaningful effect on their general average of special lessons. It makes decrease in education performance but in the study that was done by Cheraghiyan (2008) among nurses students in Abadan Azad university, they didn't find any relationship between stress during exam and academic performance. The result of the study about stress in exam and education performance among high school students in third grade they didn't found any relationship (Sijani, 1993)<sup>3</sup>.

Coller et al (1980) stated there isn't any meaningful negative relation between stress during exam and academic performance. George (1971) examined the decrease of stress during exam in university, the results revealed decreasing of stress during exam and make increasing in the academic performance<sup>7</sup>. During another study was done by Sarasun and Mandler (1952), they examined the student's performance and some conditions. These conditions were personal and emotional structures. For example, when the viewers present during the exam and speaking about the level of difficulty of the exam, the findings showed this action has a bad effect on the result of the exam because some students that they were relax, became stressful and the other students whom were stressful get a very bad result.

Self-efficacy refer to the person's strength<sup>8</sup>.

Bandura believe when self-efficacy refer to identify activities, it makes better and academic performance in developing process. Base on his thoughts, self-efficacy has effects on person's selection, educational courses and other activities that are useful and avoid of some activities that they can't afford them. Self-efficacy identifies the efforts of people and how much they consume energy, also how much they can resistant<sup>9</sup>.

Haji Hosseinlu et al (2014) stated that there is a positive successful relation between cooperative learning and efficacy<sup>10</sup>. Base on the findings that presented by Saeid Zadeh and Nasehi (2014), there is negative meaningful relationship between stress during exam and student's self-efficacy. Petvin & Deniels (2010) noted there is a negative meaningful relationship between stresses during exam and self-efficacy<sup>11</sup>. This result is like the result of the study that was done by Chen (2002), Higa & Dalidan (2007)<sup>9</sup>. Gardner & Juller (2000) said there is a positive meaningful relationship between cooperative learning and self-efficacy<sup>12</sup>. Also in the project that was done by Cohen (1991), there is positive meaningful relationship between cooperative learning and self-efficacy<sup>13</sup>.

Research question is there any simple and multiple relationship between cooperative learning and test anxiety with self-efficacy and Academic performance among female students in highs school?

During the cooperative learning, participants divided in some groups and the level of skill in every group is different. you can give some questions to the participants while they can use some solutions that are available<sup>14</sup>. One problem in learning is stress during exam. Base on Feoureh and Peskar (1987), there are two types of stress during exam, one of them is exciting and hopeful stress and the other one is bad and deterrent stress. Stress during exam depends on the performance of the students for example the performance is deterrent or constructive<sup>3</sup>. There is close relationship between cooperative learning and stress during exam with educational performance. Bandura (1997) stated self-efficacy is a concept that show experiences, ability and thinking in a same direction. High self-efficacy makes activities successful<sup>15</sup>. So, being successful depend on individual delays, individual factors and environment conditions of the acquiring person's cognitive activities



that measured by a grading system.

## METHOD

The Pearson analysis, the analysis of Cacuee and regression statistical methods, are used in the community of the female students in the city of Ahvaz during 2015-2016. The project sample included 150 female junior schools in the fourth district in the city of Ahvaz and they were selected accidentally.

### 1. The questionnaire of educational environment of Fraser class:

The Fraser questionnaire used to measure the environment class education. This type of questionnaire designed by Fraser in 1986, and it includes of 49 questions. The questions are multiple choice and the norms are 1, 2, 3, 4, and 5 for each question. Validity of this questionnaire is 78% and the reliability is 75% that measured by base on the Cranbach's alpha in the study about examination of cooperative learning effect, the amount of stable learning among students in Arak university.

### 2. Sarasun questionnaire about stress during exam:

Sarasun questionnaire used for measure stress during the exam. This questionnaire include 37 questions about yes/no questions. Yes answer has one norm and no answer has zero norms. The validity of this questionnaire is 77% and the reliability is 78% that measured base on the Cronbach's alpha in the study about the relation between stress during exam and students in Tehran city.

### 3. Educational self-efficacy questionnaire by Morgan and Jynkz:

Educational efficacy questionnaire was used and it's included 30 questions and 3 factors such as talent, effort and texture. the questions are multiple choice and the norms are 1, 2, 3 and 4. Researchers estimated the

validity of this research about 75% and the reliability is about 80% base on the Cronbach's alpha .the reliability coefficients of subscales are 70%, 66% and 78% respectively.

### 4. Academic performance questionnaire by Fam and Tailor:

Academic performance is consist of 48 questions .the questions are five options and the scores are 1,2,3,4 and 5. this questionnaire consist of five subscales such as self-efficacy, emotional effects, planning, lack of control and motivation .The validity of this questionnaire is 80% and the reliability is of the study about strategies for academic performance and student's mental health is 88% that was done by Nur Mohammadiyan (2006). Also the validity of five subscales is 74%, 63%, 73%, 92%, 91% respectively.

## FINDINGS

This study examines the relationship between cooperative learning and stress during exam with self-efficacy and academic performance among female students in high school. The results show there is meaningful relationship between former variables and criterion variables.

**Table 1. Average and standard deviation of cooperative learning variables, stress during exam, self-efficacy and academic performance among female students.**

N	SD	M	project variables
150	33.07	140.13	Former variables between cooperative learning
	4.44	15.31	Former variables between stress during exam
	20.07	80.70	Efficacy criterion variables
	33.01	144.24	Academic education's criterion variables

**Table 2. Meaningful tests for full version correlation analysis**

Sig	F	DF error	DF Theory	Amount	Test name
0.0001	29.10	294	4	0.567	Pillai's trace
0.0001	46.89	290	4	0.999	Lawley-Hotelling Trace
0.0001	37.68	292	4	0.434	Wilks' Lambda
-----	-----	-----	-----	0.5632	Roy's Largest Root Test

**Table 3. Features functions of the conventional analysis**

Number functions	Special amount	Percent	density	Canonical correlation	Solidarity square
1	0.999	99.68	99.68	0.750	0.563
2	0.004	0.314	100	0.063	0.004

As it is obvious in the table 3, solidarity square ( $R^2c$ ) are equal 0.004, 0.563 respectively. Sharry and Henson (2005) stated that identified functions which are less than 10 percent must be abandoned. So, just first function should explain and identify shared variance.

**Table 4. The results of the reduction for conventional function**

Root number	Lawley–Hotelling Trace	F	Theory DF	Error DF	Sig
1-2	0.434	37.68	4	292	0.0001
2-2	0.996	0.98	1	147	0.440

The results of the significant level in the first row of table 4, show the density of function 1-2. This test show the meaningful relationship of two functions .as we already mentioned the effect of compression functions level 1 &2 (perfect method) has a meaningful statistical concept( $\lambda$ ) = 0.434,  $F=37.68$ ,  $p<0.0001$ ).

The effect of compression functions has not meaning. ( $\lambda$ )0.996, $F=0.598$ ,  $P<0.440$ ). In other words the first function identify the meaningful amount of shared variance between two variances and the relation between two set of variables identify by first function.

**Table 5. Results of the analysis of variable and self-efficacy and female students’ performance are predictable by former variables between group learning and stress during exam.**

Variables	Standardized coefficient	Structural coefficient	Chi structure factors
Efficacy	0.435	0.824	67.89
Educational performance	0.686	0.933	87.04
$R^2c$	0.434		
cooperative learning	0.709	0.948	89.90
Stress during exam	- 0.396	- 0.825	68.06

As the table 5 show, the results of the analysis of variable and self-efficacy and female students’ performance are predictable by former variables between group learning and stress during exam.

**Table 6. The results of multiple regression analysis of cooperative learning and stress during exam with female students’ self-efficacy.**

Former variables	Beta	T	Sig	Standard error
cooperative learning	0.475	5.85	0.0001	0.049
Stress during exam	- 0.202	- 2.48	0.014	0.367

You can see in the table 6, the former variable between cooperative learning ( $B=0.475$ ,  $T=5.85$ ,  $P<0.0001$ ) and the former variable between stress during exam .it means there is a meaningful relationship between the self-efficacy criterion variable ( $B=-0.202$ ,  $T = -2.48$ ,  $P<0.014$ ).

**Table 7. The result of multiple regression analysis of cooperative learning and stress during exam with female students' self-efficacy.**

Former variables	Beta	T	Sig	Standard error
cooperative learning	0.472	6.40	0.0001	0.073
Stress during exam	- 0.304	- 4.12	0.0001	0.548

**Table 8. Simple correlation coefficient between cooperative learning and stress during exam with self-efficacy and female student's academic performance.**

Former variable	The criterion variable efficacy		The criterion variable of academic performance	
	p	r	p	r
cooperative learning	0.0001	0.65	0.0001	0.60
Stress during exam	0.0001	- 0.59	0.0001	- 0.49

## DISCUSSION

The result show there is meaningful positive relationship between cooperative learning and student's efficacy .The result of this study is same as the results of some studies that were done by Haji Hosseinlu (2014)<sup>10</sup>, Gardner & Juller (2000)<sup>12</sup>, Cohen (1991)<sup>4</sup>. The result of this study is consistent with the findings, Merser (1990) and Gregory (2003)<sup>7</sup>.

They believe students can learn to examine the different subjects in cooperative learning, also they can share their ideas to each other and they can find the differences. The findings of this study show there is positive meaningful relationship between cooperative learning and academic performance. These findings are aligned with Baghcheghi (2011)<sup>6</sup>, Keramati (2011)<sup>16</sup> and Bown (2000)<sup>16</sup>.

This result also is aligned with the results of studies that were done by Gillies (2006) and Faryvar (1999)<sup>6</sup>. It also show the students are in same groups and do their best to get the ends. The findings of this study show there is a negative meaningful relation between stress during exam and self-efficacy. This result is aligned by Saeid zadeh & Nasehi (2013), Petvin and Deniels (2010)<sup>16</sup>. But this result has not any relationship with the result of Karami et al. (2011)<sup>16</sup>. This result isn't same as the study of Sarasun and Davidson (1962). Stress during exam is mental self-employment has a bad effect on the person. The another result is about there is a negative meaningful relation between stress during exam and academic performance, this result is same as the results that some researchers like Yazdani (2011)<sup>17</sup>, Shokri et

al (2007)<sup>17</sup>, LashkariPour et al (2004)<sup>17</sup>, Dadsetan & Daneshpaju (1995)<sup>17</sup>, Coller & Halahan (1980)<sup>18</sup>, Alen George(1971), Sarasun & Mandler (1952)<sup>18</sup>were done.

But it isn't like the result of some research by Cheraghiyan et al (2008)<sup>19</sup>, Sijani (1993)<sup>19</sup>. So this result is like Gyvada & Lodelow (1989)<sup>20</sup>. They believe stress during exam is a type of bad mental excited against the situation in the class and school. It makes stress so this stress cause decreasing in academic performance.

**Ethical Clearance:** is adhered all ethical interests.

**Conflict of Interest:** The authors declare that they have no competing interests.

**Source of Funding:** Not reported

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# Incidence of Glaucoma after Penetrating Keratoplasty in Relation to Graft Size & Additional Surgical Procedures

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## ABSTRACT

**Introduction:** Glaucoma following penetrating keratoplasty is one of the serious complications due to its frequency of occurrence, difficulty in diagnosis and management, risk of graft failure and irreversible visual loss due to optic nerve damage. The etiology of this disorder is multifactorial and the clear understanding of the various mechanisms that operate during different time frames following penetrating keratoplasty is essential to chalk out the appropriate management algorithms. This study addresses the incidence of glaucoma after penetrating keratoplasty in relation to graft size and the additional surgical procedure.

**Aims and Objectives:** To study the incidence of glaucoma in penetrating keratoplasty in relation to graft size and additional surgical procedure performed.

**Materials and Method:** Prospective analysis of 100 consecutive eyes which underwent penetrating keratoplasty during the period from September 2009 to December 2010 was done. The patients were followed up for a minimum period of 9 months.

**Results:** Out of 100 eyes who underwent penetrating keratoplasty on comparing the graft sizes used with the incidence of glaucoma we have observed that risk of post penetrating keratoplasty glaucoma is relatively higher with the graft size 8.5 mm and above with the relative risk of 1.45 and 95% confidence interval being 0.5-4.09, the relative risk of 8.75mm could not be calculated due to small sample. There was no statistically significant difference between the groups (Near significance **p=0.08756**). On analyzing the two groups of which one group underwent penetrating keratoplasty and the other an additional surgical procedure with penetrating keratoplasty, we observed that there was no statistical difference in the incidence of glaucoma between the two groups with p value of 0.2231 ( $\chi^2=1.48$ ,  $df=1$ ). Among the additional surgical procedures performed combined surgery was done in 41 out of 100 patients (41%). Even though there was no statistically significant difference among the types of surgery ( $p=0.102$ ), patients undergoing penetrating keratoplasty with anterior chamber intraocular lens implantation were relatively at higher risk to develop glaucoma as compared to posterior chamber intraocular lens implantation. Patients who underwent penetrating keratoplasty with an intraocular lens exchange did not have any risk for development of glaucoma. **Conclusion:** Post penetrating keratoplasty glaucoma continues to be a clinical problem that can be sight threatening in its clinical outcome. It is mandatory that IOP is monitored on a regular basis. Recognition of the risk factors namely graft size & associated surgical procedure with penetrating keratoplasty would help in early diagnosis of post penetrating keratoplasty glaucoma.

**Keywords:** Penetrating keratoplasty, Graft size, Glaucoma, Intraocular pressure, anterior chamber intraocular lens implantation.

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## INTRODUCTION

Glaucoma following penetrating keratoplasty is one of the serious complications due to its frequency of occurrence, difficulty in diagnosis and management, risk of graft failure and irreversible visual loss due

to optic nerve damage.<sup>1,2</sup> The incidence of glaucoma after keratoplasty varies from 9% to 31% in the early postoperative period and from 18 to 35% in the late postoperative period.<sup>3,4</sup> The etiology of this disorder is multifactorial and the clear understanding of the various mechanisms that operate during different time frames following penetrating keratoplasty is essential to chalk out the appropriate management algorithms.

Post-penetrating keratoplasty glaucoma is defined as elevation of intraocular pressure >21 mmHg with or without optic nerve head and visual field changes.<sup>5</sup>

Management of post-penetrating keratoplasty glaucoma is a complex issue and requires an insight into the pathophysiology leading to elevated IOP.<sup>5</sup> The diagnosis of post-penetrating keratoplasty glaucoma is primarily based on IOP, optic disc change and progressive visual field changes in the late post-operative period. Accurate measurement of IOP, assessment of visual fields and neuroretinal structures are often not possible before penetrating keratoplasty which often leads to an inability to diagnose pre-existing glaucomatous optic neuropathy.<sup>6</sup> This study addresses the incidence of glaucoma after penetrating keratoplasty in relation to graft size and the additional surgical procedure.

### AIMS AND OBJECTIVES

- To study the incidence of glaucoma in penetrating keratoplasty in relation to graft size and additional surgical procedure performed.

### MATERIALS AND METHOD

Prospective analysis of 100 consecutive eyes which underwent penetrating keratoplasty during the period from September 2009 to December 2010 was done. The patients were followed up for a minimum period of 9 months.

Patients attending the cornea clinic of Bangalore West Lions Superspeciality Eye Hospital and Cornea Grafting Centre, Bangalore.

#### Inclusion criteria

All the patients undergoing optical penetrating keratoplasty

#### Exclusion criteria

- Patients with pre-existing glaucoma, acute

transient elevation of IOP.

Criteria for diagnosis of post-penetrating keratoplasty glaucoma was chronically elevated intraocular pressure of more than 21mmHg with or without disc and visual field changes.

### PARAMETERS EVALUATED

#### Preoperative

In all patients best corrected visual acuity was recorded and thorough slit lamp examination was done. The anterior segment features noted were the status of cornea, type of IOL present, presence of peripheral anterior synechiae. Intraocular pressure was recorded by Perkin's applanation tonometer or tonopen. Pachymetry was done. Posterior segment was evaluated with indirect ophthalmoscopy in clear media and B scan was used in hazy media.

#### Intraoperative

- The corneal graft was punched from the endothelial surface using disposable trephines.
- Donor button was almost always cut 0.5 mm larger than the recipient. Variation from this pattern included the use of same sized graft primarily in keratoconus patients.
- When necessary anterior vitrectomy was performed.
- Additional surgical procedures like synechiolysis was undertaken in those eyes judged to have significant angle closure due to synechiae.
- An iridoplasty was performed when a large iris defect was present.
- Peripheral iridectomy was done in all.

Postoperative evaluation included

Best corrected visual acuity, status of the corneal graft, IOP at 1<sup>st</sup> week, 1 month, 3 months, 6 months and 9 months with pachymetry, gonioscopy, disc evaluation and visual field analysis were done whenever possible.

The follow-up information recorded included visual acuity, status of the corneal graft, status of anterior chamber, and the intraocular pressure as measured by Goldmann applanation tonometer or tonopen. Disc

evaluation was performed in cases where media was clear and permitted a view of the disc. Visual field analysis could not be done in any patient and therefore, intraocular pressure was the only criterion for assessing the progress or control of glaucoma. In all the patients the first line of management for glaucoma was medical therapy to the maximum tolerated level.

**Statistical software** – SPSS, Microsoft Word, Excel.

### OBSERVATIONS

In our study, out of 100 patients 73% were less than 50 years of age and the mean age distribution was  $47 \pm 11$  yrs. Of the 100 eyes of 100 patients who underwent penetrating keratoplasty, 68 were male (68%) and 32 were female (32%).

Out of 100 eyes 38% of them had vision  $< 6/60$ , 36% of them had vision between  $6/36-6/18$  and 26% of them between  $6/18-6/6$ .

### Incidence of post penetrating keratoplasty glaucoma

In our study:

- Raised IOP was found in 15 out of 100 eyes.
- Mean raise in IOP was  $29 \text{mmHg} \pm 1.5 \text{mmHg}$ .
- Out of 15 patients 4 were steroid responders.

Mean time of diagnosis of raised IOP was  $5 \pm 9.5$  months.

**Table: 1. Age distribution of post penetrating keratoplasty glaucoma patients**

Age	Patients with glaucoma	Percentage
15-25yrs	2	13%
25-35yrs	3	20%
>35yrs	10	66%

**Table: 2. Relationship of graft size with incidence of glaucoma**

Graft size(mm)	No. of patients with glaucoma	Total	Relative risk	95% confidence interval
7.5	3	14	1.22	0.3-3.86
8.0	4	38	0.5	0.17-1.4
8.25	3	31	0.46	0.1-1.5
8.50	4	16	1.45	0.5-4.09
8.75	1	1	-	

Graft size	Without Glaucoma	With Glaucoma	Significance
7.5	9.4%	20.0%	$\chi^2=9.59$ , $df=5$ , $p=0.08756$
8	40.0%	26.7%	
8.25	34.1%	20.0%	
8.5	16.5%	26.7%	
8.75	0.0%	6.7%	

Out of 100 eyes who underwent penetrating keratoplasty on comparing the graft sizes used with the incidence of glaucoma we have observed that risk of post penetrating keratoplasty glaucoma is relatively higher with the graft size 8.5 mm and above with the relative risk of 1.45 and 95% confidence interval being 0.5-4.09, the relative risk of 8.75mm could not be calculated due to small sample. There was no statistically significant difference between the groups (Near significance  $p=0.08756$ ),

**Table: 3. Incidence of Glaucoma and additional surgical procedure**

Surgical procedure	Without glaucoma	With glaucoma
PENETRATING KERATOPLASTY	56.5%	73.3%
PENETRATING KERATOPLASTY + additional procedure	43.5%	26.7%

On analyzing the two groups of which one group underwent penetrating keratoplasty and the other an additional surgical procedure with penetrating keratoplasty, we observed that there was no statistical difference in the incidence of glaucoma between the two groups with p value of 0.2231 ( $\chi^2=1.48$ ,  $df=1$ ).

**Table: 4. Additional surgical procedures & Glaucoma**

Surgical procedure	Without glaucoma	With glaucoma
	%	%
Penetrating Keratoplasty+Posterior chamber intraocular lens implantation	92%	7%
Penetrating keratoplasty+anterior chamber intraocular lens implantation	75%	25%
Penetrating Keratoplasty+IOL exchange	100%	0%
Repeat Penetrating Keratoplasty	85%	15%
Penetrating Keratoplasty	81%	19%

Among the additional surgical procedures performed combined surgery was done in 41 out of 100 patients (41%). Even though there was no statistically significant difference among the types of surgery ( $p=0.102$ ), patients undergoing penetrating keratoplasty with anterior chamber intraocular lens implantation were relatively at higher risk to develop glaucoma as compared to posterior chamber intraocular lens implantation. Patients who underwent penetrating keratoplasty with an intraocular lens exchange did not have any risk for development of glaucoma.

## DISCUSSION

### Incidence of post penetrating keratoplasty glaucoma

In our series, 15 of 100 consecutive eyes who underwent optical penetrating keratoplasty developed high intraocular pressure, giving an overall incidence of 15% during the mean follow up period of 9 months. Mean time of diagnosis of raised IOP was  $5\pm 9.5$  months. Mean raise in IOP was  $29\text{mmHg}\pm 1.5\text{mmHg}$ .

Foulks et al and Karesh JW et al<sup>7, 8</sup> reported the incidence of post- penetrating keratoplasty glaucoma varying from 9% to 31% in the early postoperative period and from 18% to 35% in the late postoperative

period. In another study by Sekhar et al<sup>9</sup> (1993), of 190 eyes studied 52 developed high intraocular pressure following post-penetrating keratoplasty, giving an overall incidence of 27.4%.

Onur Karadag et al and Suleyman Kugu et al<sup>6</sup> found the incidence of post penetrating keratoplasty glaucoma to be 16.6% in the late postoperative period. The mean period of time between penetrating keratoplasty and the first occurrence of glaucoma was 5 months.

### Graft size

On comparing the graft sizes used with the outcome we have observed that the risk of developing raised IOP is high with the graft size 8.5mm (with the relative risk of 1.45 and the confidence interval being 0.5- 4.09) as compared to other groups. This may be due to formation of peripheral anterior synechia at host graft junction.

Falguni et al<sup>10</sup> in their recent study (2009) on comparing the graft sizes used with the outcome have observed that with graft size 8mm and above((65.7%) there was increased incidence of post penetrating keratoplasty glaucoma when compared to grafts less than 8mm (35.7%).

Anita Panda, Mayank S. Pangtey et al<sup>11</sup> in their study have identified that the size of the graft has a



direct correlation with the development of glaucoma. The incidence of glaucoma was 37% in the eyes with 10 mm grafts, 16% in eyes with 8–9.5 mm grafts, and 14% in eyes with 6–7.5 mm grafts.

Bourne et al<sup>12</sup> also found that the grafts with oversized buttons were associated with better control of IOP in the early postoperative period (in eyes without pre-existing glaucoma). These results, however, were not reproduced in other studies.

Perl et al<sup>13</sup> showed that use of oversized grafts (0.5 mm) provided no protection against post-keratoplasty glaucoma in any study group (aphakics, pseudophakics, or phakics).

#### Additional surgical procedure

In our study, there was no statistically significant difference among various surgical procedures performed ( $p=0.2$ ). However, patients undergoing penetrating keratoplasty with anterior chamber intraocular lens implantation (25%) were found to be relatively at higher risk compared to posterior chamber intraocular lens implantation (7%) implantation and the patients undergoing re-graft<sup>14</sup> were at higher risk. Patients who underwent IOL exchange were not found to be at risk (0%).

Several earlier studies indicated that any surgical procedure combined with penetrating keratoplasty increased the relative risk associated with post-penetrating keratoplasty glaucoma. In a recent study by Onur Karadag et al and Suleyman Kugu et al<sup>6</sup>, 157 (21%) patients underwent additional surgery combined with penetrating keratoplasty and a significant association with post-penetrating keratoplasty glaucoma was demonstrated ( $p=0.0001$ ).

Ruthanne B. Simmons et al<sup>15</sup> in their study showed that performing cataract surgery during keratoplasty was not significantly associated with postoperative IOP rise ( $p>0.1$ ), nor was performing a triple procedure ( $p>0.1$ ). Among those cases with IOL implantations at the time of penetrating keratoplasty, there was no difference between AC or PC placement with regard to postoperative IOP increase ( $p>0.1$ ).

Distortion of the angle, formation of peripheral anterior synechiae & epithelial downgrowth were found to be associated in the above patients. Peripheral anterior

synechia formation preoperatively or as a consequence of a preceding intraocular operation was found to be significantly associated with the development of postoperative glaucoma.

In our study, post penetrating keratoplasty - glaucoma was observed in 11.3% of the eyes with graft host junction synechiae and peripheral anterior synechia and 5.6% of eyes without peripheral anterior synechia. Steroid responsiveness was found to be a major risk factor in younger patients in our study.

#### SUMMARY

- A prospective analysis of 100 consecutive eyes who underwent penetrating keratoplasty during the period from August 2009 to June 2010 was done. The patients were followed up for a minimum period of 9 months.
- On comparing the graft sizes used with the outcome we have observed that the risk of raised intraocular pressure is high with graft size 8.5mm and above as compared to other groups. This may be due to formation of peripheral anterior synechia at host graft junction.
- No statistically significant difference among various surgical procedures was observed. However, patients undergoing penetrating keratoplasty with anterior chamber intraocular lens implantation were found to be relatively at higher risk as compared to posterior chamber intraocular lens implantation and the patients undergoing re-graft were at higher risk. Distortion of the angle, formation of peripheral anterior synechiae & epithelial downgrowth were found to be associated in these patients.
- Post penetrating keratoplasty -glaucoma was observed in 11.3% of the eyes with peripheral anterior synechia and graft host junction synechiae and 5.6% of eyes without peripheral anterior synechia.

#### CONCLUSION

Post penetrating keratoplasty glaucoma continues to be a clinical problem that can be sight threatening in its clinical outcome. It is mandatory that IOP is monitored on a regular basis. Recognition of the risk factors namely graft size & associated surgical procedure with penetrating keratoplasty would help in early diagnosis of post penetrating keratoplasty glaucoma. Most of these

cases are amenable to medical management.

**Conflict of Interest** – Nil

**Source of Funding**- Self

**Ethical Clearance** – Obtained from ‘Institutional Ethical Committee’

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# Performance - based Measures of Physical Function in Young Male Adults: An Association with Body Mass Index

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## ABSTRACT

**Background:** Despite increased attention to this epidemic, the prevalence of obesity continues to rise. This increasing prevalence is of great concern because the health and economic burdens of obesity are vast. Weight reduction is recommended for adults with obesity and exercise has been shown to be an important component of weight loss and weight maintenance programs.

**Methodology:** The study population consisted of college-going young sedentary male students within the age group of 20 to 30 years who met the selection criteria from colleges in Delhi and NCR with the ability to walk without an assistive device. A total of 30 subjects constituted the study.

**Results:** The difference between the mean gait speed in obese and non-obese groups ( P value of less than 0.001), the difference between the mean value of timed chair rise in obese and non-obese groups ( P value of less than 0.001) and the difference between the mean distance covered in the 6-minute walk test in obese and non-obese groups ( P value of less than 0.001) was found to be highly significant.

**Conclusion:** The findings of the current study highlight the negative impact of obesity on the performance-based measures of physical function in apparently healthy young male adults. Physical therapists play the role of health professionals who specialize in the prescription of exercise to improve physical function and overall health status.

**Keywords:** *Body mass index, physical function, performance based measures, obesity.*

## INTRODUCTION AND BACKGROUND

Obesity is a major public health problem around the world. There has been a substantial increase in the prevalence of obesity globally, even in developing countries.<sup>1</sup> Despite increased attention to this epidemic, the prevalence of obesity continues to rise.<sup>2,3</sup> This increasing prevalence is of great concern because the health and economic burdens of obesity are vast. <sup>4,5</sup> For these reasons, it is imperative that health care professionals be able to effectively evaluate and treat people with conditions related to overweight and obesity.

Physical function refers to a person's ability to perform basic and instrumental activities of daily living and mobility tasks. Impairments in physical function, such as the components of mobility and balance, have been linked to the development of disability. <sup>6,7</sup> Analysis of recent trends has shown that obesity-related disability is on the rise, reinforcing the need for a better understanding of the impact of obesity on physical function.<sup>8</sup>

Body Mass Index (BMI) is the most common method to quantify weight across a range of body sizes in adults.<sup>9</sup> The BMI is calculated by dividing an individual's weight in kilograms by his or her height in meters squared (kg/ m<sup>2</sup>). <sup>10,11</sup> Weight reduction is recommended for adults with obesity and exercise has been shown to be an important component of weight loss and weight maintenance programs.<sup>12,13,14</sup> Various studies have shown the benefits of weight reduction including

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an improvement in cardiovascular risk factors, such as a decrease in blood pressure<sup>15,16,17</sup>, an improvement in lipid profile and glucose tolerance,<sup>18,19</sup> and reduced inflammation.<sup>20,21-25</sup>

In view of the widespread prevalence of obesity and the critical role of exercise and physical activity in weight loss and health risk reduction, physical therapists are well positioned to have a substantial impact on this significant public health problem.<sup>26,27</sup> Most therapists recognized that exercise and diet are key components of a weight loss program. To effectively manage individuals who are overweight, physical therapists must support the inclusion of health promotion in patient/client management including the use of screening tools, such as BMI, in the physical therapist examination.<sup>28,29</sup>

Despite evidence relating obesity to impaired physical function, there are several limitations in the current body of research. The majority of studies investigating the relationship between BMI and physical function have focused on older adults or females or those with class III obesity. Thus, little is known about the impact of BMI on physical function in young adults. This information would enable health care professionals to better estimate the functional consequences of excess weight in young adults together with assisting physical therapists in determining whether it is necessary to alter tests and measures for patients who are obese. Hence, this study aims to find an association between performance based measures of physical function and body mass index in young male adults.

### **Objectives**

- 1) To compare the gait speed values of obese and non-obese groups.
- 2) To compare the timed chair rise values of obese and non-obese groups.
- 3) To compare the 6-minute walk test values of obese and non-obese groups.

### **METHODOLOGY**

The study population consisted of young sedentary male (defined as reporting exercising less than 3 days/week for less than 20 minutes/day over the previous 6 months) with the ability to walk without an assistive device. Those with reported neuromuscular disorders that impaired movement, respiratory conditions that

hampered movement, cardiac event such as a heart attack in the past 6 months, chest pain with activity, use of drugs that affect balance, cancer with active treatment, history of fracture of the spine or lower limbs, surgical history in the lower limbs, use of prosthetics or orthotics, recent trauma which has occurred within the past 6 months, major surgery in the past 6 months, hospitalization for a life-threatening illness in the past 6 months, use of alcoholic beverages in the previous 24 hours before the test has been excluded.

A total of 30 subjects were selected for the study using non-probability convenience sampling. Group allocation was done according to BMI categories into two groups, namely obese (mean BMI of  $31.065 \pm 0.949$  kg/m<sup>2</sup>) and non-obese (mean BMI of  $21.308 \pm 1.417$  kg/m<sup>2</sup>), with fifteen subjects in each group.

A weighing machine, a measuring tape, a stopwatch, markers and a chair without arm-rest were utilized for data collection. After the informed consent of the subjects and explanation of the procedure, a detailed evaluation of the subjects was done. Following this, the subjects BMI and performance-based measures of physical function were evaluated. Height and weight were measured while wearing indoor clothing and socks without shoes. The correct position for both height and weight measurements were obtained, by instructing the subjects to stand up straight with heels against the wall for assessment of height. Weight was recorded to the nearest tenth of a kilogram, and height was measured to the nearest tenth of a centimeter with the height rod at the top of the participant's head in midline. Height and weight measurements were used to determine the BMI.

### **Performance-Based Measures of Physical Function:**

#### **1. Gait Speed:**

Gait speed was determined by recording the time for each subject to walk the central 4 meters of an 8-meter course at usual, self-selected pace using a stopwatch. Gait speed was calculated as the distance (4 meter) divided by the time it took to complete the 4-meter walk in seconds. The initial and final 2 meters were excluded from the calculation to eliminate the effects of acceleration and deceleration. The gait speed was reported in meters per second (m/s). This test was repeated twice for each subject and the average of two trials was used.



Figure .1. Gait Speed: Initial position with the subject standing behind the marker

2. Timed Chair Rise:

Participants were seated in a rigid chair, folded their arms across their chest, and stood up straight and sat down as quickly as possible 5 times. The time to complete 5 repeated stands from the chair was recorded.



Figure .2 Timed Chair Rise: Initial position of the subject

3. 6-Minute Walk Test:

Subjects walked as far as possible in 6 minutes around a series of traffic cones placed on a level corridor measuring 30.5 meters in length, taking rest periods as needed. The number of laps completed was counted by the tester. marker was placed on the ground and the distance walked during the last lap was measured with a tape measure. The total distance walked was recorded.



Figure 3. .. 6-Minute Walk Test: As the subject begins the test

DATA ANALYSIS

Descriptive statistics (mean and standard deviation) were calculated separately for gait speed, timed chair rise and 6-minute walk test in obese and non-obese groups. Unpaired t-test was used to test the significance of difference between the two means and hence determine the relationship between BMI and each of the above mentioned tests of physical function.

RESULT

Table 1: The demographic data

	NON-OBESE (Mean ± SD)	OBESE (Mean ± SD)
Age (years)	22.4 ± 2.5	22.8 ± 2.5
Height (m)	1.7 ± 0.062	1.66 ± 0.057
Weight (kg)	61.66 ± 6.007	86.46 ± 6.194
BMI (kg/m <sup>2</sup> )	21.308 ± 1.417	31.065 ± 0.949

**Table 2: Comparison of Performance-based Measures of Physical Function Using Gait Speed in Obese and Non-obese Subjects**

S.NO.	NON-OBESE		OBESE		SE	t	df	p
	GAIT SPEED (m/s)	MEAN ± SD	GAIT SPEED (m/s)	MEAN ± SD				
1	1.23	1.28 ± 0.0469	1.18	1.21 ± 0.0289	0.0142	4.9295	28	<0.001
2	1.31							
3	1.36							
4	1.25							
5	1.31							
6	1.25							
7	1.19							
8	1.33							
9	1.28							
10	1.3							
11	1.32							
12	1.26							
13	1.29							
14	1.3							
15	1.35							

**Table 3: Comparison of Performance-based Measures of Physical Function Using Timed Chair Rise in Obese and Non-obese Subjects**

S.NO.	NON-OBESE		OBESE		SE	t	df	P
	TIMED CHAIR RISE (s)	MEAN ± SD	TIMED CHAIR RISE (s)	MEAN ± SD				
1	10.56	9.22 ± 0.9336	11.16	11.11 ± 0.4561	0.2682	7.0469	28	<0.001
2	9.14							
3	7.7							
4	9.24							
5	9.12							
6	8.6							
7	8.04							
8	8.12							
9	11.18							
10	9.78							
11	9.24							
12	10.18							
13	9.16							
14	9.2							
15	9.11							

**Table 4: Comparison of Performance-based Measures of Physical Function Using 6 Minute Walk Test in Obese and Non-obese Subjects**

S.NO.	NON-OBESE		OBESE		SE	t	df	p
	6-MIN WALK TEST (m)	MEAN ± SD	6-MIN WALK TEST (m)	MEAN ± SD				
1	444.16	455.58 ± 11.8369	420.68	427.32 ± 6.6196	3.5017	8.0703	28	<0.001
2	467.7		442.66					
3	470.52		422.8					
4	451.32		428.25					
5	459.84		422.35					
6	453.35		420.44					
7	430.86		432.68					
8	474.2		424.26					
9	440.24		433.78					
10	458.92		428.78					
11	458.54		427.84					
12	445.21		430.12					
13	454.5		432.7					
14	459.84		426.14					
15	464.52		416.35					

## DISCUSSION

The present study conclude that obese individuals tend to have a slower gait speed as compared to non-obese individuals, therefore pointing towards decreased mobility in obese individuals. This finding is supported by an earlier study done by ( Tania Cristina Dias da Silva-Hamu et al. , 2013 ) on the impact of obesity in the kinematic parameters of gait in young women. Obese individuals took more time to complete the timed chair rise test as compared to non-obese individuals in the present study. This may imply that the balance and agility in obese individuals is likely to be affected to some extent. This finding is in accordance with a prior study done by ( Schmid S. et al , 2013 ) who found the ability to successfully complete the sit-to stand test five times decreased with a higher BMI, probably due to a reduced ability to rapidly generate a high force.

Also the distance covered in the 6-minute walk test, as evaluated by the present study, was found to be less in obese subjects as compared to non-obese subjects. This may indicate that obese individuals tend to have a poorer endurance in comparison to non-obese individuals. An earlier study done by ( Hulens M., 2012 ) also revealed a similar result. The results of the present study are also consistent with the study conducted by (Andrea L. Hergenroeder et al.,2011 ), ( Zoltan Pataky et al., 2013 ) which evaluated the influence of BMI on self-report and performance-based measures of physical function in adult women. They found that individuals with obesity scored lower on the self-report measure of physical function and ability to perform discrete functional activities.

To have an active role in the prevention and management of obesity, it is imperative that physical therapists are able to accurately identify patients who

are overweight or obese. For this, more attention needs to be given to a screening or examination process that includes assessment of body size, as well as potential contributing factors such as decreased physical activity level. Also, it is important for physical therapists to assess obese patients' related physical problems in an early stage of obesity in order to focus exercise regimens and promote appropriate health behaviours. Although the present study evaluated the performance-based measures of physical function in young male adults, further studies can be done across the different BMI ranges by assessing more diverse components of physical function.

### CONCLUSION

The findings of the current study highlight the negative impact of obesity on the performance – based measures of physical function in apparently healthy young male adults. Hence it is concluded that higher BMI levels are associated with poorer performance-based measures of physical function.

**Conflict of Interest :** Nil

**Source of Funding :** Self

**Ethical Clearance:** Obtained

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# A Study on Gender Bias among Parents of Under Five in Urban Field Practice Area of SSIMS and RC, Davangere

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## ABSTRACT

**Background:** Gender discrimination against females mainly seen in provision of health care, nutrition, immunization and education by the parents. In the view preventing the endless vicious cycle of discrimination and bias, we tend to know the magnitude of same in our setting.

**Objectives:** 1. To access the magnitude of gender bias among parents of under five in urban field practice area of SSIMS&RC, Davangere.

2. To access the factors influencing the gender bias among same subjects.

**Material and method:** A cross-sectional study was done in urban field practice area of SSIMS&RC, Davangere for a period of 3months. Around 600 parents were interviewed using semi-structured questionnaire. Parents were selected using systematic random sampling. Data was entered in MS Excel sheet. Percentages were calculated for descriptive statistics. Chi-square test of significance was employed using SPSS 16.0. For factors influencing gender bias multiple logistic regression was done.

**Results:** About 68.7% of children had preference for male child. Male child was given more preference in terms of food (86.6%), education (86.3%), immunization (66%) and health care (72%). Prenatal sex determination was seen in 38% of subjects. Fathers education, family type and socioeconomic factors were found to be associated with male child preference using multivariate analysis.

**Conclusion:** Majority (68.7%) of study participants had a preference for male child in the community. In spite of Pre Natal Diagnostic Testing Act in vogue the study showed 38% had a prenatal sex determination. Socio economic factors like father's education, family type, and socio-economic status were found to influence the preference for male child.

**Keywords:** Gender bias, Prenatal sex determination, factors influencing.

## INTRODUCTION

According to WHO gender bias is defined as relatively different treatment to a person on the basis of gender due to conscious or unconscious preference [1]. Census 2011 shows debility of female population under

the age of seven [2]. Census 2011 also reveals a decline in the child sex ratio (0-6 years) reporting shows 914 females against 1000 males, declining from 927 females against 1000 males in Census 2001 [3].

Gender discrimination against females mainly seen in provision of health care, nutrition, immunization and education by the parents [4]. NFHS-3 indicates child mortality for girls was found to be 43% higher than for boys [5]. As the children are appreciated reserve for the future of our country, it imperious that they should be protected and fostered equally.

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In the view preventing the endless vicious cycle of discrimination and bias, we tend to know the magnitude of same in our setting.

## OBJECTIVES

1. To access the magnitude of Gender bias among parents of under five in urban field practice area of SSIMS&RC, Davangere.
2. To access the factors influencing the gender bias among same subjects.

## MATERIAL AND METHOD

A cross-sectional study was done in urban field practice area of SSIMS&RC, Davangere for a period of 3 months (June 2015 to August 2015). Around 600 parents were interviewed using semi-structured questionnaire. Parents were selected using systematic random sampling. A sample size of 600 (relative precision=10%) was estimated by using NFHS data 2013 the preference for male child was found to be 61%.<sup>[7]</sup>

Data was entered in MS Excel sheet. Percentages were calculated for descriptive statistics. Chi-square test of significance was employed using SPSS 16.0. For factors influencing gender bias multiple logistic regression was done.

**Inclusion criteria:** Parents of under five children who are staying in the residence for more than six months.

**Exclusion criteria:** Parents who are not willing to participate in the study.

## RESULTS

The study was conducted in the year 2015 that enrolled around 600 study participants over a period of 3 months. Socio demographical variables such as father's occupation, mother's occupation, type of family, father's occupation, mother's occupation, socio-economic status, birth order of the child were studied. On analysis we found that there were around 18.3% of illiterate mothers, 10.8% illiterate fathers in the study. About 75% of mothers and 54.5% fathers were doing unskilled work. Around 71% of family belonged to joint family. About 29.8% of the study participants belonged to class IV and around 5.7% belonged to class V socioeconomic status according to modified B.G.Prasad classification (table 1).

Around 68.7% of parents had male child preference whereas only 31.3% of the parents had girl child preference (table 2). Gender bias was done in terms of more food, education, health care, immunization. Around 38% of the study participants had prenatal sex determination (table 3). Around 98% of the parents were not aware about the government schemes for the girl child (table 4). About 27.5% of girls were not taken to hospitals during illness (table 5). Around 50% of the girls were undernourished (table 6).

**Table 1: Socio-demographic details**

Socio- demographic variables		Number n =600	Perce- tage
Mother's education	Illiterate	113	18.3
	Primary School	198	33.7
	Secondary School	230	38.3
	PUC	52	8.6
	Graduate	7	1.1
Father's education	Illiterate	65	10.8
	Primary School	335	55.8
	Secondary School	120	20.0
	PUC	73	12.2
	Graduate	7	1.2
Socio- economic status (Modified B.G.Prasad classification)	Class I	0	0
	Class II	88	14.7
	Class III	305	50.8
	Class IV	179	29.8
	Class V	28	4.7
Birth order	1	194	32.3
	2	248	41.3
	3	131	21.8
	4	27	4.5

**Table 2: Preference for child**

Preference	Boys	Girls
Male child	412(68.7%)	188(31.3%)
More food	519(86.6%)	81(13.6%)
Education	518(86.3%)	82(13.7%)
Health care	432(72%)	168(28%)
Immunization	396(66%)	204(34%)

**Table 3: Prenatal sex determination**

Prenatal sex determination	Frequency, n=600(%)
Yes	228(38)
No	372(62)

**Table 4: Awareness about the Government schemes**

Awareness of government scheme for girl child	Frequency, n=600(%)
Yes	7(1.2)
No	593(98.8)

**Table 7: Multivariate analysis of Male child preference**

Male child preference	Male child preference(n=412)	Pvalue	Odd ratio	95% confidence interval	
Father Education	Illiterate	47(11.4)	0.005	2.205	2.068-2.617
	Primary school	209(50.7)	0.003	2.297	1.133-2.666
	Secondary school	100(24.3)	0.642	1.822	1.359-2.880
	PUC	56(25.0)		1	.
Family type	Nuclear	117(28.4)	0.000	2.588	2.207-3.272
	Joint	280(68.0)	0.000	1.173	1.107-2.807
	Extended	12(2.9)	.	5.807	.
	Broken	3(0.7)	.	1.0	0.109-1.949

**Table 5: Proportion of children taken to hospital during illness as per gender**

Child	Taken	Not taken	Total
Male	192(89.3%)	23(10.7%)	215(100%)
Female	79(72.5%)	30(27.5%)	109(100%)
Total	271(83.6)	53(16.4%)	324(100.0%)

$\chi^2=14.95, df=1, pvalue<0.001$

About 27.5% of female child and 10.7% of male child were not taken to hospitals during illness and this difference was found to be statistically significant

**Table 6: Proportion of nutrition status (WHO) according to gender**

Child	Under-nutrition	Normal	Over-nutrition	Total
Male	178(45.9%)	154(39.7%)	56(14.4%)	388(100%)
Female	106(50%)	94(44.3%)	12(5.7%)	212(100%)
Total	284(47.3%)	248(41.3%)	68(11.3%)	600(100%)

$\chi^2=10.519, df=2, pvalue=0.005$

We classified children based on their nutritional status by using WHO classification and found that more number of girl child were found to be under nourished when compared to male child and this difference was found to be statistically significant.

Cont... Table 7: Multivariate analysis of Male child preference

Socio-economic status	Class II	60(14.6)	0.040	3.321	3.109-4.949
	CLASS III	208(50.5)	0.109	4.465	3.183-5.186
	Class IV	123(29.9)	0.278	5.591	4.228-6.528
	Class V	21(5.1)	.	1.0	

We found that only father's education, family type and socio economic status were significantly associated with male child preference. The study found that as the father's education decreases the male child preference increases. Broken family has got more male child preference and class IV has got more male child preference when compared to higher socio economic classes.

#### Reasons for gender preference

- Adamancy & addictions of sons (76%) and obedient nature of daughters(82%) were the common reasons for inclining towards girl child preference.
- Dowry (56%) & inability of daughters to stay along with their parents after marriage (73%) and taking care of the family & parents in their old age by sons (62%) were the common reasons for preferring to have a son.

#### DISCUSSION

Male child preference was found to be higher in our study when compared to other studies. Kansal R et al [8] in 2010, Vadera et al [9] in 2007, Puri et al [10] in 2007 studies showed that male preference was 22%, 58.5%, 56% respectively.

Rashmi S et al [11] and Puri et al [10] showed that around 5.8% and 11.6% of parents looked for prenatal sex determination. In our study it was found to be much higher (38%).

Kansal R et al [8] showed that mother education, low socio economic status, religion were the factors influencing male child preference. Puri et al [10] showed that religion and rural area were the factors influencing male child preference. In our study we found that father education, joint family and low socio economic classes were the factors influencing male child preference.

#### CONCLUSION

- Majority (68.7%) of study participants had a preference for male child in the community.
- In spite of Pre Natal Diagnostic Testing Act in vogue the study showed 38% had a prenatal sex determination.
- Socio economic factors like father's education, family type, and socio-economic status were found to influence the preference for male child.

**Conflict of Interest-** Nil

**Source of Funding** – Self

**Ethical Clearance-** Taken

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# Assessment of Learning Styles of Undergraduate Medical Students

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## ABSTRACT

**Introduction** - Learning is the knowledge or skills acquired through experience or study or by being taught. Curry (1983) states that learning is both a process and a product. “The process is adaptive, future focused; and holistic; affecting an individual’s cognitive; affective; social, and moral volitional skills. The product is observable as a relatively permanent change in behaviour, or potential behaviour. The process is observable in the improved ability of the individual to adapt to environmental stimuli.” There are individual differences in learning. if there is a mismatch between the teaching style of the teacher and the learning style of the student then the teaching/learning process can be less effective” (King, 2011).

**Objective** – 1 - To assess the various learning style patterns in the students.

2 - To suggest measures to improve the learning in students.

**Method** – Data was collected from the 6<sup>th</sup> semester MBBS students; GSL Medical College using Grasha-Riechmann scale questionnaire. Students were informed about the scale and verbal consent was taken prior to obtaining the response.

**Results** – Out of 144 students in 6th semester 135 students responded. Among the responses 64.4% were moderately independent, 59.3% moderately avoidant, 85.9% were highly collaborative, 61.5% moderately dependent, 71.1% highly competitive and 58.5% were moderately participant.

**Conclusion** – Majority of the students are highly collaborative and highly competitive.

**Recommendation** - Since the majority of the students were highly collaborative and competitive group wise teaching and regular class tests will improve their performance.

**Keywords** – Learning style, Grasha-Riechmann, MBBS students.

## INTRODUCTION

Learning is the knowledge or skills acquired through experience or study or by being taught. Curry (1983) states that learning is both a process and a product. “The process is adaptive, future focused; and holistic;

affecting an individual’s cognitive; affective; social, and moral volitional skills. The product is observable as a relatively permanent change in behaviour, or potential behaviour. The process is observable in the improved ability of the individual to adapt to environmental stimuli.” There are individual differences in learning. if there is a mismatch between the teaching style of the teacher and the learning style of the student then the teaching/learning process can be less effective” (King, 2011). It is proposed that the learning styles can be changed by the use of various teaching methods. The students naturally select the most productive style. So understanding individual learning style is important for

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effective teaching.

**Objectives** – 1 - To assess the various learning style patterns in the students.

2 - To suggest measures to improve the learning in students.

**Materials and Methods** –

**Type of Study** – This study was a Cross-sectional study.

**Place of Study** – Study was conducted in GSL Medical College, Rajahmundry

**Period of Study** – Study was conducted from 15<sup>th</sup> May to 15<sup>th</sup> June 2016.

**Study instrument** – The study instrument used was Grasha-Riechmann scale. This scale consists of 60 questions to measure six types of learning behaviours such as avoidant, collaborative, competitive, dependent, independent and participant.<sup>(1)</sup> Each question should be rated from 1 to 5. Rating 1 is for strongly disagree, 2 for moderately disagree, 3 for undecided, 4 for moderately agree and 5 for strongly agree with the statement. For each learning style there are 10 questions and average of 10 questions is taken for interpretation. They are interpreted as low, moderate or high score based on the norms for each learning style.<sup>(2)</sup>

1. **Avoidant** students tend to be at the lower end of the grade distribution. They tend to have high absenteeism, they organize their work poorly, and take little responsibility for their learning.

2. **Participative** students are characterized as willing to accept responsibility for self learning and relate well to their peers.

3. **Competitive** students are described as suspicious of their peers leading to competition for rewards and recognition.

4. **Collaborative** students enjoy working harmoniously with their peers.

5. **Dependent** students typically become frustrated when facing new challenges not directly addressed in the classroom.

6. **Independent** students prefer to work alone and require little direction from the teacher.

**Respondents** – 6<sup>th</sup> semester MBBS students

**Ethical Consideration** – Necessary ethical approval was taken from the institution and concerned authority. Verbal consent was taken prior to obtaining the response from the students.

**Data collection and analysis** - Data was collected using Grasha-Riechmann scale questionnaire and analyzed with Microsoft excel.

**Findings** –

Out of 144 students in 6th semester 135 students responded having a response rate of 95.7%. Among those who responded 83(61.5%) were female and rest 52(38.5%) were male participants.

**Table 1 – Categorization of response scores as per the learning style norm (n = 135)**

Serial No.	Learning Style	Indicators	Low	Moderate	High
1	Independent	Score range	1.0-2.7	2.8-3.8	3.9-5.0
		Response	4(3.0%)	87(64.4%)	44(32.6%)
2	Avoidant	Score range	1.0-1.8	1.9-3.1	3.2-5.0
		Response	4(3.0%)	80(59.3%)	51(37.7%)
3	Collaborative	Score range	1.0-2.7	2.8-3.4	3.5-5.0
		Response	1(0.8%)	18(13.3%)	116(85.9%)
4	Dependent	Score range	1.0-2.9	3.0-4.0	4.1-5.0
		Response	8(5.9%)	83(61.5%)	44(32.6%)
5	Competitive	Score range	1.0-1.7	1.8-2.8	2.9-5.0
		Response	6(4.5%)	33(24.4%)	96(71.1%)
6	Participant	Score range	1.0-3.0	3.1-4.1	4.2-5.0
		Response	20(14.8%)	79(58.5%)	36(26.7%)



Among the responses majority came under high or moderate category. As evident from table 1, majority of the students scored as highly collaborative (85.9%) and competitive (71.1%). This result is also supported by A. Halil et al, where they got that, collaborative and competitive dominant learning styles were most frequent among learners.<sup>(3)</sup> 64.4% students scored moderately independent, 59.3% moderately avoidant, 61.5% moderately dependent and 58.5% moderately participant. Very few students scored a low grade in each of the variable.

**Table 2 – Categorization of response score of female students (n=83)**

Learning Style Female	Low	Moderate	High
Independent	3(3.6%)	51(61.4%)	29(35.0%)
Avoidant	4(4.8%)	56(67.5%)	13(15.7%)
Collaborative	0(0.0%)	6(7.2%)	77(92.8%)
Dependent	7(8.4%)	52(62.7%)	24(28.9%)
Competitive	4(4.8%)	12(14.5%)	67(80.7%)
Participant	16(19.3%)	44(53.0%)	23(27.7%)

Majority of female students scored in the category of highly collaborative (92.8%) and highly competitive (80.7%). Hamidah, Sarina, & Kamaruzaman (2009) also showed that females have higher scores in collaborative, participative, competitive and dependent styles.<sup>(4)</sup> Around 60% of female students scored as moderately independent, moderately avoidant and moderately dependent. Only 27.7% of them were highly participant.

**Table 3 – Categorization of response score of male students (n=52)**

Learning Style Male	Low	Moderate	High
Independent	1(1.9%)	36(69.2%)	15(28.9%)
Avoidant	0(0.0%)	24(46.2%)	28(53.8%)
Collaborative	1(1.9%)	12(23.1%)	39(75.0%)
Dependent	1(1.9%)	31(59.6%)	20(38.5%)
Competitive	2(3.8%)	11(21.2%)	39(75.0%)
Participant	4(7.7%)	35(67.3%)	13(25.0%)

Among male participants highly collaborative and highly competitive score was obtained from 39(75.0%) students. 69.2% male students scored moderately independent and 53.8% scored highly avoidant. Similar to female students around 60% scored moderately dependent and moderately participant.

Comparison of responses scored by male and female students.

As per the response scores in high category, female students are more collaborative and competitive than male students. Male students are more avoidant than female students. R B Ali, D T Mahnaz and M Hasan in their study found that avoidant style and competitiveness are more common among males, which is in line with the finding of the study.<sup>(5)</sup>

In the moderate category male students are more participant and independent then female students. Female students scored higher than male students in the learning styles moderately avoidant and moderately dependent.

## CONCLUSION

Out of 135 participants majority of the students responded in the score category highly collaborative and highly competitive. Majority of female students are having the learning style of high collaborative and high competitive than male students. Male students are more avoidant learning style then female students.

## RECOMMENDATION

Competitive students can perform better when there is the opportunity for reward, so contests and games in the classroom can elicit better performance. Collaborative students learn best when given opportunities to share ideas with others. They respond better to small group discussions than large group lectures. Avoidant students learn better with a relaxed and even unenthusiastic teacher. They can perform better in a self guided online class where interaction with the instructor and fellow students is minimal. For better learning of students in the class different method of teaching should be implemented.

**Conflict of Interest** – There is no conflict of interest.

**Source of Funding** – No external source of funding.

**Ethical Clearance** – Necessary ethical approval was taken from the institution and concerned authority. Verbal consent was taken prior to obtaining the response from the students.

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# Psychological Wellbeing by Awareness of Air Prana and the Aura Surrounding a Tree among Participants from Different Age Group

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## ABSTRACT

**Background:** *Prana* is the essential energy which keeps the body alive and in healthy conditions. Kirlian photography provides information regarding prana or subtle energy field. A common man cannot view this subtle energy body without proper training.

**Aim:** The present study seeks to understand the impact of viewing air prana along with the aura surrounding a tree on one's psychological wellbeing.

**Setting and design:** Exploratory research design was used. 178 participants with a mean age of 26.8 years were taken for the study.

**Method:** Open-ended questionnaire were provided to participants to record their experience before and after guiding to view the air prana along with the aura surrounding a tree as conceptualized by Master Choa Kok Sui.

**Statistical analysis:** The results were analysed using Contingency Coefficient analysis and Chi Square tests

**Results:** 98% and 87% of the participants viewed air prana and tree aura respectively. After seeing the air prana and aura of the tree, 23% and 37% of the participants felt relaxed. Also, 78% of them felt happy, while 22% of them reported to be energised.

**Conclusions:** There was a significant change in the positive emotions of the participants after viewing the air prana and tree aura.

**Keywords:** *Relax, happy, awareness, prana, pranic energy*

## INTRODUCTION

Prana also called vital energy or life force is essential to be alive and stay healthy. Air, solar, and ground prana are the three major sources of prana <sup>[1]</sup>. Prana flows along the nerves of the body and enables them to carry motor force and sensitiveness to external impacts and is mentioned in Vedic and Yoga texts. Traditional and modern concepts of the vital energy differ, the modern views rest on principles of the bio field while the traditional views remain metaphysical <sup>[2]</sup>.

Prana contained in the air is called air prana or air vitality globule. It is absorbed by the lungs through breathing and by the energy centres of the bioplasmic body. Live objects when placed and photographed in a pulsed high electromagnetic field reveal remarkable aura or energy body surrounding it <sup>[3]</sup>. Certain trees, such as pine trees or old trees, exude a lot of excess prana. Anyone can learn to consciously absorb prana from these trees through the palms, so that the body would tingle and become numb because of the great quantity of prana absorbed. Long before the advent of modern science, ancient sages and healers affirmed the presence

of prana and the aura. Life force or vital energy is all around us. It is pervasive; we are actually in an ocean of life force. <sup>[1,2]</sup> The feeling of happiness and satisfaction subjectively experienced by individuals has been termed as psychological wellbeing. <sup>[4-6]</sup>

Earlier studies on prana have shown that experiencing prana would benefit psychologically<sup>[3]</sup>. Projection of prana to plants is also useful in pranic agriculture protocols. It has been proved to increase the yield of Pole bean <sup>[7]</sup>, cucumber <sup>[8]</sup> and green gram <sup>[9]</sup>. Pranic vegetables were also reported to have increased shelf life <sup>[8]</sup>, increase seed germination and seed vigour <sup>[9]</sup>. This study intends to analyse the effects of Prana on psychological well-being by understanding the feelings and sensations involved in perception of the pranic energy among participants.

## METHOD

**Sample:** The participants for this study were students, youth and adults totalling 178 in number, with a mean age of 26.8 years, who were residing in Mysore. Table 1 provides socio demographic details of the participants.

**Procedure:** Exploratory research design was used in this study. Permission was obtained from principals of nursing and horticulture college and officials before the study. Participants were guided to view the air prana and the aura surrounding a tree as conceptualized by Master Choa Kok Sui.<sup>[1]</sup> In Session One, participants were asked to observe the sky and surrounding the tree without any guidance to view air Prana, followed by an open-ended questionnaire which intended to record their experiences. In session two, participants were guided to view air prana along with the aura surrounding a tree and their experiences were recorded by a questionnaire.

**Tools:** Open ended questionnaire was given to record participants' experiences about pranic energy in session one and in session two

### Inclusion and exclusion criteria

**Inclusion:** 1) Those interested to learn about Prana. 2) The age criteria for participants being in the study ranging from late adolescent to elderly.

**Exclusion:** 1) Those with previous Pranic experience. 2) Those younger than 16 years

## Statistical analysis

The results were analysed using Contingency Coefficient analysis and Chi Square tests.

## RESULTS AND DISCUSSIONS

Participants' responses were consolidated, coded and grouped to similar expressions and analysed statistically. The results obtained have been tabulated and interpreted below. Table 2 shows that, Chi-square test revealed a significant difference between groups of sensations ( $X^2=166.0$ ,  $p=.000$ ) where 1-3 expressions of sensations were seen significantly high. It was found that, significant associations were observed between education and sensation of air Prana. ( $CC=.259$ ,  $p=.046$ ). Table 2 shows that 67.6% post- graduates had more 1-3 expressions compared to graduates with 56.4% and with high school/ diploma with 40.0%.

Table 3 shows that, in session one 3.9 % of respondents felt positive emotions such as peace, free/ relaxed and happy, while 1.1% felt nothing/no experience before seeing air Prana. In session two, 23.6% of the respondents felt relaxed after seeing Prana in the air. 19.7% of them felt it was a new awareness/experience to them. The table shows that education had a significant effect in the experience of relaxation ( $CC=.512$ ,  $p=.000$ ) and new awareness ( $CC=.258$ ,  $p=.003$ ). Further, age had a significant effect in the experience of new awareness ( $CC=.219$ ,  $p=.014$ ).

Table 4 shows that, only 12.9 % have not reported any emotion and rest 87.1% of the respondents were able to express their emotions after seeing the aura surrounding the tree. Chi -square test revealed a significant difference between groups of sensations ( $X^2=241.3$ ,  $p=.000$ ), where 1-3 expressions of emotion were seen significantly high. It was found that, significant associations were observed between education and emotional experiences when viewing the aura surrounding a tree ( $CC=.282$ ,  $p=.017$ ). 79.8% of Graduates had more 1-3 expressions compared to Post- graduates with 70.6% and high school/ diploma with 68.0%.

It was observed from table 5 that, education had a significant effect in the experience of relaxation ( $CC=.251$ ,  $p=.004$ ) and feeling of happiness ( $CC=.207$ ,  $p=.022$ ). Age had a significant effect in the experience of relaxation ( $CC=.316$ ,  $p=.000$ ) and new awareness ( $CC=.191$ ,  $p=.040$ ). Further, gender had a significant

effect in the experience of relaxation ( $CC = .161$ ,  $p = .032$ ).

Session two found significant effect in the experience of positive emotions such as relaxed, happiness, enthusiastic, a feeling of emotional strength (Table 6). Experience of positive emotions are significantly more in session two, compared to in Session One ( $CC = .184$ ,  $p = .001$ ).

As it is seen from the above results 98.9% of the respondents were able to see the Air Prana and express its sight with different degree of clarity. As prana is existential anybody with curiosity and willingness to see the prana can effortlessly view it. It might be a reason for majority of respondents can view the air prana. 87.1% of the respondents were able to see the aura surrounding a tree and express its sight with different degrees of clarity. Males were able to better view and express the sight of the aura surrounding a tree. The respondents have expressed the sight of aura surrounding a tree with more than one expression. 74.7% of the respondents have felt variety of emotions and expressed them in 1-3 expressions. In session two, 78.7% of respondents were experienced the positive emotions compared to 61.8% of respondents of session one, after viewing the aura surrounding a tree.

Seeing of Air prana with naked eyes has been relaxing with a new experience for the respondents. Similarly, in our previous exploratory study [3] involving adolescents and adults (811 no), 98% of respondents were able to see air prana and express its sight at different degree of clarity. More than 60% of the respondents felt relaxed when they observed air prana. In the present study, age wise comparison indicated that respondents in the age group of 30 plus reported more expressions than respondents in other age groups during viewing and experiencing air Prana. When experiencing and narrating their emotions after viewing aura surrounding the tree, age group of >20 reported more emotions than another age group. Males were able to better view and express the emotions of viewing of air Prana and aura surrounding than females. Post- graduates were able to better view and express the sensation of air Prana. In viewing aura

surrounding the tree graduates had better experience. So it is understood from result that irrespective of education, age and gender, anyone can able to view and express their experiences effortlessly.

87.1% of the respondents were able to experience the variety of emotions as a result of viewing the aura surrounding a tree. Participants felt relaxed, happy and energized after viewing aura surrounding the tree. Experience of positive emotions such as happiness, enthusiastic, relaxation, increases in mental strength/energy is significantly more in session two, compared to in Session One. Findings of this study illustrate that perceiving the aura of a tree itself can bring some positive changes in emotions which may lead to wellbeing.

**Table 1: Socio demographic profile of participants**

Socio demographic profile.	Variable	F	Percentage (%)
Gender	Male	80	45
	Female	98	55
Age	<20	95	53.4
	21-30	40	22.5
	30+	43	24.2
Education	Post-graduation	34	19.1
	Graduation	94	52.8
	High school	50	28.1
Locality	Urban	70	39.3
	Rural	108	60.7
Practicing yoga/ exercise	Yes	17	9.6
Practicing breathing exercise	Yes	19	10.7

**Table 2: Seeing air Prana across different age, gender and education during session two**

Viewing air prana		Age group			Gender		Education			Total
		<20	21-30	30+	Male	Female	PG	G	HS	
0	F	2	0	0	0	2	0	2	0	2
	%	2.1	0.0	0.0	0.0	2.0	0.0	2.1	0.0	1.1
1-3	F	44	22	30	44	52	23	53	20	96
	%	46.3	55.0	69.8	55.0	53.1	67.6	56.4	40.0	53.9
4-6	F	48	17	13	35	43	11	39	28	78
	%	50.5	42.5	30.2	32.5	33.7	32.4	41.5	56.0	43.8
6+	F	1	1	0	1	1	0	0	2	2
	%	1.1	2.5	0.0	1.3	1.0	0.0	0.0	4.0	1.1
Total		95	40	43	80	98	34	94	50	178
		CC=.216, p=.189			CC=.097, p=.640		CC=.259, p=.046			X <sup>2</sup> =166.0 p=.000

F, Frequency; p, Significance; CC, Contingency Coefficient; PG, Postgraduate; G, Graduate; HS, High School

**Table 3– Psychological experiences of the respondents in session one and Session two.**

Psychological experiences of seeing air prana		Age group			Gender		Education			Total	
		<20	21-30	30+	M	F	PG	G	HS		
Session One	Positive emotions	F	4	2	1	4	3	2	4	1	7
		%	4.2	5.0	2.3	5.0	3.1	5.9	4.3	2.0	3.9
	Test statistics	CC=.049, p=.805			CC=.050, p=.508		CC=.070, p=.650				
	Nothing	F	2	0	0	0	2	0	2	0	2
		%	2.1	0.0	0.0	0.0	2.0	0.0	2.1	0.0	1.1
	Test statistics	CC=.100, p=.413			CC=0.96, p=.199		CC=.101, p=.405				
Session Two	Feeling relaxed	F	29	9	4	14	28	5	8	29	42
		%	30.6	22.5	9.3	17.5	27.6	14.7	8.5	58.0	23.6
	Test statistics	CC=.210, p=.097			CC=.139, p=.178		CC=.512, p=.000				
	New experience	F	26	6	3	14	21	0	20	15	35
		%	27.4	15.0	7.0	17.5	21.4	0.0	21.3	30.0	19.7
Test statistics	CC=.219, p=.014			CC=.049, p=.512		CC=.258, p=.003					

F, Frequency; p, Significance; CC, Contingency Coefficient; PG, Postgraduate; G, Graduate; HS, High School

**Table 4: Seeing the aura surrounding a tree across different age, gender and education during session two**

Viewing tree prana		Age group			Gender		Education			Total
		<20	21-30	30+	Male	Female	PG	G	HS	
0	F	13	2	8	7	16	6	13	4	23
	%	13.7	5.0	18.6	8.8	16.3	17.6	13.8	8.0	12.9
1-3	F	75	30	28	62	71	24	75	34	133
	%	78.9	75.0	65.1	77.5	72.4	70.6	79.8	68.0	74.7
4-6	F	7	8	6	10	11	3	6	12	21
	%	7.4	20.0	14.0	12.5	11.2	8.8	6.4	24.0	11.8
6+	F	0.0	0.0	1	1	0.0	1	0.0	0.0	1
	%	0.0	0.0	2.3	1.3	0.0	2.9	0.0	0.0	0.6
Total		95	40	43	80	98	34	94	50	178
		CC= .241, p=.089			CC=.137, p=.335		CC= .282, p=.017			X <sup>2</sup> =241.3 p=.000

F, Frequency; p, Significance; CC, Contingency Coefficient; PG, Postgraduate; G, Graduate; HS, High School

**Table 5– Psychological experiences of the respondents before and after seeing the aura surrounding a tree**

Psychological experiences of seeing aura surrounding a tree		Age group			Gender		Education			Total	
		<20	21-30	30+	M	F	PG	G	HS		
Session One	Positive emotions	F	58	22	30	52	58	20	57	33	110
		%	61.1	55.0	69.8	65.0	59.2	58.8	60.6	66.0	61.8
	Test statistics	CC=.105, p=.375			CC=.060, p=.427		CC=.056, p=.758				
	Positive impacts	F	15	7	6	10	18	2	11	15	28
		%	15.8	17.5	14.0	12.5	18.4	5.9	11.7	30.0	15.7
	Test statistics	CC=.033, p=.906			CC=.080, p=.285		CC=.252, p=.003				
	Negative emotions	F	15	5	0	4	16	3	3	14	20
		%	15.8	12.5	0.0	5.0	16.3	8.8	3.2	28.0	11.2
	Test statistics	CC=.205, p=.024			CC=.178, p=.017		CC=.338, p=.000				
	Nothing	F	14	8	2	9	15	5	18	1	24
%		14.7	20.0	4.7	11.2	15.3	14.7	19.1	2.0	13.5	
Test statistics	CC=.158, p=.108			CC=.059, p=.431		CC=.216, p=.016					
Session two	Relaxed	F	23	18	26	37	30	19	25	23	67
		%	24.2	45.0	60.5	46.2	30.6	55.9	26.6	46.0	37.6
	Test statistics	CC=.316, p=.000			CC=.161, p=.032		CC=.251, p=.004				
	Happy experience	F	73	34	33	66	74	26	68	46	140
		%	76.8	85.0	76.7	82.5	75.5	76.5	72.3	92.0	78.7
	Test statistics	CC=.083, p=.538			CC=.085, p=.258		CC=.207, p=.022				
	Energised	F	21	10	9	19	21	8	19	13	40
		%	22.1	25.0	20.9	23.8	21.4	23.5	20.2	26.0	22.5
	Test statistics	CC=.035, p=.899			CC=.028, p=.712		CC=.061, p=.721				
	New experience	F	35	15	7	26	31	7	29	21	57
%		36.8	37.5	16.3	32.5	31.6	21.6	30.9	42.0	32.0	
Test statistics	CC=.191, p=.040			CC=.009, p=.902		CC=.157, p=.111					

F, Frequency; p, Significance; CC, Contingency Coefficient; PG, Postgraduate; G, Graduate; HS, High School

**Table 6- Experience of positive emotions in session one and session two after viewing the aura surrounding a tree**

Positive emotions	Sessions		Total
	Session One	Session Two	
F	110	140	250
%	61.8	78.7	70.2
	CC= .184, $p=.001$		

### CONCLUSION

Viewing air prana and aura surrounding a tree had a significant effect in the experiences of positive emotions of respondents. Finally, the results obtained from this exploratory study will lay a foundation for future studies on the same lines and ways to achieve good health and wellbeing.

**Conflict of Interests :** All the authors reports no conflict of interests

**Funding:** World Pranic Healing Foundation, India funded the study.

**Ethical Clearance:** Permission was obtained from principals of nursing and horticulture college and officials before the study.

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# Ocular Morbidity among 3 to 6 Year Old Children Visiting a Tertiary Care Hospital : A Prospective Study

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## ABSTRACT

**Introduction:** Preschool children are reported to have visual deficits ranging from 5 to 29% . Children are unable to understand their symptoms, communicate it, hence early detection and intervention remains a challenge. Usually there is no manifestation of the visual disorder and are unheeded.

**Purpose:** To determine the ocular morbidity among 3 to 6 year old children visiting a tertiary care hospital.

**Method and procedures :** Ethical Committee approval was obtained. Children with developmental delay, non co-operation and parental reluctance were exclusion criteria for the study. Each child was assessed with E chart for vision, stereo acuity measurement with randot preschool, dry refraction, anterior and posterior segment evaluation and cycloplegic refraction. Descriptive statistics and chi square tests were employed for statistical analysis

**Results:** Two hundred eyes (100 participants) were analyzed. 52% were boys and 48% girls. Mean age was 64.6± 12.3 months. Refractive error was observed in 80 eyes(40%) ,45 eyes(22.5%) had amblyopia, anterior segment disorders were noted in 24 eyes (12%) and squint observed in 5 eyes(2.5%) .

**Conclusion:** Refractive error, amblyopia, anterior segment disorders, squint and posterior segment pathology were the ocular morbidity found in 3 to 6 year old children.

**Keywords :** Ocular morbidity, preschool, visual disorders, refractive error.

## INTRODUCTION

Ocular morbidity describes any eye disease regardless of resultant visual loss <sup>1</sup>

Visual deficits in 3 to 6 year old children varies from 5 to 29% as reported by different authors <sup>2-4</sup> The

common causes of visual problems in this age group are amblyopia and its risk factors which encompasses refractive errors, squint, anisometropia, cataract and other ocular diseases.<sup>5, 6</sup>

In a study by Hartmann et al, 80% of 3 year olds and 94% 4 years olds could be successfully screened for visual acuity.<sup>7</sup> Ying et al emphasized the need for providing vision screening to preschool children irrespective of their ethnicity.<sup>3</sup> Singapore Amblyopia and Refractive Error Study (STARS) found the prevalence of myopia to be significantly higher in urban Asian preschoolers. This may be attributed to the environmental factors like near work, early education, socioeconomic

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status and less outdoor activities.<sup>8</sup> The penalties of identifying visual issues later in life may be permanent visual impairment which distresses school performance, motor skills, self-image and productivity in adulthood.<sup>6,9</sup> Vision screening in pre-schoolers is of prime importance as they are unable to understand their symptoms or complain and there is usually no manifestation of the disorder.<sup>10</sup> There is scantiness of published data on preschool vision screening in India.<sup>11</sup> The current study aimed to determine the ocular morbidity observed in 3 to 6 year old children visiting a tertiary hospital, coastal Karnataka.

### METHOD

The ethical approval for conducting the study was obtained from Institutional Ethics Committee, Kasturba Hospital (IEC/312).The patients were recruited from the Out Patient Department (OPD) of Ophthalmology, Kasturba Hospital, Manipal over a 16 month period. The written informed consent was obtained from the parents and verbal assent from the children in advance. All the 3 to 6 year old children who were willing to take part in the study were included. Developmental delay, hesitance in responding to the tests and parent unwillingness were exclusion criteria for the study. The objectives of the study were explained. Visual acuity was checked monocularly with E chart and proceeded to the next line only if all optotypes were correctly identified by the child. Stereo acuity assessment was done binocularly at a distance of 40 cm using randot preschool stereo test. Polaroid glasses were worn by the child and the figures had to be correctly matched. Inter Pupillary Distance(IPD) was measured with the photo refractor. Dry retinoscopy was done to determine the refractive power of the eye followed by squint evaluation. Slit lamp biomicroscope was performed for viewing the anterior structures of the eye and pupil reaction recorded before dilatation. Homide 2% (Homatropine hydrobromide) 1 drop each 2 times within an interval of 10 minutes was instilled for mydriasis and cycloplegia. Pupil reaction was rechecked after 45 minutes and one more drop instilled if necessary. Cycloplegic refraction was performed by another examiner to reduce bias. Retinal examination, diagnosis and management for the participants were done. The subject was asked to come for Post Mydriatic Test (PMT) after a week for final glass prescription if required. All the vision assessments were done using a 3 metre chart and recorded both in log Mar and the metric values.

### STATISTICAL ANALYSIS

The data was analysed using Statistical package for Social Sciences (SPSS) IBM version 15.0 (Armonk, New York, IBM Corporation). Continuous variables were tested for normality using Kolmogorov–Smirnov test.Descriptive statistics was computed using mean (standard deviation) or median (Q1, Q3) depending on the distribution of data. Chi square test was used to find the association between age and gender with ocular morbidity. A probability value,  $p < 0.05$  was considered statistically significant.

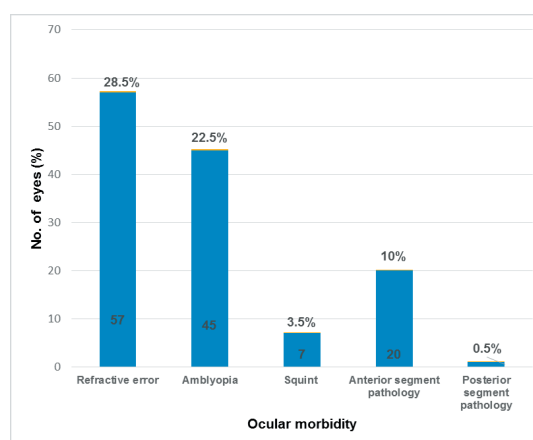
### RESULTS

A total of 200 children in the age group of 3 to 6 years who visited OPD, Ophthalmology were approached during the study period. Two hundred eyes of 100 subjects who fit into the inclusion criteria were analysed. 52% were boys and 48% were girls.

Descriptive data on age, IPD, visual acuity and stereo acuity is shown in **Table 1** and the causes of ocular morbidity is displayed in **Figure 1**

**Table 1 : Descriptive data of the study variables for the participants.**

Study variables	Mean	SD
Age ( months)	64.6	12.3
Inter Pupillary distance (mm)	48.1	1.4
	<b>Median</b>	<b>(Q1,Q3)</b>
Visual Acuity (log mar) • E chart	0.32	(0.1,0.7)
Stereo acuity (sec of arc) • Randot preschool stereo test	200	(60,800)



**Fig 1: Ocular morbidity observed in the eyes under study**

27% eyes were within normal limits. Mere refractive errors were observed in 28.5% of the eyes. Amblyopia was found in 22.5% of cases, 86.6 % had refractive etiology. 71.4% of squint cases had refractive errors associated with it. In total, refractive error was found in 90 eyes (45%).

**The causes for anterior segment disorders are listed in Table 2.**

**Table 2: Distribution of anterior segment anomalies in the study eyes.**

SI No	Causes	No. of eyes (%)
1	Allergic conjunctivitis	16(41.6)
2	Secondary cataracts	03 (8.3)
3	Eye lid disorders	06 (16.6)
4	Axial proptosis	01(2.7)
5	Subconjunctival haemorrhage	02(5.6)
6	Perlimbal melanosis	02(5.6)
7	Posterior lenticonus	02(5.6)
8	Nasolacrimal duct obstruction	02(5.6)
9	Persistent Pupillary membrane	01(2.7)
10	Congenital glaucoma	01(2.7)
<b>Total</b>		<b>36 (100)</b>

Allergic conjunctivitis was the predominant anterior segment pathology contributing to 41.6% followed by eye lid problems (16.6%) which included ptosis, lid oedema and chalazion. Secondary cataracts were traumatic and steroid induced in origin.

No statistical significance was observed between gender ( $\chi^2=1.5$ ,  $p=0.45$ ) and age ( $\chi^2=7.07$ ,  $p=0.67$ ) with ocular morbidity on doing chi square test.

## DISCUSSION

In our study, we came across refractive error as the predominant ocular morbidity in a hospital based population aged 3 to 6 years. This highlighted the need for screening refractive errors as it is frequently overlooked.

Pascual et al reported visual disorders to be fourth most prevalent disability among children in United States, amblyopia listed as the primary cause affecting 1-4% of pre-schoolers.<sup>12</sup>

The prevalence of ocular morbidity in 5 to 6 year old children was 17.5% in a population based study at Delhi as reported by Kumar R and co-workers.<sup>13</sup> Ying et al compared the prevalence of amblyopia, strabismus and significant refractive error among different ethnicity in the Vision in Pre-schoolers study (VIP). The prevalence of any VIP targeted vision disorder was 21.4% among the children with highest in Hispanic children (23.3%) and lowest in American Indian children (17.9%).<sup>3</sup> Lan and his colleagues determined the prevalence of refractive errors in Chinese pre-schoolers. The overall prevalence of myopia ( $\geq -0.50$  D) was 1%, hyperopia ( $\geq +2$  D) was 25.2% and astigmatism ( $\geq 1.5$ D) was 8.2% .<sup>14</sup> According to Fan and his colleagues, the prevalence of astigmatism  $\geq 1.00$  D in 605 Chinese pre-schoolers (mean age 55.7 months) was 21.1% .<sup>15</sup> The prevalence of visual impairment was reported to be 5% in a study conducted by Premsenthil et al in Malaysia, refractive errors were found to be the most common cause.<sup>2</sup>

According to Lattore et al, the prevalence of refractive error was 6.2% in pre-schoolers. The findings from the study posed a noteworthy public health issue as in low income countries, entry to education of children with disabilities may be around 10% according to World Health Organisation(WHO).<sup>16</sup>

Repka and colleagues reported 2% prevalence of structural ocular abnormalities and nystagmus in preschool-aged children in their population-based study. The treatment outcome in these cases were poor according to the authors.<sup>17</sup>

In their review article, Hopkins et al pointed out that amblyopia and its risk factors, refractive errors and ocular pathologies to be most commonly encountered in clinical practice .<sup>18</sup> Majority of the studies reported refractive error and amblyopia to be the common causes of ocular morbidity in 3 to 6 year old children which supported our study results.

However, the following study is inconsistent with our results. It might be because our study was hospital based while Chen et al conducted a population based study. Moreover, racial variations can also account for it.

Chen and co-workers observed the prevalence of strabismus and amblyopia to be 5.65% and 1.2% in preschool children of Eastern China. Amblyopia caused by refractive error was reported to be 85.29%

which was contrasting to studies in Australian and Britain children and consistent with STARS and Multi Ethnic Pediatric Eye Diseases study (MEPEDS). The results were supported by STARS and inconsistent with MEPEDS and Baltimore Pediatric Eye Disease Study (BPEDS) highlighting the ethnic and genetic role in the risk factors which warrants further research.<sup>19</sup> Silbert and colleagues stated the need for introducing of a set of risk factors in preschool vision checks.<sup>20</sup> Pan et al reported the referral criteria for 3 to 5 years as a 2 line difference in interocular difference or vision less than 20/40.<sup>21</sup>

Unacceptable delays between detection and diagnosis of vision deficits in under 5s due to factors like ignorance, prejudice or carelessness was underlined by Hall and colleagues.<sup>22</sup> According to Registrar, the nuances of information technology assimilated into education increased the demand on visual system for effective learning and information processing. Research showed that academically and behaviourally at the risk children are bound to have undiagnosed vision disorders and hence periodic examination is recommended.<sup>23</sup>

Membreno and colleagues reported the early detection and treatment of amblyopia to be highly cost effective in comparison with other health care interventions.<sup>24</sup>

Uncorrected refractive errors have also been associated with reduced cognitive ability and motor skills in infants and preschool-aged children according to Ibiroke et al.<sup>25</sup>

Bruce and co-workers reported significant association between visual acuity and early literacy skills. This might have future repercussions on the education and societal outcomes of a child.<sup>26</sup>

Age and gender did not show any association with ocular morbidity in our study.

MEPEDS group reported visual acuity to be associated with age in their study. According to the authors, neither gender nor ethnicity showed any correlation with vision on doing multivariate logistic regression<sup>22</sup>. These findings were inconsistent with our study results.

There is necessity to screen preschool population, create awareness, educate the public on the benefits of early intervention and emphasize the consequences of

delayed treatment.

This was a hospital based study and hence cannot be generalised. Multi centric studies can add value to establish the common causes of ocular morbidity and visual impairment in Indian hospital based population which is scanty. Moreover, population based studies which are country specific is the need of the hour to estimate the prevalence of preschool vision deficits.

## CONCLUSION

The ocular morbidity observed in a hospital based population of 3 to 6 year old children were refractive error, amblyopia, anterior segment disorders, squint and posterior segment pathology.

**Conflict of Interest :** Nil

**Source of Funding:** Partly supported by India Vision Institute and JSW Foundation

**Ethical Clearance:** Obtained from Institutional Ethics Committee, Kasturba Hospital, Manipal

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# Factors Associated with the Use of Long-term Contraception Method in Batulicin Sub-district

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## ABSTRACT

National Medium Term Development Plan (Plan) for 2010-2014 states that one of the efforts to accelerate the fertility control through contraception more directed at increasing the use of Long Term Contraception Method (LTCM). This is because the LTCM is an effective method of contraception known as it can provide protection from the risk of pregnancy for a period of up to 10 years. Based BKKBN data in 2014 showed that the use of LTCM in South Kalimantan province only reached 5.43%, while the national target to be achieved, which amounted to 20.15%. One district that has the lowest performance in the use LTCM District of Batulicin, amounting to 3.76%. This study aimed to describe factors associated with the use of LTCM in Batulicin condemnation. This study uses a cross-sectional study. The population in this study, namely WUS aged 15-49 years with a total sample of 86 people. The sampling technique used is simple random sampling. The instrument used when the research is a spread sheet and checklist. And analysis of the relationship in this study using a statistical test such as fisher. The results of the study in 2016 showed that the factors associated with the use of LTCM in District Batulicin is a generation source of contraceptive services (p-value = 0.014). While the factors that are not related to the use of LTCM in District Batulicin is the age factor (p-value = 1.000), number of children (p-value = 0.053), the old age of marriage (p-value = 0.056), education level (p-value = 0.072), the contraception purpose (p-value = 0.0174), and stages of family welfare (p-value = 0.705. Therefore, efforts are required equitable distribution of resources and dissemination of contraceptive services related to the program.

**Keyword:** *Women with fertile age, Fertility, Risk, Long-term contraceptive method.*

## INTRODUCTION

The birth rate in Indonesia is still high to be a major problem in the population. Since 2004 the birth rate reached 4.5 million per year. Based on the results of the population census conducted in 2010, Indonesia's population reached 237,556,363 people. Higher population growth will pose a problem for the Government in promoting and developing the level of Lake citizens. One of the Government's efforts in controlling the dynamics of the population, especially in terms of the growth of the program and the population through family planning (FP)<sup>1,2,3,4</sup>. Family Planning (KB) is one of the strategies to reduce maternal mortality, especially mothers with the condition 4T; Too young to give birth (under 20 years), is too often expressed, too close to a bear, and too old to produce (in the above

age 35 years). KB is one of the most effective ways to improve the durability of the family, health, and safety of mothers, children, and but. program in target planning more focused on couples of fertile age (EFA) by the group of women of fertile age (hoping) that are in the range of 15-49 years of age<sup>5</sup>.

Term Development Plan (RPJMN) 2010-2014 states that efforts to accelerate the control of fertility through the use of contraceptives, family planning in Indonesia is directed to the use of long term contraception methods (LTCM). This is in line with national development strategies in the priority activities of the Population and Family Planning (BKKBN) for the year 2015-2019 that will improve the movement and the strengthening of family planning acceptors accession by strengthening partnerships (including military and police) conducted

by strengthening advocacy communication, information, education and communication (IEC) reproductive health and family planning acceptors<sup>6,7</sup>. LTCM is a method of contraception known to be effective because it can provide protection from the risk of pregnancy for a period of up to 10 years. LTCM consists of four types, such as implants, IUDs, tubal ligation and MOP. National Development Planning Agency (Bappenas) reported that the failure rate of contraceptive use for non-acceptors by 23% -39% (23% injection, 39% pills, condoms and 38%). As for the LTCM of 0.5% -10% (IUD or IUD 10%, respectively 0.5%, 0.5% MOW). Based on these results clearly show that the LTCM is more effective for preventing pregnancy in user<sup>4</sup>.

It is also supported by the World Health Organization (WHO) and the American College of Obstetricians and Gynecologist (ACOG) in Nuryati (2014) which states that the LTCM is a method of contraception is most effective. Providing family planning acceptors for quality is expected to increase the number of family planning acceptors accession by EFA in all phases of the family, so the impact of a falling birth rate nationally<sup>4,8</sup>. However, the use of LTCM in Indonesia has decreased. Based on data from the national development strategy in the priority activities of the Population and Family Planning (BKKBN) for 2015-2019 states that the use of LTCM decreased from 10.9% to 10.6%. Meanwhile, national targets to be achieved for the use of LTCM in 2015 by 20.5%. Data obtained from the BKKBN (2014) states that, Hubei Province reached 5.43%<sup>7,9</sup>.

Data were obtained from a representative of South Kalimantan Province BKKBN (2015) showed that the use of each type of LTCM in South Kalimantan, especially Tanah Bumbu regency has not reached the national standards and provincial (MOW (2.7%), IUD (9.92%), implant (84.91%) and 0% to MOP). Based on the results of the population census, the district also has a growth rate of population growth, which amounted to 3.74%. Meanwhile, the provincial target for the population growth rate, which was 1.98%. From this

district, District Batulicin ranked one of the low usage of LTCM, which amounted to 128 people or 3.76% of the 3,404 couples. The low use of LTCM in Batulicin district will affect the pace of population growth in the district of Tanah Bumbu<sup>10,11,12</sup>.

The low use of LTCM in Tanah Bumbu regency, especially in Sub Batulicin can be caused by several factors. According to the survey conducted by the research and development center planning and family welfare centers in 6 regions of Indonesia (Java, Sumatra, Bali and Nusa Tenggara, Kalimantan, Sulawesi, Maluku and Papua), there are 4 factors that affect the use of LTCM. These factors include the demographic factors (age, number of children living, and long married), social factors (education, region of residence, and contraception purpose), economic factors (stage of), and the means (of service)<sup>4</sup>.

According to the research Ambarwati (2009), there are several factors that affect the use of LTCM (IUD), including the level of education, income, and quality of service. The higher the education, income, and quality of service, the higher the wishes of the people using the LTCM. Accordingly, research Chris (2015) states that the age, number of children, education level, place of residence, family support, purpose and reason KB has a close relationship to the use of LTCM<sup>12,13</sup>.

## METHOD

This study design was observational analytic with cross sectional design. The population in this study, the WUS ages 15-49 with a sample size of 86 people. The sampling technique used is simple random sampling. The instruments used during the research of the sheet and checklist. And the analysis of relationships in this study using a statistical test fisher.

## RESULTS AND DISCUSSION

Based on the results, the distribution frequency of the factors related to the use of long term contraception methods can be seen by table 1 below:

**Table 1. Univariate analysis**

No	Variable	Category	Frequency	Percentage (%)
1	Age	>20 years	4	4,7
		20 years	82	95,3
2	Number of child	0-2 child	58	67,4
		3 child	28	32,6

**Cont... Table 1. Univariate analysis**

3	Old Age Married	>10 years	57	66,3
		10 years	29	33,7
4	Education level	Low	54	62,8
		High	32	37,2
5	Contraception purpose	Delay and compose	39	45,3
		Ending Birth	47	54,7
6	Prosperous family stage	Not Prosperous	24	27,9
		Prosperous	62	72,1
7	Source of Service	Private	6	7
		Public	80	93
8	Contraception	Non MKJP	77	89,5
		MKJP	9	10,5

According to table 1 note that 86 of the respondents 4 respondents (4.7%) have a lifespan of less than 20 years of age (<20 years) with the youngest age, that 18 years of 1 (1.2%). And as much as 82 respondents (95.3%) had ≥20 years of age with the age of the oldest, is 49 years of 1 (1.2%). Of 86 respondents, 58 respondents (67.4%) had 0-2 children with respondent 1 (1.72%) who do not have children and using contraception for reasons to postpone pregnancy because they are at the age of 19. Based on the above then, average -the respondents in the category of 0-2 children. Out of 86 respondents 57 respondents (66.3%) have a long marriage age less than 10 years of age (<10 years). Out of 86 respondents

54 respondents (62.8%) were at the level of primary education (primary and secondary).

Out of 86 respondents 39 respondents (45.23%) use birth control in order to delay and pregnancy, as well as a total of 47 respondents (54.7%) use birth control in order to terminate the pregnancy. Of 86 respondents, 62 respondents (72.1%) belongs to the stage of a prosperous family. Out of 86 respondents 80 respondents (93.0%) received contraceptive services comes from government facilities. Out of 86 respondents, 9 respondents (30.2%) used a contraceptive method for long-term (LTCM) and as many as 77 respondents (89.5%) do not use long-term contraceptive methods (LTCM).

**Table 2. Analysis of bivariate**

Variable	Type of Contraception				p-value
	Non MKJP		MKJP		
	n	%	n	%	
Age					
>20 years	4	100	0	0	1,000
20 years	73	84,48	9	10,85	
Number of child					
0-2 child	55	94,9	3	5,2	0,053
3 child	22	78,6	6	21,4	
Old Age Married					
>10 years	54	97,5	3	5,3	0,056
10 years	23	79,3	6	20,7	
Education level					
Low	51	59,30	3	3,49	0,072
High	26	30,23	6	6,98	
Contraception purpose					
Delay and compose	37	94,9	2	5,1	0,174
Ending Birth	40	85,1	7	14,9	
Prosperous family stage					
Not Prosperous	21	87,5	3	12,5	0,705
Prosperous	56	90,3	6	9,7	
Contraception					
Non MKJP	74	92,5	3	7,5	0,014
MKJP	3	50,0	6	50,0	



Table 2 shows that there is no correlation between WUS age and long term contraceptive use ( $p$ -value=1,000). This is in line with research conducted by Fitri Indrawati and Laras (2015) stating that there is no relationship between age with LTCM election. A person's decision to choose the contraceptive used is not always affected by age, especially in terms of choosing LTCM contraception. But there are other factors that may affect a person not using LTCM contraception such as personality reasons, individual environment, knowledge of other contraceptive methods is lacking, as well as experience related to facilities and health care workers<sup>1</sup>.

Based on table 2 it is also known that there is no relationship between the number of children with the use of long-term contraceptive type ( $p$ -value=0.053). Based on the findings of the field, there are other factors that trigger a person reluctant to use LTCM, including still wanting different children's sex. This is supported by Bulatao and Lee (1983) and Shapiro (1997) in Hartoyo (2011) found a positive relationship between the child's value and the desired number of children<sup>16</sup>.

Based on table 2 it is also known that there is no relationship between the age of marriage with the use of long-term contraceptive type ( $p$ -value 0.056). Based on the conditions in the field there are 29 mothers (33.7%) who have a married age of more than 10 years still use the type of contraception Non LTCM. In fact, PLHP officers and local health workers such as midwives stated that they have advocated the use of LTCM contraception in mothers with a married age of more than 10 years, number of children equal to or greater than 3, and age more than or equal to 30 years. The longer the marriage age of the woman, the more children are born. This is in line with Nasir's (2013) study which states that if examined from the additional number of children born, women who are in the old marriage bond will typically have more children<sup>17</sup>. For that reason, Family Planning Program (KB), especially LTCM has a very important role in overcoming the birth rate in Indonesia. Thus, population growth due to the factor of fertility can be reduced<sup>18</sup>.

Table 2 also shows that there is no correlation between educational level and long-term use of contraceptive type ( $p$ -value=0.072). That is, the reason for using LTCM is not always influenced by the level of education. Respondents who are highly educated are

still many who use Non LTCM. This is because people's thinking is wrong and lack of understanding about the use of LTCM. People are afraid of the use of LTCM which they think should be operated and fear of tools inserted in the uterus and under the skin, and so on<sup>19</sup>. Based on table 2 it is known that there is no correlation between the contraception purpose and the use of long-term contraceptive type ( $p$ -value=0.174). This is in line with research conducted by Nuryati (2014) that there is no significant relationship between contraception purpose with the use of LTCM ( $p$ -value=0.054). In this study, it is stated that the purpose of using contraceptives may not affect a person in choosing contraceptives, this may be due to other factors such as knowledge factor and service quality, facility factors such as availability of contraceptive devices, health workers, and cost<sup>8</sup>.

Based on table 2 it is also known that there is no relationship between the prosperous family stage with the use of long-term contraceptive type ( $p$ -value=0.705). There are several factors that can affect the mother who is in the stage of not prosperous to want to use LTCM. Other factors can be influenced by the level of education of the mother, the purpose of the mother term contraceptive, and the age of the mother. Based on Table 2 it is known that there is a correlation between the source of contraceptive services with the use of long-term contraceptive type ( $p$ -value 0.014). The use of LTCM is mostly done in government facilities rather than private facilities. Facilities and infrastructure where the service also often affect women EFA in choosing contraceptives, both LTCM and Non LTCM<sup>14</sup>.

## CONCLUSION

Based on the results of research conducted, it can be concluded that factors associated with the use of LTCM in Batulicin District is the source of contraceptive service ( $p$ -value = 0,014). While the factors unrelated to the use of LTCM in Batulicin District were age factor ( $p$ -value = 1,000), number of children ( $p$ -value = 0.053), marriage age ( $p$ -value = 0,056), education level ( $p$ -value = 0,072), purpose berKB ( $p$ -value = 0,0174), and prosperous family stage ( $p$ -value = 0,705).

**Ethical Clearance:** This study approved and received ethical clearance from the Committee of Public Health Research Ethics of Medical Faculty, Lambung Mangkurat University, Indonesia. In this study we followed the guidelines from the Committee of Public

Health Committee of Public Health Research Ethics of Medical Faculty, Lambung Mangkurat University, Indonesia for ethical clearance and informed consent. The informed consent included the research title, purpose, participants's right, confidentiality and signature.

**Source Funding:** This study done by grants of Directorate of Research and Community Service, Ministries of research, technology and higher education, 2017.

**Conflict of Interest:** The authors declare that they have no conflict interest.

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# Correlation Between Perception of Smoke Dangers Message with Adolescent Smoking Behavior in Banjarbaru

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## ABSTRACT

Government issued regulation No. 28 Year 2013 about Imprinting and Health Information Health Warnings on Tobacco Product Packaging control efforts for the health effects of cigarette consumption in Indonesia. The effort is greatly influenced by the perception of the dangers of smoking for messaging users. This study aimed to analyze correlation between perceptions of dangers of smoking message by Minister Regulation No. 28 of 2013 which is a picture “Merokok Membunuhmu” with adolescent smoking behavior of SMA / SMK private Banjarbaru. The study uses a quantitative method with observational analytic design with cross-sectional approach. The study population 3002 people. Calculation of the sample using hypothesis testing two proportions totaling 82 samples. The sampling technique using cluster sampling. The result showed the respondents have a positive perception many as 73 people (89%) and who behave smoke as many as 34 people (41.5%). Chi-square test showed that there is a relationship between perceptions message dangers of smoking and smoking behavior ( $p=0.03$ ). Message dangers of smoking on cigarette packs may be used as an alternative medium of health promotion and health worker input in reducing the number of smokers in the target school teenagers. Other researchers can carry out research on the perception of dangers of smoking messages on other media such as audio-visual media.

**Keywords:** Perception, behavior, messages dangers of smoking.

## INTRODUCTION

Cigarettes by some people has become a necessity of life, and that is behavior that can not be left in their daily lives<sup>1</sup>. smoking and smoking behavior is an issue that is still sticking to this day. Various effects and dangers of smoking has actually been made public, but people are still smoking habit difficult to stoped<sup>2</sup>. From the health side, the effect of the chemicals contained in cigarettes such as nicotine, carbon monoxide (CO), and tar will spur employment of nervous system central and sympathetic nervous system, resulting in increased blood pressure and heart rate quickened to stimulate cancer and various other diseases, such as narrowing of the arteries, high blood pressure, heart, lungs, bronchitis and diseases others<sup>3</sup>.

Based on the results of Health Research (Riskesdas) in 2013 the average proportion with age > 10 years who smoke in Indonesia is 29.3%, and sometimes smoked 3.5%. South Kalimantan had a mean proportion of

smoking was 22.1% and occasional smoking was 3.6%. The amount is below the national rate is 30.5%. However, the average number of cigarettes smoked in South Kalimantan 16.7 rods while the average proportion in Indonesia as much as 12.3 rods that exceed the national average. The average number of cigarettes smoked in South Kalimantan ranks second in Indonesia after the Bangka Belitung. Based on data from Indonesia Global Youth Tobacco Survey (GYTS) in 2009 showed the prevalence of students who ever smoked by 30.4%. The figure consists of men by 57.8% and of women by 6.4%, and 20.3% of students are still using rokok<sup>4,5</sup>. Based on survey data PHBS Banjarbaru household level, decrease number of smokers smoking in the house from 2012 to 2013, each as much as 61.9% and 50.8%. Although this number decreased, but the number is high enough, that more than half the population who smoke in the house.

Teenage smokers in Indonesia, which is a high background that adolescence is a time of transition

between children and adults who run the different time-beda.<sup>6</sup> According to Nasution added that during this period teenagers will try to find the identity of dirinya<sup>7</sup>. Adolescents tend to try behavior that have never been done better the behavior of both positive and negative behavior. One example of the negative behaviors that often do teenagers are smoking. Based on the research results and Purwandari Lestari, smoking behavior found that the average private school students (high school and vocational) higher than public schools (SMA and SMK) in the city of Sragen<sup>8</sup>.

Efforts to control the impact of tobacco consumption on health in Indonesia through Law No. 36 Year 2009 on Health, Government Regulation No. 109 of 2012 on Safety Materials Containing addictive substances Form of Tobacco Products for Health and the Minister of Health Regulation No. 28 Year 2013 concerning Inclusion Health Warning and Health Information on Product Packaging Tembakau<sup>9</sup>. understanding of the target to the warning message ads on cigarette advertising is expected to support efforts to prevent the dangers of smoking and contribute in reducing the number of smokers. However, in reality the increase in the number of smokers showed a worrying rise in the number mainly on the remaja<sup>10</sup>.

Research Nurmayunita entitled relationship between knowledge, exposure to advertising media and perception of the level of vocational students smoking behavior Kasatrian Solo Kartosuro mentioned that there is a significant relationship between the perception of smoking behavior at the level of smoking behavior of students ( $p = 0.021$ )<sup>11</sup>. In addition, according to Widati that health messages on cigarette packs are not effective in improving knowledge and prevention of smoking behavior of informants Village Land Kedinding Kali Surabaya. This is due to the dangers of smoking message surveyed still use the old dangers of smoking message, that is, before the passing of Minister Regulation Number 28 of 2013 on June 24, 2014. Changes in cigarette new message is expected to change smoking behavior in Indonesia<sup>12</sup>. Therefore, research is needed to explain the relationship of perception about the message the dangers of smoking and smoking behavior in adolescents.

## **MATERIALS AND METHOD**

The design of this study was analytical, with cross sectional study. The population in this study were all

students / private high school and vocational school in the city of Banjarbaru derived from individual data SMA and SMK City Education Department Banjarbaru years 2014-2015. The population amounted to 3002 people. The population is spread across 18 private secondary schools are divided into five high schools and 13 vocational school. Samples were taken from 18 private secondary schools were selected using cluster sampling technique. This sampling technique is used to determine the sample if the object to be inspected or very comprehensive data sources such as district / city. Groups drawn from this study consisted of a geographical unit. Of the 18 private high schools located in the City Banjarbaru, researchers divided the study area into 4 clusters.

Based on a population that is already divided it can be seen, there are 4 sub-groups within the District of Banjarbaru, namely South Banjarbaru, North Banjarbaru, Liang Anggang and Platform Ulin. Furthermore, the draw to obtain Platform Ulin region at SMK Bhakti Nations by the number of students 424 people. Making the number of samples by using the formula hypothesis testing difference in two proportions. Obtained minimum sample size of 82 samples and will be taken at every class X, XI and XII by calculating based on the proportion of the number of students in each class with all students multiplied by the number of samples. Instruments in this study is a questionnaire that has been tested for validity and realibilitasnya. Validity and reliability conducted in Puskesmas Ulin River by 30 respondents.

## **RESULTS AND DISCUSSION**

Based on Table 1 shows that based on the perception variables, respondents have a positive perception amounted to 73 (89%) of respondents. Based on Table 2, the results of this study also showed that respondents who have behaved smoke totaled 34 (41.5%) of respondents. Based on the results of the questionnaire, found respondents who chose a smoked the most are at a friend's house (21 peoples), followed by home (14 peoples), at school (8 peoples) and others such as on the street or in the garden (5 peoples). The man who first influence respondents to smoke the most widely asked is a friend as much as 23 respondents (68%).

Based on Table 3, known that from 9 respondents (100%) who have a negative perception, there are seven

respondents (77.8%) who behave smoke and of 73 respondents (100%) that have a positive perception, there are 27 respondents (37.0 %) that behaves smoke. Fisher exact test results with a 95% confidence level, to see the connection between the perception of the message the dangers of smoking and smoking behavior found that, the value of  $p = 0.03$ . This means there is a significant relationship between the perception of the message the dangers of smoking and smoking behavior.

**Table 1. Frequency Distribution of Respondents by Perception and Smoking Behavior**

No.	Variable	Frequency (n)	Percentage (%)
<b>Perception</b>			
1.	Positive	73	89
2.	Negative	9	11
<b>Behavior</b>			
1.	Smoker	34	41,5
2.	Not Smoker	48	58,5
<b>Total</b>		82	100

**Table 2. Test Results Statistics between the Perception of the Dangers of Smoking Message to Smoking Behavior**

No	Perception	Behaviour		Total	<i>p-value</i>
		Smoker (%)	Not Smoker (%)		
1	Negative	7 (77,8%)	2 (22,2%)	9 (100%)	0,03
2	Positive	27 (37,0%)	46 (63,0%)	73 (100%)	

Respondents who have a positive perception amounted to 74 respondents (90.2%). Factors that lead to high perception among others attention selective where not all of the stimulus will be taken unless the stimulus is beneficial or useful or interesting to the individual, the characteristics of the stimulus or stimuli that move between excitatory silence will attract more attention, needs and emotional status which needs to motivate a person to be able to fulfill, past experience will be a cornerstone of thinking, and the function of the nervous system where the nerves are central to think that the damage either at the central or peripheral (sensory) can alter the creation percepts<sup>13</sup>.

According to Nasution, usually young people smoking when you're hanging out with friends, the weather was cold, and once scolded the parents. Teens also will smoke when there are problems, drowsiness, anxiety and requires concentration<sup>14</sup>. The first affects the respondents to smoke the most widely asked is a friend as much as 23 respondents (68%). This is consistent with

research Chen, Huang and Chao that teens who smoke have a close friend who also smoked and Iqbal research, which found that most respondents (98.1%) had one or more friends who behave smoke. Approximately 70.1% of respondents have offered / given cigarettes by a friend<sup>14,15</sup>.

According Murdoko, behavior is something you do as an embodiment of the attitude of the establishment. Behavior will support change if the attitude held by someone positive. Behavior will resist change if a person has a negative attitude.<sup>14</sup> Smoking behavior usually begins in adolescence even though the process of becoming a smoker has started since childhood. Adolescence also an important period of risk for the development of long term smoking behavior. In addition, smoking is the entrance of other negative behaviors such as substance abuse and drinking<sup>8</sup>.

In this study, known although respondents have a positive perception but still behave smoke. As for the environmental factors associated with tobacco

use, among others, parents, siblings and peers who smoke. Another factor that causes people to smoke is the influence of advertising. Tobacco advertisement is expected to have a stronger influence than the influence of parents or peers, it is because perceptions affect the appearance and benefits merokok<sup>16</sup>.

Fisher exact test results with a confidence level of 95%, showed a significant relationship between the perception of the message the dangers of smoking and smoking behavior. This study is in line with research James FT, Rousu MC, Hammond D, A Navarro, JR Corrigan who proved that their message on the dangers of smoking can affect the behavior of perokok<sup>17</sup>. However, there are differences with the research conducted by Alim said that there is no perception of the relationship warning labels on cigarette packs and smoking behavior in adolescents in the Village Trimulyo City Semarang<sup>18</sup>.

Perception is the experience of objects, events, or relationships obtained by concluding information and interpret message<sup>19</sup>. according Sarlito perception is an individual's ability to discriminate, categorize, focus or ability to organize observations. Perceptions on each individual varies according to expectations, experience, and motivation of the individual self that sendiri<sup>20</sup>. Perception is one of the factors that influence a person's behavior in this case is the smoking behavior. This is consistent with the theory Notoatmodjo behavior, perceptions are internal factors that influence a person's behavior. One's perception of smoking behavior can be influenced by mass media advertising, both print and elektronik<sup>16,21</sup>.

Winarni research results stating that the mass media have great power in shaping people's minds. The media has become the dominant source for the public to obtain a description and image of social reality. Tobacco advertising in mass media are always displayed in an interesting and creative by combining images, sound, and motion so that people always remember the word in iklan<sup>16</sup>. The perception that one turned out to be a major impact for someone. Perceptions about the dangers of smoking turned out to be important for the person to smoke or not. The government should also be able to play a role in preventing smoking employee, for example by making tobacco sales regulations. Another effort that the government can do is to impose a very high tax on companies rokok<sup>16</sup>.

Factors that lead to high perception among others attention selective where not all of the stimulus will be taken unless the stimulus is beneficial or useful or interesting to the individual, the characteristics of the stimulus or stimuli are stimuli that move between stimuli that silence be more interesting, needs and emotional status, namely the need to motivate a person to be able to fulfill, namely first experience of past experience will make it as the basis of reasoning, and the function of the nervous system where the nerves are central to think that the damage either at the central or peripheral (sensory) can alter the creation persepsi<sup>13</sup>.

## CONCLUSIONS

The results showed that no significant relationship between the perception of the dangers of smoking message about smoking kill smoking behavior ( $p = 0.03$ ). Further research is needed to determine how much exposure the respondents in the provision of health promotion media especially print and video media in order to know which one is better used in the promotion. Messages dangers of smoking to health warnings can be used as an alternative medium of health promotion as an input by health workers in an effort to reduce the number of smokers in the target school teenagers. The government retains the promotion of health through picture messages dangers of smoking by Minister of Health Regulation No. 28 of 2013, as based on the results of this study, there was a message on the dangers of smoking that print media can be delivered as pictorial warnings are perceived positively. Researchers can carry out research on the perception of other media such as audio-visual media.

**Ethical Clearance:** This study approved and received ethical clearance from the Committee of Public Health Research Ethics of Medical Faculty, LambungMangkurat University, Indonesia. In this study we followed the guidelines from the Committee of Public Health Committee of Public Health Research Ethics of Medical Faculty, LambungMangkurat University, Indonesia for ethical clearance and informed consent. The informed consent included the research title, purpose, participants's right, confidentiality and signature.

**Source Funding:** This study done by self funding from the authors.

**Conflict of Interest:** The authors declare that they

have no conflict interest.

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# Pregnancy Induced Musculoskeletal Dysfunction Scale(PMDS) - Development and Validation

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## ABSTRACT

**Background** - Most women consider their pregnancy discomforts as part of gestational changes unless its severity affects their regular activities. Extensive literature search shows that there is a lack in the psychometrically accepted measurement tool for pregnancy induced musculoskeletal symptoms. **Aim**-The purpose of this study is to develop validated tool to quantify the pregnancy related musculoskeletal discomforts. **Method**- The study was conducted between January-2013 and March- 2013 at Chennai. Evaluation of face and content validity performed by three Specialists in obstetrics and gynecology, three nursing professionals and by two physiotherapists experienced in the field of women's health. Maternal physical discomfort scale item pool was prepared. Evaluation of the construct validity of the questionnaire was performed by factor analysis. **Conclusion**-The scale developed (PMDS) to analyze the musculoskeletal issues proved to be a valid and reliable instrument. Analyzing pregnancy discomforts is important to health care professionals to provide effective antenatal care.

**Keywords**-Pregnant women, Pregnancy discomfort, Musculoskeletal dysfunctions, Gestational Age.

## INTRODUCTION

Pregnancy induced musculoskeletal problems are common during second and third trimesters. Most women consider their discomforts as part of gestational changes unless its severity affects their regular activities. Perception of pain remains primarily subjective. Factors such as anxiety, fear, personality, fatigue, Socio cultural aspects, expectations and distractions from pain can influence the pain perception and coping. Pregnancy discomforts are caused due to the normal physiological changes and affect the mother both physically and mentally. As the gestational age increases the added weight of the baby pulls the uterus forward and can cause increased back discomforts. Due to hormonal influence the ligaments become soften, leads to muscle aches, circulatory changes leading to cramp, edema

or varicose veins. Studies shows that 25% of women experience severe pelvic pain during pregnancy and 8% are severely disabled due to pelvic girdle pain. <sup>(1)(2)</sup>

Women may experience variety of discomforts other than musculoskeletal origin during pregnancy such as fatigue, nausea, vomiting, tiredness, breathlessness, heart burn, hemorrhoids, pelvic pressure or heaviness and incontinence. Few studies showed the effect of exercise on reduction of the pregnancy induced musculoskeletal discomforts. Findings indicate that joint laxity is more in sedentary group as the pregnancy progress. Sometimes it may affect the endurance and mobility<sup>(3)(4)</sup>. Sedentary lifestyle during pregnancy may increase development of pregnancy related discomfort than mothers who involve in leisure time physical activities.

Evident of Scientific studies explain the essential role of physical activities in health promotion improving quality of life, prevention and control of various problems during pregnancy<sup>(5)(6)</sup>. Extensive literature search shows that there is a lack in the psychometrically accepted measurement tool for pregnancy induced

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musculoskeletal symptoms. The aim of this study is to develop validated tool to measure the pregnancy related musculoskeletal discomforts.

## MATERIALS AND METHOD

An item pool of common maternal musculoskeletal discomforts was generated from literature, clinicians and pregnant women. Evaluation of face and content validity performed by three Specialists in obstetrics and gynecology, three nursing professionals and by two physiotherapists experienced in the field of women's health. They were asked to review the discomfort items and finalize the factors for wording, clarity and representativeness. Finally pregnancy induced musculoskeletal discomfort scale confirmed with 16 items through this process. The questionnaire was translated to local language and was translated back to English language. The understandability is tested by administering ten pregnant mothers in second trimester. Actual sample size of this study was calculated as 384, by anticipating 50% having maternal musculoskeletal discomforts, with relative precision of 10% at 95% confidence interval. But totally 409 pregnant women were enrolled for the current study.

The study was conducted between January-2013 and March- 2013 at Sri Ramachandra Hospital, Chennai. The study design was cross sectional study. Mothers were included in the study as per selection criteria. Pregnant mothers with the age group of 21 to 36 years, gestational age more than 20 weeks attending antenatal outpatient unit were selected for the study. Mothers were excluded for the study if they had Hypertension, Diabetes, diseases of cardiovascular, multiple pregnancy, respiratory or renal systems, previous musculoskeletal disorders, anemia, and blood disorders. Informed

consent is obtained from study population. Mothers were asked to fill up the pregnancy musculoskeletal discomfort scale (PMDS), which contains Demographic Data, parity, musculoskeletal discomfort severity with interference with their daily routine, frequency of the symptoms. Mothers were asked to mark on the body chart for better illustration of symptoms. For queries and clarifications while filling up questionnaire and to distinguish the symptoms, a physiotherapist assisted the mothers in outpatient department. For testing reliability, the questionnaire was completed by fifty mothers twice on the same day within four hours interval during their outpatient visit.

## RESULTS

Six thirty mothers volunteered for initial screening and among them 409 mothers were eligible as per the inclusion criteria. Their mean age was 26.24 with standard deviation of 2.92. Construct validity of the questionnaire was evaluated by factor analysis. In the analysis of principal components, the Bartlett sphericity test and the Kaiser-Meyer-Olkin (KMO) statistic test was used<sup>(7)(8)</sup>. A method of interpretation used in preliminary analysis was the factor loading which was greater than or equal to 0.3.

Factors such as lowbackpain, pubic pain, pelvic girdle pain ,hip,knee,foot pain, pedal edema, cramp shows adequate factor loadings>0.4, thereby considered as valid measures of maternal musculoskeletal discomfort and has its significant contribution to the measurement factor[Table-1]. The factor with highest Eigen value is 3.548 and the next factor with a value of 1.685. The KMO value is 0.732. Bartlett test of sphericity is significant at the level of  $p=0.000^{**}$ . Test retest method administered to rule out reliability statistics.

**Table-1: List of PMDS scale items with factor loadings**

ITEMS	FACTOR LOADING	ITEMS	FACTOR LOADING
Neck pain	0.23	Hip pain	0.41
Upper back pain	0.34	Knee pain	0.41
Rib pain/soreness	0.37	Ankle pain	0.35
Carpal tunnel syndrome	0.35	Foot pain	0.48
Lowbackpain	0.48	Lower limb tingling/numbness	0.23
Symphysis pubis pain	0.61	pedal edema	0.44
Pelvic girdle pain	0.53	leg cramp	0.42
Coccydynia	0.42	abdominal cramp	0.31
<b>Eigenvalue</b>	<b>3.548</b>	<b>Cronbach's Alpha</b>	<b>0.879</b>

**Table-2: Maternal musculo skeletal dysfunction among II and III trimester primi mothers.**

<b>Pregnancy Musculoskeletal Discomforts (N-409)</b>	<b>neck pain</b>	<b>Upper back pain</b>	<b>rib pain</b>	<b>CTS</b>	<b>Low back pain</b>	<b>pubic pain</b>	<b>PGP</b>	<b>coccydynia</b>
II Trimester (N-198)	7%	6%	3%	8%	32%	12%	22%	2%
III Trimester (N-211)	9%	14%	10%	11%	45%	27%	28%	4%
<b>Pregnancy Musculoskeletal Discomforts (N-409)</b>	<b>Hip Pain</b>	<b>Knee Pain</b>	<b>Ankle Pain</b>	<b>Foot / Heel Pain</b>	<b>Lower limb tingling / Numbness</b>	<b>Pedal edema</b>	<b>Leg cramp</b>	<b>Abdominal cramps</b>
II Trimester (N-198)	12%	13%	11%	13%	13%	20%	18%	10%
III Trimester (N-211)	15%	17%	15%	15%	17%	34%	26%	16%

## DISCUSSION

Pregnancy postural changes may induce most of pain syndromes. [Table-2] In our study 7 % of mothers in second trimester, 9% in third trimester has complained neckpain. Most of the women complaining neck pain were employed in clerical or in executive job. 6% of mothers in second trimester and 14% of third trimester complained upper back pain. Costal pain during pregnancy is due to flaring of ribs in final trimester. 3% and 10% mothers showed rib pain during second and third trimester respectively. Mothers suffering from carpal tunnel syndrome presented with paraesthesia or numbness in hands, majority of them were employed, complained mostly bedtime pain. 8% of second trimester, 11% of third trimester mothers complained of carpal tunnel syndrome.

Pregnant mothers complains commonly low back pain which may be caused by many physical changes of pregnancy, added weight gain, poor muscle tone, increased lordosis, changes in center of gravity and loose pelvic ligaments<sup>(9)(10)</sup>. In our study low back pain was noted in 32% in second trimester, 45% in third trimester. The pubic pain was increased from 12% in second trimester to 27% in third trimester. This could be due to hormonal laxity<sup>(9-13)</sup>. The joint becomes tender and produce pain when the patient shifts weight from one foot to other foot. Most mothers experiences this pain during initial phases of weight bearing following longer

periods of rest.<sup>(15)</sup>

In the retrospective study conducted among young and middle aged with chronic low back pain, 10% to 28% reported that they experienced first episode of back pain during pregnancy. Many hypotheses on peripartum pelvic pain focus on decreased pelvic stability due to ligament laxity. There may be a relationship between the circulating levels of relaxin and pelvic instability<sup>(16)(12)</sup>. Pelvic girdle pain in second trimester is 22% and 28% in third trimester. Present study revealed 2% of mothers in second trimester and 4% of third trimester mothers complain of coccyx pain, while sitting. This pain is more common in the post-partum period especially during lactation time.

Lower limb pain experienced by study participants is presented at hip, knee, ankle and foot pain. 12% Hip pain noted in second trimester, 15% in third trimester. Kneepain is increased from 13% to 17% in second and third trimester. Ankle and foot pain in second trimester is 11% and 13% which is raised to 15% in third trimester<sup>(17)(18)</sup>. Lower extremity pain during gestational period is caused by increased weight and fluid retention<sup>(18)</sup>. Most mothers complains of lower limb pain as restless legs, majority of mothers with heel pain had history of longer time standing profile occupation or involved in household works. Lower limb radiating pain and numbness could be due trauma to sciatic and femoral nerve distribution

resulted by sacro iliac joint relaxation or compression of lateral femoral cutaneous nerve of thigh. Radiating pain and numbness in pregnancy increases 13 to 17% from second to third trimester. Gestational hormonal changes induces fluid retention as pedal edema which increases with dependency position and relieved by elevation. 20% of second trimester and 34% of third trimester mothers reported pedal edema. Cramps may be resulted by overuse of a muscle, dehydration, muscle strain, compression of nerves and blood vessels due to circulatory changes and weight gain. But exact causative mechanism is not clear.

Cramping in pregnancy experienced over thigh, more often in calf muscles and foot. Leg cramping is 18% in second trimester whereas 26% in third trimester. Abdominal Cramping occurs as the uterus expands with stretch of ligaments and muscles and more noticeable during sneezing, coughing, or positional changes. In our study abdominal cramping is 10% in second trimester 16% in third trimester.

### CONCLUSION

Most of times Pregnancy related musculoskeletal symptoms are considered as part of pregnancy changes. Until the symptoms affect quality of life, it is not reported widely. It is important to measure pregnancy related symptoms to assess the quality of life of pregnant mothers. Hence the scale developed to analyze the musculo skeletal issues would be valid and reliable. Understanding the importance of analyzing pregnancy discomforts would help health professionals to provide appropriate therapy in antenatal care in view of prevention and health promotion<sup>(19)(6)</sup>.

**Ethics:** Sri Ramachandra University Ethics committee approved this study. Informed consent is obtained from all the study participants.

**Acknowledgment:** Participants

**Conflicts of Interest:** The authors declare that they have no competing interests.

**Funding:** Self

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# Assessment of Attitude of Staff Nurses on Nursing Research and its Utilization

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## ABSTRACT

Staff nurses involvement in clinical nursing research is dependent on the attitude of nurses toward research. The **objective** of this study was to explore the attitude of staff nurses on Nursing research and its utilization at selected institutions in Bangalore, Karnataka. **Methodology:** The descriptive study design was adopted and 300 staff nurses were selected by systematic random sampling technique from eight hospitals. The attitude on nursing research was assessed by validated and reliable self-administered attitude scale which consist of 40 items. **Results:** The overall mean attitude was score 130.2 (SD 11.5) regarding attitude on Nursing research and its utilization. The most of the staff nurses (51%) agreed and 18.3% strongly agreed that they have all the motivation to use research findings if they get support. About 25.3 percent of staff nurses agreed and 10.7 percent strongly agreed that they do not have time to conduct research. The most of the staff nurses 53.7 percent agreed that research will help in updating Nursing profession. About 45.3 percent and 17.3 percent agreed and strongly agreed that knowledge gained through experience is more useful than research. Most (40%) of Nurses agreed that they do not have the authority to change the patient care practice. The majority of staff nurses (45.7 percent agreed and 13 percent strongly agreed) feel the research will consume their personal time. Majority, 50 percent of staff nurses agreed and 16.7 percent strongly agreed that to conduct and utilize research findings requires financial support. About 50 percent of staff nurses agreed and 12 percent strongly agreed that physicians will cooperate and value nursing research findings. **Conclusion:** Based on the study findings it can be concluded that, the staff nurses have positive attitude regarding nursing research. If the nurses are supported and motivated for research utilization it can improve the patient care.

**Keywords:** Nurses, Attitude, Nursing Research, Research utilization, perception.

## INTRODUCTION

Nursing research is very important for the nursing profession which provides nurse's body of knowledge on nursing practice, helps in modifying the present practice and / replaces the existing practice. For any activity to be performed the intention/ positive attitude is required, this attitude is influenced by many factors.

Which includes the individual educational background, interest and support will influence the development of positive attitude. The Nurses attitude is most important which determines the quality of patient care. The quality of patient care again depends on nurse's knowledge and skill of the individual. To enhance the knowledge of nursing practice nurses should have a positive attitude towards problem-solving and Nursing research and its utilization.

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MacLean, Désy, Juarez, Perhats, Gacki-Smith (2006) had conducted the study to assess the research needs in order to enhance research utilization. Need assessment was done with self-administered assessment tool which was administered to 216 Emergency

department managers and nurses in 26 nurses in emergency departments. The researcher used the tool which includes the items on knowledge, and experience on Nursing research and also barriers to conducting research. The Descriptive statistics were used for analysis. The results showed that the primary barriers had limited knowledge and experience and barriers were not having time to conduct research and less appreciation for research contributions.<sup>1</sup>

Though the nurses have positive attitude involving or utilizing nursing research is seldom. A descriptive survey conducted by Bjorkstrom, Hamrin, (2001) on attitudes towards research and development within nursing. About 407 Swedish nurses were selected based on random sampling technique. The author used the questionnaires which consist of parts: demographic assessment tool, and attitude scale. The results of the study showed that the participants had positive attitudes towards nursing research. About 46% never or rarely utilized nursing research findings in their daily today practice. About half of the subjects never read research reports. The study concluded that even if the respondents had a positive attitude towards research and development, there was a poor application in their daily work.<sup>2</sup>

By reviewing the above facts the researcher was interested in exploring the attitude of staff nurses on Nursing research and its utilization.

**Objectives of the study:** The objectives of the descriptive study was to explore the attitude of staff nurses on Nursing research and its utilization, and to find the association between the attitude and selected variables.

**MATERIALS AND METHOD**

The survey approach with descriptive research design was adopted. The sample of 300 staff nurses was selected by systematic random sampling technique from 8 hospitals of Bangalore. The attitude questionnaire on Nursing research and its utilization was prepared with the support of review literature and exports validation. The attitude tool consists of 40 items, which includes the items on Nursing research, utilization and Nursing research and its barriers to research utilization. The attitude scale was 5 point scale, for the 40 items the maximum score was 200. The score of 1-100 considered as a negative attitude, 101-150 as moderately positive

attitude and 151-200 considered as a highly positive attitude in nursing research and its utilization. The tool was assessed for pretested and reliability was 0.86. **Data Collection** was done after obtaining permission from concerned authorities obtained from 8 hospitals & consent obtained from the participants for the study. After selecting the sample they were gathered in a convenient place in their institutions & introduced the purpose of the study and also instructed on how to fill the attitude scale.

**RESULTS**

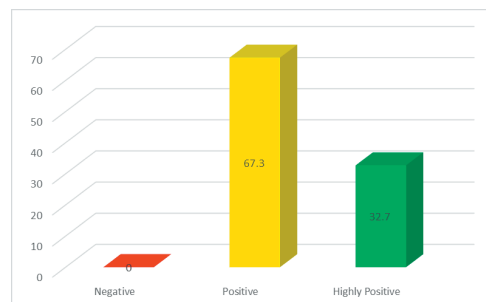
**Description of sample characteristics:**

Majority 199 (66.3%) of the staff nurses were in the age group of 20-25years, and only 4 (1.3%) were >50 years. Most of the staff nurses in the study were female 212 (70.7%) and only 88 (29.3%) were males. The majority (93.7%) of the staff nurses were with BSc (N) nursing qualification. Most of the staff nurses (74.6%) were not TNAI members. Only 46.4% of nurse staff nurses said institution will provide support.

**Table -1: Mean and Standard deviation scores on attitude of staff Nurses on Nursing research and its utilization (n= 300)**

Variables	Maximum score	Mean	SD
Attitude on Research	100	65.7	7.09
Utilization of Nursing research	55	36.29	5.08
Barriers to research utilization	45	28.2	3.05
Overall	<b>200</b>	<b>130.2</b>	<b>11.15</b>

The table 1 shows that, the overall mean 130.2 with SD of 11.5 for staff nurses regarding attitude on Nursing research and its utilization. Which can be interpreted as most of the nurses were having a positive attitude towards the nursing research.



**Figure -1: Percentage distribution of Level of Attitude of Staff Nurses regarding Nursing research and its utilization**

Figure 1 shows that 32.7% staff nurses had highly positive attitude and 67.3% staff nurses had moderate positive attitude and non-had negative attitude towards Nursing research and its utilization.

The other important findings of the study: With regard to Staff nurses attitude towards **on nursing research and its Utilization**. About 36.6 % feels the staff Nurses thinks that the nursing research is too theoretical. Nearly 40.4 % of staff Nurses believe that research information is not in simple language. The majority (70.3 %) of nurses believe that nursing research focuses on the development of the nursing profession. About 36% of staff nurses they don't have time to conduct research. Most (62.2%) of the nurses thinks that knowledge gained through experience is more useful than research. About 48.4% them believe that research is often unrealistic in practice because it is not based on nursing practice, 46% them feels that doing literature review is laborious process required lot of time, about 50.7% perceive that computer knowledge is essential for research, Most (68%) of nurses think that researchers should be done by senior nurses. About 37.3% of Nurses think that researches conducted by nurses are to fulfil the academic requirement and 33.6% of them feels that getting guides for research is difficult

With regard to **Utilization of Nursing research**, 69.3% of nurses feels that they have all the motivation to use research findings if they get support. About 31.7 % expressed that they don't have adequate resources use the research findings, 47.7% of them thinks that research just means more of paperwork, Most (53.1 %) they feel that being able to use research will make nurses better professions. Nearly 44.7% of nurses believe that day to day experience is more than enough to take decisions rather than doing research. About 51.7% feels that senior nurses may not support to implementing new practice and 53.7% thinks that it is difficult for female nurses to perform research

With regard to **Barriers for research utilization** 61.6% of staff nurses believe that support from administration is essential, 62% of staff nurses expressed that physicians will cooperate and value nursing research findings, 35.7% feels that nurses do not have time to think about implementation of research findings, Most (50%) feels that peer support is essential for implementation of research findings. About 40% of nurses feels that they do not have authority to change the

patient practice. Most (59%) of them feels that research will consume personal time and the majority (64.4 %) of staff nurses feels that to conduct and utilise research findings require financial support.

The Chi-square test was used to find the Association between the attitude score and the selected variable, like Age (11.45 p=0.04) educational qualification (9.99, p=0.007) and the professional experience (23.5 p=0.001) in-service education (6.49 p=0.01). With these findings, it is interpreted that, there was a significant association between the attitude on Nursing research and its utilization and the above-said variable, and there was no association found between other variables.

## DISCUSSION

In the present study Majority of the staff nurses 199 (66.3%) were in the age group of 20-25years, and only 4 (1.3%) were >50 years. Most of the staff nurses in the study were female 212 (70.7%) and only 88 (29.3%) were males. The similar findings were also seen in the study conducted by Poreddi Vijayalakshmi et al (2014) in their study majority (n=104, 78.8%) were of the nurses who took part in study were women and the mean age of the participants was 37.6±9.3 (M±SD).<sup>3</sup>

In present 67.3% staff nurses had moderate positive attitude, 32.7% staff nurses had highly positive attitude and non-had negative attitude towards Nursing research and its utilization. The similar findings were seen in the study conducted by Smirnoff M, et al (2007) on Nurses' attitudes toward nursing research at a metropolitan medical center, the author expressed that nurses had positive attitude and perceived that institutional support are not enough to increase involvement in nursing research it was suggested in that it is necessary to enhance the additional institutional infrastructure and educational support.<sup>4</sup>

In the present study, it was also observed that 31.7% of nurses expressed that they don't have adequate resources use the research findings, 47.7% of them thinks that research just means more of paperwork, Most (53.1 %) they feel that being able to use research will make nurses better professions. Nearly 44.7% of nurses believe that day to day experience is more than enough to take decisions rather than doing research. The study is supported by Chien WT, et al (2013) on Nurses perceived barriers and facilitating factors for research utilisation. The researchers conducted a

descriptive survey in 2011 among 743 registered nurses from four hospitals at China. In their study, it was found that the junior diploma nurses were reported a higher level of barriers than those of seniors with postgraduate education. Author reported that higher and more varied barriers to research utilization were felt by Chinese nurses than those from other countries and they were associated with a few demographic factors.<sup>5</sup>

### CONCLUSION

The research is essential for evidence-based practice, it is necessary that nurses need to have a positive attitude towards nursing research and its utilization. It is also important that nurses should get the adequate training towards research process and statistics, which facilitates in enhancing evidence-based practice and improve the patient satisfaction.

**Funding:** This research received no grant from any funding agency.

**Conflicting Interests:** The Author declare that there is no conflict of interest.

**Ethical Clearance:** Ethical permission was obtained from the concern hospitals at Bangalore and consent was obtained from the participants after explaining the purpose of the study.

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# Morbidity Patterns of Patients attending Psychiatry OPD in (Private) Medical College in Greater Noida

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## ABSTRACT

**Aim:** To find out psychiatry morbidity among patient attending psychiatry OPD in private college set up in upcoming urban city hub.

**Study design:** present study is based on hospital records review of psychiatry OPD at private medical college in Greater Noida, Uttar Pradesh.

**Materials and Method:** Two year OPD records of Adult Psychiatry clinic at Sharda Medical College Greater NOIDA were reviewed. Socio-demographic profile and diagnosis was obtained from the records. Diagnosis of psychiatric morbidity was done according to ICD 10 classification.

**Statistical analysis:** Descriptive analysis of data was carried out.

**Results:** a total of 5112 OPD patient consulted adult psychiatry clinic. Male being 2854 (55.9%) females 2258(44.1%).75% population was urban and only 25% were from rural. Depression being the commonest diagnosis (2044) 40% followed by anxiety (1583)30%, OCD (766)15%, Schizophrenia (511)10% and Others5%.

**Conclusion:** In our study almost equal number of male & female patient attended psychiatry OPD. Reinforces the fact both genders are equally affected by the psychiatry morbidity. High psychiatric morbidity means more burden which necessitate more psychiatrist and psychiatric clinics not only in urban, semi-urban but also village setting.

**Keywords-** Depression, Psychosis, Anxiety, OCD

## INTRODUCTION

Patterns of psychiatry illnesses have been reported to be similar cross the various nations. Culture also plays an important role on the morbidity pattern in the community is also an acknowledge fact.

According to WHO, mental illness accounts for 15% of total burden of disease. Indian prevalence rate for all mental disorders is 70.5 (rural, 73 (urban) and 73 (urban + rural)/1000. Urban morbidity is 3.5% more than rural morbidity.

A review of epidemiological studies on psychiatric disorders documented at any point of time 10% of total population require professional help. Several studies reports substantial amount of morbidity at primary care facility in India thus it is required to treat these illnesses at primary health care levels. Provision of health is widely recognized as a state subject private capital and expertise are increasingly welcomed.

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**MATERIAL & METHOD**

Present study was carried out in psychiatry department at School of Medical sciences and Research ,Greater NOIDA, Uttar Pradesh. The study facility is a medical college and 30 bedded department in Greater NOIDA catering to mainly urban population and rural population of surrounding villages, facility catered to mixed population and also serve as referral hospital. Department of Psychiatry is running regular general adult psychiatry clinic since 8 years this managed by trained psychiatrists.

In this study hospital records (OPD records) for last one year’s July 2015 to June 2016 were reviewed. Information mentioned on the front was used for demographic profiling, diagnosis was made using ICD 10 (International classification of diseases 10<sup>th</sup> version).

Descriptive analysis of data was carried out

**RESULTS**

During study period a total of 5112 OPD patient consulted adult psychiatry clinic. Male being 2854 (55.9%) females 2258 (44.1%).1022 being new cases 552 being female (54%) and 470 males (46%) 75% population was urban and only 25% were from rural.

According to ICD classification most common diagnosis was Depression (2044) 40% followed by anxiety (1583)30%, OCD (766)15%, Schizophrenia (511)10% and Others5%. Common psychiatric disorders were the most common diagnosed psychiatry morbidities 85% amongst new patient attending Psychiatry OPD. Most of the new patient belonged to 20-40 years age and were females. Married (62%) were more than unmarried.

Patients with epilepsy, headache and migraine also consulted in adult psychiatry OPD.

**Table 1: Profile of study population**

Characteristics	Frequency	%
<b>Participating factors</b>		
Death (of near relative)	102	2
Marital dysharmony	664	13
Family quarrel	408	8
Property/ financial problem	562	11

Stress (work /home/sexual harassment)	920	18
Co morbid medical conditions	860	17
School stress	306	6
Job dissatisfaction	357	7
Extra marital affaire	102	2
Poor social support	817	16

**Table-2: Sex /age marital status wise distribution**

<b>Sex</b>		
male	2854	(55.9%)
female	2258	(44.1%).
<b>Age group</b>		
< 20	293	5.7
20-40	2067	40.4
40-60	2165	42.35
➤ 60	587	11.48
<b>Marital status</b>		
single	1482	29
married	3169	62
widowed	257	5
divorced	53	1
separated	154	3

**Table-3 : Urban and rural distribution**

Characteristics	Frequency	%
urban	3840	75
rural	1272	25
New	2453	48
Male	1128	46
female	1325	54

**Table-4: Psychiatric diagnosis and their percentages**

Diagnosis	Frequency	%
depression	2044	40
anxiety	1583	30
schizophrenia	511	10
OCD	766	15
others	255	5

## DISCUSSION

Present study reported burden and pattern of psychiatric morbidity in psychiatry clinic at secondary level health facility in north India. CMD was the most common disorders amongst reported psychiatric morbidity in the present study. This was comparable with profile of psychiatric disorders at primary care level as reported in various studies in India.<sup>(6-7)</sup> Barua et al in their study reported similar pattern of psychiatric disorders secondary level hospital in Karnataka.<sup>(8)</sup> present study highlights the need of one day psychiatry clinic at sub-district hospitals.

Wright (1987)<sup>9</sup> had found that 32% of the patients were suffering from epilepsy, 25% from psychosis and 13% from depression. Sharma<sup>10</sup>(1987) described 42% of the patients in his study to be suffering from depression, 17% from neurosis and 16% from epilepsy.<sup>5</sup> inn the study by Shreshtha<sup>11</sup>(1987), 63.7% of the patients were suffering from psychosis, 18% from neurosis and 6% from epilepsy.<sup>4</sup>

Soren<sup>12</sup> et al in a study conducted in Jharkhand, India found affective psychosis (31.9%) as the main psychiatric problem followed by non-affective psychosis (18.8%), epilepsy (15.8%) and neurotic disorder (11.2%). Wairach<sup>13</sup> et al had found 6.8% non affective psychosis, 40.3% females were suffering from mood disorders and 29.7% from anxiety disorders, 2.4% were suffering from epilepsy. Raipur Rani<sup>14</sup> study in india reported schizophrenia in 11%, Manic-depressive psychosis in 18%, epilepsy in 13.8%, anxiety neurosis in 22%, depressive neurosis in 21%.<sup>21</sup>

Our findings are also similar to the findings of the study by Dubey<sup>15</sup>(1970) which was conducted in the rural community of Uttar Pradesh (India), in which about 44% of the patients were suffering from neurotic and related disorders and 9.1% from schizophrenia.

Present study shows psychiatric morbidity more in females (54%) than in males (46%). Dubey in his field survey in Uttar Pradesh, India found a high prevalence of mental morbidity in females than in males.<sup>16</sup> Nandi et al also corroborated these findings in their study in Bengal.<sup>19</sup> present study shows psychiatry morbidity more in female than in male but more male come for follow up

## CONCLUSION

Mental disorders comprise a wide variety of disorders: consists mainly of neurotic and mood disorders which present with somatic symptoms. It affects the most productive age groups, affecting the economic status of person and a country as a whole.

Majority of the mental disorders have a good prognosis, suggesting the need for early identification and prompt management. Awareness program in public about somatic symptoms in mental disorders will definitely be of help.

This will ensure decentralize mental health care below district level in the country. With given paucity of psychiatrist in the country,emphasizing more of public private partnership in mental health is today's requirement if we want to give good care at primary health care level and above.

**Conflict of Interest:** None

**Source of Funding:** Self

**Ethical Clearance:** Taken from the competent authority.

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# The Right to Water: An Inalienable Right

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## ABSTRACT

This article is an attempt made by the author to discuss the various problems associated with water. As we know water is an essential ingredient of living organism. Whether a human or an animal, it is considered to be the lifeline of environment. Various factors those are solely responsible for the pollution and non accessibility of the water to the people. It is also emphasized that right to water is a fundamental right and guaranteed under the constitution of India.

**Keywords:** water, right to water, healthy environment, human life, pollution of water

## INTRODUCTION

Amongst the planets of the solar system the earth is unusual in possessing surface temperature that allows water to exist in three different states viz: Solid, Liquid and Gas. Further earth is the only body of the solar system to have oceans of salt water. The total area covered by them is about 140 million square miles which is roughly comes to 71% of earth's surface. The oceans contain 27.2 % of all water on the earth. Each year about 80,000 cubic miles of water from the ocean are evaporated to fall as rain or snow. So the chief sources of water are Surface water and Underground water. In India the Central Ground Water Board has prepared a report that contains the quality features of the ground water. The Ground water is useful for different purpose as it contains mainly calcium bicarbonate and mixed type. The presence of sodium chloride in water also seen in India. However, other types of water are also available including Sodium-Chloride water. The quality in more profound aquifers likewise shifts from place to place are for the most part discovered reasonable for its normal use. On rare occasions the ground water is unfit to use due to various contaminations or mainly for geogenic cause. There are also other different reasons where a ground water quality problem lies in India. The water people use it for different purpose as it is the basic needs of human life. It will not be incorrect to say water is the backbone of all living creature. Most importantly the fundamental right to access free and safe water also considered to be the prime element in the nation. Despite of the all progress we witnessed in the area of

science a majority of people who are unable to get a drop of water for their daily needs. The United Nations (UN) since long making it clear that all socio economic rights for 'progressive realisation' can only be fruitful if 'minimum core obligations' are constructed in to them. In India yet the legislature has failed to define any water legislation which is the minimum core obligations of the state. Now the time has come make it clear that a certain quantity of water is to be fixed on per capita day basis. Although we could able to manage the water in few water area lands to provide water for the agricultural use but in reality many of the poor farmers are also debarred of accessing right to water in their agricultural land. The problem with water can also be seen in its pollution. Water pollution is common in India and very lethargic legislations have been made to overcome the problem. Above all we say "Water is Life".

## REVIEW OF LITERATURE

United Nation Organisation passed a resolution during the United Nations Water Conference in (1977) that "All people, whatever their stage of development and their social and economic conditions, have the right to have access to drinking water in quantum and of a quality equal to their basic needs."

The United Nations General Assembly (July 2010), through its resolution 64/292, states that for the fulfilment of the all basic human rights clean drinking water and sanitation or hygienic conditions are the essentials of right to water and sanitation.

The Committee on Economic, Social and Cultural Rights (November 2002), envisaged that to live a life with dignified human life the right to water is an indispensable element. Water is a necessary element for the fulfilment of all human rights. The right to water is the right of every person to use it for personal and domestic purpose in adequate, secure, suitable and physically available means.

The World Health Organization (May 2011) through its resolution 64/24, states that the National Health Strategies requires to fulfil the water and sanitation related Millennium Development Goals with the help of basic needs of the human right to water and sanitation. It also makes stronger the associations of WHO with its all UN members to encourage the accessibility of safe drinking water and maintaining hygienic environment.

The WHO in its guidelines prescribed that, each individual shall have the access to supply of water for its daily personal and household use normally includes drinking, sanitation, washing, cooking and to maintain hygienic in its domestic house.

The Universal Declaration of Human Rights 1948 contains total 30 number articles. But in the year 2006 the UN Human Development focuses on the global water crisis and the UDHR does not contains water as a human right. A huge moment was made to add a new article under Article 31 as “every citizen has the right to clean and accessible water, adequate for the health and well-being of the individual and family, and no one shall be deprived of such access or quality due to individual economic circumstances.”

According to (Howard & Bartram, 2003)<sup>1</sup> in their book reported that a person needs near about 50 to 100 litres of water daily, and a minimum of 20 litres of water per day for its use.

According to Johannesburg Plan of Implementation of the World Summit on Sustainable Development, of Art. 26 (b) provided that recovering an expenditure in the water filed shall not be the obstacle to use by the poor citizens.

According to a report of WHO/UNICEF (2013)<sup>2</sup> the Joint Monitoring Programme (JMP) for water supply and sanitation that, there are 780 million of people and more than 2.6 billion of people are not getting right to use to minimum hygienic services due to lack of accessibility.

The Convention on the Elimination of Discrimination against Women (CEDAW) 1979 also highlighted under Article 14 (2) that “the states parties shall take all appropriate measures to eliminate discrimination against women in rural areas to ensure, on a basis of equality of men and women, that they participate in and benefit from rural development and, in particular shall ensure to women the right: ... (h) To enjoy adequate living conditions, particularly in relation to housing, sanitation, electricity and water supply, transport and communications.”

Although the Constitution of India does not specifically explain water as a fundamental right however it is secured by the constitution as protected right which has been interpreted by the judiciary to guarantee right to life embraces the right to safe and sufficient water covered under article 21 of the constitution of India.

In *Delhi Water Supply v. State of Haryana*, 1996 SCC (2) 572, the court held that, the Haryana state must take steps of availability of water for the consumption of the people in Delhi for their domestic use as Haryana using the Jamuna river for its irrigation and the people of Delhi wanted it for the drinking purpose.

### **Meaning of the Right to Water:**

According to Jaap de Visser, the right to water access can be defined and it is the state's obligation that:

(i) Physical access to water must be ensured for all. It means for all sections of population accessibility must be free and easy so that all individual can get water especially vulnerable and marginal groups.

(ii) Economic access to water must be ensured. It means the cost of water should not be the obstacle for accessing water at all levels.

(iii) The individual's right to be protected against all undue violation and it is to be guaranteed where is to be provided.

### **Main Causes of Water Pollution in India**

The problem of water pollution exists in all populated areas. It is specifically serious in the urbanized regions with industries. It has been estimated that industries take 50% (mostly for cooling) agriculture takes 33% and municipalities take 7 % of all water used. Water possesses self cleansing action but there is no limit to

it. Health problem arises with the increasing addition of pollutants. More sewage as well as more industrial and agricultural wastes add to the problem. So action is required to be taken to reduce the level of pollutions to an acceptable limit, if the human race is to survive.

The water pollutants can be classified into Ten different types.

(i) Industrial heat rising in steel melting, petroleum refining and nuclear plants.

(ii) Organic chemicals including synthetic compounds such as insecticides, pesticides, DDT etc.

(iii) Other chemical Minerals originating in chemical, mining and metallurgical operations.

(iv) Plant nutrients like nitrogen and phosphorous compounds from agricultural land and domestic sewage.

(v) Oxygen demanding wastes are principally organic matters from sewage plants and industries. These wastes require aerobic bacteria for decomposition.

(vi) Infectious agents or bacteria and viruses present in sewage and animal wastes.

(vii) Metal ions and mining operations

(viii) Sediments arising out of erosion

(ix) Man made actions causing harm to water

(x) Any other reasons

### **River Pollution in India**

**The Ganga:** The Ganga river flows through Uttar Pradesh, Bihar and West Bengal. The cities and towns situated on the banks of the Ganga dump untreated sewage into the river everyday. In addition to the above, people use it for bathing, washing of clothes and immersing ashes or unburnt corpses. Industries like DDT factories, tanneries, paper and pulp mills, petrochemical industries, fertilizers complexes, rubber industries use the river to get rid of their wastes. The waste discharged from the oil refineries have been so large that in 1967 the Ganga water was reported to have caught fire near Monghyr. A Major fire broke out on 29<sup>th</sup> October 1987 in the Damodar river at Santaldih, killing a large amount of fish. A number scientific investigations show that downstream of Varanasi, the

industrial effluents discharged into the river increases and the polluted water extinguishes the fishes from the river. Several attempts have been made to take steps for the cleaning of Ganga river and the “Ministry of Water Resources, River Development & Ganga Rejuvenation”, is established by the ministry of the Government of India and the chief body for the enactment of provisions for water resources in India. It was established in the year 1985 followed by a bifurcation of the then Ministry of Irrigation and Power when the Department of Irrigation was re constituted as the Ministry of Water Resources and in the year 2014, the Ministry has been renamed to “Ministry of Water Resources, River Development & Ganga Rejuvenation”.

**The Yamuna:** From Delhi to Agra Yamuna water is unfit for drinking and bathing. Further industrial effluents including about half a million of DDT washes enter into the Yamuna river.

**The Rushikulya:** Its is a small coastal river of Ganjam district in Odisha. The chemical wastes coming out and adding to the water resulting pollution.

**The Brahmani:** This river is also being polluted to a great extent. The industries like steel and fertilizer plants at Rourkela and other several industries at Talcher are pouring the wastes into the river.

### **Judicial Interpretation in the realm of Right to Water**

Water is considered to be the unique element and it differs from other fundamental elements. Water is taken to be the elements along with air, earth and fire which is an essential part of human life. Water plays a pivotal role in maintaining hygienic and to combat with the epidemics in the environment. From the social point of view it has also contribute the fresh water which directly comes from the sky and is a gift to the human being so also a public good.<sup>3</sup> The right to access clean water can be withdrawn from the right to food, right to clean and safe environment and right to health which is guided by the right to life (Article 21) ensured by the constitution of India. Adding to it, under article 39(b) of the directive principles of state policy it declares that “the state shall in particular direct its policy towards securing that the ownership and control of the material resources of the community are so distributed as best to sub serve the common good. The intellects of right to “healthy environment” was first articulated in the case of Bandhua

Mukti Morcha v. Union of India<sup>4</sup> and secured the right to clean water as part of the right to a healthy environment. In another case A.P. Pollution Control Board II v. Prof. M.V. Nayudu,<sup>5</sup> “the Andhra Pradesh government had granted an exemption to a polluting industry and was allowed to set up near two main reservoirs in Andhra Pradesh, the Himayat Sagar lake and the Osman Sagar lake, which is in violation of the Environment Protection Act 1986. The Supreme Court struck down such exemption and held that the, Environment Protection Act and The Water (Prevention and Control of Pollution) Act 1974 did not enable the State to grant exemption to a particular industry within the area prohibited for location of polluting industries. Exercise of such a power in favour of a particular industry must be treated as arbitrary and contrary to public interest and in violation of the right to clean water under article 21 of the constitution of India. The Government could not pass such orders of exemption having dangerous potential, unmindful of the fate of lakhs of citizens of the twin cities to whom drinking water is supplied from these lakes. Such an order of exemption carelessly passed, ignoring the ‘precautionary principle’ could be catastrophic.” In Narmada Bachao Andolan v. Union of India<sup>6</sup>, the apex court held that “Water is the basic need for the survival of human beings and is a part of the right to life and human rights as protected under Article 21 of the Constitution of India. The sustainable development and healthy environment are fundamental human rights implicit in the right to life.” In Hinch Lal Tiwari v. Kamala Devi,<sup>7</sup> the supreme court is of opinion that, “It is important to notice that the material resources of the community like forests, tanks, ponds, hillock, mountain etc. are nature’s bounty. They need to be protected for a proper and healthy environment which enables people to enjoy a quality of life which is the essence of the guaranteed right under article 21 of the Constitution of India.”

## CONCLUSION

Earth is our mother. We must protect the modesty of our mother. The right to water has not been expressly defined under the constitution of India, though there is need to be an express command by the legislatures for the protection of right to water. The government must take endeavour to protect and provide the pollution free water to all individuals especially to the poor, vulnerable and marginalised group of people. The judiciary must see the balance between the policies framed by the government and the rights guaranteed to the citizens. Finally the governments, different agencies, NGO’s and other local communities should make effort hand in hand to provide all citizens fundamental water requirement.

**Ethical Clearance:** Not required, as the research article is based on accessibility of water and right to water. The research is doctrinally undertaken.

**Source of Funding :** Self

**Conflict of Interest :** Nil

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# An Epidemiological Study of Road Traffic Accident (RTA) Cases Admitted in a Tertiary Care Hospital – A Retrospective Study

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## ABSTRACT

**Background:** Accidents represents a major modern epidemic of non-communicable diseases in present century. Injuries due to road traffic accidents are observed to be major causes of mortality, morbidity and disability & economic loss in developing countries .India accounts for about 10% of road crash fatalities worldwide. In India fatality due to road traffic accidents is around 20 deaths per 100,000 population .

**Objectives:** 1. To estimate the burden of Road traffic accidents cases admitted in emergency department of SVS Hospital over 6 months period .

2. To analyze the factors influencing the accidents.

**Materials and Method: Study Design:** Retrospective study. **Study Setting:** Department of community medicine SVS Medical College & Hospital, Mahabubnagar – Medical Records Department. **Study Period:** Data collected over 6 months period (from January 2013 to June 2013) **Tools:** Medical records of patients admitted with road traffic accidents. **Participants-** All the RTA cases attended emergency department of SVS Hospital.

**Results:** The total 2040 cases were admitted in emergency department out of it 64.50% (1316) cases were admitted due to road traffic accidents. Out of total RTA cases 1006 (76.40%) were male and 310 (23.60%) were female cases. The mean age of cases was 26.8 (in years).Maximum cases (29.30%) were reported between the age group of 21-30 years followed by 28.40% in 11-20 years age group.Highest accidents 54.90% happened on two wheeler vehicle followed by 4 wheeler vehicle. Bruise/Minor injuries were reported in maximum cases (75.70%) followed by Fractures (12.40%) & injury over head (11.90%) Maximum 44.90% victims reached to hospital for first contact care within one hour. Accidents due to reasons like speed ,overtaking, ignorance, etc were reported in maximum cases 93.20% .Alcohol consumption during driving was responsible in 6.80% cases (table 6). The outcome following road traffic accident was complete cure in 63.08 % of victims, around 29.02% cases were discharged against medical advice and around 07.82 % cases absconded from hospital only one death was reported.

**Keywords:** Road Traffic Accidents (RTA), Risk factors, SVS Hospital, MRD departme

## INTRODUCTION

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A WHO Advisory group in 1956 defined accident as an “unpremeditated event resulting in recognizable damage”<sup>1</sup>. Road accidents are a human tragedy, which involve high human suffering. They impose a huge

socio-economic cost in terms of untimely deaths, injuries and loss of potential income. The ramifications of road accidents can be colossal and its negative impact is felt not only on individuals, their health and welfare, but also on the economy. Consequently, road safety has become an issue of national concern.<sup>2</sup>

The *Global status report on road safety 2013* presents information on road safety from 182 countries, accounting for almost 99% of the world's population. The report indicates that worldwide the total number of road traffic deaths remains unacceptably high at 1.24 million per year. The *Global status report on road safety 2013* estimates that more than 231 000 people are killed in road traffic crashes in India every year. Approximately half of all deaths on the country's roads are among vulnerable road users - motorcyclists, pedestrians and cyclists<sup>3</sup>

Over 1,37,000 people were killed in road accidents in 2013 alone, that is more than the number of people killed in all our wars put together. 16 children die on Indian roads daily. here is one death every four minutes due to a road accident in India. One serious road accident in the country occurs every minute and 16 die on Indian roads every hour. 1214 road crashes occur every day in India. Two wheelers account for 25% of total road crash deaths.<sup>3</sup>

20 children under the age of 14 die every day due to road crashes in the country. 377 people die every day, equivalent to a jumbo jet crashing every day. Two people die every hour in Uttar Pradesh – State with maximum number of road crash deaths. Tamil Nadu is the state with the maximum number of road crash injuries. In India fatality due to road traffic accidents is 19.9 deaths per 100,000 population.<sup>3</sup>

## OBJECTIVES

1. To estimate the burden of Road traffic accidents admitted in emergency department of SVS Hospital over 6 months period.
2. To analyze the factors influencing the accidents.

**Study Design:** Retrospective study. **Study Setting:** SVS Medical College & Hospital, Mahabubnagar – Medical Records Department. **Study Period:** Data collected over 6 months period (from January 2013 to June 2013) **Tools:** Medical records of patients admitted

with road traffic accidents. **Participants-** All the RTA cases attended emergency department of SVS Hospital.

## METHODS AND MATERIALS

**Study design:** This is descriptive, Retrospective study which was conducted in department of community medicine, SVS Medical college & Hospital, Mahabubnagar, Telangana state.

**Study period** – 6 months from January 2013 to June 2013.

**Study population** All the RTA cases attended emergency department of SVS Hospital.

**Study technique:** Medical records of all patients who admitted with road traffic accidents.

**Participants-** All the RTA cases attended emergency department of SVS Hospital

**Sample size:** A total (1316) cases were admitted due to road traffic accidents

**Study variables:** We collected all information of the victims given in medical record which includes description of the accident, factors like human, road, vehicle and environmental factors behind the accidents, type of injury and the treatment or referral given.

**Analysis:** Simple statistical methods were used for analysis.

## OBSERVATIONS & RESULTS

In the present study The total 2040 cases were admitted in emergency department out of it **64.50%** (1316) cases were admitted due to road traffic accidents. Out of total RTA cases 1006 (76.40%) were male and 310 (23.60%) were female cases. The mean age of cases was 26.8 (in years). Maximum cases (29.30%) were reported between the age group of 21-30 years followed by 28.40% in 11-20 years age group ( table 1 & 2). Highest accidents 54.90% happened on two wheeler vehicle followed by 4 wheeler vehicle ( table 3). Exploring the type of injuries happened during RTA, Bruise/Minor injuries were reported in maximum cases (75.70%) followed by Fractures (12.40%) & injury over head (11.90%) ( table 4). Maximum 44.90% victims reached to hospital for first contact care after 3 hours of accident ( table 5). Accidents due to reasons like speed, overtaking, ignorance, etc were reported in

maximum cases 93.20% .Alcohol consumption during driving was responsible in 6.80% cases (table 6). The outcome following road traffic accident was complete cure in 63.08 % of victims, around 29.02% cases were discharged against medical advice and around 07.82 % cases absconded from hospital .only one death was reported.

**Table-1: Age wise distribution of victims**

Age	No.	%
1-10	95	07.2
11-20	374	28.4
21-30	386	29.3
31-40	242	18.4
41-50	135	10.3
51 -60	44	03.4
61&>	40	03.0
<b>Total</b>	<b>1316</b>	<b>100%</b>

**Table-2, Sex wise distribution of victims**

Sex	No.	%
Male	1006	<b>76.4</b>
Female	310	23.6
<b>TOTAL</b>	<b>1316</b>	<b>100.0%</b>

**Table-3, Distribution of the victims according to the type of vehicle involved in accident**

Types	No.	%
2 Wheeler	722	54.9
3 Wheeler	251	19.1
4 Wheeler	294	22.3
Pedestrians	49	3.7
<b>TOTAL</b>	<b>1316</b>	<b>100.0%</b>

**Table-4, Distribution of victims according to type of injury of victim**

Injuries	No.	%
Head	156	11.85
Fractures	265	20.13
Bruise/Minor injuries	895	68.02
<b>TOTAL</b>	<b>1316</b>	<b>100.00</b>

**Table-5, Distribution of victims according to time gap in reaching to hospital for first care of contact of victim**

Time gap	No.	%
< 1 hr	591	44.90
1-2	301	22.87
2-3	235	17.80
>3 hrs	269	20.53
<b>TOTAL</b>	<b>1316</b>	<b>100.00</b>

**Table-6, Distribution of victims according factors causing the accident**

Category	Numbers	Percentage%
Accident due Alcoholic influence	90	6.80
Accidents due to other reasons (speed ,overtaking, ignorance, etc)	1226	93.20
<b>Total</b>	<b>1316</b>	<b>100%</b>

## DISCUSSION

In the present study The total 2040 cases were admitted in emergency department of tertiary care hospital, out of it **64.50%** (1316) cases were admitted due to road traffic accidents that shows the burden of accidents cases in emergency department is much higher than other medical problems. In this study among RTA victims 76.40% were male and 23.60% were female cases which shows male female ratio of 3.23:1 in similar study done by Vimla Thomas et al<sup>4</sup> .It was observed that 85% of the victims were males in the study. The male-to-female ratio was 5.5:1. Ganveer and Tiwari<sup>5</sup> in their study in Nagpur found that number of male victims (85.8%) was more when compared to female victims (14.2%). They found male to female ratio of 6:1 which is also similar. The mean age of the victims was 26.8 years which was quite similar to the findings by Deepak Sharma et al <sup>6</sup>, on other hand mean age was 32.42 years in the study done by & Vimla Thomas et al<sup>4</sup>. Maximum cases (29.30%) were reported between the age group of 21-30 years followed by 28.40% in 11-20 years age group which is quite similar to the findings of Vimla Thomas et al<sup>4</sup>. In present study 76.10% victims were from the age group of 11 to 40 years, relatively similar findings were reported by WHO in The Injury Chart book<sup>7</sup>.

It is quite obvious that maximum victims are from

productive age group which can affect economy & productivity of the society and country. The present study showed that below and above the age of 10 and 50 years, there were less accidents. The reasons may be that children are not using vehicles frequently. Lower proportion of RTAs in those aged 50 and above could be due to the generally less mobility of the people similar finding were observed by Jha N et al<sup>8</sup>. Maximum accidents 54.90% were reported on two wheeler vehicle followed by 4 wheeler vehicle. The results are in conformity with the findings of Vimla Thomas et al<sup>4</sup> and Gururaj et al<sup>9</sup> and Sahadev et al<sup>10</sup>. Among two wheeler victims Only 31% people used helmet during driving which is quite similar finding in the study of Vimla Thomas et al<sup>4</sup>, only 27.98% used helmets. Exploring the type of injuries happened during RTA Bruise/Minor injuries were reported in maximum cases(68.02%) followed by Fractures (20.13%) & injury over head (11.85%). In the study of Vimla Thomas et al<sup>4</sup> the most common injury sustained by the victims was fractures which were seen in 49.33% of the cases. Minor injuries accounted for 34% of the road traffic accident cases, followed by head injury (11.78%). Victims of head injuries were quite similar with present study. maximum 44.90 % victims could reach to hospital for first contact care within 1 hours of accident. In study by Vimla Thomas et al<sup>4</sup> majority of the victims (54.22%) managed to reach the hospital within 1 hour and .in other study by Deepak Sharma et al<sup>6</sup> in which majority (50%) managed to reach the hospital within 1 hour of accident.

In the present study the outcome following road traffic accident was complete cure in 63.08 % of victims, around 29.02% cases were discharged against medical advice and around 07.82 % cases absconded from hospital .only one death was reported .on other hand in the study conducted by Vimla Thomas et al<sup>4</sup> the outcome following road traffic accident was complete cure in 49.56% of cases, Around 13.11% dead, 14% were discharged against medical advice, 9.11% absconded. Complete cure was maximum out come in both the studies, other differences could be due to setting of our hospital in rural area.

### CONCLUSIONS

RTA can be considered as a behavioral disease also because in majority of the cases human factors play important role in accidents. Several risk factors were explored in this study such as age, sex, type of

vehicle, condition of vehicle, use of alcohol, non-use of helmets, & seat belts, casual attitude, time factor in reaching to hospital after accidents, risk taking behavior are associated with increased occurrence of road traffic accidents. These factors need to be focused and health education should be given on these areas. Strict legislations need to be implemented towards wearing seat belt & helmet, speed limit, following traffic rules ,drunken driving which may help reducing further accidents.

**Limitations-** Being a retrospective study some epidemiological factors like education, occupation, income, social class, stress, using of cell phones during driving, inadequate sleep among drivers, etc could not be studied since it was a record based study.

**Conflict of Interest:** In the present study the presence of a conflict of interest is independent from the execution of impropriety. In the present research study primary interest which refers to the principal goals of the profession or activity, such as the protection of subjects, the health of participants, the integrity of research, and the duties of public office were maintained without any failure. This Secondary interest like any financial gain or any wish to do favors for family and friends or colleagues was not done by this study. This study was conducted mainly for research, learning & professional Advancement.

**Source of Support:** The present study was conducted in minimum expenditure and whatever fund & support was required it was fully given by all authors (self funded ). No other Funding agency is involved in this study..

**Ethical Clearance-** As it is mentioned that present was a retrospective record based study in which there was no intervention or hazards for environment or human or animal life. Ethical clearance was taken from Institutional ethical committee (IEC) prior to conduction of study.

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# Fermentation and Hypoxia Ensure Colorant and Synergistic Adverse Impacts on the Evolution, Survival, and Transfiguration of Premature Existence Phase Bivalves

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## ABSTRACT

Low oxygen precincts in beach front and vast sea biological systems have extended in late decades, a pattern that will quicken with climatic warming. There is developing acknowledgment that low oxygen areas of the sea are additionally fermented, a condition that will increase with rising levels of barometrical CO<sub>2</sub>. By and by, be that as it may, the simultaneous impacts of low oxygen and fermentation on marine life forms are to a great extent obscure, as earlier investigations of marine hypoxia have not considered pH levels. Later stage shellfishes were impervious to hypoxia or fermentation independently however experienced fundamentally (40%) diminished development rates when presented to both conditions at the same time. All things considered, these discoveries show that the outcomes of low oxygen and fermentation for early life organize bivalves, and likely other marine living beings, are more serious than would be anticipated by either singular stressor and in this manner must be viewed as together while surveying how sea creatures react to these conditions both today and under future environmental change situations.

**Keywords:** Hypoxia, Fermentation, Climatic Warming, pH levels.

## INTRODUCTION

Inside beach front zones, the over the top conveyance of supplements from horticulture and urban focuses fortifies algal profitability, and the resulting microbial corruption of this natural matter lessens oxygen levels, contributing towards hypoxia <sup>[1]</sup>. Hypoxic districts of waterfront zones have extended in late decades <sup>[2]</sup> to the disadvantage of inhabitant living beings and fisheries. In the vast sea, oxygen least zones are persevering components of subsurface waters with rates of microbial oxygen utilization that surpass oxygen ventilation rates and are growing because of sea warming <sup>[3]</sup>. A less every now and again considered outcome of microbial breath is the creation of CO<sub>2</sub> and the resultant diminishment in pH through the development and separation of carbonic corrosive<sup>[4]</sup>. Through the procedure of breath, levels of CO<sub>2</sub> and O<sub>2</sub> are stoichiometrically connected in marine biological systems, being in this manner changed by contrasts in

gas trade and synthetic equilibria<sup>[5]</sup>. Late reviews have in fact demonstrated a nearby correspondence between low oxygen and fermentation in numerous waterfront and untamed sea frameworks, with pCO<sub>2</sub> levels in low oxygen zones frequently of a greatness more noteworthy than anticipated for surface seas not long from now (>1,000  $\mu$ atm)<sup>[6]</sup>.

Regardless of the basic co-event of hypoxia and fermentation in marine frameworks, their simultaneous consequences for sea life are ineffectively caught on. Fermentation adversely impacts a variety of marine living beings. The approach for design and development of a new rotary hydraulic motor for marine application is designed in <sup>[11]</sup>. Oxygen is required to manage high-impact life, and the edges at which low broke up oxygen causes mortality or potentially hurt have been built up for some marine life forms <sup>[7]</sup>. Isolation, optimization, and production of biopolymer from marine bacteria were discussed in <sup>[12]</sup>. The

expansive dominant part of research center reviews evaluating the impacts of low oxygen on marine creatures has controlled oxygen levels by regulating nitrogen gas, a procedure that diminishes both oxygen and pCO<sub>2</sub> levels and consequently essentially increments, as opposed to declines seawater pH<sup>[8-9]</sup>. Consequently, the larger part of hypoxia studies performed to date has made a lab condition (low oxygen, low CO<sub>2</sub>, high pH) that does not mirror the genuine physiological difficulties to marine life in low oxygen zones<sup>[10]</sup>.

## METHODOLOGIES

Influencing pH and thawed oxygen intensities by tanked fume

The gas proportionators conveyed these gasses to exploratory vessels loaded with 0.2 μm separated seawater from the eastern USA, to yield the levels of pH and disintegrated oxygen coveted for investigations utilizing volumetric stream rates that turned over the volume of trial vessels >100 times day by day forestalling equilibration with air CO<sub>2</sub> and oxygen. For analyses with hatchlings, the gas blends from the proportionator framework were persistently conveyed to the base of 1 L high thickness polyethylene measuring utensils with polycarbonate tops while 10 L polyethylene vessels with polyethylene covers were utilized for trials with adolescent bivalves. Vessels were raised for minimum 24 h before initiating tests. Broken down oxygen levels were measured with a Clark-sort anode YSI 5100 oxygen meter, which gave a systematic exactness of ±4% and was aligned every day. Broken down oxygen estimations made with this test were about indistinguishable to, and never altogether unique about, those acquired using Winkler titrations. This instrument gave a methodological accuracy ±3% to recreated estimations of aggregate broke down inorganic carbon and gave full recuperation (104±5%) of guaranteed reference material for aggregate inorganic carbon in seawater.

**Investigates using logically hypoxic and acidified water**

The Falsify River gets exorbitant supplement loads from thick private populaces and duck ranches and encounters hypoxia amid summer months. While the two bivalves concentrated here can be found along the whole eastern shore of North America incorporating estuaries that trade with and encompass the Falsify

River, for example, benthic overviews uncover these living beings don't endure in the Forge River. Particular authorization was not required for this movement since this was an open area and seawater gathering is not directed by any city government. The pH and broke down oxygen of the water was measured as portrayed above and the saltiness of the water was resolved to utilize sonde. Water from carboys was exchanged by gravity, without rising to reproduce (n?= 4) 1 L high thickness polyethylene measuring glasses with polycarbonate tops for investigations. Test water was controlled with sodium carbonate or air circulation to complexity changes in pH (carbonate expansion just) to changes in broke up oxygen and pH simultaneously (air circulation). In particular, recreate vessels (n?= 4) were left unamended as a control, circulated air through at 50 ml min<sup>-1</sup> with surrounding air, or controlled μ26 μM sodium carbonate for each 0.1 pH unit contrast between the test water and a pH estimation of 8.0. The expansion of sodium carbonate brought pH, carbonate particle, and aragonite immersion states to values almost indistinguishable to the air circulation treatment, however, did not change broke up oxygen while percolating regularly brought pH to ~"8 and disintegrated oxygen to ~"250 μM. Broken up oxygen, pH, and exact carbonate science levels were checked as portrayed above and are accounted for in the outcomes area. Water was traded ~" each three days, and levels of broke up oxygen and pH by and large rose between water changes.

## RESULT AND DISCUSSION

In tests where air, CO<sub>2</sub>, and N<sub>2</sub> gasses were blended to make hypoxic and fermented conditions for levels of broke down oxygen were essentially lower in the hypoxic and consolidated low oxygen and fermented treatment in respect to alternate medications, while levels of pH were altogether lower in the fermented and joined low oxygen and fermented medicines with respect to alternate medications. The medicines cooperated to yield not as much as added substance rate of transformed hatchlings while there was no collaboration as to size. Transformed people from ordinary oxygen medications at typical and low pH conditions measured 1,130±16.8 μm and 996±36.7 μm long, separately, while transformed people from low oxygen medicines at ordinary or low pH conditions were just 445±32.0 and 447±35.0 μm, individually. People that neglected to transform after 40 d in these medicines were much littler.

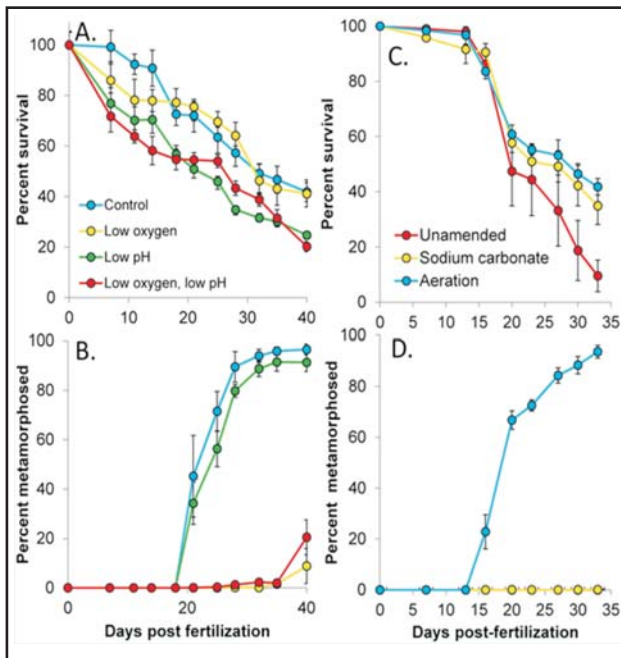


Fig. 1.

In fig 1, (A) % survival and (B) %transformation of surviving an irradiance hatchlings amid presentation to two levels of pH and broke up oxygen. (C) Percent survival and (D) percent transformation of surviving.

### CONCLUSION

The development of hypoxic zones in beachfront and open seas is one of many anticipated results of strengthening worldwide environmental change [9]. While microbial procedures will keep on promoting fermentation in these locales, this will be exacerbated by the stacking of anthropogenic CO<sub>2</sub>. We recommend that as of late found high CO<sub>2</sub> sensitivities in numerous finfish and shellfish and the intensified impacts of high CO<sub>2</sub> and low O<sub>2</sub> in bivalves in respect to every individual parameter ought to provoke a re-arrangement of future reviews. A thorough assessment of the consolidated impacts of low oxygen and fermentation on marine life is basic for seeing how sea biological communities react to these conditions both today and under future environmental change situations.

**Ethical Clearance:** Taken from AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Eliminations of the Fluoride Content in Drinking Water by the Isotherms

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## ABSTRACT

Groundwater polluted with overabundance fluoride (over 1.5 mg/L) represented a few dangers to people in general wellbeing in India. Strategies accessible for fluoride tainted water treatment are coagulation- filtration utilizing alum+lime+bleaching powder (Nalgonda strategy), adsorption using enacted alumina, coagulation, nanofiltration, and so on. Utilization of aluminum mixes for water treatment reason needs substitution on a neurological medical issue. In this paper, the various isotherm methods are analyzed to remove the fluoride content in the drinking water and also the numerical analysis is performed.

**Keywords:** *Coagulation, Filtration, Aluminum, Fluoride.*

## INTRODUCTION

Fluorine is one of the most reactive elements are illustrated in [1-3] in the all chemical elements. Fluorine is caused the human health affects due to the high reactivity. In the US, the fluoride content in the drinking water is 2.0 mg/L and 1.0 mg/L in India. The fluoride content of the drinking water is varied according to the climate variations. In the warm weather, the fluoride is 1.0 mg/L, and 1.5 mg/L in the cool climates explained in [4-6]. In general, the water drinking is highly developed in the summer seasons, so the problem occurs highly suffered the third party countries. There is no treatment provided for the dental and fluorosis said in [7]. The prevention of the fluoride content is only solutions of the adverse effects. The various methods are used to eliminate the fluoride content in the drinking water. Absorption is one of the efficient methods is said in [8-10] for the fluoride eliminations in the drinking water.

The Phyllanthusembolic [11] is illustrated in Preparation and Characterization of the Structural, Optical, Spectroscopic and Electrical Properties of Pr2O5 doped Borate Glass, that is powdered sample is raised from the market, and its generic name is, Indian Gooseberry and the material are maintained at 378-383K for 24 hrs. The free acid is removed by washing the material with the doubly distilled water. Then, the material is dried at the 3 hrs. The acid treatment is

avoided by the thermal process [12] is explained in optical and electrical studies of non-linear optical crystal: Potassium boro-oxalate and the resulting materials are cooled to the room temperature. The final material was stored in the vacuum desiccators [13] is illustrated in fuzzy C strange points clustering algorithm. Four used isotherms are analyzed below.

## METHODOLOGIES

The methodologies includes for the proposed work are listed below:

### Langmuir absorption isotherm:

This isotherm is one of the best of the all other isotherms for applying the liquid system for the full absorption. It can be described as below,

$$K_e = K_m Q_a \frac{C_e}{1} + Q_a C_e$$

Where  $C_e$  → Equilibrium Concentration

$K_e$  → Amount of Ion absorbed

$Q_a$  → Equilibrium absorption

Linear form as below,

$$\frac{C_e}{Q_e} = \frac{1}{K_m} C_e + \frac{1}{Q_a} K_m$$

**Freundlich adsorption Isotherm:**

This isotherm is one of the earliest equilibrium determinations that is illustrated as below,

$$Q_e = KfC_e^{1/n}$$

Where  $Q_e$  → Ion adsorbed

$Kf$  → Constant

$1/n$  → Constant

Linear form,

$$\text{Log}q_e = \text{log}kf + \frac{1}{n} \text{log}C_e$$

**Temkin Isotherm:**

The shape of the Temkin isotherm is considered the chemisorptions of the materials are described as below,

$$Q_e = a + b \text{log}C_e$$

Where  $Q_e$  → Ion adsorbed

$C_e$  → Equilibrium Concentration

$a$  and  $b$  → Temkin constants

**Redlich-Peterson Isotherm:**

It can be described as below,

$$Q_e = A \frac{C_e}{1 + Bce} + C$$

Linear form

$$\ln\left(\frac{A C_e}{Q_e} - 1\right) = g \ln(C_e) + \ln(b)$$

**CONCLUSION**

In this analysis, the carbon generated from the *Phyllanthus Emblica* is used to eliminate the fluoride content of the drinking water. There are three parameters are mainly used to reduce the fluoride content that is, contact time, dose adsorption and temperature. Four generally used isotherms are analyzed both the numerical analysis as well as experimental. The adsorption of the fluoride slightly increased with the indication of the temperature. By using the *Phyllanthus Emblica*, the fluoride is removed from the ground water.

**Ethical Clearance:** Taken from AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Highly Protected Arbitrary Biometric Key Based Electronic Accessing System

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## ABSTRACT

A great number of the systems available today, allowing the path just to those individuals who know a particular code, have a card or have chosen physic marks. Although it is more expensive for the security reason, every organization is showing their interest. The secret key strategy is the least costly and most straightforward advancements which require software assets. Of course, this structure is easily attackable, since it is anything but straightforward to get the password data from a man. The Smart Cards based systems are remarkably valuable, yet utilized like the primary ID system, are not too much reliable since cards can be effortlessly stolen, lost or actually overlooked at home. The proposed system is the biometric based locker with short message service (SMS) which guarantees the security of individual and secret effects of a man. The system could scan the finger, coordinate it with the saved pattern and open the locker.

**Keywords:** Password; SMS.

## INTRODUCTION

Robbery is one of the significant issues in schools and workplaces. Biometric is considered as a standout amongst the best technique with regards to security. Biometric is a mechanized procedure of perceiving a man in light of his physical qualities which incorporates confront, unique mark, hand geometry, penmanship, iris, retinal, vein, and voice. Most colleges and workplaces utilize lockers and cupboards for putting away records, securing things and keeping of imperative archives for protection and security purposes. Biometric information is considered as various and unmistakable from individual data since it can't be figured out to reproduce any personal data and can't be stolen to endeavor burglary. Development of a programmable electronic digital code lock system is illustrated in <sup>[1]</sup>. In any case, a few lockers utilized conventional latches and were shared by at least two clients<sup>[2]</sup> explains the Handbook of Fingerprint Recognition. Regular lockers don't ensure full wellbeing and security of property since typical latches can be opened by compelling.

Fingerprints are the most understood biometric advancement used as a piece of various applications. Fingerprint based bank locker system using the microcontroller, and Biometric locker systems

are illustrated in <sup>[3-5]</sup>. It requires the imaging and connection of the print outline which consolidates the edges and minutia centers. These examples are exceptions to every individual. This was done to diminish bothers about keys and to ensure the security of the occupant. By then it will check the extraordinary, unique mark, and if composed, the microcontroller sends the mystery key to the affirmed singular versatile number. The individual then needs to enter the passwords to the framework. The system at first got the one of a kind unique mark of the locker occupant and composed the impressive finger impression to resuscitate the locker gateway. The fingerprints affirmation and organizing is a standout amongst the most direct techniques for checking a man's character.

Regardless of the way that there were existing learns about biometric lockers, the survey expected to develop an upgraded display. After the third attempt, the framework will send a notice short message service (SMS) to the proprietor when an unrecognized extraordinary, unique mark was recognized by the biometric sensor, as the improvement to the audit. The SMS contains the auto-made secret word which will be used to open the locker. To enter the identification, the system fused a particular keypad in the outline. IDS using combined analysis of support vector machine

and principle component analysis are presented in<sup>[6]</sup>. Automatic control for onboard ship gangway conveyor system based on PLC is approached in<sup>[7-8]</sup>.

### OBJECTIVE OF THE STUDY

The review intended to build up a model of a much-secured bank lock system that can:

- 1) Enroll fingerprints of all fingers, and spares these examples as the secret key in the system.
- 2) When an OTP is shown unlock the locker utilizing print.
- 3) Send instant message when an unrecognized fingerprint is experienced amid endeavor.

### METHODOLOGIES

Our framework will utilize print as the secret key for validation. The benefit of biometrics is that the data is novel for every person and that it can distinguish the person disregarding varieties in the time it does not matter if the first biometric sample was taken the year ago). Fingerprint acknowledgment is the initial capacity of a scanner wherein in it involved two phases, enrollment and check. Amid enrollment, fingerprints are checked, dissected and coordinated, then put away in a coded frame. Once the print is selected, confirmation happens wherein the client will check if the finger impression organized the spared designs.

The benefit of our system is that it not just gathers single fingerprint from a client as the secret key. GSM module is used in the plan to empower the system to send the warning message to the locker client. Rather our system will arbitrarily gather few fingerprints from either hand of the customer and gives confirmation. Since the biometric information can't be stolen, the system would be preserved and secured. These examples were dissected utilizing details where the lines of the fingerprint are ended into two. The separation and points of the particulars are employed as the calculation in turning the data with one of a kind numeric code. Unique mark is utilized to enter the secret key of the locker.

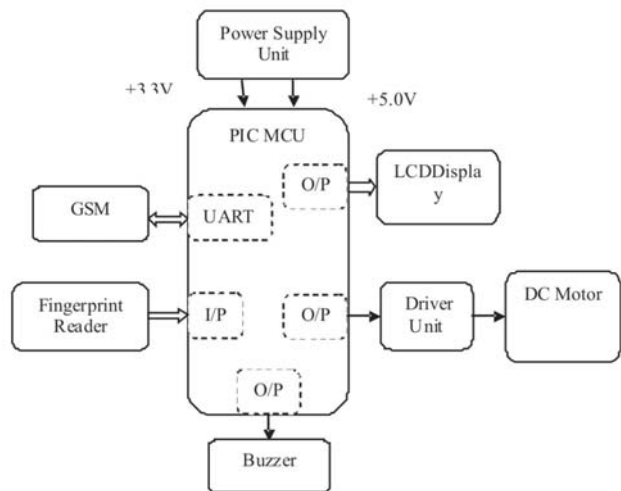


Fig. 1 Block Diagram of Fingerprint based Bank Lock Security System

### RESULT

Initially, the microcontroller at first checked the connections of the GSM module and fingerprint sensor. Fig. 2 demonstrates that the system effectively introduced the device associated with it. After installment or if the client will utilize the locker, he expected to output his unique mark of the finger. The single score of the customer ought to coordinate the pre-enlisted fingerprints. The ID number of the different target is found the DC motor will start to rotate to open the locker. If the unique finger impression was not perceived, alert message "PASSWORD NOT MATCHED" is shown on the LCD. On the third endeavor, "INVALID" mistake message was displayed. GSM module was activated by the microcontroller unit to send the instant message to the manageable number of the client.

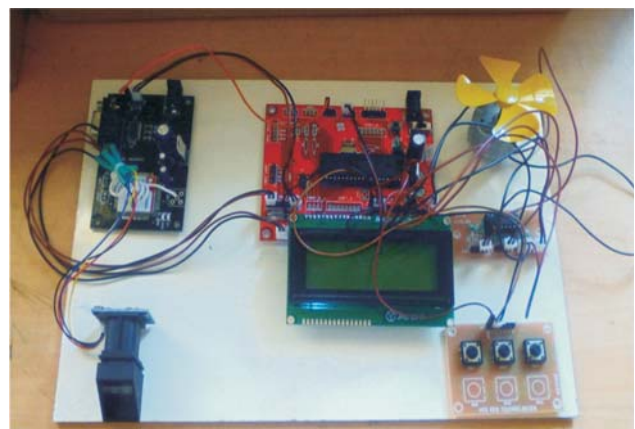


Fig. 2 Prototype of Fingerprint based Bank Lock Security System

## CONCLUSION

From the results of the proposed biometric locker system, the programs uploaded to the microcontroller effectively encouraged its operations. The modules utilized for the system were right to communicate with the microcontroller unit. It had executed the accompanying capacities viably:

- 1) Proper enrollment, saving and examining the fingerprints of the client;
- 2) Correct unique fingerprint and password acknowledgment and location to open the lock of the locker.
- 3) When an unrecognized unique finger impression was visible means, it will stop the operation and send an alert message to authorized person.

**Ethical Clearance:** Taken from AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Fail Secure Dual Chamber Cardiac Pacemaker Mechanism with Rate Approachable Control and Cryptographic Safety

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## ABSTRACT

The aim of the project is to design a failure safe rate responsive cardiac pacemaker device that could be monitored and configured by a doctor using a secured wireless communication. The contraction firmware relies on upon a hard, consistent RTOS (Real-Time Operating System) piece and hereafter the device helpfulness is guaranteed and is expected to restrict dissatisfactions given programming breakdowns. A made cardiovascular pacemaker is a restorative device that usages electrical inspirations passed on by cathodes getting the heart muscles, to control the throbbing of the heart. The fundamental part of a pacemaker is to keep up a tasteful heart rate, either in light of the fact that the heart's normal pacemaker is not adequately fast, or there is a piece in the heart's electrical conduction structure. Exhibit day pacemakers are remotely programmable and empower the cardiologist to pick the perfect pacing modes for individual patients. Some of them have different anodes strengthening fluctuating positions inside the heart to improve synchronization of the lower chambers (ventricles) of the heart.

**Keywords:** ECG, Pacemaker, DSO and RTOS.

## INTRODUCTION

Innovation has progressed incredibly, and there are more than a huge number of transistors in today's implantable pacemaker framework. A cardiovascular pacemaker is utilized to treat Brad arrhythmia (a heart rate that is too moderate). In this paper, rather than using a few simple ICs to detect the heart rate and convey electrical incitement, a very coordinated blended flag interface single-chip-arrangement IC [1] Exhibit a meager power CMOS mixed-signal IC for implantable pacemaker applications. The essential purpose for pacemaker ICs has been alert on low-control computerized outline systems [2] is proposed in "A four-chip implantable defibrillator/ pacemaker chipset, [3] illustrates An 8-bit microcomputer with analog subsystems for implantable biomedical applications. Using some low-control plan systems and the large measure of pure and computerized hardware has been coordinated to give new elements and capacities to future era pacemakers. Low power utilization is by a long shot an essential outline prerequisite to meet the 10–12 years of single battery operation [4]. Each nanoampere of current utilization has been precisely considered in this outline. Meter for Measuring Battery Charge Delivered in an Implantable Device is

approached in [5]. Hierarchical Bisecting Min–Max Clustering Algorithm.

## METHODOLOGIES

The necessary parts and functionalities of the pacemaker structure will screen the electrical movements of the heart through the cardiovascular standard ECG of the patient. The device has electrodes to sense the ECG signal and an ADC (Analog to Digital Converter) to convert the analog signal into the digital domain.

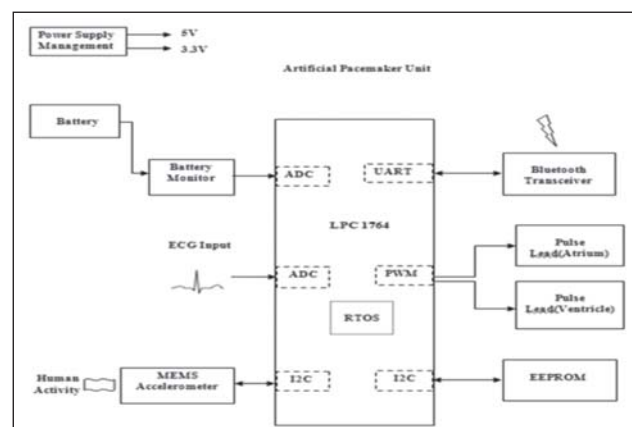


Fig. 1. Artificial Pacemaker Unit

The yield is a heartbeat with settled abundance and term. The gadget makes the chamber beat first and it is trailed by the ventricle beat. The beat yield is brought out through the terminals and it can be watched utilizing an oscilloscope/DSO amidst show. The gadget will chat with the external world through a remote correspondence channel. Bluetooth is employed as the remote medium. The device status and necessary parameters can be examined and shaped over this channel. An individual reprogramming unit is constructed for this purpose. The reprogramming unit facilitates the doctor-pacemaker communication. The unit will communicate with PC/Laptop via USB. To maintain a strategic distance from remote strikes and hacking of the contraption, an exceptional cryptographic estimation (RC4 Stream Cipher) is used to scramble and unscramble in the midst of any data trade. The key for this calculation is gotten arbitrarily from the ECG information and therefore exceptionally secured.

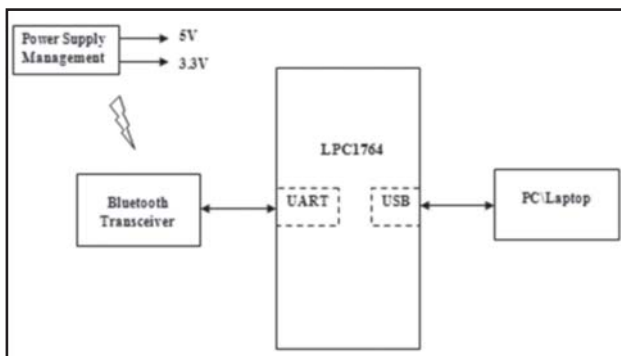


Fig. 2. Monitoring Unit

Screens the status of the battery using a voltage screen circuit and reports it by methods for Bluetooth. Stores the detailed patient information on a non-eccentric EEPROM chip integral into the device. In the midst of display, the arranging of cardiovascular banner must be varied to mirror heart calm. This is conveyed by using an ECG generator unit. It has a Graphics LCD and Pushes Buttons as its UI. An ECG waveform is yield by methods for the DAC (Digital to Analog Converter) periphery. The return of this unit can be kept an eye on an oscilloscope. ARM Cortex-M3 based LPC176x microcontroller is used as the central microcontroller for this wander for each one of the three units of the system. The application firmware is created using Free RTOS which is the progressing RTOS used as a piece of this device that confirmation its convenience under all conditions, thus making the contraption defend.

## RESULTS AND DISCUSSIONS

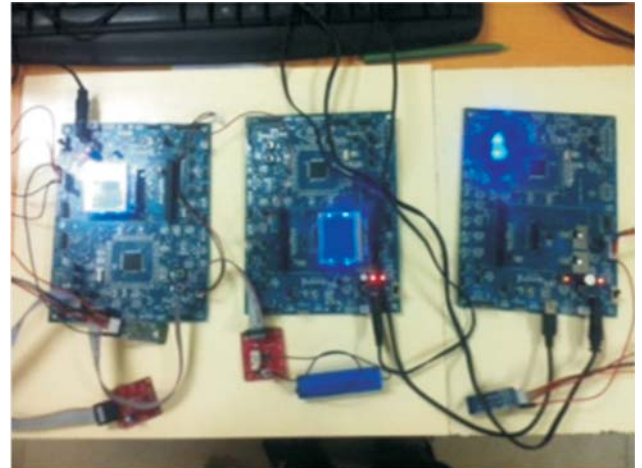


Fig. 3. Hardware Implementation

The contraption will be rate responsive pacemaker sort that can change its pacing rate as shown by the physical activities of a patient. Accordingly, mimics the working of a trademark heart. The physical activity level of the patient is identified using a one of a kind development sensor called Tri-center MEMS accelerometer. The device will be an advanced twofold chamber pacemaker sort that can pace both chamber and ventricle and from this time forward works like a normal heart.

## CONCLUSION

Low power consumption is by far the most important design requirement for biomedical implants. Every nanoampere of current use must be carefully considered and utilized in the IC. In this paper, a very low-power single-chip mixed-signal interface IC for pacemaker applications is presented. Most of the analog transistors are operating in the dark sub-threshold region and switched-capacitor methods are used to construct new circuits at very low power utilization. Some new functionality has been introduced and the complete device has an estimated longevity of 5–10 years.

**Ethical clearance:** Taken from AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Bio Acoustic Sources Segmentation in a Noisy Underwater Environment Using Wavelet Denoising with Ica

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## ABSTRACT

An advanced type of Independent Component Analysis (ICA) algorithm is used in this paper for separation of biological sounds in underwater noisy environment. Underwater noisy environment are formed by echolocation clicks, snapping shrimps and dolphin whistles mixing. Different types of ICA algorithms like Infomax, Fast-ICA are used to apply on mixture of bio-signals. Depend upon separability performance, effectiveness of these algorithms has been compared. Using ICALAB and open source, signals are available and ICALAB simulation packages are based on this to compare the algorithms of ICA. Finally, graph for proposed technique is shown for comparisons using wavelet denoising.

**Keywords:** Underwater Ambient Noise, ICA, EFICA, FJADE

## INTRODUCTION

Different sounds are made by marine mammals like fish species communicate in underwater dolphins, snapping environment. Mixture of sounds is known as background noise or ambient at any specified place in the ocean from any number of diverse sources. Mixture of different sounds is produced by bottlenose dolphins and it is the species. Closure of shrimp's snapper's claw is extremely fast and it is the reason for this sound production. Snapping shrimps are originated in a huge numbers in underwater environment. Because of this ahuge crackling background noise is seen in underwater environment<sup>[1-2]</sup>.

## METHODOLOGIES

The methodologies includes for the proposed work are listed below:

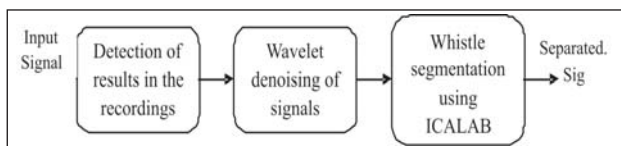


Fig. 1. Proposed System Whistle Segmentation

Algorithm is implemented for the dolphin signals separation is shown in below Fig. 1 which consists of detection, denoising and at last ICALAB. Fig.1 shows the algorithm for dolphin whistle segmentation form

underwater ambient noise. Which consisting of the detection followed by wavelet denoising and the last step is segmentation using ICALAB, which is the MATLAB package based on ICA<sup>[3-4]</sup>.

## Whistle Detection in the recording

The technique of windowing is applied for the detection and it is given to part of signal then calculates the standard deviation. Fig.4 shows the detection<sup>[5]</sup>The part of signal containing well-built deviation consists of whistles.

## Wavelet denoising of acoustic signals

Data is represented by the matrix of coefficients using the d signal decomposition by the Discrete Wavelet Transform (DWT) in the equivalent transform domain. The decomposed signal is denoised and at last reconstructed. The implementation of wavelet denoising is given in Fig.6<sup>[6-7]</sup>Design of acoustic modem for an autonomous underwater vehicle<sup>[8]</sup>for identify the animal in the sea.

## Independent Component Analysis (ICA)

Individual audio objects are obtained by the mixture of real world sound with decomposing is called an audio source separation. The problems of audio source separation are addressed successfully with the help of ICA.

**ICALAB**

This toolbox is used for signal separation and it is the MATLAB based package. The signals can be loaded in the toolbox in the .mat File format and the toolbox performs ICA on signals, and signals get separated.

**Performance Analysis of Ica Algorithms**

**AMUSE-** Algorithm for Multiple Unknown Source Extraction.

**SOBI-** Second order blind identification algorithm.

**FJADE-** Flexible joint approximate diagonalization of cumulant matrices.

**FPCA-** Fixed point ICA.

**EFICA-** Efficient ICA.

**RESULTS AND DISCUSSION**

This chapter explain about the results of the proposed denoising technique.

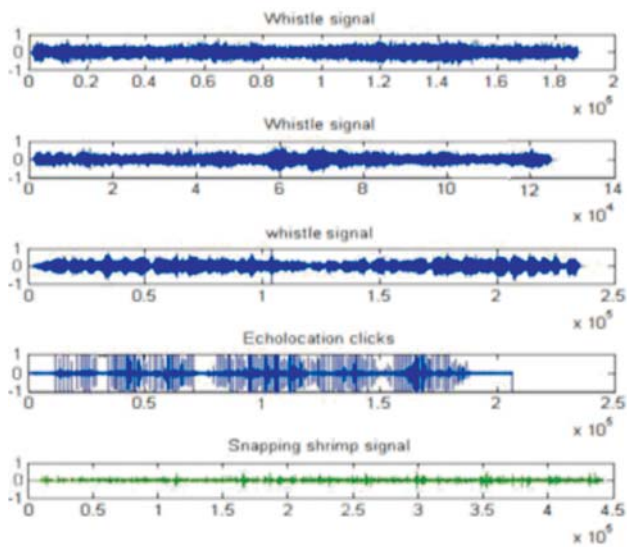


Fig. 2. Database of acoustic signals

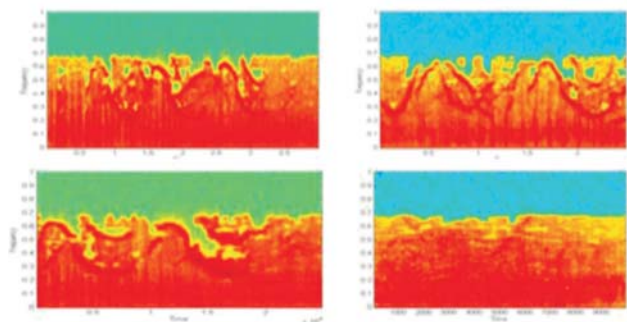


Fig. 3. Results of Detection

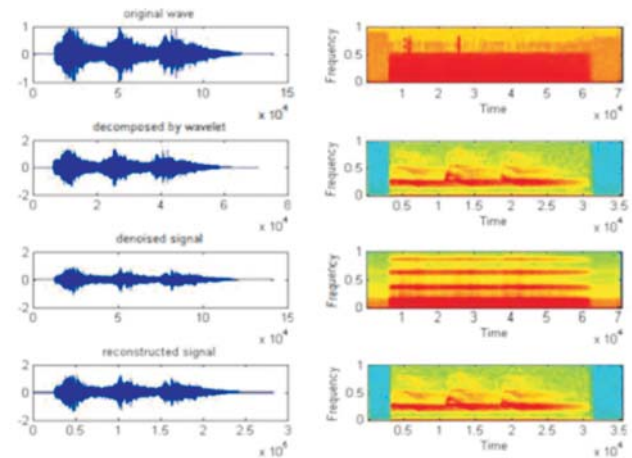


Fig. 4. Wavelet denoising of dolphin whistle sound using wavelet decomposition methods

**CONCLUSION**

ICA is used in this proposed system to separate the acoustic signals mixture successfully. EFICA is the best suitable ICA algorithm for bio-acoustic source separation. FJADE, AMUSE and FPICA shown the subsequently comparable results. Algorithms are applied to check their effectiveness and it requires further investigation at real sites where different underwater ambient sources may affect on results extensively.

**Ethical Clearance:** Taken from AMET University.

**Source of Funding:** Self.

**Conflict of Interest:** NA

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# Classification of Chemical Elements Present in Daily Materials in Orthotics and Prosthetics

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## ABSTRACT

In this paper we analyze the chemical composition of materials used daily in the field of Orthotics, Prosthetics and Assistive Technology, which act as the interface of contact between the prosthetic / orthotic element and the patient's skin. The methodology is experimental, using the wavelength dispersive X-ray fluorescence technique, applied to samples of wool and synthetic cloth. To perform these studies, we used special equipment belonging to the Management of Chemistry, National Atomic Energy Commission, and the measurements were made in collaboration with personnel of this institution.

**Keywords:** : Synthetic material, ORTHOTICS, Prosthetics, National Atomic Energy Commission.

## INTRODUCTION

Bedsore, also known as pressure ulcers, occur as a result of excessive pressure on localized areas of the skin. Prolonged immobilization is a common cause of such condition. At first you may see redness or discoloration of the skin in the affected area due to inadequate blood circulation, caused by lack of movement. Subsequently, tissue necrosis, may become deep wounds and even abscesses. This death tissue occurs when soft tissue is compressed between a bony prominence and an external surface for long periods of time. Quadriplegic and paraplegic people are right to experience this type of injury, as well as the elderly who must stay in bed for long stays, resulting in these bedsore. Therefore, they are very common in areas like the buttocks, heels, sacral region, among others.

The basic principles of treatment -to prevent or reduce focus of pressure- on the affected regions or the most conducive to develop bedsore, consist to keep such areas sanitized, and have a healthy and balanced diet. It is also essential to review the mattress, the cushion of the wheelchair, and reposition the patient according to the instructions given by the physician. Both mattresses like cushions of air and water are highly recommended, and also the one it is called "synthetic medical skin", which consists of a synthetic cloth used daily in the area of orthoprosthesis to avoid prostrate or sloughing of people in wheelchairs,

and even coverage of orthoses (Figure 1), and to cushion the span between a prosthesis and the body itself, as might be the case for a knee replacement.



Fig. 1. Use of synthetic material to prevent bedsore in orthoprosthesis

Addition of synthetic material, are also often used natural materials (wool) for the same purpose to avoid bedsore, considerate both as safe and biocompatible in contact with human skin. Hence, our purpose in this paper is to perform a chemical analysis of samples of the two types of materials, to determine the elements present in them, and then their biocompatibility with human use in direct contact with skin. Investigation on growth and characterization of 3-methoxy-4-hydroxy-

benzaldehyde organic single crystals was analysed in [3]. Structural and electrical properties of organic stilbazolium single crystal of DSCHS was discussed in [4]. Effect of Ni<sup>2+</sup> and Cu<sup>2+</sup> dopants on SnO<sub>2</sub> semiconductor nanoparticles synthesized by facile hydrothermal technique and their optical properties were discussed in [5]. 9-[4-(Azidomethyl) phenyl]-9H-carbazole-3-carbonitrile was proposed in [6].

### MATERIAL AND METHOD

Samples were taken from two different materials - cloth (synthetic) and wool (natural) which are used in direct contact with skin, or in certain situations can be in touch. For the determination of chemical elements present in the samples, we've worked in collaboration with the Department of Management Services Analytical Chemistry, belonging to the "Comisión Nacional de Energía Atómica" (National Atomic Energy Commission, CNEA). The wavelength dispersive X-ray fluorescence (XRF) [1] technique was used to put in evidence the type of elements of the samples. Elements with atomic number less than 11, corresponding to sodium (Na), nor more than 92, uranium (U), were not analyzed.

### RESULTS

We show the elements found in the spectroscopic scanning (Table I):

Material of the sample	Elements
Synthetic cloth	Na, P, S, Cl, Ca, Zn, Fe, Ti
Natural wool	Cl, K, S, Ca, Zn, Cu, Ni, Fe, Cr

Common chemical elements were observed in both samples: chlorine, calcium, zinc, iron. Besides several other different, among which we can highlight the presence of chromium in the case of natural wool. Also, the spectrograms (Figure 2) show a signal corresponding to scandium, which was not analyzed since we used a scandium tube as excitation source.

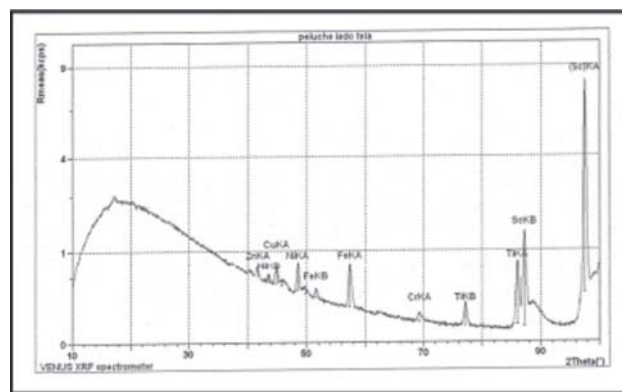


Fig 2. Spectrogram of the synthetic material

### DISCUSSION

While usually these types of materials are considered biologically inert, the presence of certain elements could indicate that this is not necessarily true. In the case of chromium, for example, it's known for causing skin rashes, stomach upset, ulcers and respiratory problems, among others. Even chlorine, present in all samples cannot be considered safe and is important to know their proportions. To determine the existence of possible adverse effects of these elements on human health, further studies are needed. Not only qualitative ones but quantitative as well, in order to establish whether in fact they are within the range of biological tolerance values [2]. Our next task will focus on completing this work with other quantitative studies and biochemical analysis of biocompatibility, with the aim of bringing these results to particular businesses or shops that use or require them. Finally, we emphasize the importance of introducing this type of analysis in the field of ortho-prosthetic, and the need and value of inter-institutional work.

### CONCLUSION

Classification of Chemical Elements Present In Daily Materials in Orthotics and Prosthetics that act as the interface of contact between the prosthetic / orthotic element and the patient's skin. The methodology is experimental, using the wavelength dispersive X-ray fluorescence technique, applied to samples of wool and synthetic cloth. Here, we used special equipment belonging to the Management of Chemistry, National Atomic Energy Commission, and the measurements were made in collaboration with personnel of this institution. The main goal of this work is used to

particular businesses or shops. Furthermore, the importance of introducing the type of analysis in the field of ortho-prosthetic, and the value of inter-institutional work is evaluated.

**Ethical Clearance:** Taken from AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Analysis of Breast Cancer Using Tetrolet Transform

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## ABSTRACT

Breast cancer is considered as a severe problem and general form of cancer that often affects woman. A tool called Computer Aided Diagnosis (CAD) can assist the doctors in the recognition of abnormalities in medical images. In this paper, we have classified the tumor from the mammogram images to normal and abnormal classes. First the Region of Interest (ROI) of the mammogram image undergoes the tetrolet transform and its output sent to feature extraction stage. The Gray level Cooccurrence Matrix (GLCM) features are extracted from different levels of decomposition. Then the features are analyzed using the Support Vector Machine (SVM) classifier and is classified as normal and abnormal classes.

**Keywords:** Mammogram, Breast Cancer, Tetrolet, GLCM and Svmclassification.

## INTRODUCTION

The mortality and incidence due to breast cancer increase day to day with many techniques and some of the methods are discussed below. The classification of benign and malignant classes in digital mammograms based on Trace transform functional is discussed in [1]. It is an overview of Radon transform which calculates the functions of the image with line tracing through its pixels.

The machine learning process like; relevance vector machine, kernel Fisher discriminant, and SVM are measured for benign and malignant classification of clustering the microcalcifications in [2]. A mammogram classification system discussed in [3], considers the KNN classifier using the wavelet basis features extractions. The filters used in Daubechies family are db4, db8, and db16 for 2D wavelet decomposition. The lower subband image coefficients are taken alone for the feature vector.

A micro classification system in [4], introduces a content based mammogram image retrieval process. Using the twelve set of feature extraction from clustered micro-calcification clusters the SVM classifier is used for classification. A SVM based micro-calcification system in the digital mammogram is explained in [5]. Training the SVM by means of the algorithm called supervised learning to classify the location from the image whether the micro-calcification is available or not. A study on scientometric dimension on gender in worldwide thyroid cancer is presented in database of web of science [6]. Image Super Resolution Using Wavelet Transformation Based Genetic Algorithm is

implemented in MATLAB platform [7].

A classification system based micro-classification by means of the non subsampled contourlet transform is explained in [8]. By performing the normalization of feature vector obtained from decomposed subband images by means of energy computation process. The SVM classifier is used for the classification. A mammogram classification based on surfacelet transform and SVM classification is presented [9]. Statistical features based classification of micro calcification in digital mammogram using stochastic neighbour embedding is explained [10]. The performance evaluation of the breast mass classification CAD system based on DWT, SVM is discussed [11]. A review of cancer statistics in India is measured [12].

## METHODOLOGIES

The methodology in this paper is based on the mammogram classification by means of the tartlet transform for the extraction of the GLCM features by means of the ROI images. Then the extracted features are classified using the SVM classifier as normal and abnormal classes. The framework of this paper is as shown in fig 1.

## EXTRACTION OF FEATURES

The first step of our system is to extract the features from the input images that are given to it. The input images are first pre-processed by colour conversion process where the gray scale images are obtained from the images. Then the ROI extraction regions are



separated from the input image that gives only the region of interest areas as output which undergoes the tetrolet transform process. From that transformed output of tetrolets, GLCM features can be extracted from those images. This feature is stored as the trained database so that they can be used further in classification.

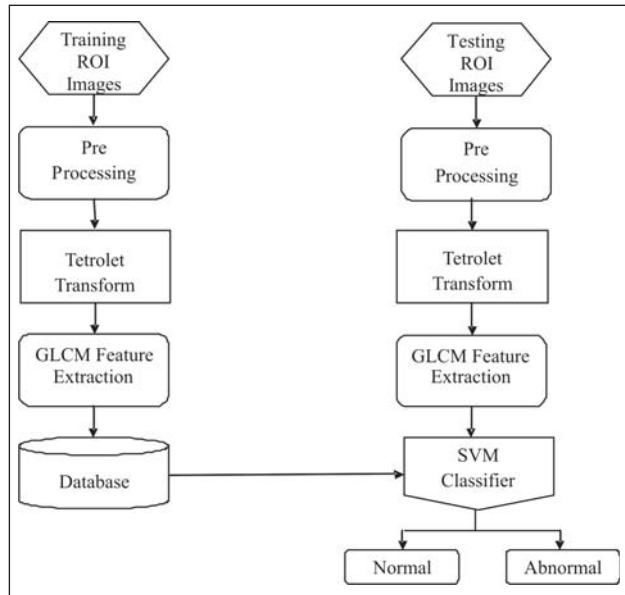


Fig.1. Framework of Mammogram classification system

## CLASSIFICATION

Next to the feature extraction process follows the classification where the exact output of the system and the performance calculations are done. The classifier used here is the SVM classifier which acts as a decision making regarding the output of the system. The testing process is similar to that of the training process and is the only difference is that the classifier is added to it. The classifier is of two inputs one is the testing features and the next is the trained database. By comparing both the inputs the decision is made whether the given input is normal or abnormal.

## EXPERIMENT RESULTS

The results and the interference of our system using the tetrolet transform based mammogram classification are discussed here. The features extracted here are the GLCM features and is evaluated by the SVM classifier. The database for our method used here is from the MIAS database that provides a number of mammogram test image. Table 1 shows the overall performance of our system.

Table 1. Overall Performance of the classification system

Level of decomposition	Classification accuracy (%)		
	Accuracy	Sensitivity	Specificity
1	81	86.707	65.458
2	84.459	87.198	62.849
3	87.957	61.842	63.739
4	99	88.967	89.826
5	82.841	87.968	78.402
6	83.712	70.676	84.589

It is observed from table 1 that at 4<sup>th</sup> level of decomposition the accuracy is high. The accuracy obtained here is 99%. Also the sensitivity and specificity values are high at 4<sup>th</sup> level of the decomposition. So the 4<sup>th</sup> level of decomposition is considered as the best outputs.

## CONCLUSION

In this paper, the GLCM features are analyzed for mammogram diagnosis using digitized mammograms in the MIAS database. Firstly, the mammogram is decomposed by tetrolet transform and then the GLCM features are extracted from various level of decomposition (1-6). At last SVM classifiers is used for the classification and to evaluate the performance of each features. The highest accuracy of 99% is obtained by the GLCM features at 4<sup>th</sup> level for decomposition and can be used with CAD systems to maximize the diagnosis accuracy.

**Ethical Clearance:** AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Analyze Incline User Dispersal for Irritable System Collision

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## ABSTRACT

Customary viral showcasing issue goes for choosing an arrangement of persuasive seed clients to boost the attention to items and thoughts in one single informal community. In any case, in genuine situations, clients' profiles in the objective interpersonal organization (e.g., Face book) are typically classified to people in general, which hinder the traditional viral advertising systems achieving the objective shoppers successfully. Rather, since clients these days are generally required in various informal communities at the same time, the viral showcasing can really be performed in other open systems. These systems with open profile data are eluded as the source systems, from which data can diffuse to and actuate clients in the objective system by implication. Therefore in the cross-organize data dispersion, other than the powerful seed clients, the individuals who go about as extensions engendering data between systems really assume a more critical part and some can trigger the tipping point in the objective system, who are named as the tipping clients formally. Propelled by this, in this paper, we concentrated the "Finding Tipping Users for Cross Network Influencing" (TURN) issue over numerous adjusted heterogeneous informal organizations. To delineate the data dissemination prepare crosswise over adjusted heterogeneous informal communities.

**Keywords:** *Data Dissemination, Viral Advertising Systems, Cross Network Influencing, Data dispersion*

## INTRODUCTION

However in the genuine situations, it is hard to apply viral promoting on some online informal communities which make personal and private conveying hovers inside the clients' decision of dear companions. For instance, since 2012, Centers for Disease Control and Prevention (CDC) has propelled the national tobacco instruction battle "Tips from Former Smokers"<sup>1</sup> to urge smokers to stop. One of the points of the battle is to amplify their exposures and impact in online interpersonal organizations.<sup>[1]</sup> for example, Facebook<sup>2</sup> and Twitter<sup>3</sup>. The battle has made extraordinary progress; in any case, the promoting impact in Facebook is not on a par with different systems. HMC<sup>4</sup> from UIC,<sup>[2]</sup> which is bolstered to assess the publicizing impacts, clarifies the reason that Facebook empowers clients to pick their own security settings and pick who can see particular parts of their profile. Consequently because of the protection and security arrangements of the system, advertisement organizations don't approach clients' profiles and can't without much of a stretch get word out to the crowd whom they most wish

to reach. Henceforth customary single-system viral showcasing techniques which impact target clients specifically can at no time in the future perform well<sup>[3]</sup>. In the mean time, clients these days are normally required in numerous online interpersonal organizations at the same time, and those participating in Facebook are likewise utilizing different systems, for example, Twitter, Foursquare and Instagram, in the meantime<sup>[4]</sup>.

These interpersonal organizations, whose data is more open and clients are significantly less demanding to reach, give great channels to promotion organizations to speak with gathering of people. Also, the greater parts of them have given the administrations that clients can share the posts, pictures and recordings to their Facebook landing page easily. In such a circuitous way, data can be engendered to the Facebook arrange that we focus on from these open informal organizations. At the end of the day, viral advertising can really be performed in these open interpersonal organizations rather,<sup>[5]</sup> i.e., data from which can diffuse to and enact clients in the objective system by

implication. To separate them from the objective interpersonal organization (e.g., Facebook), these informal organizations with simple get to are named as the source systems. Underwater vehicle for surveillance with navigation and swarm network communication<sup>[6]</sup> for getting a un interrupted communication.

## METHODOLOGIES

We propose a novel system data dispersion display; "Cross Network Information Diffusion" (CONFORM) for fast AEM data processing and inversion<sup>[7]</sup>. In CONFORM, different dissemination interfaces in the heterogeneous systems are removed and melded by weight to compute the clients' actuation probabilities. To address the TURN issue, another strategy called "Tipping Users Discovery Algorithm (TUDOR)" is proposed to distinguish the tipping clients who achieve the biggest impact pick up, which is another idea initially presented in this paper. Broad analyses are led on true interpersonal organization datasets, which show the adequacy and effectiveness of TUDOR.

The TURN issue examined in this paper is a novel issue, and it is very surprising from the regular data dispersion and viral promoting issues. Rather than finding the impact sources (i.e., the seed clients), the TURN issue goes for distinguishing the tipping clients from the source arrange. Along these lines, the models proposed for conventional viral promoting issues can't be connected to address the TURN issue. Notwithstanding its significance and oddity, the TURN issue contemplated in this paper is extremely testing to unravel because of the accompanying reasons:

**Issue Definition:** To the best of our insight, we are the first to propose the TURN issue. A reasonable meaning of the tipping client idea and in addition the TURN issue is required, which is as yet an open issue to this setting so far Information Diffusion Model crosswise over Heterogeneous

**Systems:** The systems considered in this paper are all heterogeneous data systems, including different sorts of hubs and complex intra-arrange associations. Also, because of the mutual normal clients, these systems are mostly adjusted through the grapple interfaces too. Step by step instructions to viably show the data dispersion

prepare over the adjusted heterogeneous systems is an incredible test.

**NP-hard:** The TURN issue in view of our cross system dispersion model to be acquainted in is demonstrated with be NP-hard, in this way there exist no polynomial time calculations

## CONCLUSION

We concentrate the TURN issue in this paper, which give a novel approach to direct popular promoting. TURN goes for finding tipping clients in the source system to impact clients in the objective system in light of the given seed clients. We outline the CONFORM model to depict the cross system data dissemination in a couple of heterogeneous systems. The TUDOR strategy is proposed to address the TURN issue, which can accomplish a  $(1 \pm 1/e)$  - estimate of the ideal outcomes. Broad trials on true informal community datasets show the prevalent execution of TUDOR in tending to the TURN issue.

**Ethical Clearance:** AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Automatic Street Light and Monitoring System for Weather, Intruder and Emergency Speaker

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## ABSTRACT

The venture point is to plan a canny innovative road lighting post that runs an implanted web server to give brilliant electronic administrations to individuals living in the city notwithstanding the vitality sufficient light management authorities and other crisis dealing with offices. This keen lighting framework can execute in urban areas, roads, grounds, stops and donning scene. The exceptional elements of the venture depicted underneath. The microcontroller runs a web server that sends information to the customer side application. Any gadget with an Internet program, for example, cell phone or PC/Laptop can be utilized to screen the data sustain. The customer side client verifies with a one of a kind client name and secret word before getting to gushing substance. The web server is in charge of serving the website pages, overhauling the customer ask for and for keeping up the TCP/IP association until the client closes the session. Website pages built with HTML dialect. The gadget utilizes the LwIP open source TCP/IP convention stack for its web availability. **Keywords:** ARM Cortex-M4, IP surveillance camera, PIR Way Finding, OV2640 camera sensor, Business advertising, Weather Station, Rain and Flood Monitoring, Emergency speaker.

**Keywords:** TCP/IP, IP Surveillance Camera, Rain and Flood Monitoring, OV2640 camera Sensor, HTML Dialect

## INTRODUCTION

A project of this sort needs a very capable microcontroller with a large amount of RAM [1,2]. Thus STM32F429 from STMicroelectronics is chosen as the primary MCU, which is an ARM Cortex-M4 based microcontroller that can run up to 180 MHz. It has 2MB of Flash memory and 256 KB RAM.

This paper investigates and validate of solar thermal storage system combined with phase change material. The impact of parameter variations on the steady state behaviour of grid-connected renewable energy conversion systems explains solar irradiation on the steady state behaviour of grid-connected renewable energy conversion systems. In this paper also described in, Fuzzy C strange points clustering algorithm [5]. Analysis of cloud computing technology [6].

## METHODOLOGIES

The device has the following features to be implemented. Mobile device with limited storage capacities, the design ensures that image and audio recording will happen only during an emergency event triggered by the user. The device supports up to 8GB of onboard memory.

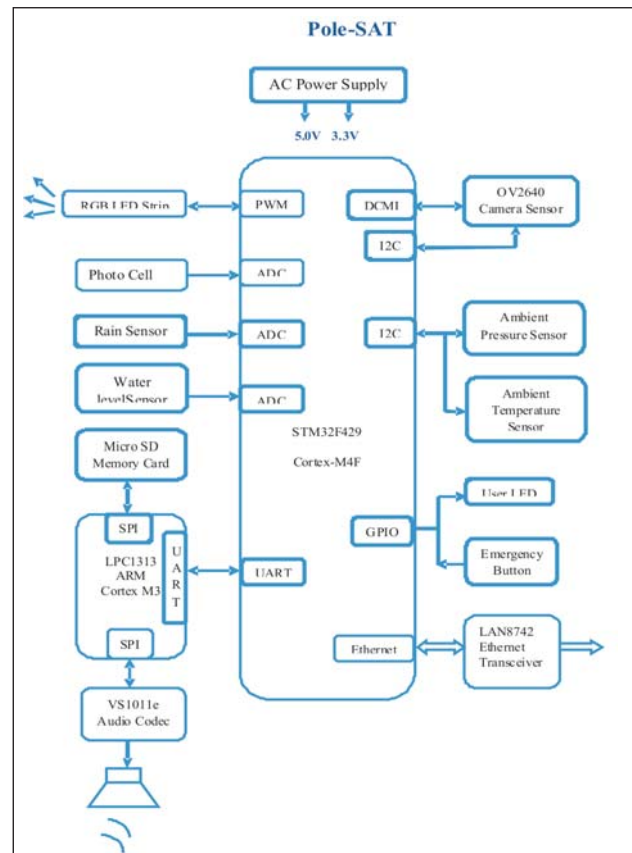


Fig. Block diagram

## EMBEDDED WEB SERVER

The microcontroller runs a web server that sends data to the client side application. Any device with an Internet browser such as a smartphone or PC/Laptop can be used to monitor the data feed<sup>[3, 4]</sup>. The client side user authenticated with a unique username and password before accessing streaming content. The web server is responsible for serving the web pages, servicing the customer request and for maintaining the TCP/IP connection until the user ends the session. Web pages constructed with HTML language. The device uses the LwIP open source TCP/IP protocol stack for its internet connectivity.

## LIVE VIDEO FEED

The system consists of a camera sensor to stream a live video feed. When a request made, the onboard microcontroller captures the JPEG images from the camera using the built-in DCMI peripheral and starts to stream it over the web in JPEGcompression format at an acceptable rate. The image resolution fixed at 470 x 272. The microcontroller has a large RAM area, about 256KB, which is a must for this kind of application.

## CONCLUSION

This paper describes a new intelligent street lightingsystem which integrates new technologies available on themarket to offer higher efficiency and considerable savings.The system maintenance can be easily and efficiently plannedfrom the central station, giving scope to additional savings.The discussed method is particularly suitable for street lightingin urban and rural areas where the traffic is average in a givenspan of time. The system is completely amenable to userneeds. The system can adopt in the future for loadssupplied by the power system, which aids the screening ofenergy consumption. Moreover, new perspectives arise inbilling and the intelligent management of remotelycontrolled ads and for smart grid and smart metering applications.

**Ethical Clearance:** Taken from AMET Universitycommittee

**Source of Funding:** Self

**Conflict of Interest :** NA

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# Medical Image Compression Using Roi and Nroi Images

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## ABSTRACT

Advanced medical imaging requires storage space of huge quantities of digitized clinical data. Due to the inhibited bandwidth and storage capacity, however, a medical image must be compressed before transmission and storage. Among the existing compression schemes, transform coding is one of the most effective strategies. Image data in spatial domain will be changed into spectral domain after the transformation to attain more compression gains. In our proposed system, separation of the original image into Region of Interest (ROI) and Non-Region of Interest (NROI) parts is done. Then Lossless compression with Set Partition in Hierarchical Trees (SPIHT) algorithm is used to compress the ROI part and Lossy compression with Haar wavelet transform is used to compress the NON-ROI part. This algorithm gives better Peak Signal Noise Ratio (PSNR) and Bits per pixel (BPP) value for medical images.

**Keywords:** ROI, NROI, SPIHT and HAAR wavelet

## INTRODUCTION

Medical imaging has a huge blow on medicine, particularly in the diagnosis fields and surgical planning. High compression rates are produced by current compression schemes if quality loss is reasonable. Efficient hybrid algorithm based image compression is presented in [1]. Discrete Wavelet Transform, Discrete Cosine Transform and Huffman quantization scheme is used to calculate the PSNR, compression ratio and mean square error by transforming the DET level. DWT and DCT are applied first on individual components. Then probability index is calculated using Huffman quantization.

Region of interest coding techniques for medical image compression is described in [2]. ROI coding is to permit the use of arbitrarily and multiple shaped ROIs with random weights describing the degree of significance for every ROI including the background so that the final regions may be represented by various quality levels. Lossless compression of medical images is discussed in [3]. Magnetic resonance imaging images are used for compression and image compression is based on ROI. Embedded zero-tree wavelet is used. Finally compares the two wavelets is made possible of lossless compression to analyze the each technique performance. Integer Wavelet Transform (IWT)-Singular Value Decomposition (SVD) based quantization for

digital medical image compression algorithm using adaptive Huffman coding and graph is explained in [4]. Image quality is maintained by this procedure and wavelet based image compression SVD implementation is examined. IWT is used as irreversible for image compression.

Medical image compression based on hybrid DWT with Back Propagation Neural Network (BPNN) approach is described in [5]. Compressed image quality is improved by DWT technique and BP algorithm can be widely used as a learning algorithm in Artificial Neural Networks. Underwater acoustic image compression using improved SPIHT wavelet transform is discussed in [6]. SPIHT algorithm is used after wavelet transform in the low frequency sub-band. However SPIHT algorithm miscellany redundancy decision rule which is located in the low frequency sub-band wavelet coefficients. Different medical imaging modalities such as brain [7], mammogram [8], and fundus [9,10] are used for computed aided diagnosis which requires effective compression algorithm.

## METHODOLOGY

The proposed system of this paper used the novel SPIHT algorithm. Original images are separated into ROI and NROI parts in this step. Lossless compression is used to compress the ROI part with the help of SPIHT

Algorithm, while the NROI part can be compressed with the help of Lossy compression and is compressed with the help of Haar wavelet transform.

### ROI AND NROI SEGMENTATION

The methodology for the image resolution is explained in Image super resolution reconstruction using iterative adaptive regularization method and genetic algorithm<sup>[7]</sup>. Binary thresholding method is used in the proposed methodology for segmenting an image into ROI and NROI part. Image thresholding is a simple and efficient way of partitioning an image into a foreground and background. Input images are converted from gray scale to binary images which is isolated an objects is the one of type of segmentation. ROI part of the brain is the tumor part which having the intensity larger than the background then only the tumor is viewed separately from the original image and additional compressed for transmission. The image resolution in the satellite systems is presented in the Land use and land cover classification of LISS-III satellite image using KNN and decision tree. In Computing for Sustainable Global Development<sup>[8]</sup>.

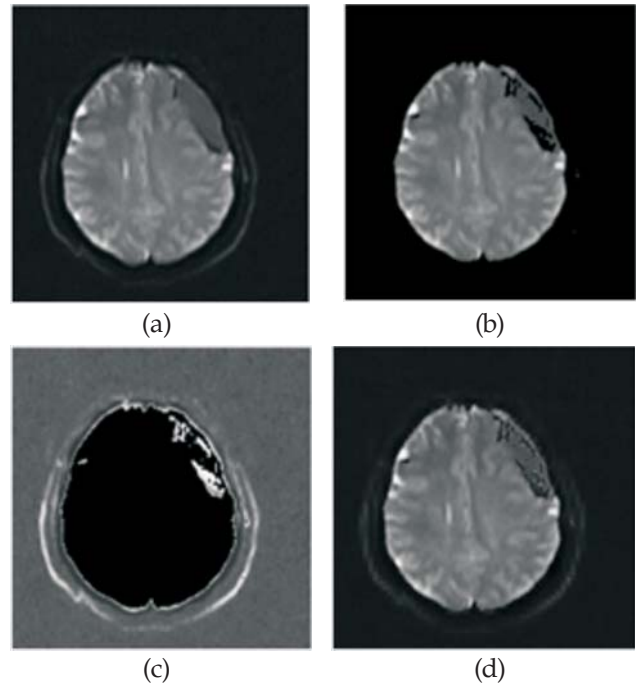


Fig. 2. (a) Input Image, (b) ROI Image, (c) NON-ROI Image and (d) Decompressed Image.

### CONCLUSIONS

In this paper a new scheme for medical image compression using SPIHT algorithm is proposed. Various types of parameters are measured in order to know the quality of compressed image. This paper discusses about algorithms used for compressing images for both lossless and lossy techniques. Due to capacity and time constraints, there are still many problems yet to be lifting scheme specific research and analysis work has been further better in future work.

**Ethical Clearance:** Taken from AMET University committee

**Source of Funding:** Self

**Conflict of Interest:** NA

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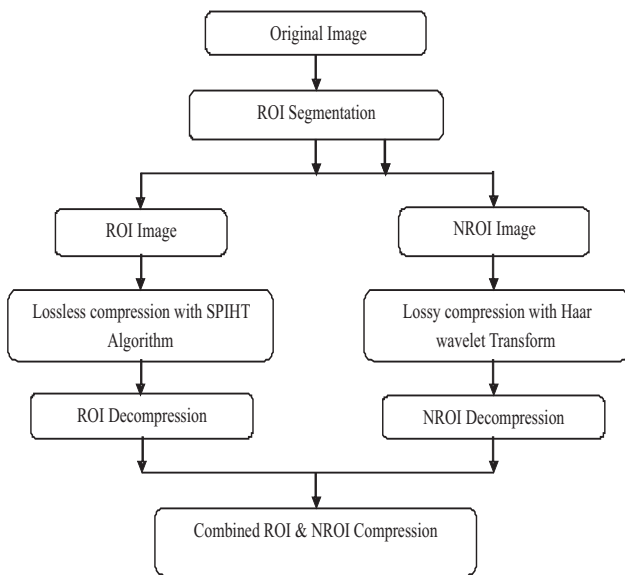


Fig. 1. Block Diagram of the Proposed MRI Compression Technique

### RESULTS & DISCUSSIONS

Results obtained to the proposed method are discussed in this Section. Figure 2 shows the proposed medical image of brain MRI as input image. The important area for proper diagnosis is tumor region in the medical image. The ROI is manually selected using the free hand tool available in Mat lab. PSNR and BPP value for proposed system is 49.28 & 3.54.



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# Consequences of Unnecessary Plastic Bags on Marine Aggregation and Ecosystem Recitals

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## ABSTRACT

The collection of plastic flotsam and jetsam is a worldwide ecological issue because of its strength, tirelessness, and wealth. Despite the fact that impacts of plastic garbage on individual marine creatures, especially well evolved creatures and winged animals, have been widely recorded, next to no is thought about consequences for gatherings and results for environment working. In Europe, around forty percent of the plastic things delivered are used as single-utilize bundling, which quickly gather in waste administration offices and as litter in nature. A scope of biodegradable plastics have been created with the goal of diminishing the ingenuity of litter, be that as it may, their effects on marine collections or environment working have never been assessed. A field trial was led to evaluate the effect of traditional and biodegradable plastic bearer sacks as litter on benthic large scale and faunal collections and biogeochemical forms on an intertidal shore close Dublin, Ireland. Following nine weeks, the nearness of either kind of sack made anoxic conditions inside the silt alongside diminished essential profitability and natural matter and fundamentally bring down plenitudes of infaunal spineless creatures. This demonstrates both ordinary and biodegradable sacks can quickly modify marine arrays and the biological community administrations they give.

**Keywords:** Defilement, Contamination, Polyethylene, Biogeochemistry, Supplement Cycling, Oceanic, Biodegradable.

## INTRODUCTION

In the review of the papers <sup>[1-4]</sup>, the Plastic things have turned into a vital piece of everyday life in numerous social orders, and utilize is expanding, with an expected yearly worldwide creation of two-ninety-nine million tons in twenty-thirteen. Of this, single-utilize bundling things represent the lion's share, just about forty percent, of aggregate creation. The process of the paper is evaluated that right around five percent of the plastic delivered is transported by means of wastewater streams, inland conduits, wind or tides and winds up in the marine condition as litter<sup>[5]</sup>. In fact, plastic waste records for up to eighty percent of all litter found in marine territories. Of this litter, plastic packs are a standout amongst the most widely recognized items<sup>8</sup> particularly on intertidal and sub tidal benthos. Biodegradable plastics have been proposed as another option to traditional plastics, for example, polyethylene. Biodegradable plastic sacks are proposed to separate more quickly than ordinary plastic packs and are, consequently, accepted to be less tenacious as litter. However there have been few reviews assessing their debasement in normal territories and the degree to

which any improved corruption may diminish marine litter is not clear. Without a doubt some degradable polyethylene plans have been appeared to continue in the earth for a considerable length of time after their transfer is explained in <sup>[6-8]</sup>.

Given their relative unmanageability to decay under characteristic conditions, traditional and biodegradable plastic packs represent a potential danger to living beings in seaside biological systems when present as litter. The particle swarm reduction is presented in Proposed System of Ship Trajectory Control Using Particle Swarm Optimization <sup>[9]</sup>. Tainting of marine territories by plastic litter can be tastefully unfavorable, prompting negative financial results. There is additionally extensive confirmation identifying with outcomes for natural life. More than six-sixty species are known to experience marine flotsam and jetsam and negative results including physical harm from snare and gagging, and mortality are accounted for people from an extensive variety of animal categories, including flying creatures, warm blooded creatures and spineless creatures. While data on impacts at the individual level is of extensive esteem, proof of impacts at more elevated

amounts of natural association, i.e. species arrays, groups and populaces, is frequently of basic significance to leaders since it can be utilized to advise approach measures. Giving this data is important, for instance, to illuminate choices about enactment to lessen the amount of single utilize, dispensable things including plastic packs and/or about the adequacy of option materials with upgraded degradability.

## METHODOLOGIES

### Appraise In-faunal Assortment

A ten-centimeter width corer was embedded down to five centimeter profundity however much to the focal point of each plot as could be expected. The center specimen is three-ninety-three centimeter cube was exchanged to sealable packs, put away at four degree Celsius and upon landing in the research center quickly sieved through a one-two-five millimeter work sifter skillet to hold full scale fauna and expansive fauna. All material recuperated from the strainers was safeguarded independently for each example in seventy percent ethanol for list and ID to the least detectable conceivable utilizing an analyzing magnifying instrument.

### Appraise Ecosystem Recitals

Before whatever other estimations being taken, five plots from every treatment were haphazardly chosen to decide the capability of the surface dregs point five centimeter utilizing a cathode. Next, pour water was examined before any unsettling influence made by the other testing strategies. Pore-water tests were gathered utilizing reason worked in situ profilers in light of the plan. Quickly, the profilers, made of sheets, had grooves sliced at interims to append on a vertical succession, permitting testing at four centimeter profundities. The profilers were embedded vertically into the residue, secured by metal pins, and a solitary biodegradable or ordinary sack was put fixated on top. Control plots had a profiler embedded and secured with pins as it were. Toward the finish of the investigation, pore-water was inspected by connecting a needle to every film and water was gathered specifically into sterile vacuum tubes and biogenic silicate were measured from the water tests utilizing a taking after techniques. All centralizations of pore water were amended for silt porosity and were institutionalized to dry mass thickness taking after inventories were ascertained inside the profundity profile by joining of direct pore-water focus inclinations,

rectified for porosity, down to four centimeter profundity.

### Statistical Exploration

All information were broke down utilizing the information were checked for typicality and homogeneity of change and no changes were esteemed fundamental. All reaction factors from the dregs tests were separately examined utilizing a restricted with "lead" as a variable having three levels. Potential was measured from just five arbitrarily chose repeats from every treatment in the field because of time confinements postured by the tide. The information were investigated utilizing an indistinguishable model from some time recently. At the point when the fundamental test was noteworthy, a post-hoc match insightful correlation of the methods was registered to find out the from the earlier speculations. Multivariate information were broke down utilizing the veggie lover bundle gathering structures were figured utilizing species check information, though array syntheses were registered in view of nearness/nonappearance of species. So also, files were figured amongst tests and contrasts are indicated utilizing two-dimensional non-metric multidimensional scaling appointments. The information were ascertained utilizing two-fifty emphases or until the most reduced stress was achieved utilizing the capacity in veggie lover utilizing the motor. Before computing per mutational examinations of difference, multivariate homogeneity of fluctuations were checked. Contrasts between gathering structure and piece inside the residue were broke down with "Treatment" as a solitary variable with three levels by figuring a restricted utilizing the capacity in veggie lover, with probabilities computed in light of the crude information. To evaluate which distinguished gatherings contributed most to dissimilarities between medicines, likeness rates were figured utilizing the giggle routine in the veggie lover bundle.

## RESULTS AND DISCUSSION

It is evaluated that roughly seventy percent of the marine litter that enters the ocean winds up gathering on the ocean bed, to be sure plastic garbage represents the lion's share of litter recorded on the benthos in many parts of the world including the Mediterranean Sea, European beach front regions<sup>55</sup> and even remote Alaskan and profound Arctic ocean bottoms. Hence if the measure of plastic in the earth increments as

anticipated, the potential for more extensive scale effects is significant. In spite of the fact that it had beforehand been recommended that plastic litter can change supplement trade amongst silt and overlying water and consequently influence biological system benefits, this had not been tried as of not long ago.

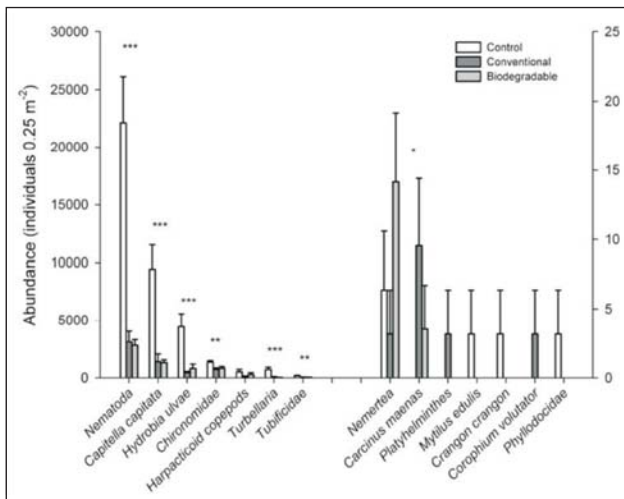


Fig. 1. Comparison between conventional and Biodegradable system

Species wealth in the main five centimeter layer of plain residue, underneath predictable and ecological plastic sacks. Qualities are means Asterisks demonstrate huge contrast between medications, with the correct portion of the informational collection is spoken to by the correct y-pivot.

Other than negative stylish impacts, it is clear from this review littering of sedimentary natural surroundings by plastic flotsam and jetsam can change key parts of environments, including essential efficiency, invertebrate biomass and benthic turnover rates of imperative constraining supplements. Plastic flotsam and jetsam is progressively gathering in seaside natural surroundings worldwide and the full degree of effects in various territories is not clear. While the impacts of marine garbage on people are very much archived, this review shows the potential for fast consequences for collections and a few essential biological system administrations.

### CONCLUSION

The nearness of both sorts of sacks made the arrays vary from those in control medicines. This was driven by contrasts in relative plenitudes, instead of to changes

to the sorts, the quantity of species or change in the relative strength of person. The appointment demonstrating gathering creation recommends that the nearness of plastic sacks expanded multivariate difference, which was affirmed by the standard testing for homogeneity of change. This shows fluctuation in the in-faunal piece among imitates from the pack medicines was more prominent than in the control plots. The expansion of plastic sacks, regardless of whether biodegradable or ordinary, made anoxic conditions in the dregs, as demonstrated by decreased possibilities and expanded ammonium pools. The physical impact of fixing the surface and viably blocking oxygen dissemination into the silt presumably added to the lessening in potential, while the diminished oxygen accessibility at the water-sediment interface likely represented the abatement in-faunal plenitudes.

**Ethical Clearance:** AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Chlorophyll-A Predicting Based on Artificial Neural Network for Marine Cage Fish Farming

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## ABSTRACT

Base on the 201 gatherings of information that acknowledged over the most recent ten years, a 3 layer (3,8,1) BP simulated neural system show on rapidly foreseeing chlorophyll-a focus in marine enclosure angle cultivating range was set up. Three field exact estimation parameters (water temperature, pH, broke up oxygen) was as the information variable and chlorophyll-a was the yield in our model. In most condition the estimate results was nearly to the real information when utilizing this model. Its forecast exactness was fundamentally higher than the direct relapse condition. For the reason that the information utilized as a part of building model which has some question and the multifaceted nature of foreseeing chlorophyll-a substance, there existed some mistake between estimate esteem and real esteem when utilizing this model in a few arrangements of information. This article advanced the strategies to perfect the model in the following stage.

**Keywords:** BP Artificial Neural Network marine Cage Fish Cultivation Area.

## INTRODUCTION

Chlorophyll-a was the basic shades of phytoplankton photosynthesis. It could be used for depiction of phytoplankton biomass, and it was furthermore a principal document in expecting red tide. Regardless, the improvement of phytoplankton was affected by water temperature, light, supplement, rhythmic movement and whatnot. Meanwhile there has anomalous condition of non-straight and insecurity relationship among natural group parts. It was difficult to achieve convincing steady watching, so that general effective ordinary gaging strategies were every so often watched. Manufactured neural system (ANN) was an outskirts subject which increase quick improvement since the 1980 of the twentieth century. It was appropriate to deal with the mind boggling and nonlinear frameworks address [6]. Since it has the elements, for example, nonlinear, vast of parallel dispersion structure and effective of nonlinear guide capacity, and needn't of earlier information of related framework, and can manufactured adaption model to learning and building model naturally, in this way it has broadly application in biological framework reproduction, and environmental information handling and extraction of remote detecting biological parameter<sup>[4, 5]</sup>. It has been connected. In the range of

atmosphere<sup>[3]</sup>, hydrological and red tide estimate and expectation<sup>[1]</sup> however the application in research parts of waters chlorophyll-a figure was less<sup>[2]</sup>. Presently the most current application model of counterfeit neural system was BP organize (Back-Propagation calculation, back spread calculation) The BP arrange incorporates input layer, inferred layer and yield layer. It was a Feedforward systems which be comprised of nonlinear change modules. A value added bio preservation marine fishes under different storage conditions by using bacteriocin from the lactobacillus SP is discussed in [7]. A biosynthesis and antimicrobial activity based studies of salicylalchitosan and functionalized zinc oxide nanoparticles and also the comparative studies with its non-functionalized form are discussed in [8]. An analysis on the structural, spectroscopic, and dielectric properties of borate glas are explained in [9]. The spectral analysis of photonic crystal based bio-sensor using AdaBoost algorithm is discussed in [10].

## MATERIALS AND METHOD

### A. Study area

Dapeng Cove was a semi-enclosed coastal gulf that located at southwest of Daya Bay in middle Guangdong province. The water depth was 3~7m and the water

surface area was approximately 1400 hm<sup>2</sup>. The nature tide was the un-regular half solar tide. Fish cage culture was started from 1985 in southeast of the cove. At present, the breeding farm area took about 39 hm<sup>2</sup> and the annual output was 450 tons. The average depth of cultivation sea area was 5m which had bad condition in seawater exchange. 5 investigation stations were set in Dapeng Cove base on the fish cage culture conditions. 201 groups of survey information were collected from 2001 to 2009. In these data 67 groups were collected from June, 2001 to April, 2009 in seasonal survey, and the other 134 groups were acquired from September to November, 2009 in the frequency of every 3 days.

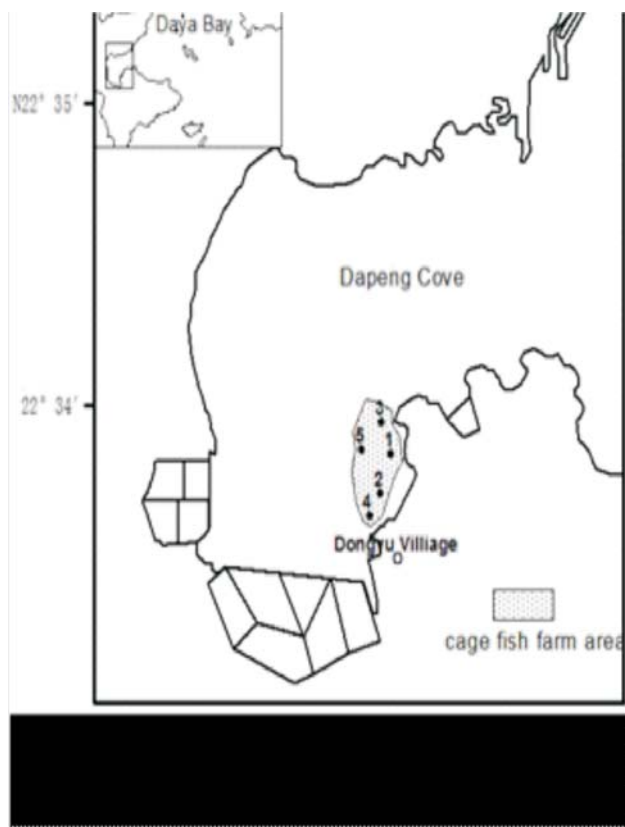


Fig.1. Dapeng cove's sampling site

**B. Sampling and analysing process**

Water temperature, pH esteem, saltiness and broke up oxygen (DO) of surface layer were scene distinguished by YSI 556. Straightforwardness was resolved scene by Secchi plat, as well. Chlorophyll-a of water tests were gathered and separated and after that reclaimed to the research facility which dictated by spectrophotometry technique before 2007 and by fluorescence strategy (GB17378-2007) after that.

**C. Establishing and training for BP artificial neural network**

The principle hypothesis of BP system which makes the elements that affecting expectation question as contribution to the system and the gauge protest was as the yield of the system. At the point when BP system was built up, it might be utilized to do manage learning on the specimens, in order to recognize the complex nonlinear mapping connections between effect elements and expectation protest. At the point when the parameters of BP system were in suitable, it could union to a littler mean square blunder.

It was a restricted association organize. Look into has demonstrated that supplement substance was the principle calculate impacting chlorophyll-an and various investigations of Dapeng Cove have demonstrated that development of phytoplankton in Dapeng Cove was constrained principally by phosphorus after 1998.

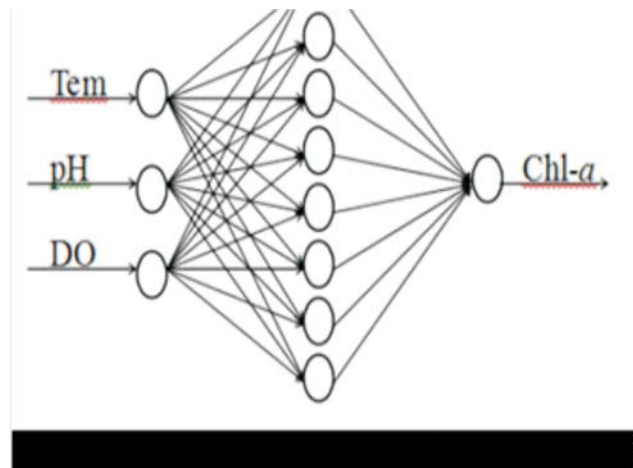


Fig.2. Architecture of a BP neural network topology

**RESULTS**

At the point when system structure was extensive, it needs long estimation time and was effectively became involved with a neighbourhood least call attention to out of acquiring ideal outcomes. This article utilized the expanded force and enhanced BP calculations, in this manner defeating the after-effect of going into nearby minima. After 110 number of preparing learning times the system blunder (MSE) of built up system come to at 0.00099997(original booked mistake was 0.001) and, the system merging was better. We improved preparing comes about.

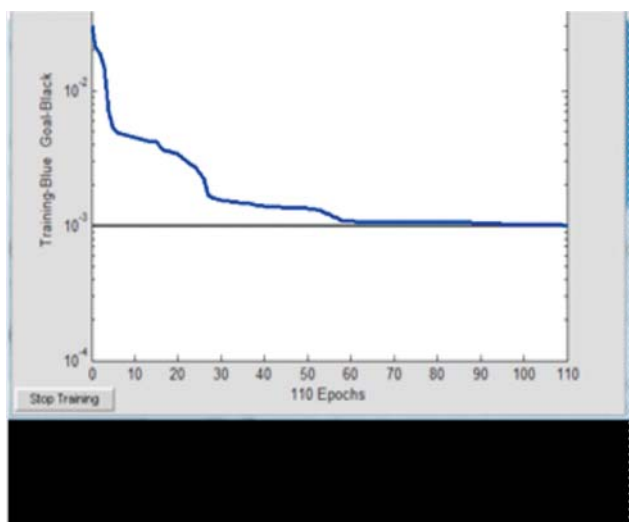


Fig.3 performance curve of a model train

## CONCLUSIONS

Under a similar example information used to set up model and similar variables, re-enact after-effects of BP was more steady with measured esteem and its reproduction results was better. After-effect of straight relapse model was moderately poor, extensive mistakes. Prescient exactness of BP system was altogether over that of the relapse display. Disdaining the above points of interest, however the blunder of checked information yields and estimation information was huge in a couple sets of test information. One reason for this was probably going to be excessively numerous and too pack information for building up model (151 gatherings). Copious supplement content, higher yearly water temperature, poor states of water trade, red tide may happen during the time were the second reason.

Increment the multifaceted nature when anticipating the chlorophyll-a substance and created the forecasts on part of the information be not perfect. Choosing better building up model information will be 206 our next bearing of research. In the first place, channel more sensible information to fabricate display including saltiness and water shading. Second, stations ought not be excessively close and the normal estimation of adjacent comparable physico-concoction condition of waters ought to be utilized. Third, red tide likelihood in various season was vast distinctive, and in winter and spring red tide will probably happen

than in summer and harvest time in Dapeng Cove, so conjecture model could be set up for chilly and warm season, individually.

**Ethical Clearance:** Taken from AMET University committee

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Capable Radiographic Image Recovery System Using Convolutionneural System

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## ABSTRACT

Content-Based Medical Image Retrieval (CBMIR) is a critical research field with regards to restorative information administration. In this paper we propose a novel CBMIR framework for the programmed recovery of radiographic pictures. Our approach utilizes a Convolution Neural Network (CNN) to acquire abnormal state picture portrayals that empower a coarse recovery of pictures that are in correspondence to an inquiry picture. The recovered arrangement of pictures is refined by means of a non-parametric estimation of putative classes for the question picture, which are utilized to sift through potential anomalies for more pertinent pictures having a place with those classes. The refined arrangement of pictures is at long last re-positioned utilizing Edge Histogram Descriptor, i.e. a low-level edge-based picture descriptor that permits to catch better likenesses between the recovered arrangement of pictures and the question picture. To enhance the computational proficiency of the framework, we utilize dimensionality decrease by means of Principal Component Analysis (PCA). Analyses were done to assess the viability of the proposed framework on medicinal information from the "Picture Retrieval in Medical Applications" (IRMA) benchmark database. They got comes about demonstrate the adequacy of the proposed CBMIR framework in the field of medicinal picture recovery.

**Keywords:** *Principal Component Analysis (PCA), Picture Retrieval in Medical Applications, Convolution Neural Network (CNN), Content-Based Medical Image Retrieval (CBMIR)*

## INTRODUCTION

This presents the need of novel, keen procedures to productively seek through vast accumulations of therapeutic pictures is described in <sup>[1-4]</sup>. An open test for grouping/recovery of medicinal pictures is the between versus intra-class fluctuation issue. A few Content-Based Medical Image Retrieval (CBMIR) models have been proposed to address these issues utilizing agent highlights for the pictures' substance .by and large, the proposed frameworks can be sorted into two unique classes: errand/methodology needy and free CBMIR frameworks. The CBMIR frameworks from the principal class are created in view of a particular organ, imaging methodology or symptomatic review.

These frameworks are insufficient for other restorative applications. With respect to the second class, there have been few endeavors to create assignment/methodology free CBMIR frameworks: and Image Retrieval in Medical Applications (IRMA) among numerous others is explained in this paper <sup>[5]</sup>.

In this work<sup>[6]</sup> we make utilization of CNN-based elements as worldwide picture descriptors that will be utilized in the main stage to play out a coarse recovery, while EHD is utilized as nearby descriptor to get a better grained positioning of the recovered pictures in the second stage. CNNs signify a group of sustain forward, neural systems that engender the information motion through a few computational pieces/layers, which figure convolution highlights, apply non-direct actuation works, and perform pooling operations to decrease the dimensionality of the portrayal. CNNs have been appeared to be extremely successful in numerous PC vision errands specifically by utilizing profound models is explained in <sup>[7]</sup>. The quality of CNNs gets from learning portrayals for the information at various levels of reflection. For picture information, the lower levels of reflection may depict the distinctively orientated edges in the picture; center levels may portray parts of a protest, while high layers allude to bigger question parts and even the protest classes. The satellite image classifications are explained in the Land use and land cover classification of LISS-III satellite image using KNN and decision tree <sup>[8]</sup>.

## METHODOLOGIES

We have confined the investigation to the 31 classifications having no less than 50 pictures and we arbitrarily chose 50 pictures for every classification, yielding a dataset of 1550 pictures composed into 31 classes. The pictures of this database experience the ill effects of the between class versus intra-class fluctuation issue. Pictures from this dataset are sorted out into semantic classes in an approach to mirror the human view of picture likeness. The execution on the dataset was assessed by considering 10 irregular pictures from each class as the question picture (altogether 310 inquiries) and by measuring the normal exactness and recall, or the normal exactness (which agrees with the normal accuracy), contingent upon the test. The efficient image resolution is explained in this Image Super Resolution Using Wavelet Transformation Based Genetic Algorithm<sup>[9]</sup>.

The investigations were led on a Dell Precision T7810 PC with 32GB RAM and the proposed approach has been actualized utilizing MATLAB R2016a. All tests were kept running with degree estimate  $m = 20$ , where not contrastingly expressed.

We look at the outcomes gotten by our strategy with 10% dimensionality lessening against other cutting edge approaches. We actualized in MATLAB the strategies proposed in and connected them to the same dataset. As appeared, the proposed strategy performs altogether superior to the contenders. This is presumably because of the utilization of abnormal state, information driven CNN-descriptors in the principal arrange, while the contenders depend mostly available made mid-or low-level components.

## CONCLUSION

In this paper, we have proposed a productive CBMIR framework for radiographic pictures in light of a novel two-organize recovery approach. The point of the primary stage is to give a coarse-grained recovery of the pictures basically gone for distinguishing an arrangement of putative classes to which the inquiry picture has a place with. Hence, we utilize abnormal state CNN-based elements. The assessed set of important classes is utilized as a part of the second stage to channel our potential exceptions and concentrate the recovery just on those pictures having

a class name that was viewed as significant in the past stage. In the second stage, the confined arrangement of pictures is positioned in light of low-level EHD highlights, which take into account a better grained assessment of the likeness to the question picture. The tests we led have demonstrated the viability of the proposed approach.

**Ethical Clearance:** AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# A Variable Collection Regarding the Storage Space Moment of Packaged Food in Fuzzy Association Rule Mining Structure

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## ABSTRACT

The development in the packaged food industry has made weight on the packaged food distribution center to upgrade the request picking proficiency. The choice decision supportive network (DSN) for stock keeping units (SKUs) allotment along these lines needs to settle on quality choices for shortening the request picking time. Keeping in mind the end goal to enhance the basic leadership capacity of the DSN, the determinant components of the significant info variable - the capacity time of SKUs, must be distinguished. Given the loose way of the potential determinant considers fuzzy association rule mining (FARM) structure is proposed in this review. It applies the FARM strategy to recognize and assess the components and examples concerning the capacity time of SKUs in bundled sustenance distribution centers. The system was tried through a contextual investigation, and the outcomes demonstrated that the structure can distinguish the most applicable information factors with respect to the capacity time and can portray the connections between them particularly.

**Keywords:** Decision Supportive Network (DSN), Stock Keeping Units (SKUs), Fuzzy Association Rule Mining (FARM), Packaged Food.

## INTRODUCTION

With the progression in worldwide calculated administrations, the shipment of food abroad has turned out to be more attainable and has developed quickly, particularly amid the occasion time frames<sup>[1]</sup>. This uncovers a need to enhance the operational proficiency of stockrooms that handle packaged food keeping in mind the end goal to bolster the requested development. Packaged food in this review alludes to dessert shop, scones, and arrangements of nuts, seeds and organic product that are contained in food bundles<sup>[2]</sup>. Warehousing of packaged food is testing given the qualities of the packaged food industry: (i) the interest for packaged food vacillates as for the occasion time frames, (ii) an extensive assortment of items is included, and (iii) the expiry date of the food is of awesome concern. Packaged food stockrooms in this manner need to work at top effectiveness, have the capacity to store items as indicated by their diverse stockpiling necessities, and consider the food expiry date while setting up capacity arrangements<sup>[3]</sup>. What's more, since food bundling offers defensive and stylish capacities to the food item, the developments of items by any methods inside the capacity region must be maintained a strategic distance from<sup>[4]</sup>. Having viable capacity operations and basic leadership capacity

along these lines assume imperative parts in packaged food distribution centers and in this way, choice decision supportive network (DSN) are required for such complex operations<sup>[5]</sup>.

The choice decision supportive network is a class of framework that helps leaders amid the critical thinking process by recovering information and testing options<sup>[6]</sup>. It has been embraced in different distribution center operations, for example, stockpiling allotment, stockpiling task, arrange arranging and capacity condition observing and controlling, rendering enhancements in the proficiency and adequacy of the capacity area task, arrange picking and hazard control<sup>[7]</sup>. Arrange picking incorporates the procedures of social occasion items from the stock and sorting them as per requests for shipment.

The request picking time is vigorously influenced by the viability of the SKU portion in a storeroom, as doling out sensible areas for SKUs can lessen the voyaging separation for the request pickers<sup>[8]</sup>. Consequently a powerful DSN is required for upgrading the nature of the choices made in SKU designation, concerning how to dole out SKUs into various zones in a distribution center.

The studies of curcuminaniline biofunctionalized copper oxide nanoparticles based on Green synthesis; characterization and antimicrobial activity are discussed in [9]. A Scientrometric Analysis of quantum of Ebola virus disease occurrence and quantum of research publications id discussed in [10]. The Isolation, Optimization and Production of biopolymer (poly 3-hydroxy butyrate) from marine bacteria activities are discussed in [11]. The aim of this review is to propose a FARM system for recognizing the variables and examples concerning the capacity time of SKUs, thus helping choice support in SKU allotment in the packaged food industry. Keeping in mind the end goal to discover the determinant variables of the capacity term of packaged food and the shrouded connections among them for supporting the basic leadership in SKUs allotment, a structure that applies the FARM method is proposed. The structure of the system is appeared in Fig. 1. It contains three modules, (i) Data Preparation Section (DPS), (ii) Rule Mining section (RMS), and (iii) Knowledge Evaluation and Maintenance Section (KEMS).

**Data Preparation Section (DPS)**

The capacity of this module is to secure the information required for further investigation in the following module. Keeping in mind the end goal to acquire every single pertinent data, the parameters for creating fuzzy association principles are first recognized. Regarding the parameters determination, it should be possible adaptable keeping in mind the end goal to develop concealed examples from various blends of the potential components. Be that as it may, the parameters mirroring the capacity time should be accessible, since the capacity time is the resultant piece of the principles. As per the parameters, the records that can give the related data are accumulated. In the event that the required information is inaccessible, one may accumulate the missing information and spare them in recently made records. Data preprocessing is then started to perform information cleaning and institutionalization. On the off chance that the institutionalized crude information are not yet ready to give significant data to the utilization of the following module, they are handled before being foreign made to an information distribution center, which enables clients to skim over the information helpfully.

**Rule Mining section (RMS)**

This module is the center some portion of the structure for creating the needed fuzzy association rules. The initial step of tenets era is to characterize

fuzzy sets of the parameters. The chronicled information spared in the information distribution center is then examined for getting the scopes of quantitative estimations of every parameter.

In the wake of concentrate the past information, the participation capacities and universe of talk can be set as needs be. At that point, the base bolster check edges of the parameters are characterized for sifting through the itemsets that contain few fuzzy tallies, where the itemsets are developed among the parameters by utilizing a mining calculation. The means for executing the calculation are shown for the situation consider segment of this paper. The base certainty edge is then set and contrasted and the certainty estimations of the qualified itemsets, with a specific end goal to produce usable fuzzy association rules. The base bolster check edges and least certainty limit are proposed to be set by utilizing the experimentation approach.

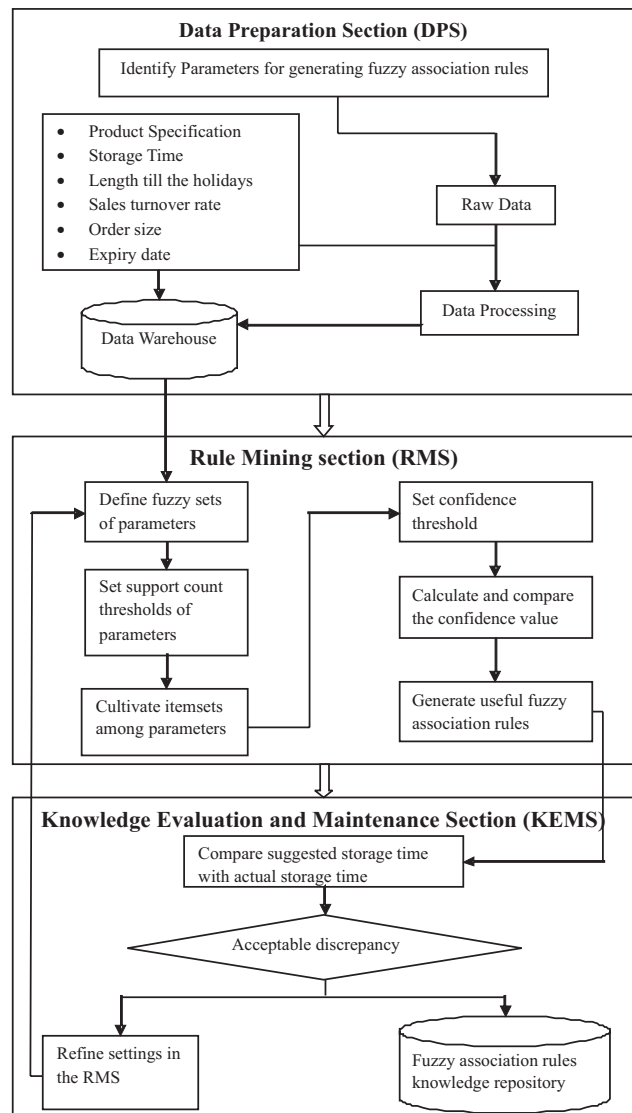


Fig.1. Structure of FARM framework

## Knowledge Evaluation and Maintenance Section (KEMS)

The efficiency of the fuzzy association rules that are produced from the RMS are assessed in this module. Since the goal of the administer mining procedure is to discover the determinant elements of capacity time and how these components influence the capacity time, the execution pointer of the tenets is along these lines prescribed to be the real stockpiling time of the SKUs. By contrasting the range which the recommended stockpiling time falls into to that of which the real stockpiling time falls into, inconsistency esteem is acquired. The administration needs to settle on a worthy error level for examination. In the event that the disparity is worthy, the fuzzy association rules that records for the outcome would be put away into the fuzzy association rules learning store, and thusly be utilized as a part of basic leadership in SKUs portion. On the off chance that the disparity is too huge, refinements would be made in the meaning of the fuzzy sets or the digging calculation for creating another arrangement of standards.

## CONCLUSION

Given the significance and unpredictability of settling on quality choices in SKUs distribution for the packaged food industry, the determinant variables of the capacity time of SKUs must be distinguished. A structure that assesses the potential information parameters concerning the capacity time is proposed in this review. The system applies fuzzy association rule mining methods to depict the if-then connections between different info parameters and the capacity time. The approval procedure in the system guarantees that the information vault would contain just the guidelines that can precisely anticipate the real scope of capacity time. Testing is actualized for a situation organization that works a packaged food distribution center. The test outcomes demonstrate that the structure can find the determinant variables of the capacity time of SKUs. It can create valuable fuzzy association rules that can foresee a precise scope of capacity time for SKUs.

Moreover, the fluffy classes of the standards particularly portray the if-then relationship of the information parameters and the capacity time. The information developed by the structure can be connected in the DSN for SKUs assignment and in market examination.

**Ethical Clearance:** Taken from AMET University committee

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Decidedly Constant Biological Polymer Meadow-Consequence Transistor Feeler for Discriminatory Exposure in the Sea Surroundings

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## ABSTRACT

In dawn spans, the powerlessness to debasement in both encompassing and watery conditions has kept natural hardware from increasing quick footing for detecting applications. Here we report an ordinary meadow-impact transistor feeler that knocks this periphery consuming response can route is indigo-based polymer semiconductor. All the more significantly, these natural meadow-impact transistor feelers are steady in both freshwater and seawater conditions over developed timeframes. The natural meadow-impact transistor feelers are further able to do specifically detecting substantial metal particles in seawater. This disclosure has potential for economical, ink-fly printed and vast scale ecological observing gadgets that can be conveyed in territories once thought of as past the extent of natural materials.

*Keywords: Polymer, MITs, ink-fly.*

## INTRODUCTION

The utilization of meadow-impact transistors (MITs) for convenient, mark free detecting applications in the meadow of social insurance and natural checking has gotten awesome consideration in late decades. Such gadgets consider the transduction and change of substance cooperation into an electrical flag, giving similarity advanced read-out techniques. The detecting guideline depends on the connection or assimilation of charged animal types, for instance, an ion or a DNA oligonucleotide<sup>6</sup>, with the interface of the MIT. Thusly, the surface potential is changed, which influences the present that streams<sup>[1]</sup> in the conductive channel of the MIT by means of the meadow impact. To take into consideration particular discovery of specific animal groups, the MIT's surface is artificially functionalized with particular restricting groups. Apart from the effective showing of MITs for the discovery of DNA<sup>7,8</sup>, proteins<sup>9</sup> or little molecules<sup>10,11</sup>, substantial metal particle recognition has likewise been investigated for observing water squander, waterfront zone contamination and marine condition changes<sup>[2-4]</sup>.

Likewise, MITs worked from natural materials have additionally turned into a concentration of extreme

research. In these gadgets, a natural little particle or a polymer is utilized as the dynamic semiconductor material. All things considered, for the solid discovery of a biochemical response or the observing of water waste or the marine condition, a steady execution in a watery media is important. The insecurity of natural semiconductors within the sight of water in conjunction with high working voltages for MITs has already prompted almost immediate gadget corruption amid operation<sup>[5]</sup>, constraining the utilization of MITs as dependable and reproducible biochemical feelers in a watery environment. This geometry, be that as it may, keeps an immediate cooperation of the watery media with the natural semiconductor. The insolubility of this atom requires that it is stored through warm vanishing and is thusly not perfect with minimal effort arrangement preparing methods.

Thus we report and look at the utilization of an elite polymer semiconductor in a natural polymer-based MITfeeler that beats the issue of water precariousness and is effortlessly route. The introduced MITfeeler is completely perfect with adaptable substrates and is profoundly steady over developed timeframes. Besides, we show exceptionally stable

execution in a seawater situation. We exhibit that our MIT can fill in as a compound feeler to screen saltiness changes and even be customized for the specific recognition of imperative analyzes, for example, overwhelming metal particles in a marine situation. Our discoveries might be utilized to grow new sorts of MIT-based substance analytic devices, and prompt new outline ideas in marine situations, a meadow that still needs conservative, stable feeler units<sup>[6]</sup>.

## METHOD

### ManeuverConstruction

Before functionalization, the wafer was cleaned for 15 min with bright ozone. The substrate was moved into a glovebox and inundated in an answer of were cut from the wafer and utilized for gadget development. The channel w/l proportion was 320 for the long haul dependability estimations. In this way, the gadgets were come back to the glovebox and a thick, was kept on the presented SiO<sub>2</sub> to improve the electrical execution of the natural polymer. A short time later, Au anodes were vanished. To streamline electrical execution in fluid situations, a moment layer was instantly turn covered. The thickness of each film was eighty Nanometers. In this manner, the specimens were toughened for one hour on a hotplate at one eighty degree Celsius and after that permitted to chill off gradually. Thusly, the examples were strengthened for five minutes on a hotplate at one sixty degree Celsius and after that permitted to chill off gradually. In this manner, the examples were strengthened for thirty minutes on a hotplate at one seventy five degree Celsius and after that permitted to chill off gradually.

In this paper also reviewed in, Biosynthesis and antimicrobial activity studies of salicylalchitosan functionalized zinc oxide nanoparticles and comparative studies with its non-functionalized form<sup>[7]</sup>. Spectral analysis of photonic crystal based bio-sensor using AdaBoost algorithm is presented in<sup>[8]</sup>. Acoustic study of atropine sulphate in water of various concentrations at 35°C using ultrasonic interferometer is explained in<sup>[9]</sup>.

### Electrical Dimensions

All estimations were performed under surrounding conditions at room temperature. For electrical testing in watery situations, a stream cell with an inward volume of mounted specifically on the gadget. For fluid gating tests, a move through reference anode was put in accordance with the tubing in close region to the

stream cell. Before electrical estimations in fluid conditions, the examples were equilibrated for one hour in contact with the arrangement. For time-subordinate estimations, a working point at settled source-deplete voltage and door voltage was picked. All estimations were controlled by an independent program.

## RESULTS AND DISCUSSION

We presented a novel utilization of our beforehand announced polymer that can be utilized for the creation of adaptable, arrangement route MITs feelers with high return and reproducibility. The created gadgets demonstrate startling and astoundingly high soundness over an expanded era in seawater, one of the harshest watery conditions in which an OMITfeeler can be worked. This perception prompted another field of examination the utilization of a natural polymer as feeler in a marine situational application beforehand out of reach to natural hardware. Our examination opens a completely new domain of uses for MITfeelers; the utilization of natural materials as printable, minimal effort and extensive territory feelers for checking watery, particularly marine, situations is currently conceivable. Through and through, these perceptions constitute a huge jump forward for the field of natural gadgets.

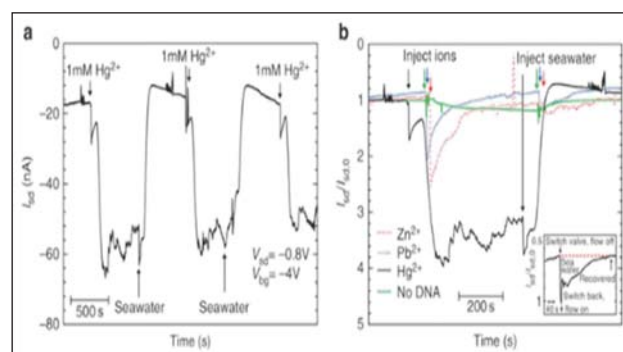


Fig. 1. Selective reaction of the MITfeeler to rather than its reaction to broken up in seawater

Arrangements of seawater and broken down in seawater are on the other hand presented to MIT, bringing about reproducible levels. Figure.1 shows the Selective reaction of the MITfeeler to rather than its reaction to broken up in seawater. Information gathered from three unique examples Effectiveness of *Lactobacillus* sp (AMET1506) as probiotic against vibriosis in *Penaeus monodon* and *Litopenaeus vannamei* shrimp aquaculture. The little sharp change in quickly taking after infusion of another arrangement is a coupling reaction to exchanging the programmed valve that happens in tests of high particle focuses.



## CONCLUSION

A thing is certain, on the off chance that one needs to save an existence broadened on our old planet, it is important starting today changing lifestyle on the grounds that the man, magician's disciple, are debasing in an irreversible way his marine condition. Being given their tremendousness, the oceans and the seas are viewed as sewers without end. The measurement of caution was come to. Moreover, as a result of enormous in its populace, the humanity needs constantly more ground and nourishment. It should however figure out how to protect the mainland biotopes on which it depends, and additionally the huge hold of potential nourishment which is the ocean. The abandon will progress and the ocean won't be soon any more in ability to give the lavishness that it so generously gave him amid hundreds of years, without never to have gotten, in return, the regard to which it has the privilege.

**Ethical Clearance:** Taken from AMET University.

**Source of Funding:** Self

**Conflict of Interest:** NIL

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# Biofabrication of AuNPs Using Marine Endophytic Fungus

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## ABSTRACT

Nanotechnology is one of the promising fields of research and producing new roads and applications in prescription. As of late, marine vegetations, for example, marine endophytes are picking up the consideration of numerous scientists because of the horde of bioactive atoms that they have. Furthermore, they discover applications in numerous pharmaceutical and cosmetic industries. In this review, they have concentrated the green synthesis of gold nanoparticles (AuNPs) from *Penicillium citrinum* (P. citrinum) and its antioxidant activity. P. citrinum was detached from brown algae. AuNPs were tested for complimentary radical scavenging activity by 1,1-diphenyl-2-picrylhydrazyl strategy. The particle sizes of AuNPs were determined by FESEM and DLS.

**Keywords:** Gold Nano Particles (AuNPs), *Penicillium citrinum*, marine endophytes.

## INTRODUCTION

Nanotechnology is a multidisciplinary subject that incorporates many branches of science, for example, science, physics, and chemistry etc. More than 800 items in view of nanotechnology are assessed to be in the market and the number is expanding step by step. Nanotechnology has applications in farming, medical and pharmaceutical and electronic industries<sup>[1]</sup>. Gold, and also other metal nanomaterials, are synthesized generally by physical and compound techniques. In any case, these techniques have a few impediments, for example, the utilization of brutal chemicals, extreme synthesis conditions, laborious as well as less beneficial.

Notwithstanding these disadvantages, these procedures represent a natural hazard as they include dangerous chemicals that have deleterious health suggestions on human beings. Consequently, the requirement for a less harmful, reasonable and applicable method of nanoparticle synthesis is in great demand in medical, pharmaceutical and agriculture industries<sup>[2-3]</sup>. The rich diversity of the organic system attracted the consideration of numerous scientists for the blend thenanoparticles Biosynthesis of nanoparticles can be achieved using plant concentrate, microscopic organisms and growths.

In this paper also described in, Sequential cultivation of human epidermal keratinocytes and dermal mesenchymal like stromal cells in vitro<sup>[4]</sup>. Green Synthesis, Characterization and Antimicrobial Activity Studies of Salicylalchitosan Biofunctionalized Copper Oxide Nanoparticles Effectiveness of Lactobacillus sp (AMET1506) as probiotic against vibriosis in *Penaeus monodon* and *Litopenaeus vannamei* shrimp aquaculture<sup>[5]</sup>.

## Extracellular Synthesis of Gold Nanoparticles (AUNPS)

P. citrinum was developed in 100 ml of PDB soup taken in 250 ml Erlenmeyer cup. The cup was brooded at 25°C in a static position for 72 h. The mycelial biomass was isolated by filtration and afterward widely washed with refined water to expel the hints of media segments Foaming properties of sesame seed protein hydrolyzates<sup>[5]</sup>. This biomass was taken into jars containing 100 ml refined water and hatched at room temperature for 48 h. The suspension was separated with What man channel paper number 1 and the filtrate was blended with fluid arrangement of 1 mM AuCl<sub>4</sub> for diminishment Effectiveness of Lactobacillus sp (AMET1506) as probiotic against vibriosis in *Penaeus monodon* and *Litopenaeus vannamei* shrimp aquaculture.

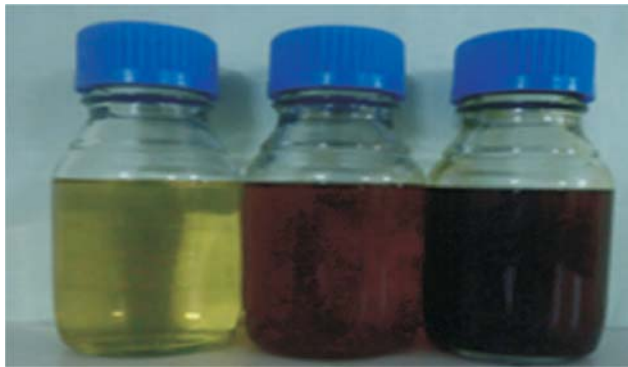


Fig. 1. AuNPs synthesized from the *P. citrinum* creation of dark pink colour confirms the synthesis of AuNPs

## RESULTS AND DISCUSSION

This study was aimed at biogenic synthesis of AuNPs from endophytic organisms separated from *S. Wightii*. The morphological reviews uncovered that the segregated endophytic parasite was *P. citrinum*. Sequential cultivation of human epidermal keratinocytes and dermal mesenchymal like stromal cells in vitro<sup>[6]</sup>. The character of *P. citrinum* was additionally verified by 18S rDNA and ITS investigation (Accession no-KT384174). Bioreduction of Au<sup>+</sup> ions to AuNPs by endophytic parasitic concentrate were done by blending the fluid concentrate of *P. citrinum* with metal gold salt at room temperature. Green Synthesis, Characterization and Antimicrobial Activity Studies of Salicylalchitosan Biofunctionalized Copper Oxide Nanoparticles<sup>[7]</sup>. The response was observed for a few hours. Arrangement of GNPs was affirmed as the shading changed from yellow to rosy violet because of the excitation of surface plasm on reverberation of AuNPs.

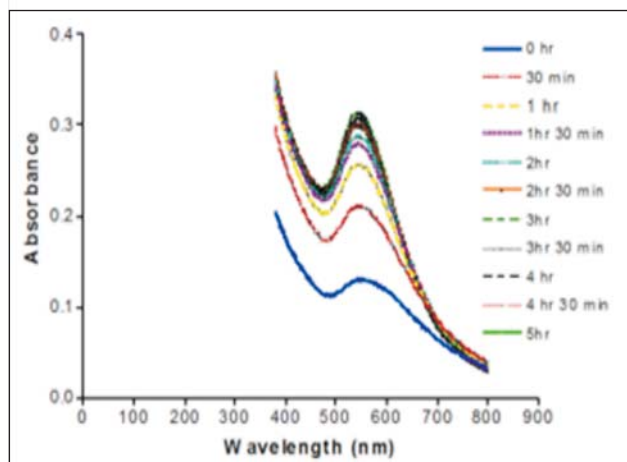


Fig. 2. UV-vis spectra absorbance value of synthesized AuNPs

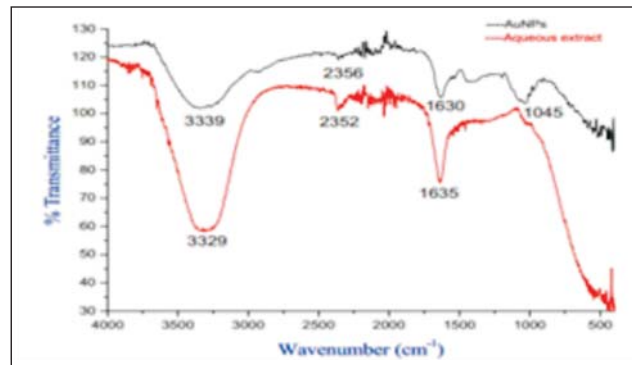


Fig. 3. FT-IR spectrum of AuNPs synthesized by *P. citrinum*

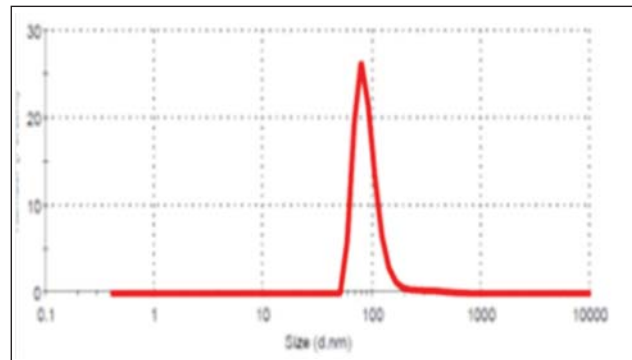


Fig. 4. Particle size distribution of the biosynthesized AuNPs

The present examination set up the successful synthesis of AuNPs utilizing ocean weed endophytes (*P. citrinum*) for the principal time. The AuNPs synthesized by green method. The results of this review demonstrated that the AuNPs delivered by bio decrease were inside the 100 nm size range. This study provided the stage to synthesize the AuNPs with a straightforward and cost-effective and environment-friendly method.

**Ethical Clearance:** Taken from...AMET University.

**Source of Funding:** Self

**Conflict of Interest:** NIL

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# Biological Interactions of Endophytic Fungi and their Applications in Various Fields

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## ABSTRACT

Endophytic fungi are naturally adapted to within the tissue of the plants without harmful effect to the host plants. It protects the host plants through secretion of secondary metabolites under the stress condition. Endophytic fungi are a symbiotic association. Hence, biological interaction is also useful to the human beings due to this interaction create the novelty to explore the biotechnological applications in field of pharmaceuticals, agricultures and industries. Therefore, further research to understanding the mechanism of interaction involved between endophytic fungi and plants is needed.

**Keywords:** Endophytic Fungi, Host Plants, Biological Interaction, Symbiotic, Biotechnological Applications

## INTRODUCTION

Recent studies show that endophytes are not host specific. Single endophytes can invade a wide host range. Studies suggest that some strains of the same fungus isolated from different parts of the same host differ in their ability to utilize different substances (Carroll, 1983). Therefore, endophytes can be isolated from different plants of the different families and classes and grow under different ecological and geographical conditions (Petrini, 1986). The host endophyte relationship may be varied from host to host and endophyte. A number of research showed that host plant and endophyte association are capable to balanced pathogen host antagonism not truly symbiotic nature (Schulz *et al.*, 1999). Certain mycorrhizae, e.g. ectendomycorrhizae, ericoid mycorrhizae and pseudomycorrhizae are indistinct (Stone *et al.*, 2004) and some mutualistic mycorrhizal fungi associated with plants of Ericaceae and Orchidaceae family have been referred to as endophytes. Past studies are recorded endophytic fungi from plants occurred in various environmental circumstances (Ganley *et al.*, 2004; Suryanarayanan *et al.*, 2005; Sraj Krzic *et al.*, 2006), with tropic, temperate, Xerophytic and aquatic. Current studies have shown that tall fescue toxicosis is mediated by a number of compounds, including clarinet alkaloids, lysegic acid amides and ergopeptines (Roberts *et al.*, 2005).

## Physiological role of endophytic fungi in nutrition transfer

Additionally, endophytes can be defined as endosymbiotic microorganisms that live in plant tissues without causing symptoms of disease. Endophytes have been found to associate with almost all plant species, and some are capable of internal migration within plant tissue to inhabit foliage, stems, and bark, as well as roots. Root-associating endophytic fungi contribute to numerous similarities with their mycorrhizal counterparts; though, most endophytes do not have an obligate biotrophic life stage and live at least part of their life cycle left of the plant (Rodriguez *et al.*, 2009). However, the mechanism of plant colonization, and the nature of the symbiosis is poorly understood when compared with mycorrhizal fungi. The ability of fungal endophytes to transfer nutrients to the host is a relatively recent discovery, and the mechanisms of this transfer are unknown (Behie *et al.*, 2012).

## Plant endophyte interactions affect metabolite production

The type of communication between an endophyte and a plant is restricted by the genes of both organisms and modulated by the environment (Moricca, 2008). The endophyte may present in a metabolically hostile environment and continuously encountering host

defense chemicals (Schulz *et al.*, 1999). Endophytic fungi from medicinal plants could be a rich source of functional metabolites. The Endophyte plant association could also be subjugated to stimulate the production of secondary metabolites by the host plant. Plants growing in adverse habitats have to be screened for isolation of endophytes and their metabolites (Raghukumar, 2008; Schulz *et al.*, 2008). The observation of the experiment indicates that endophyte infection alters pattern of gene expression in the host plant. In past endophytes from angiosperms and gymnosperms have been studied for novel secondary metabolites. Suryanarayanan *et al.* emphasis on evaluation of endophytes in lower plants, namely algae, bryophytes, pteridophytes and lichens in addition to higher plants.

### Protection of host from pathogens

Endophytic fungi are known to be a rich source of novel antimicrobial substances. The endophyte associated plants produce some metabolites that induce resistance. It was found that symbiotic plant activates defense system more quickly than non-symbiotic plants after pathogen challenge. Endophytes may contribute to their host plant defenses against phytopathogenic organisms through plant physiology control (Giménez *et al.*, 2007). An increase in plant growth will prevent a variety of abiotic and biotic stresses, reflecting plant vigor or persistence and considered as a potential protection to pathogen challenge (Kuldau and Bacon, 2008). Many studies recently found that endophyte fungal has the ability to protect the host from diseases and limit the damage caused by pathogen microorganism (Arnold *et al.*, 2003; Ganley *et al.*, 2008). The common methods of these researches were *in vitro* coculture with pathogens and endophytes, or comparison of the survival rate of plant inoculated with fungal endophytes with endophyte-free plant.

Hyperparasites is another ecological strategy that endophytes provide to protect host plant. In hyper parasitism, the pathogen is directly attacked by a specific endophyte that kills it or its propagules. Fungal endophytes parasitize around hyphae of pathogens by various means as twisting, penetrating the hyphae of pathogens and secreting lyase to decompose cell wall of pathogens. For example, *Trichoderma* are able to parasitize hyphae of plant pathogen *Rhizoctonia solani* and many of these observations are linked with biocontrol (Grosch *et al.*, 2006). In contrast to hyper parasitism, microbial predation is a more general way to suppress plant pathogens. Some endophytes show predatory behavior under nutrient-

limited conditions. For example, *Trichoderma* produce a range of enzymes that are directly used against cell walls of fungi to utilize the fragment of pathogens (Benhamou and Chet, 1997).

### Role of endophytes in abiotic stress tolerance

Researchers have shown that some endophytic fungi are able to protect their host plant from drought conditions (Clay *et al.*, 2002). Also salt tolerance is observed in plants infected with endophytes. Endophytic fungi also increase heat tolerance in their host. So it can be said that endophytes acts as a biological trigger to activate the stress response more rapidly and strongly than non-symbiotic plants (Redman *et al.*, 2002). Generally speaking, plants are relatively sensitive to high levels of abiotic stresses such as drought, high salt, and extreme low/high temperatures, therefore, they are less able to survive and thrive in extreme environments. However, when an association between a plant and a mycorrhizal or endophytic fungus is established in an extreme habitat, the plant together with the habitat-adapted fungal endophytes, are able to survive or even thrive in that environment. Without the fungal endophytes, the same plant is unable to endure habitat-imposed abiotic and biotic stresses (Redman *et al.*, 2011).

### The importance of endophytic fungi in grasses

The importance of endophytic fungi in grasses has been understood better than non-grass endophytic fungi (Hyde and Soyong, 2009). The endophytic fungi of non-grass endophytes are important because of deterring or decreasing insect herbivory, enhancing drought/disease resistance in plants and increasing plant growth. Besides these facts, opined that production of herbicidally active metabolites by endophytic fungi is higher than phytopathogenic and soil fungi. Most of the world's plant species are strongly associated with an endophyte. It is very unlikely that there are any plant species that are not associated with a fungal species (Cheplick & Faeth., 2009). There are at least 80 grass genera and several hundred grass species that are known to host endophytes (Clay, 1990). Meadow fescue (grass) infected by a seed-fungus of the darnel (*Lolium temulentum* L.) was reported to systemically form extensive hyphal layers 13 within the plant's seeds and to be transmitted in this way (Freeman, 1904). It was also suggested that this seed-fungus may be linked to the production of harmful substances within the host plant, but there was little evidence to support this hypothesis. However, about

70 years later, researchers in the USA and New Zealand investigated tall fescue (*Festuca arundinacea* Schreb.) and perennial ryegrass (*Lolium perenne* L.) infected by *Epichloë coenophiala* and *Epichloë typhina* var. *lolii* respectively. Both research groups independently demonstrated that these endophytes were responsible for producing alkaloids that were harmful to herbivores that fed on the host plants (Moon *et al.*, 2000).

### Role of Endophytic fungi in host plant

In the 1970's, endophytes were considered to be neutral as they were believed to neither cause any harm nor benefit the plant. However, in the course of time, many studies revealed that endophytes play an important role in host protection against predators and pathogens (Azevedo *et al.*, 2000). The stability or the variability of the asymptomatic interaction depends on numerous factors such as environmental stress, senescence of the hosts, virulence of the endophytes and the host defense response (Schulz and Boyle, 2002). The molecular and biochemical basis for the exchange from endophytic to parasitic lifestyle are characterized by an imbalance in nutrient substitute that can explain why colonization of different hosts can cause a fungus to adopt contrasting lifestyles. In this regard, *Colletotrichum magna*, a fungal pathogen which provokes anthracnose in cucurbit plants, exercises an endophytic lifestyle when growing asymptotically on an assortment of non-cucurbit species (Hahn and Mendgen, 2001; Redman *et al.*, 1999). There is adequate proof that endophytic fungi play an important role in host plant physiology.

### New bioactive secondary metabolites from endophytic fungi

Many endophytes have the potential to synthesize various bioactive metabolites that may directly or indirectly be used as therapeutic agents against numerous diseases (Strobelet *et al.*, 2004; Alyet *et al.*, 2010; Kharwaret *et al.*, 2011; Kusari and Spitteller, 2012b). Occasionally, endophytes that produce, host plant secondary metabolites with therapeutic value or potential have been discovered. Whereas screening endophytic fungi for new bioactive secondary metabolites which is may correspond with its respective ecological niche and continual metabolic interactions between fungus and plant which may enhance the synthesis of secondary metabolites (Rakshithet *et al.*, 2010). Novel anticancer drugs are also required due to

the high worldwide mortality rate. Many antitumor compounds possess a cytostatic activity and act by inhibiting microtubule assembly, and eventually inducing programmed cell death (Rosario *et al.*, 2008).

### CONCLUSION

Due to the abundance and diversity with the uniqueness of endophytic fungi stimulate the researchers to carry out the research to benefit the human society. Hence, to explore the novel endophytic fungi with novel potential further research is essential.

**Ethical Clearance:** Taken from AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Marine Phytoplankton Recognition based K-Nearest Neighbor Classification Method

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## ABSTRACT

Marine ecosystem has changes in indicators like marine phytoplanktons are unicellular algae with a variety of shapes and decoration. Phytoplankton recognition used a K-Nearest Neighbor (K-NN) classifier and dual layer in this study. After that classification phase, here this method used a K-NN mechanism from texture information such as moment, geometric and gray level co-occurrence matrix features and shapes also used. Each individual classifier has its own specific input feature and decision mechanism. The marine phytoplankton recognition experiments show that the proposed classification method outperforms two well-known stand-alone classifiers, K-NN.

**Keywords:** Marine Phytoplankton Recognition, Moments, K-NN classification.

## INTRODUCTION

The computer-aided recognition and classification of marine phytoplankton (see Fig.1), mostly including diatoms and dinoflagellates which are primary producer and play significant roles in marine ecosystem, has recently become one of the novel topics in the area of machine vision due to its applications for scientists with the increasing necessity for the rapid finding of marine phytoplankton in marine science research and marine red-tide monitoring, and the problems of decreasing numbers of phytoplankton taxonomists and time-consuming in microscope identification<sup>[1]</sup>.

Most essential technology is taxonomy and marine phytoplankton identification in many fields, such as monitoring a red-tide. Red tides are normal phenomena in which fast multiplication of microscopic, unicellular algae consequences in the tint of seawater. It is initiated by a grouping of the massive development and aggregation of Red-tide species. For instance, species of *Akashiwo sanguinea* developed into a red-tide in Xiamen sea area, but some other red-tide species can cause a massive local fish kill<sup>[2]</sup>.

In this paper also described in, Studies on the Development of Biocatalyst for Removal of Calcium from Water. Plant Growth Promotion Potential of Heavy Metal Resistant Bacteria From The Sewage Contaminated Coovum River. Controllability of impulsive neutral functional integrodifferential inclusions with an infinite delay<sup>[7]</sup>.

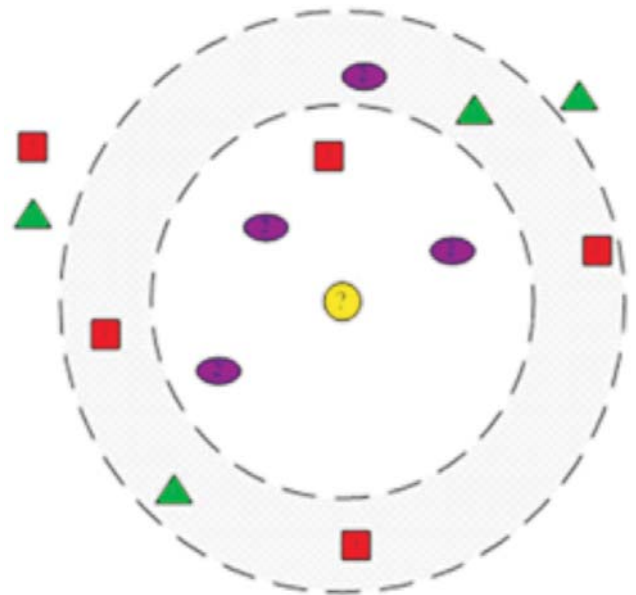


Figure 1 K-NN classification

## RECOGNITION SYSTEM

Digital microscope technology was used to obtain 1300 phytoplankton images belonging to 35 phytoplankton genera and for establishing a marine phytoplankton database with taxonomy information of individual species. These databases are used as retrieval database and training sets. Generally, shape gives a first impression while humans distinguish different objects, then the details for example textures, provide particular information. In the marine phytoplankton recognition system, we use dual layer classifier. The first-layer

classifier called shape coarse classification, it divide phytoplankton into five shapes (different shapes are also shown in Fig. 1)<sup>[8]</sup>. The second-layer classifier is composed of five independent classifiers (experts), and each classifier has its particular classification mechanism which fit for respective class.

### SOME FEATURES IN SYSTEM

The main focus on this section is to introduce the features extracting from marine phytoplankton images in the system, including shape features and texture features. These different combinations of the features would help to classify in different classifiers<sup>[9]</sup>.

#### Hu Moments

One approach to describe contours is based on moments. Hu has defined seven of moment (HM) invariants computed from central moments which are invariant under translation, scaling and rotation<sup>[4]</sup>.

#### Zernike Moments

Zernike moments (ZM) are kinds of orthogonal complex moments. Let  $f(x, y)$  be an image intensity function, and the ZM are defined by<sup>[3]</sup>.

#### Gray Level Co-occurrence Matrixes

In real applications, the shape information is often not enough to distinguish all kinds of marine phytoplankton. Their texture apparently helps (see phytoplankton with same shape in Fig. 1). Haralick introduced the gray level co-occurrence matrix (GLCM) as one statistical method for analysis and description of texture<sup>[5]</sup>. Gave the result that the best performance was GLCM by contrasting with three other texture measurement methods—Fractal Dimension, Markov Model and Gabor filter.

#### K-nearest Neighbor Algorithm

K-NN algorithm is among the simplest of all machine learning algorithms. An object is classified by a preponderance vote of its neighbors with the thing being assigned to the class most common amongst its k nearest neighbors [6].

### EXPERIMENTAL RESULTS

All experiments are tested base on our marine phytoplankton images database, and all training sets are random selected from the database and the results are given by being recurring 5 times in order to make results self-regulating of the learning base draw. The proposed method are compared with stand-

alone methods including K-NNs-only and retrieval-only methods, it can be seen that the dual layer and K-NN classifier

### CONCLUSION

In this paper, a dual layer and K-NN classifier using in marine phytoplankton images recognition system is proposed, it is based on K-NNs mechanisms, then it used texture and shape features such as geometric, moments features and gray level co-occurrence features. As envision, the classifier performed better by comparing with stand-alone classifier in our initial experiments.

**Ethical Clearance:** Taken from...AMET University.

**Source of Funding:** Self

**Conflict of Interest:** NIL

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# Esterification of Oxalic Acid with Ethanol Using Mesoporous MgAlPO<sub>4</sub> Catalyst

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## ABSTRACT

Esterification of oxalic corrosive with ethanol utilizing novel mesoporous Mg substituted aluminophosphate (MgAlPO<sub>4</sub>) as impetus was done in fluid stage. The impact of certain response conditions like temperature, time, impetus measurements on ethanol transformation, molar proportion of reactants and selectivity of item was considered. The substitution of magnesium in the AlPO<sub>4</sub> structure creates high quality of bronsted corrosive destinations. This correction makes the impetus to be exceedingly dynamic towards esterification of oxalic corrosive with ethanol.

**Keywords:** Ethanol, Aluminophosphate, Magnesium, AlPO<sub>4</sub>.

## INTRODUCTION

The esters of oxalic corrosive have adequate applications in the field of natural science. In natural buildup responses, the dialkyl and alkyl oxalates are utilized as effective reagents<sup>[1]</sup>. These alkyl oxalates additionally experience diminishment responses<sup>[2]</sup> bringing about the items like alkyl glycolates and ethylene glycol which are modernly essential<sup>[3]</sup>. In the customary technique for amalgamation of oxalates, natural solvents, solid acids and valuable metals, for example, Pd, Pt, Rh and so on upheld impetuses are utilized to upgrade the esterification<sup>[4]</sup>. These sorts of impetuses are expensive, unrecyclable and furthermore produces undesirable condition. A few different heterogeneous impetuses utilized as a part of the esterification responses contained heteropolyacids, particle trade saps, zeolites and so forth. In spite of the fact that these strong corrosive impetuses are discovered dynamic for the esterification responses, the low warm strength and high level of arrangement of side items make the impetuses wasteful. Consequently, visit endeavors have been made keeping in mind the end goal to supplant these disadvantages by thermally steady, exceptionally acidic, huge pore heterogeneous impetuses<sup>[5]</sup>.

Metal substituted mesoporous aluminophosphates are the developing heterogeneous impetuses utilized as a part of the quantity of engineered natural responses. The high warm soundness and acidic nature of these

materials make a few corrosive catalyzed natural responses conceivable. Along these lines, in this present examination, magnesium substituted aluminophosphate has been utilized as a strong corrosive impetus for the union of mechanically valuable esters of oxalic corrosive.

## MATERIAL AND METHOD

The MgAlPO<sub>4</sub> was incorporated by the past report<sup>[6]</sup> utilizing a basic aqueous strategy with the gel sythesis of 0.8Al<sub>2</sub>O<sub>3</sub>:1P<sub>2</sub>O<sub>5</sub>:0.2MgO:0.5SDS:300H<sub>2</sub>O. Esterification response was done in a clump reactor fitted with a reflux condenser and a thermometer. The ethanol and oxalic corrosive blend was included with MgAlPO<sub>4</sub> impetus. After the culmination of the response, the response items were isolated from strong MgAlPO<sub>4</sub> impetus by filtration and the item was broke down by gas chromatography (Chemito 1000). The impact of response conditions like temperature, contact time, impetus measurement and molar proportion of the reactants were concentrated to improve the greatest ethanol change<sup>[7]</sup> and item selectivity.

### Effect of reaction temperature:

The impact of response temperature was explored by differing the temperature from 50 to 200oC at liquor to corrosive mole proportion of 3:1 for 6h. The outcomes in the table 1 unmistakably portrayed the transformation of ethanol expanded with the expansion of temperature. At 50 and 100oC, a peripheral increment

in transformation was watched and the selectivity of the ester was observed to be low. This infers the response was unfeasible at bring down temperatures. With the bring up in temperature from 150 to 200oC, a gigantic increment of transformation as for ethanol was watched.

Additionally, the selectivity of diethyl oxalate likewise expanded. This enormous increment in transformation and selectivity regarding temperature was because of the expansion of movement of the impetus at higher temperatures. The higher temperature advances the portability of the H+ locales in the impetus. This makes the reactants to likely shape diethyl oxalates.

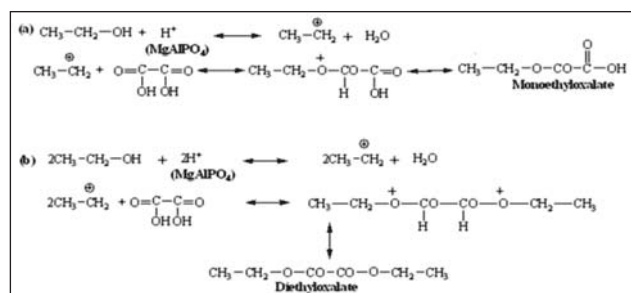


Fig.1. Schematic representation of formation of monoethyl and diethyl oxalate using MgAlPO4 catalyst

Table 1. Effect of reaction temperature on esterification of oxalic acid over MgAlPO4

Temp (°C)	Conversion of ethanol (%)	Product selectivity (%)	
		Ethyl	Diethyl
50	25	47.3	52
100	27	39.2	60.4
150	88	9.1	91.5
200	90	8	91.7

Table 2. Effect of reaction time on esterification of oxalic acid over MgAlPO4

Temp (°C)	Conversion of ethanol (%)	Product selectivity (%)	
		Ethyl	Diethyl
2	85	7.6	90.8
4	89	7.8	91.3
6	90	8	91.7
8	92	8.8	91.1

### RESULTS

The integrated MgAlPO4 have greater corrosiveness, warm security (1200oC) and substantial pore estimate (pore dia=28.7nm). These properties make the impetus more dynamic towards the esterification response.

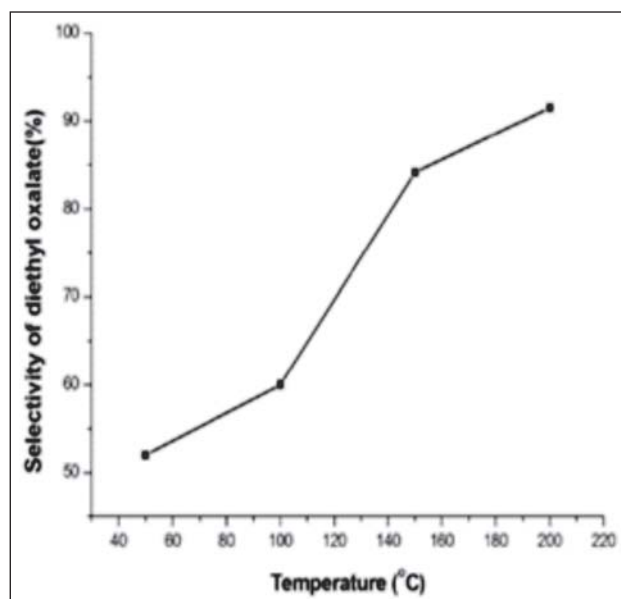


Fig. 2. Effect of reaction temperature Vs selectivity of diethyl oxalate

### CONCLUSION

The effective natural reagents monoethyl and diethyl oxalates were effectively incorporated in an eco-accommodating strategy by utilizing mesoporous MgAlPO4 strong corrosive impetus. The different trial conditions like temperature, time, molar proportion and impetus stacking are analyzed so as to achieve the most extreme change of ethanol and selectivity of the items. The outcomes affirmed that the diethyl oxalate is the real item however at brings down impetus stacking somewhat upgrades the selectivity of monoethyl oxalate. In this manner, another green approach has been built up for the combination of alkyl oxalates.

Ethical Clearance: Taken from.....AMET University

Source of Funding: Self

Conflict of Interest: Nil

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# Production of Food Processes Monitoring Using Remote Supervision

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## ABSTRACT

This paper shows a remote watching system in perspective of the SCADA illustrate (Supervisory Control and Data Acquisition), especially made for robotized era frames in a food association. The goals described for this wander were the checking of three creation lines and six storage facilities of rough materials, close by the sign/appraisal of three execution measures asked for by the association: era rate, squeezed sum and OEE (Overall Equipment Effectiveness). The made system should in like manner consolidate other normal SCADA functionalities, specifically alerts organization, handle slanting and data logging. The associated approach incorporated the quick and dirty examination of the present motorization systems, the helpful assurance of the remote checking structure and the relating execution (using the LabVIEW organize), test and endorsement. The wander took around six months and the system was successfully realized in one of the association's plants. Each one of the objectives was expert.

*Keywords: OEE, Creation, SCADA, LabVIEW*

## INTRODUCTION

To confront the perpetually developing aggressiveness of the present markets, organizations need to enhance the execution of their creation frameworks by exploiting every single existing asset. Fitting checking frameworks can be created keeping in mind the end goal to obtain the information essential not exclusively to guarantee the best possible working of the generation forms, additionally to permit the investigation of the procedures conduct along a particular day and age (slanting), by registering an arrangement of execution measures<sup>[1]</sup>. This examination can give a huge contribution to the advancement of further upgrades on the generation forms, in particular as far as proficiency<sup>[2]</sup>. In the exceedingly directed sustenance industry the information securing for observing generation procedures is of imperative significance. It is critical to screen the key factors required in these procedures, along these lines recognizing any inevitable issues that may jeopardize the consistence of the last item<sup>[3]</sup>.

The principle goal of this paper is to exhibit a SCADA based framework for remote checking of three generation lines and six storehouses of crude materials

in the Frulactnourishment organization (Portugal), executed with the LabVIEW improvement stage<sup>[4]</sup>. The LabVIEW's DSC (Datalogging and Supervisory Control) module is investigated keeping in mind the end goal to evaluate its sufficiency for the venture. Other than the observing of a few procedure factors (e.g. temperature, weight, weight in process and mixing speed), the planned functionalities include: cautions administration, handle drifting and information logging. Besides, three execution pointers were particularly asked for by the organization: creation rate, pressed weight and OEE<sup>[5]</sup>.

## LITERATURE REVIEW

Producing forms in the sustenance business are normally difficult to robotize due to their non-consistency, high changeability of crude materials and furthermore to the shortage of sensors for constant checking of the key factors. Along these lines, the presentation of PC helped frameworks in this sort of industry has been slower than in different process enterprises <sup>[6]</sup>. Notwithstanding, the need to stay focused in today's turbulent markets drove the organizations to put resources into the usage of

robotized creation frameworks. Truth be told, a noteworthy advantage of mechanization and process control is the capacity to create a given scope of items in a reliable way [7], giving the most satisfactory programming and equipment arrangements that can be altered and redesigned by the organization needs. A Green Approach based on Synthesis, Characterization and Antimicrobial Activities of Turmeric Curcumin and Curcumin Stabilized Zinc Nanoparticles is discussed in [8].

### SYSTEM DESIGN AND IMPLEMENTATION

The system architecture is depicted in Fig. 2. The SCADA application uses client-server communication. The PLCs acquire the process data on each production line as well as the signals from the sensors installed on all the raw material silos. The PLCs are linked via Ethernet to the server application, which records the data on a MySQL database (DB) and the alarms on the Citadel DB [9].

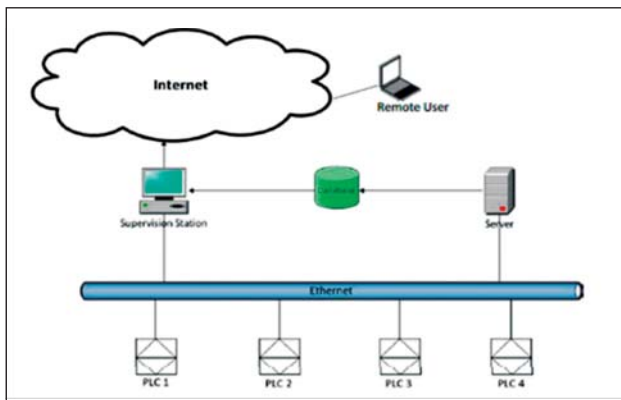


Fig. 1. System architecture.

The system can be configured with multiple servers for redundancy purposes. Therefore, on an eventual problem with one server, others would be available.

Specific LabVIEW applications were developed for the Server, the Supervision Station, and the Remote User access. The LabVIEW applications (named Virtual Instruments-VI) comprise a front panel, i.e. the user interface, and a block diagram, representing the program code, on the G graphical language. The LabVIEW Database Connectivity Toolkit supports the use of SQL databases. This toolkit has a full range of SQL functions and allows ODBC connections with SQL databases.

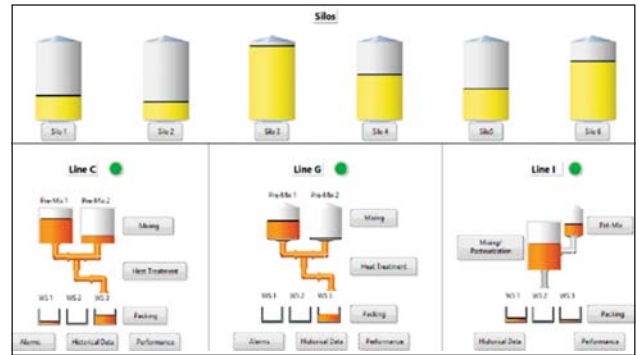


Fig. 2. HMI VI Control Panel for the SCADA application.

The remote access to the supervision application was empowered utilizing LabVIEW remote boards. The primary VI (running on the supervision station) front board, represented on Fig. 2, universally speaks to the framework continuously. The top part shows the status of the storehouses and the base part the three creation (lines C, G and I). Every generation line comprises of various operations executed in three workstations (WS1 to WS3). Alerts observing, access to verifiable information and execution pointers are accessible for every one of the three creation lines. Various subVIs is summoned from inside the primary VI, each of which particularly tending to single creation procedures or functionalities.

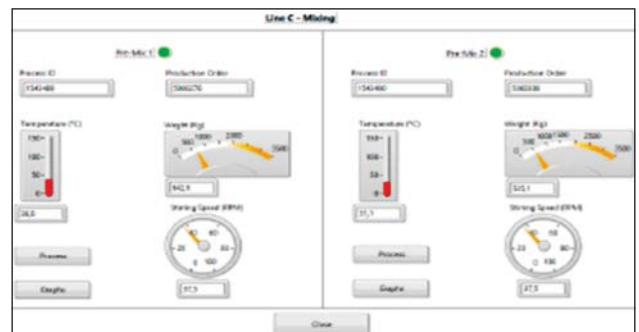


Fig. 3. Process monitoring at Line C.

### DRIFTING

The drifting usefulness, accessible in LabVIEW under the Historical Trend work, empowers the entrance to the Citadel DB of a given procedure, and specific process stages, over a given time span. This gives a chart of the verifiable development of the important shared factors inside the predefined time allotment, or, something else, the ongoing information from the common factors, starting with information from the begin of the day. This usefulness empowers the recognition of patterns on the information (factors)



which may show conceivable anomalous circumstances at short to center term, in this way empowering for earlier prudent activities from the line administrators or site supervisors.

**Ethical Clearance:** Taken from...AMET University.

**Source of Funding:** Self

**Conflict of Interest:** NIL

## ALERTS

Various basic process factors were distinguished, e.g. the temperature of the warmth treatment ought to consent as far as possible. LabVIEW empowers the enactment of logging and disturbing functionalities by designing the properties of shared factors. This empowers the enrolment of variable values on the Citadel DB, the activating of visual alerts on the application HMI, among others. Fig. 5 shows the event of one such caution on line G. Here, this occasion triggers a visual caution (the pipe changes from dark to red and the warmth treatment catch flashes red).

## CONCLUSION

It is clarified the outline and sending of a remote SCADA framework on an office of a noteworthy player of the sustenance business. The utilization of Key Performance Indicators was ordered and its reason clarified remembering the field of use and its importance on the business. It was likewise clarified how the observing framework could be extended or duplicated to other area offices, how it could be incorporated on the current framework and the assessed exertion on doing as such. Correlation with different arrangements was endeavored yet not conveyed to a perfect state worth specifying.

The SCADA frameworks hold a vigorous engineering that meet all requirements for a dynamic extension, while giving various level convenient information, which empower the acknowledgment of significant worth included exercises and applicable basic leadership over the association, i.e. strategic and operational levels. The outline standards, the chose advancement toolbox and the application specifics, can be attainably connected to other creation offices, which require the remote control and observing of generation procedures. Regarding future work, other than the likelihood of utilization in various offices, the framework created can be enhanced with the goal that it can likewise intercede in the procedures (e.g., reaction activity to a caution event).

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# Hydrogen Production VIA Catalytic Decomposition of Methane

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## ABSTRACT

Methane decay on different Ni-bolstered impetuses has been examined as a strategy for generation of sans co hydrogen for use in energy components. The low levels of CO shaped because of the collaboration of surface carbon (framed from methane disintegration) with the help have been quantitatively investigated (part per million levels) by methanation of the CO and consequent examination by fire ionization location (FID). This examination highlights the reliance of the sort of carbon shaped and the measure of CO developed on the idea of the help. No filamentous carbon was seen on Ni/H-ZSM-5 at hoisted methane deterioration temperatures, though Ni/HY and Ni/SiO<sub>2</sub> indicated filamentous carbon arrangement over the whole temperature go examined (723 K to 873 K). While two types of carbon (carbodic and graphitic) were seen on the Ni/SiO<sub>2</sub> after methane disintegration at 723 K, just graphitic carbon was seen at 823 K. The rate of CO development was seen to be most elevated on Ni/H-ZSM-5 and least on Ni/SiO<sub>2</sub>. The CO arrangement rates demonstrated a typical pattern for every one of the impetuses: high starting rates taken after by a lower balanced out rate. The CO development rates were found to increment with expanding temperature. The CO content in the hydrogen stream was ca. 50 ppm and 250 ppm for Ni/SiO<sub>2</sub> and Ni/HY, individually, after the CO creation rates settled. The low levels of CO combined with the dependability of the impetuses for methane decay make this a fascinating theoretical process for hydrogen creation for energy component applications. Recovery considers have demonstrated that there is no loss of movement for methane deterioration at 723 K on Ni/H-ZSM-5 over numerous response cycles.

**Keywords:** Methane, Ni/SiO<sub>2</sub>, CO, Ni/H-ZSM-5.

## INTRODUCTION

Power modules being earth favorable and very efficient speak to an energizing type of innovation for changing over the synthetic vitality of a fuel straightforwardly into power. Methane (the principle constituent of gaseous petrol)<sup>[1]</sup>, because of its expansive wealth and high C/H proportion, is a perfect wellspring of hydrogen (which is the best known essential fuel for power devices). Phosphoric corrosive power devices, which are the most monetarily created energy units,<sup>[2]</sup> don't endure CO focuses over 1.5%. The sans co prerequisite of the hydrogen stream is significantly more stringent (ppm level) for the all the more as of late created proton trade film (PEM) energy units<sup>[3]</sup>. Customary procedures, for example, steam improving of methane, fractional oxidation, and autothermal changing (1–4) deliver noteworthy measures of CO alongside hydrogen. Expulsion of CO from the hydrogen stream

expands the many-sided quality as well as is very unfavorable to the aggregate procedure financial aspects<sup>[4]</sup>. It is thusly important to investigate different options for the generation of without co hydrogen.

## EXPERIMENTAL

### Catalyst Synthesis

Ni impetuses bolstered on H-ZSM-5, HY, and SiO<sub>2</sub> were blended by customary wet-impregnation with an ostensible metal stacking of 10 wt%. Ni(NO<sub>3</sub>)<sub>2</sub> • 6H<sub>2</sub>O (sum relating to 10 wt% Ni in the impetus was utilized for impregnation) salt was utilized as the wellspring of Ni metal and for each situation the impregnation method was performed at room temperature. H-ZSM-5 (Code No. DAZ-P; Si/Al = 500; surface region, 400 m<sup>2</sup>/g; and pore volume, 0.18 cm<sup>3</sup>/g) and NaY (Code No. DAY-P; Si/Al = 100; surface region, 700 m<sup>2</sup>/g; and pore

volume, 0.3 cm<sup>3</sup>/g) were gotten from Degussa and SiO<sub>2</sub> (Cab-O-Sil; surface range, 325 m<sup>2</sup>/g; and surface thickness of hydroxyl gatherings,<sup>[5]</sup> 3.055 nm<sup>2</sup>) was acquired from Cabot Corp. NaY was changed over to HY by means of watery particle trade (ammonium hydroxide arrangement). The technique was rehashed 3–6 times to accomplish a high level of particle trade<sup>[6]</sup>. Preceding stacking Ni on silica, the silica was calcined overnight at 823 K. After impregnation, the impetuses were dried overnight at ~373 K and afterward calcined at 823 K for 4 h.

### RESULTS

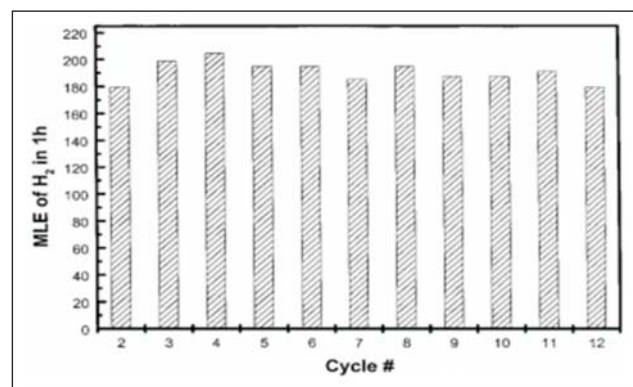
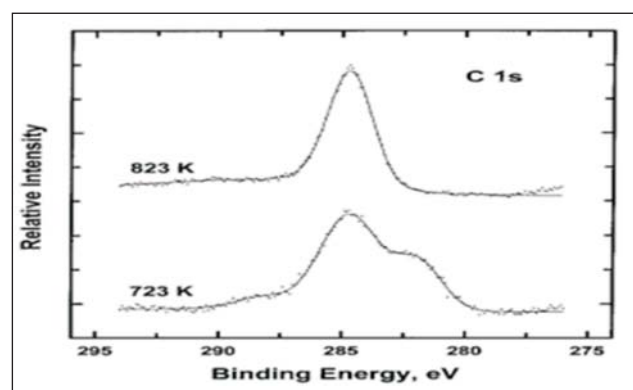


Fig. 1(a). and 1(b). Synthesis Result for Energy and Frequency characteristics

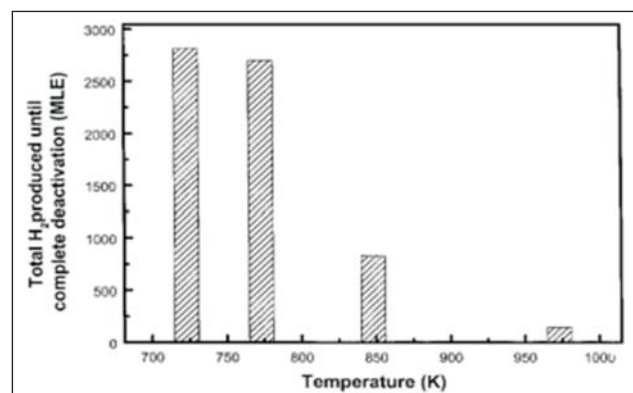


Fig. 2(a)

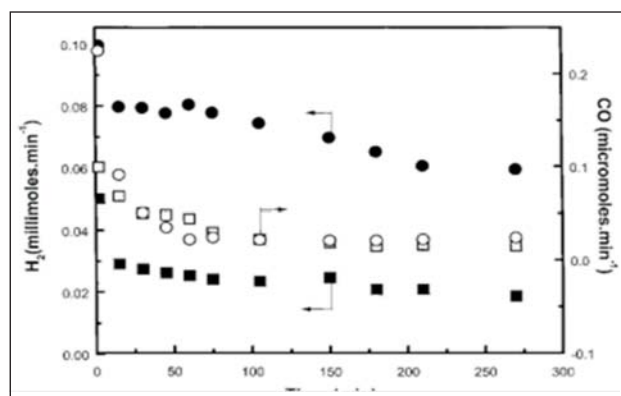


Fig. 2(a). and 2(b). Synthesis Result for Temperature characteristics

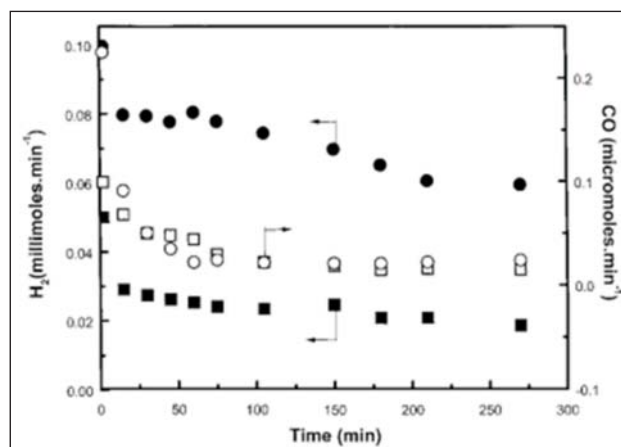


Fig. 3. Synthesis Result for time analysis

### CONCLUSION

Methane decay on different Ni-upheld impetuses uncovered that there was a solid reliance of the idea of the surface carbon and CO arrangement rates on the idea of the help. At high temperatures an exemplifying sort of graphitic carbon was seen on Ni/HZSM-5 while Ni/HY and Ni/SiO<sub>2</sub> demonstrated the nearness of filamentous carbon, which brought about a more prominent lifetime for the last two and a quick deactivation for the previous. The carbidic type of carbon was available at low temperatures (<723 K) yet truant when higher temperatures were utilized (>773 K) on all impetuses. The CO content in the hydrogen stream was observed to be most elevated on Ni/HZSM-5 and least on Ni/SiO<sub>2</sub>. When all is said in done, CO arrangement rates were high at first yet diminished quickly with time and after that stay unflinching until impetus deactivation. The measure of CO in the hydrogen stream settled at ca. 250 ppm and 50 ppm for Ni/HY and Ni/SiO<sub>2</sub> at 823 K. Recovery contemplations have demonstrated that Ni/H-ZSM-5 holds its synergist movement for methane decay over

various response cycles at 723 K. Future investigations tending to oxidative and steam recovery are at present under way.

**Ethical Clearance:** Taken from AMET University

**Source of Funding:** Self

**Conflict of Interest:** Nil

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# A Survey Approach Offrontal Face Estimation from A Low Resolution Video Sequence

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## ABSTRACT

Sustaining low-quality pictures from low spending plan observation cameras, to frameworks like, e.g., face acknowledgment, produces wrong and temperamental results. In this way, we requirement for a instrument to cross over any barrier between low-determination, low quality pictures and facial investigation frameworks. The face is one of the most imperative remote biometrics and is generally utilized in numerous facial investigation frameworks, similar to face acknowledgment, human- PC association, et cetera. True difficulties of these frameworks are that they have issue with low determination pictures. In this way, our methodology is to apply a remaking based super resolution calculation. It has two fundamental issues: First, it requires moderately comparable pictures and second is that its change element is constrained by a component near two. To bargain with the first issue, a three-stage approach which delivers a face-log containing pictures of comparative frontal countenances of the most astounding conceivable quality. To manage the second issue, restricted change variable, we utilize a learning based super-determination calculation connected to the after effect of the remaking based part to enhance the quality by another variable of two. The proposed framework can to be sure deliver a high determination and great quality frontal face picture from low determination feature success.

**Keywords:** Face Quality Assessment, Face Log Generation, Super Resolution, and Surveillance Video

## INTRODUCTION

High determination pictures are constantly needed. Hence, having a automated framework working with LR and low-quality face pictures is attractive. On the other hand, low-quality pictures don't have enough high-determination (HR) subtle elements for facial investigation frameworks and utilizing them straightforwardly as a part of these frameworks is not dependable. Hence, we require a system for connecting this hole between LR pictures and facial investigation frameworks. Superresolution (SR) is one of such systems for acquiring a high determination picture from all the more low determination info pictures. SR calculations are characterized into two classes: Reproduction based SR (RBSR) <sup>[1]</sup> and learning-based SR (LBSR). High resolution image formation from low resolution frames using Delaunay triangulation is represented in <sup>[2]</sup>. Reconstruction based SR calculation work with more LR info pictures. The main RBSR framework was a recurrence area calculation proposed by <sup>[3]</sup>. Spatial area answers for RBSR were later created and determined in <sup>[4]</sup>. These techniques have better contemplations for clamor and obscure than the recurrence area

approaches. A multi-frame image super-resolution method is presented in <sup>[5]</sup>. These strategies for the most part vary in three focuses: enrolment calculation, the strategy for acquiring the last reaction of the framework and the regularization system. Other RBSR strategies include: no uniform addition (NUI) <sup>[6]</sup> based approaches, projection onto an arched set <sup>[7]</sup> systems, most extreme probability (ML) <sup>[8]</sup> says that the paper analysis of water trees and characterization techniques in Xlpe Cables. Strategies, greatest a posteriorsystems, to give some examples. Computational expense of NUI systems is low yet they can't utilize the corruption models if commotion and obscure are distinctive in the LR pictures. POCS routines are anything but difficult to utilize however they have high computational expenses, moderate union and issues in delivering an one of a kind reaction. Constructing face image logs that are both complete and concise is determined in <sup>[9]</sup>. ML techniques essentially search for an HR picture that augments the likelihood of having the LR inputs. ML techniques are inclined to be amazingly illconditioned.

MAP techniques expressly utilizesthe from the earlier data as an earlier likelihood on the HR picture.

These techniques are additionally not well postured and need some regularization term for settling their last reaction. The change variable of the RBSR calculations is near two.

Super determination component in this paper manages this present reality issues of SR framework working with confronts originating from an observation feature succession. Such a framework has a few issues: the slight motions confinement of the articles, the poorly postured and illconditioned nature of the HR reaction, moderate joining of the framework, and little amplification elements. Land use and land cover classification of LISS-III satellite image using KNN and decision tree has been presented in [10]. Supporting all edges of a reconnaissance feature arrangement to any SR framework is unthinkable, in light of the fact that there are numerous face pictures in such a grouping that are not helpful because of issues like not changing in the head-posture, haziness, uneven enlightenment), et cetera. Counting every such picture in the process diminishes the joining velocity of the framework and makes the last reaction off base and temperamental. Accordingly, we requirement for a system to survey the nature of the recognized countenances and reject the futile ones. Besides, confronts given to a RBSR framework ought to be fundamentally the same to one another. Thus, we present a three-stage approach, which creates a face log containing pictures of comparable appearances of the most elevated conceivable quality

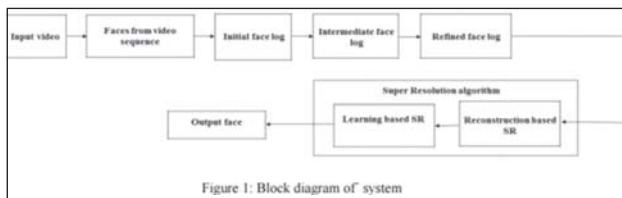


Figure 1: Block diagram of system

In the first step, we group face pictures as far as head posture. In steps two and three, we consider this introductory face log taking into account various quality and closeness measures, separately, and wind up with a refined face-sign on which the SR calculations can work. The nature of the distinguished countenances, consider four facial elements: sharpness, splendour, out of arrangement pivot and face size. For checking the similitude of the confronts, two comparability measures are utilized: basic likeness also, relationship coefficient. Image super resolution reconstruction using iterative adaptive regularization method and genetic algorithm has been described in [11]. In the recreation based part a MAP calculation and in the acknowledgment section a multilayer recognition (MLP) is utilized. The recreation

based part enhances the quality by a variable near two and the learning-based part by a variable of two. It implies that the last yield of the framework is enhanced by a variable near four. The piece chart of our framework is indicated in Fig. 1.

### FACE LOG GENERATION

In the in the first place piece of the framework, face-log era, the data feature arrangement is abridged to one [up to three face-log(s)]. The pictures inside the face-logs are fundamentally the same to one another and are of better quality contrasted with alternate pictures of the arrangement. In fell SR hinder [12], a RBSR is connected to the created face-log(s) and produces a HR picture. The quality of this HR picture is enhanced by an element of two contrasted with the LR pictures in the feature succession. This HR picture is then sustained to a LBSR to enhance it much more, semi-frontal face pictures. The other two face-logs are connected with two side-perspective face pictures of the subject. For building these three face-logs, we first utilize a head-posture estimation system that is produced for LR pictures. In view of the estimation of this element, we group face pictures of the information feature grouping into three face-logs containing frontal [13], left side-view, and right side-perspective face pictures. These face logs are meant as introductory face-logs. Each of these introductory face logs goes into the same processing's, independently.

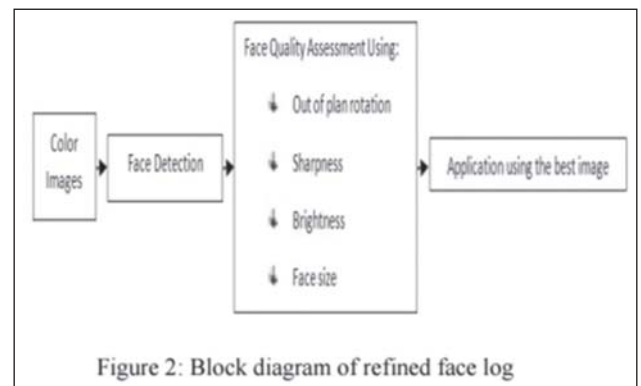


Figure 2: Block diagram of refined face log

### FACE DETECTION

Face discovery is not the principle centre of this paper but rather since a percentage of the removed components for the face(s) in this square are utilized as a part of the appraisal process as well, we quickly depict it here. Given a shading picture, most importantly, as per a Gaussian model of skin shading, a likelihood picture of the info picture is created. At that point utilizing a versatile limit, this likelihood picture is

portioned to a double one which has the skin areas isolated from the non-skin ones. Here after a falling classifier utilizing the removed elements for every area chooses if this district is a face or not. The removed elements for every face include: face size, middle of the mass and introduction of the face, number of openings inside the face, the gaps territory to its.

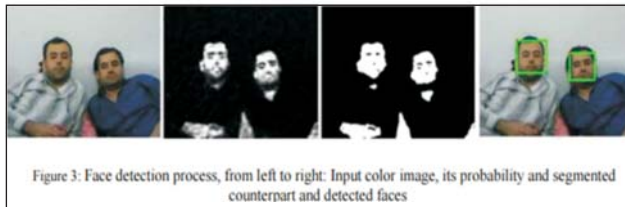


Figure 3: Face detection process, from left to right: Input color image, its probability and segmented counterpart and detected faces

### Facial component extraction

For every face locale distinguished by the Face Detection, we use both a portion of the separated elements from the face location piece, furthermore new elements to survey the quality of them. For every element we relegate a generally processed score with the goal that we can choose which picture is the best in wording of value in the given succession of pictures. The accompanying subsections depict the subtle elements of these elements and the scoring procedure.

### CONCLUSION

Top notch frontal face pictures are needed for the face examination frameworks; however normal observation features are of poor quality. In this way, the requirement for a system to connect between low quality, low-determination face pictures from feature arrangements and their applications in facial investigation framework. Super-determination is one of these instruments. Free development in such feature arrangements increments the enlistment slips and thusly is the principle wellspring of mistake for common super-determination frameworks. To manage this issue we utilized uses a face quality appraisal calculation to dispose of futile pictures in the data feature grouping and order pictures with comparable movements to the same class. It has been demonstrated that it diminishes the enrolment mistakes and enhances the aftereffects of the system a face-log era strategy that commonplace remaking based super-determination frameworks have a change component near two. Accordingly, for having change components greater than two, with the utilized remaking based calculation with a acknowledgment based super-determination. This builds the change component of the framework to very nearly four.

**Ethical Clearance:** NA

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Peak Recognition of Electrocardiogram Signals by Neural Network -A Review

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## ABSTRACT

ECG Feature Extraction assumes a huge part in diagnosing the vast majority of the cardiovascular maladies. One heart cycle in an ECG sign comprises of the P-QRS-T waves. This component extraction plan decides the amplitudes and interims in the ECG signal for consequent investigation. The amplitudes and interims estimation of P-QRS-T section decides the working of heart of each human. Various exploration and strategies have been created for examining the ECG signal. The proposed plans were for the most part taking into account Fuzzy Logic Strategies, Artificial Neural Networks Genetic Algorithm Support Vector Machines and other Signal Examination systems. Every one of these methods and calculations has their focal points and restrictions. This proposed paper examines different systems and changes proposed before in writing for separating component from an ECG signal. Likewise this paper likewise gives a similar investigation of different systems proposed via specialists in removing the component from ECG signal. This paper talks about different strategies prior proposed in writing for separating element from an ECG signal. What's more this paper demonstrates the similar investigation of technique which is utilized to check the precision of in general framework.

**Keywords:** Neural Networks, Cardiac Cycle, ECG signal

## INTRODUCTION

The most broadly utilized flag as a part of clinical practice is the ECG. It is much of the time recorded, broadly utilized for the evaluation of cardiovascular capacity. It was in this manner one of the first flags where biomedical sign preparing procedures were connected upon Biomedical Signal Processing is illustrated in <sup>[1]</sup>. ECG preparing procedures have been proposed to impact design acknowledgment Electrocardiography: Pastand future, Annals NY Academy of Sciences isdiscussed in <sup>[2]</sup>parameter extraction, spectro-worldly methods for the appraisal of the heart's status, de-noising, <sup>[3]</sup> is determined inthis. gauge amendment and arrhythmia detection. The investigation of ECG sign is broadly utilized for examination of heart diseases.ECG is utilized to quantify the rate and normality of heart thumps, the vicinity of any harm to the heart, and the impacts of medications or gadgets used to direct the heart can be related to the assistance of investigation of ECG signal. ECG signs are oscillatory and intermittent in nature. A complete ECG beat is indicated in Figure.1.

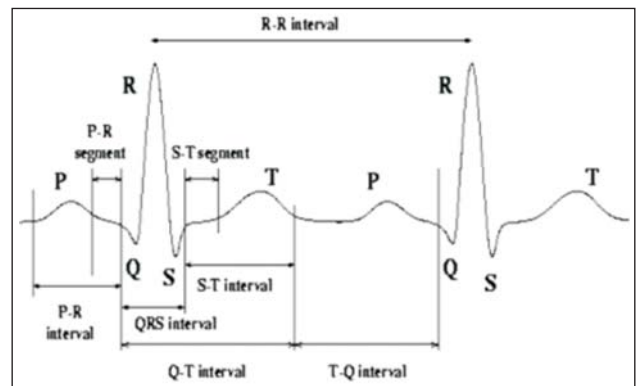


Fig. 1. Sample ECG Signal showing P-QRS-T wave

It can be seen that the ECG beat has a particular, trademark shape. One cycle of ECG sign comprises of P-QRS-T wave. Ventricular late potentials characterization in time-frequency domain by means of a wavelet transform is discussed in <sup>[4]</sup>. The critical parameters are tops adequacy, time span. So the element extraction is the principle criteria for further handling. Till now different examination and techniques had been proposed for highlight extraction of ECG signal. The different system which has been proposed incorporates



advanced sign examination, MD-TFD, in system, RCE system, ANN [5] is elaborating the Classifying Multichannel ECG Patterns with an Adaptive Neural Network. , MLP system every technique has its own particular strategy for extraction. ECG is utilized for patient .checking and analysis. Pull-in voltage study of various structured cantilever and fixed-fixed beam models using COMSOL multiphysics is presented in [6]. The separated element from the ECG sign assumes an essential part in diagnosing the cardiovascular illness. In this manner the centrality of highlight extraction is essential for the determination of any maladies. There are diverse strategies which incorporate Fuzzy Logic techniques. A multi-stage neural network classifier for ecg events is determined in [7], Artificial Neural Network, Hidden Markov Model [8], Genetic Algorithm, Support Vector Machines, Self-Organizing Map Bayesian and different techniques with every methodology displaying its own focal points and detriments. A recurrent Elman neural network - based approach to detect the presence of epileptic attack in Electroencephalogram (EEG) signal has been described in [9]. This paper gives a diagram of different strategies and changes utilized for extraction of the components from ECG signal.

### ECG Analysis for Diagnosis

Highlight extraction technique for signs utilizing wavelet change where it change simple sign to computerized one and grouping utilizing bolster vector machines was initially proposed in [10]. Taking after steps were performed, firstly pre-process the information then extricated the elements of the signs and in conclusion orders of ECG signs. Two routines were connected together to separate the elements which gives the element vector of ECG information set. To remove the coefficients of the change as the components of each ECG portion wavelet change is utilized. Simultaneously, autoregressive demonstrating (AR) is additionally connected to get hold of the transient structures of ECG waveforms. At that point at last the bolster vector machine (SVM) with Gaussian portion is utilized to characterize distinctive ECG signal heart musicality. The consequences of PC recreations came to the general precision. ECG signal classification based on statistical features with SVM classification is explained [11].

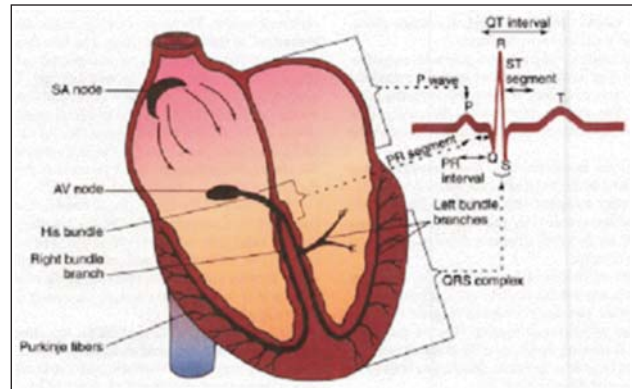


Fig. 2. Model of ECG signal generation present in the heart

In figure 2, the R wave locator of ECG sign utilizing the wavelets was created [11]. The database has been gathered from MIT-BIH arrhythmia database and the signs from Lead-II have been investigated further. The determination of point of interest coefficient d4 has been done (as it is anything but difficult to execute) taking into account the accompanying vital parameters i.e.

- **Total vitality substance of the signs**
- **Actual Frequency of the signs and**
- **Lastly Cross-relationship investigation of decay structure of ECG sign.**

Hundred records were tried for R crests. The generally speaking of discovery utilizing Daubechies (db6) and Symlets (sym11) group of wavelets are 96.55% and 83.37% individually, which are up to the mark. The significance of utilizing wavelet change helps as a part of uprooting clamor contained of the signs at every level of separating so the necessity of any preprocessing further is not required. This guarantees the handiness of the system specified. At that point it is done utilizing distinctive records of the database with clamor present in it. The outcomes with db6 are best by changing limit than sym11 which gets false crests (missed tops) [12]. The summation of the qualities from these sections gave the component vectors of single cycles. This calculation was tried on two ECG signals, the first was taken from the MIT biomedical database was deteriorated into four levels and de-noised by the ideal wavelet "sym4" with worldwide edge esteem 1.3073. This ECG sign was with nearby unusual pulse movement. The second ECG sign was recorded from a patient amid an epileptic seizure. The ideal wavelet capacity was wavelet Coiflet5 "coif5"

with worldwide edge 23.217. The three rushes of the QRS complex speak to ventricular depolarization.

Q waves compare to depolarization of the inter ventricular septum of heart too breathing and are for the most part little and flimsy in QRS complex. It prompts an old myocardial dead tissue (in which case they are enormous and wide) · The R wave reflects depolarization of the ventricles and these are the biggest influxes of QRS buildings. · The S wave is because of last depolarization of the ventricles of heart beat.

### Neural Network Based Data Processing

The presented ANN was prepared by the primary elements of the 100 ECG sign pictures of ten distinct ailments. The examples are taken from BIT-MIH site and ECG machine of Cardiologists ECG machine. The test outcomes indicated that the characterization precision of the classifier of ANN was up to 92%. The removed components of the ECG sign utilizing wavelet disintegration (Signal space change) were successfully used by ANN in delivering the order exactness of more than 90%. Another calculation for highlight extraction of ECG signs was proposed by in [10]. Here they took a shot at grouping execution of a programmed classifier of the electrocardiogram (ECG) for the recognition of strange beats of ECG signals. Right grouping of sign is critical for right forecast of heart arrhythmias. Here we concentrated on RR-interims. Design received Kohonen self-arranging maps (SOM) for examination components, grouping of sign. For the advancement of classifier SOM and learning vector quantization (LVQ) calculations are utilized on the premise of ANSI/AAMI EC57 standard.

The ECG signals (typical beat, congestive disappointment beat, ventricular tachyarrhythmia beat, a trial fibrillation beat) from the Physio-bank database were utilized here for preparing and testing of classifiers. MME classifier prepared on the three different component vectors creates preferable execution over that of the ME prepared on the composite elements. The consequences of the present study exhibited that the MME can be utilized as a part of order of the ECG signals by looking into the misclassification rates of ECG sign

### CONCLUSION

ECG has been extensively utilized for diagnosing numerous heart infections. Different strategies and changes have been proposed before in writing for

extricating component from ECG. All in all, the closer the premise capacity catches the sign attributes, the more minimized is the representation, what's more, more probable are the components delicate to applicable ECG states and heartless to varieties in unessential clamor. In this section, we have modified the fundamental elements of a ceaseless wavelet representation by picking polynomial wavelet premise works that match the attributes of a fiducially 1-beat long ECG sign example removed from the Poincare separating of ECG state space. The altered representations were observed to be approximately two requests of size more reduced (measured in term of sign entropy) than the wavelet premise capacities accessible in the standard wavelet library. Despite the fact that we can effectively ordered the heart arrhythmias.

**Ethical Clearance:** Taken from.....AMET University

**Source of Funding:** Self

**Conflict of Interest:** Nil

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# Gender Classification System Based on Wave ATOM Transform

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## ABSTRACT

Fingerprints are one of the most reliable biometrics used to identify people's characteristics. They have unique patterns and also inexpensive to collect and analyze. The proposed system deals with the classification of gender over fingerprint images based on Wave Atom Transform (WAT). In order to efficiently extract the salient features by for the classification of gender by fingerprint images and then provide the classification results using GMM classifier to evaluate the corresponding features. An efficient method for gender classification from fingerprint images based on WAT is gives the highest accuracy of about 90% at 3rd level of decomposition.

**Keywords:** Gender Classification, WAT, Features, GMM Classifier

## INTRODUCTION

The classification system for the gender classification from fingerprint images is done by various algorithms and they are reviewed below. The system discussed in <sup>[1]</sup> classifies the gender by sampling which is based on the linear subspaces and compares it by an indefinite-kernel Support Vector Machine (SVM) formulation. The classification system explained in <sup>[2]</sup> uses the active appearance model based face alignment and the local binary pattern features are extracted and classify the features by using the SVM classifier.

The system discussed in <sup>[3]</sup> for gender classification will extract the geometric and boundary features based on Zernike moments and Fourier descriptors and is classified by using the two Eigen spaces corresponding to the images. The feature selection method in <sup>[4]</sup> is based on fusion features such as minimum Redundancy and Maximal Relevance (mRMR), Normalized Mutual Information Feature Selection (NMIFS) is used for extraction of LBP features in gender classification. A classification system in <sup>[5]</sup> is based on incremental bilateral two-dimensional Principal Component Analysis (PCA) and extreme learning machine for feature extraction and is evaluated using the SVM classifier.

The gender classification system discussed in <sup>[6]</sup> is of geometric normalization and histogram equalization for features and is analyzed by using the SVM classifier.

The system in <sup>[7]</sup> uses the weighted majority voting method based ensemble Genetic Algorithm (GA) for extraction of features and is classified by k nearest neighbor classifier. The system in <sup>[8]</sup> extracts the features by PCA and GA algorithm and is classified by using the Neural Network classifier. The gender classification system in <sup>[9]</sup> extracted the Gabor wavelet transform features and is analyzed and classified by SVM classifier. Wavelets for speaker recognition using GMM classifier is discussed in <sup>[10]</sup>.

## METHODOLOGY

The proposed gender classification system classifies the given fingerprint image in to whether they belong to male or female by exploiting WAT features and GMM classifier. The schematic of the proposed gender classification model shows in Figure 1. In the feature extraction, the WAT coefficients of the fingerprint images are measured as useful features and the supervised learning of GMM is used for classification in the classification module.

## FEATURE EXTRACTION MODULE

In any classification system, feature extraction is an essential preprocessing approach. At first, the fingerprint image is represented by the WAT by decomposing it. It provides multi resolution representations of the input fingerprint based on the level of decomposition. All coefficients are considered

as features for the classification process. This method is applied to all the training images and the feature vectors are stored in the database.

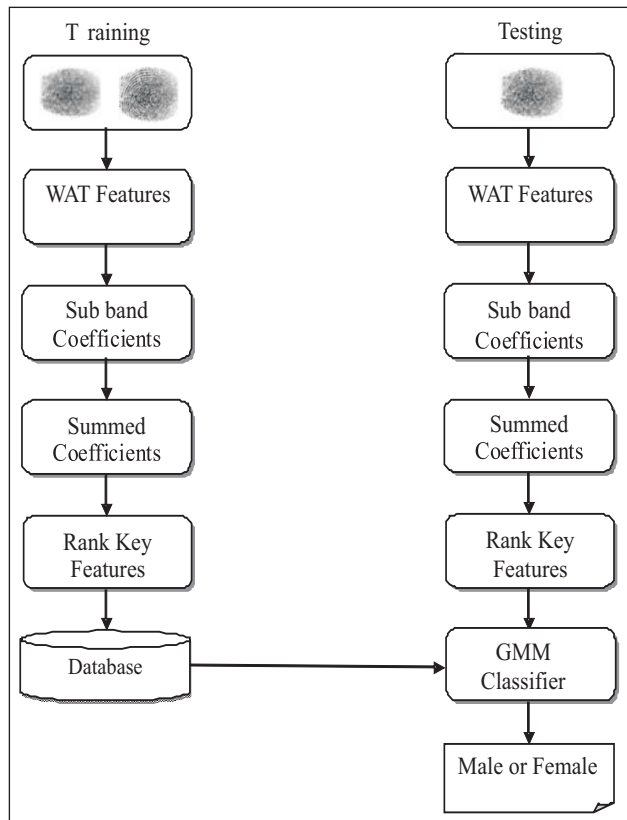


Fig. 1. Proposed gender classification system using WAT and GMM

**CLASSIFICATION MODULE**

Gender determination is employed in the classification module also named as validation stage. The unknown fingerprint image whose gender has to be classified undergoes the same feature extraction and the selected coefficients are obtained. Then, the obtained dominant features from the test image are compared with feature database by using GMM classifier. In GMM, the probability density functions are modeled as mixtures of 4, 8 and 16 Gaussian densities.

**RESULTS AND DISCUSSIONS**

The internal database used in gender classification system includes fingerprints from 50 males and 50 females of different ages. The scanner used to collect the fingerprints from the users is Fingkey Hamster II scanner of resolution 500 dpi. The size of the acquired finger print is 260x300 pixels. As the classification system requires training images for female and male category, the whole dataset is divided into two parts by equally splitting it. Among the two parts, one part is used for GMM training and another is used for testing. To analyze the proposed approach, the size of the images are resized to 128x128 and various density of Gaussian model such as 4, 8 and 16 are used. Table 1 shows the performance of the system in terms of classification accuracy

Table 1. Performance of the system in terms of classification accuracy

Size of the Input Image	Gaussian Density	# of rank features					
		1	2	3	4	5	6
128x128	4	82.18	81.33	81.60	82.11	82.21	81.31
	8	91.34	89.66	89.46	91.30	89.69	91.43
	16	95.37	95.49	95.48	95.41	95.31	95.60

It is observed from the Table 1 that over 90% accuracy is obtained while using Gaussian density of 16 irrespective of the level of decomposition with 3 selected dominant features. Hence, the proposed approach uses 3rd level decomposition with Gaussian density of 16 in GMM classifier to classify the gender of the given fingerprint.

**CONCLUSION**

In this paper, fingerprint based gender classification is presented based on UWT and GMM

classifier. The former one is used for feature extraction and later one is used for classification. The classification is analyzed by varying the number of Gaussian density and 3rd level UWT features are used. The size of the input image is rescaled to 128x128 pixels in order to decompose the image by UWT. Results show that the UWT based features gives 95.49% accuracy.

**Ethical Clearance:** Taken from AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Age Classification System by Shearlet Transform Based Gmm Classifier

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## ABSTRACT

Fingerprint plays a significant role in most consistent biometrics in identification of people's characteristics. They have unique patterns and also inexpensive to collect and analyzed. The system proposed here deals with the classification of age by fingerprint images based on Shearlet Transform and are applied to image analysis. In order to efficiently extract the salient features by for the classification of age by fingerprint images and then provide the classification results using GMM classifier to evaluate the corresponding features.

**Keywords:** Fingerprint, Shearlet, GMM Classifier, Age Classification

## INTRODUCTION

The classification system for the age classification by fingerprint images is done by various algorithms and is reviewed below. The system discussed in [1] is based Gabor features and is classified by fuzzy linear discriminant analysis Classifier. The age classification system in [2], is done by extracting the Facial features and are analyzed by back propagation neural networks. The classification system discussed in [3] is of 2D based LDA system namely PCA based LDA approach and LDA based approach.

The age classification system in [4] is based on the extraction of local binary pattern features and is analyzed in SVM classifier. Image Super Resolution Using Wavelet Transformation based on Genetic Algorithm methodology is discussed in [5]. Research [6], discussed Detection of glaucoma based on color moments and SVM classifier using k mean clustering and it is an efficient algorithm. Wavelets for speaker recognition using GMM classifier is discussed in [7].

## METHODOLOGY

In this methodology the classification system uses the fingerprint images predicts the age by using Shearlet

Transform features and classification is done based by GMM classifier. The block diagram for the age classification system is as shown in figure 1.

### Age Classification System

Automated age group classification system by using fingerprint images based on its gender is explained in this section. Three age groups; adolescence (0-20 years), younger adult (21-40 years) and senior adult (above 41 years) are categorized. The implementation is done by two successive modules; feature extraction and classification.

### Feature Extraction

The proposed system for age group classification system begins with designing feature extraction unit, which is considered as a vital step for machine learning approaches and pattern recognition. Primarily, the finger print images undergo shearlet based decomposition at various levels to symbolize the fingerprints in the form of multi-resolution analysis. The extracted sub bands are added to give a new sub band and are said to be as feature for classification scheme. The action is repeated for all the training images and the extracted features are stored as feature database which is later used for classification.

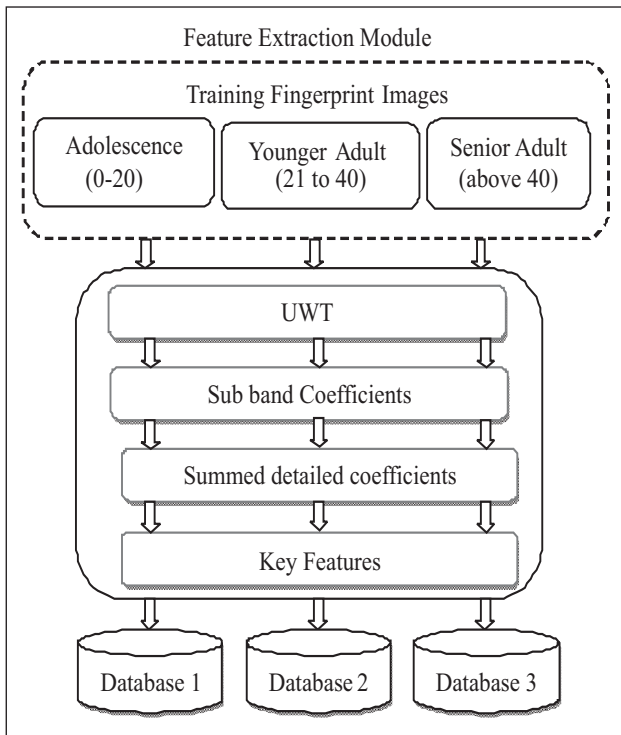


Fig. 1. Block diagram of the age classification system

### CLASSIFICATION SYSTEM

Age group classification is done by using GMM classifier. The test image will undergoes the same feature extraction process as like training image and the important features are selected by ranking approach. The features from unknown images are compared with the stored feature database and are classified by GMM classifier in various Gaussian component densities, where the unknown fingerprints are categorized in three groups as adolescence, adult and senior adult. In GMM, the parametric probability density functions are modeled as mixtures of 4, 8 and 16 Gaussian densities.

Table 1 Accuracy of first stage GMM classifier on male fingerprints at 3<sup>rd</sup> level UWT

Size of the Input Image	Gaussian Density	# of rank features					
		1	2	3	4	5	6
128x128	4	91.91	90.34	89.30	89.39	89.12	89.33
	8	96.16	93.40	92.89	92.36	91.73	92.02
	16	97.13	94.13	93.55	92.98	92.40	92.40

It is observed that in table 1, the maximum classification accuracy achieved by first stage classification is 92.98% in 3<sup>rd</sup> level decomposition. However, the best choice for 1<sup>st</sup> and 2<sup>nd</sup> stage classification is chosen based on the number of features,

### RESULTS AND DISCUSSIONS

In this section, the experimental results and their inferences are discussed. Here the performances of the proposed age group classification system are analyzed. To evaluate the performance of the proposed systems, many computer simulations and experiments with internal database are performed.

#### Performance of Age Group Classification System

In this section, the performance of the proposed age group classification system is discussed. The scanner discussed in the previous section is used to capture fingerprints from age groups. Figure 7 shows the right thumb fingerprints collected from 5 males.



Fig. 2. Right thumb fingerprints of male adolescence (top row), younger adult (middle row) and senior adult (bottom row)

#### Performance of Male and Female fingerprint Images

The classification result of the first stage GMM classifier on male fingerprint images at 3<sup>rd</sup> level decomposition is shown in tables 1.

size of the image and level of decomposition. The performance of the proposed GMM classification on female fingerprint images is shown in tables 2 for 3<sup>rd</sup> level decomposition.



**Table 2 Accuracy of first stage GMM classifier on female fingerprints at 3<sup>rd</sup> level UWT**

Size of the Input Image	Gaussian Density	# of rank features					
		1	2	3	4	5	6
128x128	4	93.16	93.87	93.85	94.08	94.73	95.82
	8	97.21	96.72	96.91	97.07	96.99	97.04
	16	98.02	98.17	98.07	98.35	98.35	98.35

From the tables 2, it is found that the maximum average classification accuracy of 98% is obtained in 3<sup>rd</sup> decomposition levels. For better age group classification accuracy on female fingerprint images, 3<sup>rd</sup> level of decomposition of 128x128 scaled fingerprint images gives better accuracy.

### CONCLUSION

In this paper, fingerprint based age classification is presented based on shearlet transform and GMM classifier. The former one is used for feature extraction and later one is used for classification. The classification is analyzed by varying the number of Gaussian density and the features obtained at the 3<sup>rd</sup> level of decomposition of the male and the female fingerprints are used. The size of the input image is rescaled to 128x128 pixels in order to decompose the image by shearlet transform. Results show that the shearlet based features gives 98.35 % accuracy.

**Ethical Clearance:** Taken from AMET University.

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Analytical Method for Maritime Accident Analysis

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## ABSTRACT

The ship operation is arrangement of systems comprised of different systems for example, transport administration, navigational support, payload taking care of and port facility. The marine accidents make extensive harm to logistics and environment. In this way, it is viable to guarantee the security of the ship operation. The reason for this paper is to propose an analytical method for maritime accident analysis with the bridge test system and to affirm the viability of the strategy. By this analytical method, it has appeared to discover the most vital consider navigational watch to avoid marine accident.

**Keywords:** Marine Accidents, Navigation.

## INTRODUCTION

The collision accident that is a piece of marine accidents has a seriously affects logistics and environments. Since, the collision accidents prompt the potential for flame, blast, surge and inverting<sup>[1]</sup>. There is a great deal of collision accidents brought about by human variables. Explores different avenues regarding the bridge test system are successful for investigation of human variables, for example, inadequate watch. Late reviews on human elements of marine accidents with test systems were centered around navigational workloads<sup>[2]</sup>.

While many reviews on human factors with bridge test system were played out, the analytical approach for the navigational conduct by examinations with the bridge test system has not been built up yet<sup>[3]</sup>. In this way, the motivation behind this paper is to propose a technique for marine accident analysis with the bridge simulator. This strategy is the scientific way to deal with discovers the most imperative element to stay away from marine accidents<sup>[4]</sup>. Underwater vehicle for surveillance with navigation and swarm network communication for accident prevention in marine navigation system is presented in<sup>[5]</sup>. Design and analysis of navigation and safety assessment of wind farm support vessels is discussed in<sup>[6]</sup>. In addition, bridge test system investigations and examinations of navigational practices were performed to affirm the viability of analytical approach proposed in this review. The analytical approach was effective in finding the essential variable to maintain a strategic distance from marine accidents.

## Analytical Process

The analytical process in this review is made out of four stages and shows in Fig. 1.

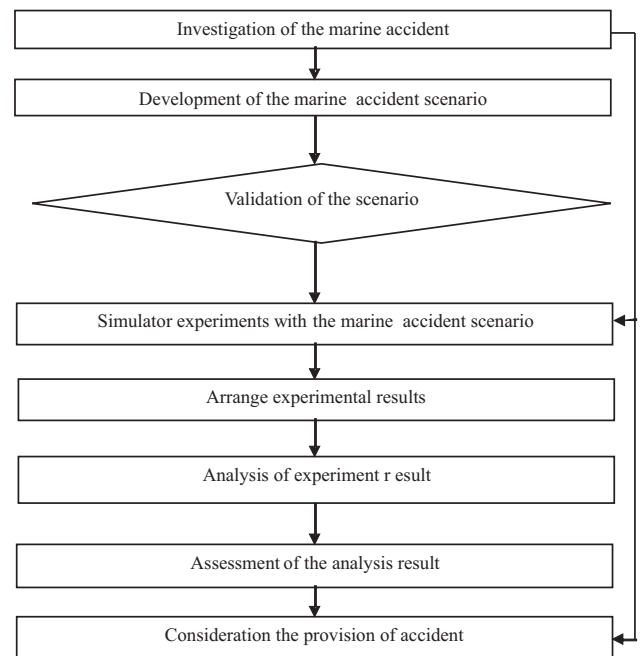


Fig.1. Analytical process

**First Step:** Creating an accident situation – Data gathering of intriguing accident would be led so as to determine its attributes and make a situation for contextual investigation.

**Second Step:** Observation – Bridge test system investigations are performed to watch navigational conduct.

**Third Step:** Task reflection and Creating a straightforward undertaking model – Basic navigational practices are disconnected and the basic assignment model is produced in view of the gathering of essential navigational practices.

**Fourth Step:** Identify essential element – Expression of straightforward assignment show like an Event Tree and assessment of the impact of individual errand would be directed critical element of an accident.

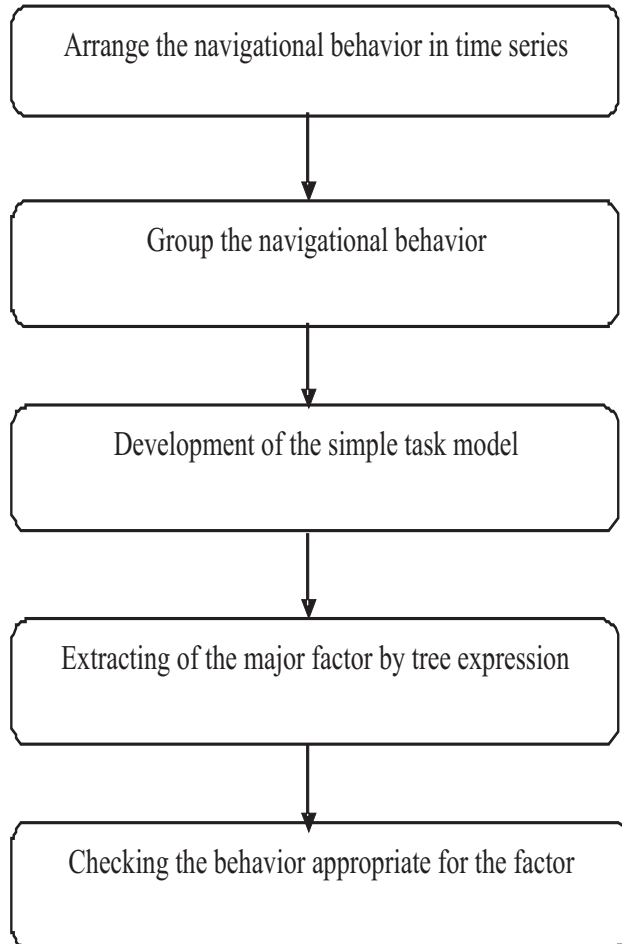


Fig. 2. Analytical Approach

**EXPERIMENTAL RESULTS**

For investigation of subjects’ behaviors, four contents, as below, were separated.

- The relations amongst time and subject’s practices
- Status of navigational watch (watching ships)
- Operation of navigational instrument
- Subject’s remarks

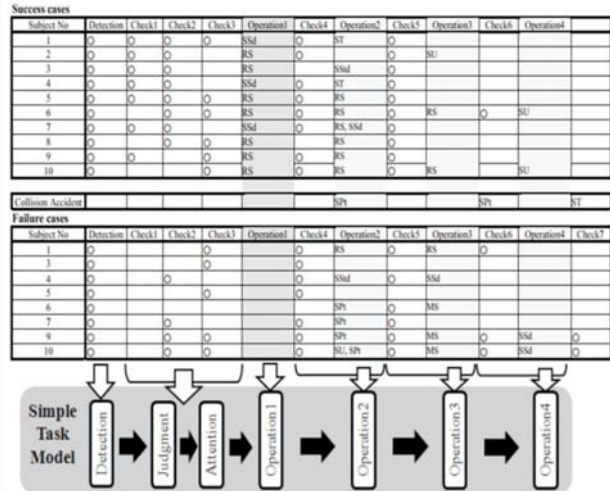


Fig. 3. Group the Navigational Behaviors and growth for Simple Task Model

**CONCLUSION**

In this paper, proposed a method to discover the most vital factor in an accident process analysis with bridge simulator. Additionally, bridge simulator experiments and analyses of navigational behaviors were performed to confirm the effectiveness of analytical process proposed. In this review, subjects’ practices were generally arranged into the gathering of fundamental navigational conduct. As the investigation in this review depended on exceptionally basic assignment display, at that point, it is important to concentrate the gathering strategy for fundamental navigational practices and the demonstrating in different circumstances, besides.

**Ethical Clearance:** Taken from AMET uni

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Design and Improvement of a Heart Failure Management Framework for Client Interface Based on Wearable and Information Innovations

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## ABSTRACT

In the Western World, Cardiovascular Diseases (CVD) is the main wellspring of death. They cause 45% of all passing's. Other than Heart Failure, the worldview of CVD, influences mostly individuals more seasoned than 65. Confronting this reality has supported MyHeart Project, whose mission is enabling natives to battle CVD by methods for a preventive way of life and an early conclusion. This paper displays the outline and improvement of the User Interaction for a Heart Failure Management Framework. This framework comprises on wearable and versatile advances which screens the vital Body Signals in an everyday schedule, giving a constant appraisal of this chronic sickness.

**Keywords:** Heart Failure Management Framework, Cardiovascular Diseases (CVD), Wearable and Information Innovations.

## INTRODUCTION

Heart Failure (HF) is a moderately basic incessant issue, principally influencing individuals more seasoned than 65. The expansion on the future in the created nations has brought about an expansion in the quantity of hospitalizations because of interminable illnesses, and in addition to the personal satisfaction of the maturing populace<sup>[1]</sup>. Inside this specific situation, a Heart Failure Management Framework (HFMF) was intended to accumulate all crucial data from the populace experiencing HF. To then process this data to acquire input on the sort of help that the patient may require<sup>[2]</sup>. HFMF likewise gives experts chose data, allowing the assessment of side effects, for example, arrhythmic and ischemic hazard, with the point of avoiding conceivable re-hospitalizations<sup>[3]</sup>.

HFMF makes utilization of the most recent innovations to screen heart condition, both wearable pieces of clothing (for measuring ECG, Respiration, Activity and Cardiac Impedance); and versatile gadgets, (for example, Weight Scale and Blood Pressure Cuff) with Bluetooth capacities. HFMF means to diminish the mortality and dismalness of the HF populace<sup>[4]</sup>. The framework likewise concentrates on enhancing the productivity of the human services assets, boosting the money saving advantage rate of the heart disappointment administration<sup>[5]</sup>.

All the day by day information are prepared and utilized as a part of the recognition of utilitarian limit, declining and ischemia confusions<sup>[6]</sup>. The planning inclination of information is naturally surveyed keeping in mind the end goal to empower the early discovery of: a) conceivable clinical de-pay (clinical destabilization cautioning signs), b) the constant "out of healing center" arrhythmia chance stratification and, c) the assessment of the HF movement<sup>[7]</sup>. Then again, inspiration methodologies were considered keeping in mind the end goal to furnish patients with germane and applicable data, as per their physical and psychological status<sup>[8]</sup>.

## PROPOSED SYSTEM

The plan and advancement of the UIS was performed in three phases: the main stage is the framework outline, the second stage is the center segments execution and the third stage is the application customization<sup>[9]</sup>.

Client Interaction Design Stage, the initial step comprised of the meaning of the objective gathering attributes. The objective client of HFMS is an elderly individual matured around 65 years or more. He knows about his heart condition and is proactive to take a superior care of it. The client ought to have the capacity to effortlessly start top the application, see his every

day errands, be cautioned of the past uncompleted undertakings, take after directions to perform checked sessions, see comes about, answer surveys (e.g. 5 inquiries in the evaluation of his inclination), and counsel messages from experts. Then again, the client collaboration framework ought to speak with the Back-end and get data from the Front-end through Bluetooth.

The center modules were intended to be autonomously utilized from the utilization cases. These center modules manage the framework middleware, the transmission needs and the information administration. The User Interaction Core gives an arrangement of libraries that arrangement with the primary necessities of the patient's versatile station, making uncommon accentuation on the correspondence and the information administration capacities of the design. Concerning correspondence prerequisites, HF Management holds the accompanying two correspondence channels: a) the Front-end module which does the association with the electronic pieces of clothing of the patient; and b) the Back-end module which executes the correspondence to the servers. Concerning the information administration a necessity, this center module gives the proper intends to store and recover all data, and also pre-handle crude information when required.

Once the center segments were characterized, the System was altered to every specific utilize case. This customization was characterized by restorative specialists in the field of long haul care of patients and also in the field of Heart Failure issue. Amid the main framework usage, each utilization case was characterized regarding the exact "day by day schedule" to be performed by each of the HF patients who had been selected in the framework. The day by day routine is separated into the morning schedule, the activity routine and the before resting schedule. Amid the morning schedule, the patient begins the application soon after awakening awakens. Quickly if there are new updates in the patient profile, these are downloaded into the UI framework.

The PDSL convention depends on a heap of layers whose correspondence depends on interfaces. Along these lines, this convention is intended to be a universally useful correspondence convention. It can send diverse signs and calculation comes about utilizing distinctive correspondence diverts which are characterized in the convention. The A&D is a convention in light of settled casings of information and it is utilized for constrained purposes and for

gadgets with restricted abilities. There is a gadget layer which disconnects the many-sided quality and furnishes the framework with a reasonable interface, in view of techniques and flag recovery occasions which make the framework more broad, versatile and solid to utilize.

## CONCLUSION

Security issues should be done, since those are a basic piece of the framework. With a specific end goal to make an emphatically reliable framework, a blunder taking care of convention amid the exchange of information will be likewise created. There are still further upgrades to be created utilizing the Bluetooth correspondence innovation, which will give a more noteworthy straightforwardness of the framework network. In future undertakings, more calculations will be incorporated into the framework, for example Atrial Fibrillation location and Heart Rate Variability. The most prompt test is the formation of a totally devoted gadget which will keep the client far from any communication with the working framework, staying alert just of the HFMF.

**Ethical Clearance:** Taken from AMET uni

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Mammogram Classification Based Onk-Nearest Neighbor Classifier

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## ABSTRACT

The computer-aided detection system plays a very important task in early cancer analysis. In this paper, we have classified the breast tumor in mammogram images to benign and malignant classes using shearlet transform. First the region of interest (ROI) of the mammogram image is denoised using median filter then subjected to shearlet transform and various statistical features are extracted from different levels and orientations. Then the features are fed to K-Nearest Neighbor (K-NN) classifier using minimum features. Finally, the mammogram is classified as benign or malignant using K-NN classifier.

**Keywords:** Median Filters, Shearlet Transform K-NN Classifier.

## INTRODUCTION

Breast cancer detection using comparison of SVM kernel functions is presented in<sup>[1]</sup>. A comparative study of diverse kernel functions for breast cancer classification is presented. Support Vector Machine (SVM) classifier with different kernel functions is used. The comparison based on neural network method using MLP is also given. In addition, study the affect of selecting feature subsets before applying classification with different kernels and used genetic algorithm. Breast cancer classification using various classifiers is described in<sup>[2]</sup>. Preprocessing is the first step using image enhancement algorithm, after that Regions of Interest (ROIs) are extracted. Then statistical and texture features are extracted from the ROI and Sequential Forward Selection and Sequential Floating Forward Selection are used for feature selection. At last KNN classifier, linear discriminant analysis, quadratic discriminant analysis and SVM classifier for classification is used.

Automatic detection of mammogram using hierarchical matching is discussed in<sup>[3]</sup>. A hierarchical template matching method is used to detect the breast mass in mammograms in this study. First, three types of templates are designed and the sech template is selected to mass matching. Finally some of false positives elimination, a set of rules is set based on various features. Vicinal Support Vector Machine based mammographic mass classification is presented in<sup>[4]</sup>.

Vicinal Support Vector Machine (VSVM) as an enhancement learning algorithm for mass detection on digital mammograms is used in this paper. First, one-class SVM is given for the abnormal cases detection. Then VSVM is verified for the detection of malignant cases. Whole training data are clustered into diverse soft vicinal areas in feature space by kernel based deterministic annealing method.

Wavelet features using microcalcifications in digital mammogram is discussed in<sup>[5]</sup>. Classification of mammogram image into benign or malignant is the main aim of this method. Artificial neural network classifier is used for classification purpose to detect the micro calcification at each site in the mammogram images. Detection of clustered microcalcifications using case-adaptive decision rule is described in<sup>[6]</sup>. Bayes' risk approach is used to describe the decision rule in the detector output, for which the prospect model of the false-positives is determined directly from the image under contemplation. Categorization of benign and malignant digital mammograms using mass classification SNE and DWT is explained<sup>[7]</sup>. A mammogram classification based on surfacelet transform and SVM classification is presented<sup>[8]</sup>. The performance evaluation of the breast microcalcification CAD system based on DWT, SNE AND SVM is explained<sup>[9]</sup>. A review of cancer statistics in India is measured<sup>[10]</sup>.



## PROPOSED METHOD

In our proposed system we have classified the breast tumor in mammogram images to benign and malignant classes using shearlet transform. First the region of interest (ROI) of the mammogram image is subjected to shearlet transform before that input images are denoised using median filter and various statistical features are extracted from different levels and orientations. Then the features are fed to K-NN classifier using minimum features. Finally, [7], the mammogram is classified as benign or malignant using K-NN classifier. The block diagram for our proposed system is shown in the below figure.

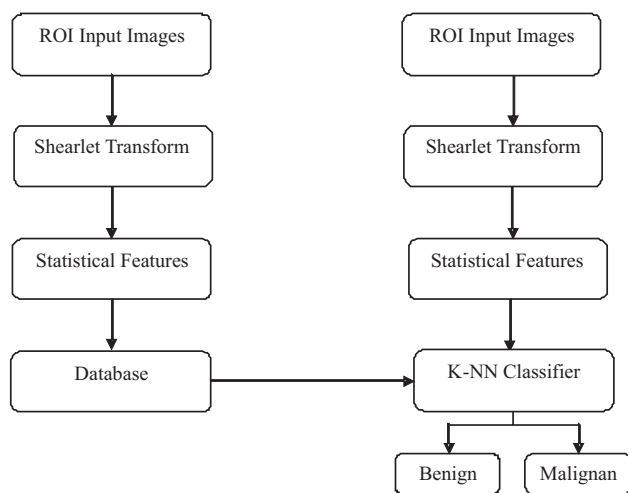


Fig. 1. Proposed Block Diagram of Mammogram Classification

## FEATURE EXTRACTION STAGE

The proposed system for mammogram classification system starts with feature extraction step, which is an important step for machine learning approaches. Shearlet transform and statistical method based feature extraction is done. Mean, standard deviation, Variance and skewness are determined using transform.. This method is repeated for all the training images and the extracted features are saved as database which is afterward used for classification.

## CLASSIFICATION STAGE

Mammogram classification is done by K-NN classifier. The test image will work the same extraction process as like training image in the database. Then unknown images are used for classification stage compared with the saved database and classified by K-NN classifier. Finally, classification is done as benign and malignant with 95%.

## RESULTS AND DISCUSSION

The first step in the proposed integrated approach for breast cancer classification based on shearlet transform is to test the unknown image which is to be classified as Benign or Malignant. It considers ROI extracted image as input. Extracted images are denoised using median filter. After that shearlet transform is used to extract the features. Here statistical features are calculated. In order to decrease mortality due to breast cancer, an efficient and accurate classification system is required to detect breast cancer earlier. The classification stage used a novel K-NN classifier to classify the images as benign or malignant.

## CONCLUSION

An efficient approach for breast cancer diagnosis based on shearlet transform and K-NN classifier is presented. Shearlet transform is used to decompose the given mammogram for feature extraction, then extracting the shearlet moments from the decomposed image as features. The effectiveness of the proposed system is analyzed on MIAS database images. The obtained maximum classification rate using shearlet moments for benign is 100% and malignant is 90%.

**Ethical Clearance:** Taken from AMET uni

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Measuring of Fitness Trackers

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## ABSTRACT

Data collected by fitness trackers could play an important role in improving the health and well-being of the individuals who wear them. Many insurance companies even offer monetary rewards to participants who meet certain steps or calorie goals. However, in order for it to be useful, the collected data must be accurate and also reflect real-world performance. While previous studies have compared step counts data in controlled laboratory environments for limited periods of time, few studies have been done to measure performance over longer periods of time, while the subject does real-world activities. There are also few direct comparisons of a range of health indicators on different fitness tracking devices. In this study, we compared step counts, calories burned, and miles travelled data collected by three pairs of fitness trackers over a 14-day time period in free-living conditions. Our work indicates that the number of steps reported by different devices worn simultaneously could vary as much as 26%. At the same time, the variations seen in distance travelled, based on the step count, followed the same trends. Little correlation was found between the number of calories burned and the variations seen in the step count across multiple devices. Our results demonstrate that the reporting of health indicators, such as calories burned and miles travelled, are heavily dependent on the device itself, as well as the manufacturer's proprietary algorithm to calculate or infer such data. As a result, it is difficult to use such measurements as an accurate predictor of health outcomes, or to develop a consistent criteria to rate the performance of such devices in head-to-head comparisons.

**Keywords:** *Fitness Trackers; Accuracy; Physical Activity; Free-living Conditions*

## INTRODUCTION

The past several years have seen an exponential growth in the market for personal wearable devices, with estimated sales of up to 126 million units anticipated by the end of 2019 [1]. Fitness tracking devices lead sales in this market, and continue to gain popularity as the correlation between an active lifestyle and the prevention of chronic diseases is demonstrated by research [2], [3]. These trackers give their users the ability to monitor and track key health markers, thus encouraging them to continue their healthy efforts.

Such programs, however, rely on the ability of these devices to reliably generate accurate data. Data accuracy ultimately depends on two factors: the quality of the sensors embedded in the device, and the algorithm used to interpret the raw data. To this end, there has been a surge in the number of research studies testing the accuracy of wearable fitness devices as compared to research-grade accelerometers and multi-sensor devices [4]. Most of these studies have focused on a cross-sectional comparison of consumer-based products to

research-grade gold standards only in a laboratory or a controlled real-world environment. Conducting experiments without the prescribed restrictions of a laboratory (i.e. under a free-living condition) is significantly more challenging, as the variations in speed, direction and intensity of physical activities are larger. This may be why only a few studies have measured the accuracy of trackers in free-living conditions and most free-living studies have been short in duration, typically in the range of one or two days. Furthermore, the integrity of these results could also be compromised if the subjects under study (who are often volunteers) do not follow the experiment protocols.

In this work, we set out to compare parameters and experimental settings that have not been explored in previous work. We start by looking at other health indicators measured by these devices, such as calories burned or distance travelled. We designed a series of experiments to compare these along with the more commonly studied measure of step counts. While the step count provides a general sense of movement and

physical activity, calories burned and the number of miles travelled could be better indicators of an individual’s energy expenditure and, hence his/her physical fitness level. If the fitness trackers are to become an integral part of our health monitoring regimen, the accuracy of all data must be validated.

The results of our study suggest that measurements for all three data categories examined could vary significantly when compared side by side. While the variations for step count and miles travelled followed the same trends, there was no apparent correlation between variations in calories count and that of the other categories. Therefore, it is important to take such variations into account when implementing programs that could rely on the accuracy of a variety of fitness devices. The rest of this paper is organized as follows. Section II gives an overview of some of the research in validating and comparing data tracked by fitness devices. Sections III and IV describe the experiment design, methodology and the analysis of the results. and Section V concludes the paper with some comments on what was learned from our study.

### LITERATURE REVIEW

A wide range of fitness activity monitors has flooded the market over the past five years, providing researchers in exercise science, nutrition, and sport medicine with new measurement tools. But, before such tools can be incorporated into research, the accuracy of the data must be validated. Several studies have examined the accuracy of as many as ten fitness monitors simultaneously, by comparing the number of steps reported by these consumer-based products.

In one study ten consumer-level wearable fitness devices were examined, both in the laboratory and in free-living conditions, and results were compared to a research-grade pedometer. This study focused solely on the comparison of step counts across the ten devices. Under laboratory conditions, the participants walked on a treadmill for 30 minutes wearing all ten consumer-based devices and two research-grade devices on two different days. Under free-living conditions, the participants wore all consumer devices and only one research-grade device (ActivPAL) for seven and half hours on a single day. They concluded that seven of the ten devices showed similar output when counting steps, and five showed a relatively close output compared to the research-grade device.

In a different study, seven consumer-level wearable fitness devices were compared to two research-grade

devices during a 48-hour period timeframe in free-living conditions. This study measured step count, and other parameters such as the total daily energy expenditure (TDEE). The team found that the measured steps for all consumer-level devices had a strong correlation with those of the research-grade devices, while all the consumer devices greatly underestimated TDEE compared to the research-grade devices.

We also studied those papers, Culture Shock on Learning of International Students in India [8]. Analyzing women empowerment in working conditions: A study on women employees [9]. An outcome of per iodized small side games with and without mental imagery on playing ability among intercollegiate level soccer players [10]. Human Personal Attribute towards Industrial Social Contribution.

### DATA COLLECTION

#### Experimental Setup

Since the above studies confirmed that the step count of consumer-base devices are comparable to measurements obtained from research-grade devices, the focus of this study was to compare performance and data accuracy across a series of consumer-based products. We chose fitness trackers that had a large share of sales in the market at the time of our experiment: Fitbit Flex, Fitbit Charge HR, Garmin v´ıvoactive, and Apple Watch. Table 1 showcases some of the common data collected by these fitness trackers. The combination of motion and direction sensed by an onboard tri-axial accelerometer and a gyroscope are used to calculate the number of steps and flights of stairs taken. The number of calories burned can be inferred from this information using an internal algorithm that might vary between manufacturers.

TABLE I  
FITNESS DEVICES USED IN THIS STUDY

Make-Model	Device Description
Fitbit Flex	Tracks steps, distance, calories burned, and active minutes. Also, how long and well the user sleeps.
Fitbit Charge HR	Provides continuous, automatic, wrist-based heart rate and simplified heart rate zones. Tracks workouts, heart rate, distance, calories burned, floors climbed, active minutes and steps. Monitors sleep automatically and has an alarm.
Garmin vıvoactive	Built-in sports apps, including GPS-enabled running, biking and golfing options, and swimming and activity tracking.
Apple Watch	A smartwatch that claims to monitor every move, not just walking or running. Apple Watch collects data when the user stands, sits, and exercises through GPS and calculates heart rate.

## Data Collection Methodology

Three independent experiments were conducted during this study. A different member of the research team wore two devices side by side on the same wrist for 14 days. The research team included two males and a female. The devices were worn during the day, from the time that the subjects woke up until the time that they went to bed for an average daily wears time of 16 hours. Before the start of the experiments, each subject entered the required physical information, such as gender, height, weight, and age, via the manufacturer's mobile application or website. At the completion of each day, the subjects would synchronize the devices with either the mobile application or the cloud service application associated with each manufacturer in order to submit their daily activities.

## RESULTS AND ANALYSIS

### Experiment 1: Comparing devices of same model

This experiment was performed as an inter-device study, and as a baseline to assess the reliability of Fitbit Flex, which is a wristband tracker. The results are depicted in Figure 1, where the relative differences (Fitbit 1 less Fitbit 2) in number of steps taken, calories burned, and miles travelled are plotted against time. The data is sorted in ascending order of step count variations, with the highest difference in step count being 7%. It is worth noting that, throughout the experiment, Fitbit 1 always showed a higher step count than Fitbit 2. We did not observe a strong correlation with the daily relative differences and the absolute number of steps taken (i.e. higher number of steps per day did not translate into a higher relative difference).

Previous studies have all indicated that Fitbit has good alignment with research-grade devices and have confirmed the accuracy of step counts for this manufacturer. Our two-week experiment in free-living conditions also shows that the two identical devices are consistent in counting the number of steps, with little variation in either the number of steps or reported distance travelled for the two devices. One interesting observation shows no correlation between the number of steps taken each day, and the reported number of calories. Even for the days where we see the highest variations in the step count, the deviations in the reported calories were only around 1.6%. We suspect that this may be related to the non-linear model used to calculate calories burned. The Fitbit calorie count resets each night at midnight and begins counting

immediately thereafter. As a result, without even getting out of bed, each morning a basal metabolic rate of 700-1000 is registered for an individual based on gender, age, height, and weight. This rate could account for about half of the wearer's daily calorie consumption. As a result, small variations in the step count do not translate to a significant change on the reported calories burned.

### Experiment 2: Comparing different brands

This experiment was done to compare two smartwatches from different brands. We examined Fitbit Charge HR and Garmin v'voactive. The results of our two-week experiment are depicted in Figure 2, where the relative differences (Fitbit Charge HR less Garmin) in the number of steps, calories burned, and miles travelled are plotted against time. The data is sorted in ascending order of difference in step counts, with the highest difference peaking at 34%. We noticed that, throughout the two weeks of this experiment, the Fitbit device consistently showed a higher step count than Garmin, regardless of the location of the devices on the wrist (i.e. it did not matter which device was worn closer to the wrist).

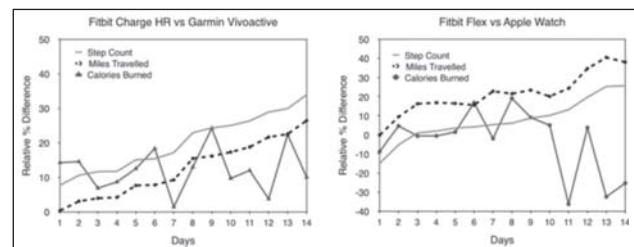


Fig. 1. Simulation Results for the characteristics

Similar to Experiment 1, we did not observe any strong correlation between the daily relative differences and the absolute number of steps taken. The number of miles travelled showed the same trend, but with an overall lower variation, upto a maximum of 26%. The surprising result was the lack of correlation between the number of steps taken and the amount of calories burned. Over the two-week period we did not observe any consistent pattern between the variation in calorie count and step count. We conclude that, in this experiment, a cross-device comparison of the measured calories might not result in an accurate prediction or indication of health levels.

### Experiment 3: Measuring smartwatch fidelity

This experiment was performed to understand how a multi-use device, like the Apple Watch performs. As

a baseline, we compared it against the Fitbit Flex. The result of our two-week long experiment is depicted in Figure 3, where the relative differences (Apple less Fitbit) in the number of steps, calories burned, and miles travelled are plotted against time. The data is sorted in ascending order by the difference in step counts, with the highest and lowest difference registering at 26% and -15%, respectively. Throughout most of the experiment (with the exception of two days), Apple Watch showed a higher step count than the Fitbit, regardless of the location of the device on the wrist, much like what was observed in Experiments 1 and 2.

In this experiment, the variation in the number of miles traveled is higher than the reported step count. However, similar to Experiment 2, there is no significant correlation between calorie variations and either miles travelled or steps taken. This experiment further affirms that these variations are seen across different fitness trackers.

### ANALYSIS

Our first experiment confirms the reliability of Fitbit Flex in reporting the daily number of steps taken by an individual. Our result correlates well with a previous study that reported on the inter-device reliability of a different model of Fitbit. Our two-week experiment further affirms the reliability of Fitbit over a longer period and outside of a controlled lab environment. We infer that individuals can reliably compare their daily physical activity with peers who own the same Fitbit model. While a further study is needed to confirm the reliability of Fitbit devices across different models, we expect this inference would be supported.

Fitbit estimates a Basal Metabolic Rate (BMR) for an individual, based on data entered during account setup such as gender, age, height, and weight. The BMR usually accounts for at least half of the reported daily calories, but the exact manner by which the step count is integrated into this equation is not disclosed. Experiment 2 compares the results of two very different fitness trackers with similar output measures. The variations in the step count is much higher than what was seen in Experiment 1. Some of the observed variations could be related to the actual sensors used in each device. We are not aware of the specification of the tri-axial sensors used in each device, but we suspect that they are manufactured or calibrated differently. Previous studies and our observations indicate that

wrist-worn fitness trackers show higher levels of variations when compared to the more conventional hip-worn trackers used in laboratory-based experiments.

Experiment 3 compares the Apple Watch with the fitness band Fitbit Flex. Our experiment indicates that the step counts reported by the Apple Watch are higher than the Fitbit Flex. In two laboratory studies Fitbit Flex has shown relatively close agreement with research-grade devices (within a 10% range). As a result, we speculate that Apple Watch might be overestimating the number of steps taken. Unlike the second experiment, we see higher variations in the number of miles reported by these devices.

### CONCLUSION

In this paper, we described a series of experiments where several fitness tracking devices, including two models of Fitbit, a Garmin smartwatch, and an Apple Watch, were used to collect data for 14 days. Data on the number of steps taken, distance travelled and calories burned by each subject was collected over this period, and a comparison analysis was performed. Our data analysis shows that step count, miles travelled, and calories burned could vary significantly when devices of different manufacturers are compared side by side. While the variations in the step count and the distance travelled followed the same trends, we saw no correlation between the variations in calories burned and what was observed for the step and distance variations.

**Ethical Clearance:** AMET university

**Source of Funding:** self

**Conflict of Interest:** NA

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# Regular Discovery and Sorting of Workout in the Health Scenario

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## ABSTRACT

Causal relationship between physical activity and prevention of several diseases has been known for some time. Recently, attempts to quantify dose-response relationship between physical activity and health show that automatic tracking and quantification of the exercise efforts not only help in motivating people but improve health conditions as well. However, no commercial devices are available for weight training and calisthenics. This work tries to overcome this limit, exploiting machine learning technique (particularly Linear Discriminant Analysis, LDA) for analyzing data coming from wearable inertial measurement units, (IMUs) and classifying/counting such exercises. Computational requirements are compatible with embedded implementation and reported results confirm the feasibility of the proposed approach, offering an average accuracy in the detection of exercises on the order of 85%.

**Keywords:** *Machine Learning, Data Classification, IMU, Wearables, Mhealth*

## INTRODUCTION

Physical activity increases the wellness of an individual. This simple fact, which is instinctively recognized as true by every person who has practiced sport, is supported by a large amount of studies<sup>[1]</sup>. Recently, the focus has moved to quantify the dose-response relationship between physical activity and health. Results show that 150 minutes of moderate-intensity aerobic activity per week (or 75 minutes of vigorous-intensity aerobic activity) are associated with a 20-30% reduction in the risk of several diseases<sup>[2]</sup>. Regarding weight training, research shows that adults can benefit from performing activities that maintain or increase muscular strength and endurance for a minimum of two days each week; it is recommended that 8-10 exercises are performed on two or more nonconsecutive days using the major muscle groups<sup>[3]</sup>. The positive relationship between physical activity and mental health has been investigated as well<sup>[4]</sup>.

The industry of electronics has already recognized this opportunity; several tracking devices as well as Apps for smartphones are available on the market. However, this landscape of devices misses two major categories of fitness activities: weight training and calisthenics (strength-training exercises that do not necessarily involve weights, such as sit-ups, pushups, etc). Therefore, a device able to track and automatically

analyze this kind of exercises, for example checking for correctness of execution and counting the number of repetitions, could have a big impact on the market, for sport and for physiotherapy applications. The proposed paper explores the possibility of using machine learning techniques, and in particular Linear Discriminant Analysis (LDA), applied to data coming from wearable Inertial Measurement Units (IMUs) for strength-training exercise recognition. Preliminary experimental results of an LDA architecture trained with data coming from a single 6-axis wrist-worn IMU have confirmed the feasibility of automatic classification of weight exercises.

This paper is anatomized through, An outcome of periodized small side games with and without mental imagery on playing ability among intercollegiate level soccer players<sup>[4]</sup>. Human Personal Attribute towards Industrial Social Contribution<sup>[5]</sup>. Culture Shock on Learning of International Students in India<sup>[6]</sup>. Study on the ideal ways of enhancing the quality of maritime education, training and research<sup>[7]</sup>.

The paper is structured as follows: in the next section an overview of related studies is reported. In section III a resume of some machine learning techniques is provided. Section IV details the proposed approach, and experimental results are discussed in section V. Finally some conclusions are drawn.



## STATE OF ART AND RELATED STUDIES

In this section, an overview of studies about automatic data discrimination applied to sport science is presented, followed by a discussion of commercially available devices.

### Automatic classification for sport science

Powerful, low-cost embedded mobile systems have become more and more important in the field of rehabilitation and sports science. Small and lightweight wearables allow to collect data about patients/athletes in a realistic environment for further analysis and classification. As an example, a smart shoe equipped with an IMU and a classification system able to discriminate between different surfaces (grass, street and trail) and inclinations (uphill, flat and downhill) with a mean classification rate of 85.3 % and 81.2 %, respectively is presented in [8]. The same research group presented in [9] a multi-nodal sensor system (based on accelerometers and gyroscopes) for the classification of treadmill and bicycle exercises. Features extracted from these data are classified by means of a Support Vector Machine (SVM) with a linear classifier. The classifier has an accuracy of 98% when detecting the type of activity (treadmill vs bicycle), but it drops to 61% when it determines the intensity of the bicycle exercise. Muehlbauer et al. [10] present a work for the automatic identification of exercises that divides the problem into 3 stages: (1) segmenting exercise periods from non-exercise, (2) recognizing which exercise is being performed, and (3) counting repetitions. Accelerometers and, when available, gyroscopes data are recorded by means of a smartphone, worn at the upper part of the arm; autocorrelation features are extracted from them and later classified with a SVM. This work achieves 85% segmentation accuracy and 94% recognition accuracy using subject-independent training [11].

### MACHINE LEARNING TECHNIQUES

Several methods for data reduction and discrimination have been proposed in the last decades [15]; a brief description of the most used is presented below. Principal Component Analysis (PCA) is a statistical unsupervised approach, used to project features from a high-dimensional space to a new low-dimensional one, defined by orthogonal principal components (PCs), while retaining the majority of the information held in the original data [12]. The goal of PCA is to maximize the variance between data without

considering class separation. High dimensional data can pose problems for machine learning, as predictive models based on such data could lead to overfitting; furthermore, many of the attributes may be redundant or highly correlated, which can also lead to a degradation of prediction accuracy. Euclidean Distance to centroids (EDC) is a very intuitive supervised classification method. The mean of each class is calculated (the so-called centroids) over all samples; no other information apart from this is used. This method assumes that the distribution of samples around the centroid is symmetrical and similar for each class. The Euclidean distance for each sample to be classified is then calculated, and it is assigned to the class with the lowest distance.

Linear Discriminant Analysis (LDA) method is similar to EDC, but it takes into account the so-called covariance matrix of the different classes; by doing this, the distance between a test sample and a given class centroid is weighted according to the overall variance of each class. This method is valid only if the classes have similar variance-covariance matrices; otherwise, the covariance matrix will be inaccurate. Quadratic Discriminant analysis (QDA) is similar to LDA, with the difference that QDA does not assume that the classes have similar variance-covariance matrices, making it more suitable than LDA when the classes have very different variance structures. The boundary produced by QDA is quadratic, which may consist of two separate sections of boundary lines, making this method more flexible in some specific situations.

Support Vector Machine (SVM) method can create a complex decision boundary between classes. The classification rule is determined by only a small number of training sets, called Support Vectors, which lie near to the decision boundary. Hard margin SVMs assume that two classes are perfectly separable, and aim to find the optimal boundary that separates them, with the maximum possible margin. Soft margin SVMs tolerate a degree of misclassification and are designed to balance the classification error with the complexity of the model.

### THE PROPOSED APPROACH

The basic idea of the proposed solution is shown in Fig. 1. One or more wearable IMUs take care of acquiring the user's movements while performing exercises and communicate, for example through the broadly-used Bluetooth connection, with a processing unit for data

evaluation. Following the recent trends in personal systems for medical and sport/fitness support, the latter could be implemented with a smart device, such as a smartphone, tablet and even a smartwatch. Indeed, the term mHealth was coined to address the use of smart devices for supporting healthcare. Interesting to notice, it is possible to exploit the embedded accelerometers of such smart devices as the IMU for data acquisition, thus simplifying the system architecture. Following such a paradigm, it is evident that data elaboration implemented by the processing unit should have a complexity compatible with the computational resources available in the employed smart device. Despite the use of cloud-based architecture could overcome this limit, it has not been considered here since we wanted our solution to be able to operate even without an Internet connection.



Fig. 1. SVM application for health scenario

The proposed algorithm is based on the work presented by Morris et al., where a combination of PCA and SVM method to classify data is employed. In this work, data classification is performed by combining PCA and supervised LDA; LDA has been chosen instead of SVM because it is mathematically simpler, thus less demanding in terms of computational time and resources. PCA and LDA must be first trained by using a large set of training data, acquired when the users are performing well-known exercises. In our work, the machine training is carried out by using data of all subjects but one; then, this excluded data-set is classified with the trained machine, and the performance evaluated. This procedure is called leave-one-out, a common technique for data cross-validation. Such a process is usually a one-time operation and it is complex, long-lasting and requires a considerable amount of computational resources; for those reasons, usually it is performed by an ancillary PC. More specifically, the proposed system adopts a single wrist-worn wearable IMU and it is trained to detect whether

a user is performing a specific group of target exercises (segmentation), to classify which exercise is being performed (classification) as well as the number of repetitions of that exercise being performed by the user (exercise counting).

In the following subsections, details concerning the adopted IMU and the processing algorithm are given.

## EXPERIMENTAL RESULTS

Test data have been collected from a group of 7 volunteers, 5 males and 2 females, aged 22-37, from amateur to expert in weightlifting. They performed a circuit of nine exercises (squats, deadlifts, rowing, bench press, shoulder press, biceps curls, french press, lateral raise, and lateral raise bent forward) while wearing the x-IMU (Fig. 6). The volunteers kept a diary where they annotated the timing of the exercises, in order to help the labelling phase, as well as every unusual fact during the training. An important instruction was that, between two sets of exercises, the subjects had to act as normal as possible, to create a dataset with the highest possible data variability (between ex and non-ex). The number of correctly and wrongly detected/classified events lead to the computation of true positives/negatives, TN, and TP, and of false positives/negatives, FN and FP, from which precision, accuracy and recall are evaluated [19]. A pictorial description for the Segmenter is visible in Fig. 7.

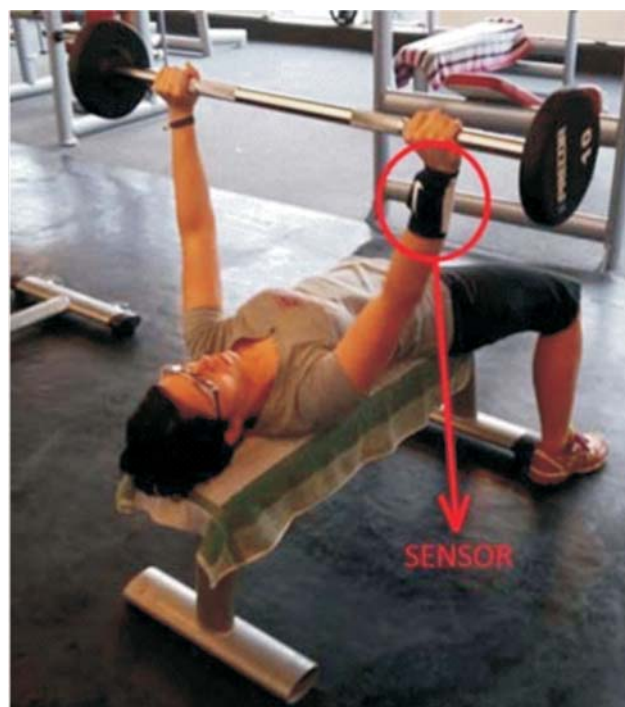


Fig. 1. SVM processed image for health scenario

The single stages (Segmenter, Classifier and Counter) have been analyzed separately. The following results are obtained by using a single-user dataset, where, as previously mentioned, a leave-one-out logic has been adopted for the machine training. Validation results related to the Segmenter are shown in TABLE I. The dataset has been grouped into exercises, to have a better evaluation of the capability of the Segmenter of distinguishing ex from non-ex. The last row measures the three statistical parameters on the complete dataset.

It is clear that the precision of the Segmenter is worse than recall and accuracy. This means that a high number of FPs are produced by the Segmenter, thus a significant amount of non-ex windows are recognized as ex. This is due to the fact that subjects perform stretching between different sets of exercises, and the repetitive nature of such an activity leads the Segmenter to consider the related data as an exercise. This problem could be solved by considering stretching as another class of exercises. Conversely, the overall accuracy of the Segmenter (correctly identified segments) is good, reaching values higher than 90%. The high Recall rate indicates few FNs.

TABLE I. PERFORMANCE OF THE SEGMENTER STAGE.

Exercise	Precision [%]	Recall [%]	Accuracy [%]
#1 (Squats)	90.03	100	98.16
#2 (Deadlifts)	93.29	99.09	98.79
#3 (Rowing)	87.50	100	98.13
#4 (Bench Press)	75.28	100	96.32
#5 (Shoulder Press)	57.55	99.29	91.15
#6 (Biceps Curls)	98.38	94.06	98.68
#7 (French Press)	96.26	95.71	98.39
#8 (Lateral Raise)	100	81.46	96.37
#9 (Lateral Raise, bent forward)	80.04	93.52	92.79
<b>TOTAL</b>	<b>74.49</b>	<b>95.51</b>	<b>94.36</b>

To evaluate the Classifier performance, it is necessary to compare the manually created labels, related to specific exercises, with the predicted ones. The workouts are labelled as increasing numbers, going from 1 to the number of exercises, i.e., 9. It should be noticed that the Classifier is processed only on data predicted as ex by the Segmenter, thus reducing the dataset on which evaluating the Classifier performance. Moreover, that fact implies that performance evaluation is related only to the Classifier and not to the sequence Segmenter+Classifier. The confusion matrix related to the Classifier is reported in TABLE II. The same dataset

used to evaluate the Segmenter's performance has been used, once again grouping the data into exercises; for the sake of readability, exercise names have been replaced by numericallabels, as in TABLE I. Results show that the Classifier performance presents a great variability, going from 100% precision for #6 and 100% recall for #1 and #7 to 36% recall for #8. This could be due to the combination of the non- correctness of execution performed by some subjects, and the relatively small number of examined workouts. In order for the Classifier to work in a proper way, analyzed data should present the largest "statistical variance" possible. Interesting to notice, the exercise with the lowest recall (i.e., #8) is the "lateral raise"; the Classifier labels most of the windows as "lateralraise, bent forward" (i.e., #9), very similar to #8. Hence, the low recall could be due to the incapacity of distinguishing between those exercises with very similar execution.

Finally, to evaluate the performance of the Counter, it is sufficient to compare the number of actual repetitions with the number of predicted repetitions. Preliminary tests show that the Counter achieves performance that goes from 100% accuracy, to a 30% error in the worst case. It should be highlighted that the Counter algorithm is still in a preliminary phase and the counting algorithm is quite simple and prone to errors; thus these results can be considered promising.

## CONCLUSIONS

In this work, an IMU-based system for the detection of exercises in the fitness scenario has been proposed. The presented architecture adopts machine learning techniques to process data from a wearable device hosting a 6-axis IMU and provides indications related to the class of performed exercises and the number of repetitions. The system has been trained and validated by using a set of exercises of weightlifting performed by several volunteers with different skills. Experimental results agree with the recent research work in similar fields, reaching an average accuracy in the exercise detection around 85%. Algorithm optimization to improve exercise-counting performance and to reduce computational effort and thus allowing a possible embedded implementation is currently under investigation.

**Ethical Clearance:** AMET university

**Source of Funding:** self

**Conflict of Interest:** NA

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# Applications of Radiobiological using Laser Plasma X-Ray Beam

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## ABSTRACT

Recent technological advances and new radiobiology difficulties are behind the colossal enthusiasm for the utilization of small scale illumination methods for radiobiological thinks about. Radiobiological small scale bars are offices ready to convey exact measurements of radiation to preselected singular cells in vitro and survey their natural results on a solitary cell base. They are along these lines particularly effective devices to address particular issues where extremely exact focusing on precision and measurement conveyance is required. The greater part of radiobiological miniaturized scale pillars are focused on molecule quickening agents to lighted natural specimens with a correct number of particles. As of now there are just three miniaturized scale pillar offices in routine utilize which utilize centered X-beams: two depend on research facility seat X-beam sources (Queen's University Belfast and Nagasaki University) and one created utilizing synchrotron X-beam shafts (Photon Factory in Tsukuba, Japan). While low measurements rates constrain research facility seat sources to a couple keV, micron estimates X-beam tests of a couple of many keV are achievable utilizing synchrotron sources. Every office has however their own advantages and downside focuses. Procedures for centering X-beams are entrenched and consistently enhancing with central spots down to 50 nm achievable for ultra soft X-beams utilizing roundabout diffraction gratings known as "zone plates". In this paper begun to build up a laser plasma x-beam smaller scale shaft illumination framework, and exhibited a preparatory investigation of the cell survival and gamma-H2AX center development in the way of life cells lighted with laser-created plasma x-beam.

**Keywords:** *K X-Rays, Soft X-Ray Laser, Radiobiological Effect, Bystander Effect*

## INTRODUCTION

Recently, high energy, monochromatic x beams exuding from laser-delivered plasma (LPP) are pulling in much consideration as another radiation source key for high vitality thickness physical science, bioscience, and material sciences. Radiation-induced genomic instability is explained by <sup>[1]</sup>. Going for these applications, we have been enhancing exhibitions of K lines produced from LPP and delicate x-beam lasers (SXRLs). The monochromaticity is especially imperative when x beams are dealt with thin band optics or used to specifically energize a particular material required in matters. of a human tumour cell line to very low radiation doses and The international campaign on intercomparison between electrodes for geoelectrical measurements are discussed by <sup>[2]</sup><sup>[3]</sup>. What's more, time-length of such sources is ordinarily a request of pico-second, and it could be practically identical or considerably shorter than recuperation time

of organically harmed cell by light, so that the LPP source can be another source contrasted and traditional x-beam hotspots for researching the instruments of illumination survival and demise of natural cells. The application of multifrequency airborne electromagnetics to iron ore exploration and Conductivity-depth transformation of slingram transient electromagnetic data are described by <sup>[4]</sup><sup>[5]</sup>. At that point, we propose to build up a ultra short, serious x-beam small scale bar framework to concentrate the radiobiological impact and the spectator impact. Modelling the airborne electromagnetic response of a vertical contact is discussed by <sup>[6]</sup>. We report a preparatory investigation of the cell survival and gamma-H2AX center arrangement in the way of life cells illuminated with K x-beams produced by a femtosecond (fs) laser driven plasma. A charged-particle microbeam and a soft X-ray microprobe is described by<sup>[7]</sup>.

### LASER-PRODUCED PLASMA X-RAY SOURCE

Two types of LPP x-beam source have been produced with respect to the x-beam miniaturized scale shaft framework. One is K x beams created with a ultra short high power laser beat at powers of 1017-1018 W/cm<sup>2</sup> and span of 50-100 fs. Disputed articles, The international campaign on inter-comparison between electrodes for geo-electrical measurements described the Vivacious electrons created by means of laser-plasma cooperation engender profoundly into a strong material. A tabletop Ti:sapphire laser framework, that produces 70 fs, 150 mJ beats at 10 Hz reiteration rate was utilized to create K x-beam beat from a copper (Cu) target. The transformation effectiveness is around 10<sup>-5</sup> of occurrence, comparing to the quantity of Cu-K photons (8 keV) of around 3 x 10<sup>10</sup> photons/4 sr/beat. The application of multi-frequency airborne electromagnetics to iron ore exploration presented the beat width of K discharge, that is similar to the life-time of hot electrons in the plasma, is evaluated to be around 1 ps. The other source is a SXRL light extricated from LPP. The delicate XRL (90 eV) is produced by intensification of unconstrained discharge (ASE) in plasmas with the populace reversal. The yield vitality is around 1 J, comparing to a flux of around 10<sup>11</sup> photns/beat. The beat width of the x-beam laser is around 7 ps.

monochromatic radiation source is primally required. On account of LPP K x beams, we receive a poly narrow x-beam focal point with a specific end goal to gather veering x beams from LPP to a spot of around 300 m in measurement, and at the same time a pinhole of 10-40 mm diam. to point of confinement illumination range. On account of the SXRL, the bar is engaged to around 10-20 m with a circular multilayer reflect or to around 0.5 m with a FZP. The miniaturized scale bar framework comprises of programmed smaller scale stages and an optical magnifying instrument and these x-beam pillars.

### RESULTS AND DISCUSSIONS

Conductivity-depth transformation of slingram transient electromagnetic data started beginning experiments of the cell survival and gamma-H2AX focus formation in the culture cells with the K x-rays. The gamma-H2AX focus configuration can be used for the principle of the double-strand break of DNA. To understand the exposure in a general culture condition, x-rays vertically exposed a culture dish. We have used the Cell line of A549 (human lung adenocarcinoma cell line). A silicon nitride (SiN) membrane coated with collagen was adopted as a cell adhesion substrate.

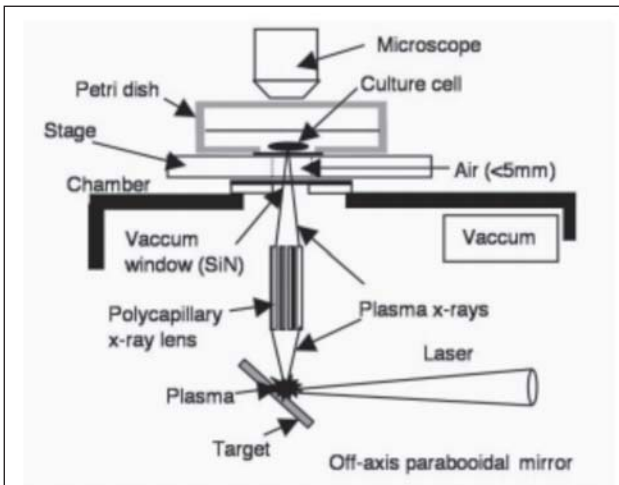


Fig. 1. Schematic View of X-ray Micro beam System

A x-beam micro beam, centered down to a micrometer scale is relied upon to be another apparatus for the investigation of radiobiological impacts by lighting a solitary organic cell. Many sorts of x-beam centering gadget have been created to produce the x-beam micro beams. The sub-micron spot measure has as of now been accomplished in the hard x-beam district with a synchrotron x-beam source and delicate x-beam locale with LPP x-beam source. In these cases, Fresnel zone plates (FZPs) are generally utilized however

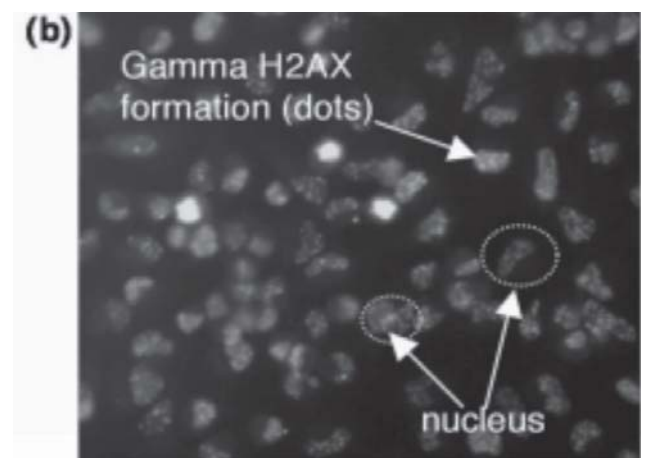
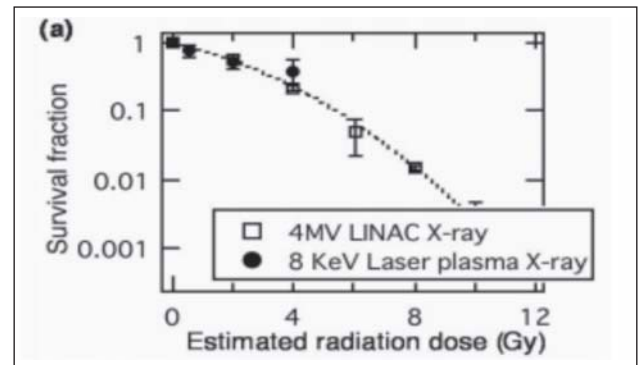


Fig. 2 (a) and (b) X- Ray Radiation

A day before to the x-beam light, sufficient number of cells was seeded on the SiN layer. Quickly before the illumination, cells refined on the SiN layer were connected to culture dishes with a 1mm measurement gap. The measurements rate was 0.1 Gy/min evaluated from the photon numbering technique with a x-beam CCD camera. Survival division was assessed with settlement arrangement measure, and gamma-H2AX center development was distinguished with against phospho-H2AX counter acting agent and fluorescence smaller scale scope. Figure 2(a) demonstrates the cell survival divisions. The cell survival parts were 0.76, 0.53, 0.39 when the radiation measurements is around 0.5, 2, 4 Gy, individually. Figure 2(b) demonstrates the gamma-H2AX center arrangements prompted by the x-beam illumination of 0.5 Gy. Modelling the airborne electromagnetic response of a vertical contact stated the response of the electromagnetic force.

### CONCLUSION

In this paper started the growth of x-ray micro beam system for radiobiological applications, and beginning experiments on the radiation-induced effect using LPP x rays. In near future, apply the system for the study of "Bystander effect" to provide the basic data of the radiotherapy including the relation between the irradiation area and the ranges of cancer invasion.

**Ethical Clearance:** AMET university

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Analysis of CO<sub>2</sub> Photoreduction Using Au Nanoparticles On TiO<sub>2</sub> Catalyst

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## ABSTRACT

Two types of gold-supported TiO<sub>2</sub> catalysts (anatase and rutile) were prepared using a deposition precipitation method, and their photocatalytic activity towards CO<sub>2</sub> reduction was tested in the gas phase using H<sub>2</sub>O as an electron donor and a xenon lamp as the energy sources. The crystal structures were verified using a scanning electron microscope (SEM) and the loaded Au nano-particles (NPs) had no effect on the surface structure. Fourier transform infrared spectroscopy (FTIR) was used to evaluate the photoreduction products. CO and CH<sub>4</sub> were the major products detected in the bare rutile and anatase TiO<sub>2</sub>, respectively. It was observed that the deposition of Au NPs on the TiO<sub>2</sub> catalyst surface (anatase and rutile) quantitatively enhances the reduction of CO<sub>2</sub> to methane (major product). Relative CH<sub>4</sub> production efficiencies following 2-5 h of irradiation were 5.2 for Au/TiO<sub>2</sub> anatase, 5.0 for Au/TiO<sub>2</sub> rutile, 1.7 for TiO<sub>2</sub> anatase and 1.0 for TiO<sub>2</sub> rutile. The CH<sub>4</sub>/CO production ratios following 2-5 h of irradiation were 18.7 for Au/TiO<sub>2</sub>anatase, 3.8 for Au/TiO<sub>2</sub> rutile, 6.0 for TiO<sub>2</sub> anatase and 1.1 for TiO<sub>2</sub> rutile. Based on these results, it can be inferred that CH<sub>4</sub> production was enhanced by Au loading independent of the crystal structure of TiO<sub>2</sub>, and the CH<sub>4</sub> production ratio was dependent on the crystal structure of TiO<sub>2</sub>.

**Keywords:** Nano Particles, Crystal Structure, FTIR, SEM

## INTRODUCTION

Global warming and climate change have become serious global environmental problems due to the mass consumption of fossil fuels. The average atmospheric concentration of CO<sub>2</sub> has increased from 280ppm to approximately 400ppm. Therefore, developing new energy production technologies with low or zero CO<sub>2</sub> emissions is necessary. Semiconductor photocatalysis is an efficient method for reducing CO<sub>2</sub> emissions and transforming CO<sub>2</sub> into fuels such as CO, CH<sub>4</sub> and CH<sub>3</sub>OH using solar energy. TiO<sub>2</sub> is a widely used semiconductors for this purpose due to its stability and low cost<sup>[1]</sup>. However, the catalytic activity of pure TiO<sub>2</sub> for the photoreduction of CO<sub>2</sub> is not high. Therefore several methods have been explored to improve the photocatalytic activity of TiO<sub>2</sub>. An increase in the CO<sub>2</sub> conversion efficiency was observed when the TiO<sub>2</sub> surface was loaded with metals, which function as charge-carrier traps, and suppress the recombination of photoexcited electron-hole pairs<sup>[2]</sup>. Haruta et al.<sup>[3]</sup> prepared Au nanoparticles (NPs) using several methods

and employed them in the fabrication of Au/TiO<sub>2</sub> structures. They reported that Au NPs deposited on easily reducible metal-oxide surfaces, such as TiO<sub>2</sub>, and function as photooxidation catalysts, despite Au being generally stable and having no catalytic activity. In this study, we focus on gold-supported TiO<sub>2</sub> and report the effect of Au NPs loading onto TiO<sub>2</sub> with different crystal structures. However, TiO<sub>2</sub> rutile is stable at temperature above 500 °C and offers several other advantages as a photocatalytic material. Therefore, it was used in the gas phase photocatalytic CO<sub>2</sub> reduction for hydrocarbon production using water as an electron donor<sup>[3]</sup>. Photoreduction of CO<sub>2</sub> by TiO<sub>2</sub> nanocomposites synthesized through reactive direct current magnetron sputter deposition was described in<sup>[7]</sup>. Also the experimental methods for 9-[4-(Azidomethyl) phenyl]-9H-carbazole-3-carbonitrile and 1-[6-(1H-Indol-1-yl) pyridin-2-yl]-1H-indole-3-carbaldehyde was described in<sup>[4]</sup>. Crystallographic, experimental (FT-IR and FT-RS) and theoretical (DFT) investigation, UV-Vis, MEP, HOMO-LUMO and NBO/NLMO are studied in<sup>[5]</sup>.



## EXPERIMENTAL METHOD

Au-supported TiO<sub>2</sub> catalysts were prepared using a deposition-precipitation method. A solution of HAuCl<sub>4</sub>•4H<sub>2</sub>O was used as the precursor. The pH of the solution was adjusted to 6 by the addition of a 0.1 M solution of NaOH. Once the pH value was constant, TiO<sub>2</sub> powder was added under vigorous stirring. The deposition precipitation procedure was performed at room temperature for 4 h. The crystals were recovered by filtration, washed and dried overnight under an N<sub>2</sub> atmosphere. Finally, Au/TiO<sub>2</sub> catalysts were calcined in air at 400 °C for 4 h. The surface morphologies of anatase TiO<sub>2</sub>, rutile TiO<sub>2</sub>, Au/TiO<sub>2</sub> (anatase), and Au/TiO<sub>2</sub> (rutile) were obtained using a scanning electron microscope (SEM) (JSM-5600V; JEOL) at an accelerating voltage of 20 kV<sup>[6]</sup>. A diffuse reflectance UV-vis spectrometer (U-4100, Hitachi) was used to obtain the UV-vis spectra of the four types of catalysts. Au/TiO<sub>2</sub> was deposited on a quartz filter paper (20mm×20 mm) and before starting the experiments, the samples were degassed at 200 °C for 2 h in air. A Fourier transform infrared spectroscopy (FTIR) reactor system was designed for the photocatalytic reaction. The air in the gas reactor containing the deposited Au/TiO<sub>2</sub> sample was replaced by CO<sub>2</sub> with 50% relative humidity, and a xenon lamp was used to irradiation the sample with UV-Visible light. FTIR measurements were conducted every 1 h<sup>[7]</sup>.

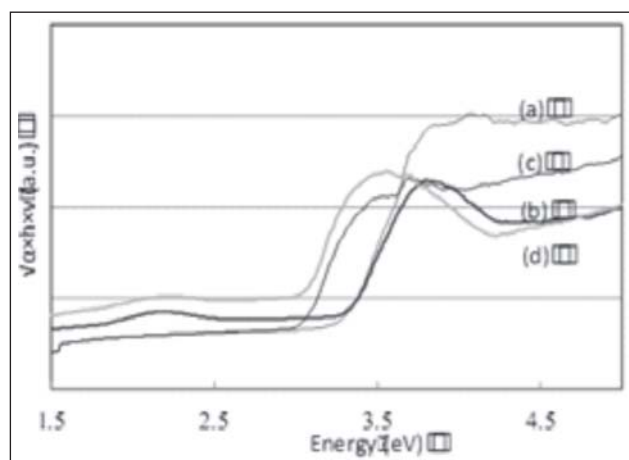


Fig. 1. UV-vis spectra of four types of catalysts. (a): anatase TiO<sub>2</sub>, (b): Au/TiO<sub>2</sub> (anatase), (c) rutile TiO<sub>2</sub>, and (d) Au/TiO<sub>2</sub> (rutile)

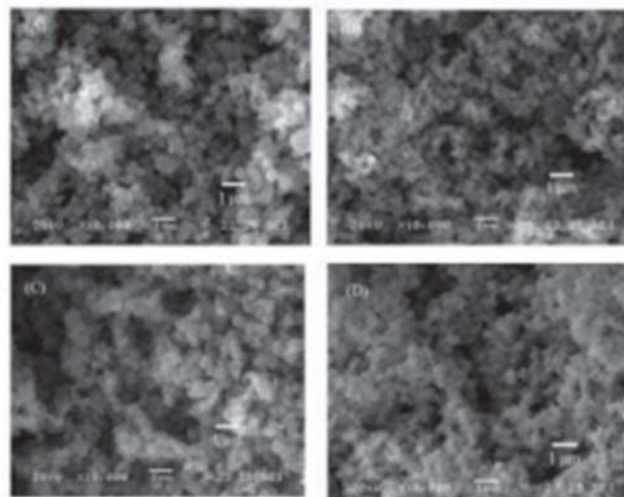


Fig. 2. SEM images of (a).Au/TiO<sub>2</sub> anatase (b).Au/TiO<sub>2</sub> rutile(c).TiO<sub>2</sub> anatase and (d).TiO<sub>2</sub> rutile

## RESULTS AND DISCUSSION

The Au-supported TiO<sub>2</sub> powder catalyst was violet in color and had an absorption peak at approximately 600 nm because of the surface plasmon effect of Au nanoparticles. The diffuse reflectance UV-vis spectra of the four types of catalysts are shown in Fig. 1. The reflectance was converted into the ratio ( $\alpha$ ) of the absorption and scattering coefficients using the Kubelka-Munk equation. Au loading did not affect the band-gap energies<sup>[8]</sup>. The estimated band-gap energy for both rutile TiO<sub>2</sub> and Au/TiO<sub>2</sub> (rutile) was 3.0 eV, and 3.2 eV for both anatase TiO<sub>2</sub> and Au/TiO<sub>2</sub> (anatase). The Au NPs' have absorption at approximately 2 eV for Au loading samples. Figure 2 shows the SEM images of anatase TiO<sub>2</sub>, rutile TiO<sub>2</sub>, Au/TiO<sub>2</sub> (anatase), and Au/TiO<sub>2</sub> (rutile). Changes were not observed in the surface before and after Au loading both on the anatase TiO<sub>2</sub> and rutile TiO<sub>2</sub>. The effect of irradiation time on the formation of CO<sub>2</sub> photocatalytic reduction products was investigated over a period of 0–5 h. Two primary products (CO and CH<sub>4</sub>) were detected in the gas phases. Methanol, formic acid and formaldehyde were undetectable in the gas phase. The FTIR spectra shows peak at approximately 2165 cm<sup>-1</sup> and 3018 cm<sup>-1</sup> in Au/TiO<sub>2</sub> anatase samples before and after irradiation<sup>[9]</sup>. The FTIR spectra following an irradiation time of 0 h and 5 h are shown in Figs. 3a and 3b. After irradiation, a series of absorption peaks corresponding to CO and CH<sub>4</sub> molecules were obtained. Using the peaks at 2165 cm<sup>-1</sup> and 3018 cm<sup>-1</sup>, we calculated the amounts of CO and CH<sub>4</sub> from the differences in the absorbance at 2165 cm<sup>-1</sup> and 3018

cm<sup>-1</sup> and the respective values from the standard curves. The relationship between the CO concentration and irradiation times for the four types of catalysts (anatase TiO<sub>2</sub>, rutile TiO<sub>2</sub>, Au/TiO<sub>2</sub> anatase and Au/TiO<sub>2</sub> rutile) is shown in Fig. 4. The CO concentrations were normalized to the weight of the catalyst<sup>[10]</sup>. After 1 h irradiation, a linear relationship between the CO concentration and irradiation time was observed. The slopes indicate the CO production efficiencies (Table 1). The slope mainly depends on the Au loading up to 1 h of irradiation, and on the crystal structure of

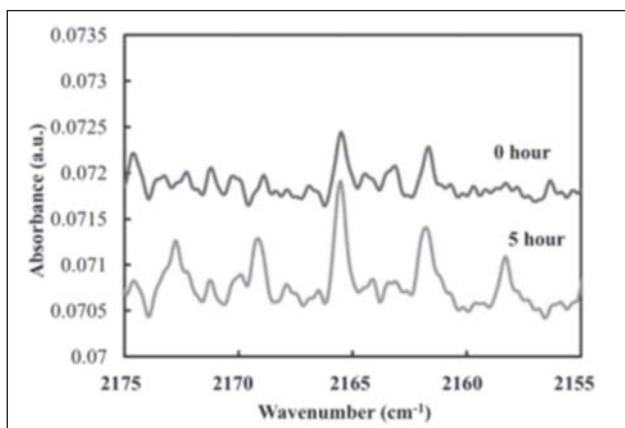


Fig. 3. FT-IR spectra of CO (a) .Au/TiO<sub>2</sub> (anatase) before irradiation and (b).Au/TiO<sub>2</sub> (anatase) after irradiation by Xe Lamp for 5 h.

Table 1. CO production coefficients of the four types of catalysts

Irradiation time (h)	0-1	2-5
Catalyst	Production coefficient (μmol/g.h)	
Au/TiO <sub>2</sub> (anatase)	0.25	0.015
Au/TiO <sub>2</sub> (rutile)	0.26	0.072
TiO <sub>2</sub> (anatase)	0.094	0.015
TiO <sub>2</sub> (rutile)	0.14	0.060

TiO<sub>2</sub> up to 2–5 h. The slope depends on both the crystal structure of TiO<sub>2</sub> and the Au loading. The CO and CH<sub>4</sub> production efficiencies at irradiation times of 2–5 h for the four types of catalysts are summarized in Fig. 5. CO production efficiencies of both anatase TiO<sub>2</sub> and Au/TiO<sub>2</sub> (anatase) are similar, while those of rutile TiO<sub>2</sub> and Au/TiO<sub>2</sub> (rutile) are similar. Considering these results, it was assumed that the coverage of Au NPs was not 100% and some bare TiO<sub>2</sub> surface still remains. CO production mainly occurred on the bare TiO<sub>2</sub> surface. CH<sub>4</sub> production efficiencies were enhanced by Au NPs' loading. Eight electrons are needed for the production of CH<sub>4</sub> from CO<sub>2</sub>. The Au NPs on TiO<sub>2</sub> function as charge–carrier traps, resulting in enhanced CH<sub>4</sub> production efficiencies. The ratio of

CH<sub>4</sub> production with and without Au loading was calculated from the slope of the plot between materials' concentration and irradiation times. The ratios were 3.1 and 4.9 for anatase and rutile, respectively. The higher ratio in case of rutile can be explained based on the fact that the electrons can easily transfer from Au NPs to TiO<sub>2</sub> at the interface of Au NPs/TiO<sub>2</sub>. Considering the slope at irradiation times of 0–1 h, the CO production efficiencies of all 4 types of catalysts are greater than those at irradiation times of 2–5 h. One reason for this is that CO in the atmosphere

Fig. 4. The relationship between CO concentration and irradiation times for four types of catalysts (anatase TiO<sub>2</sub>, rutile TiO<sub>2</sub>, Au/TiO<sub>2</sub> anatase, and Au/TiO<sub>2</sub> rutile). The CO concentrations were normalized by weight of catalyst.

Adsorbs on the catalyst's surface and desorbs when the catalyst is irradiated by light. Another reason is that there are two types of reaction sites, one for a short lifetime (1h) and another for longer lifetime such as 5 h: further studies are needed for detailed evaluation. The CH<sub>4</sub> production efficiencies of rutile at irradiation times of 0–1 h are extremely low. One reason for this could be the presence of adsorbed contaminants on the surface or interface, which are converted into CO<sub>2</sub> on the catalyst surface during the initial irradiation time. After several hours of irradiation, the contaminants are cleaned and CH<sub>4</sub> is produced with higher efficiencies. Based on these results, it was

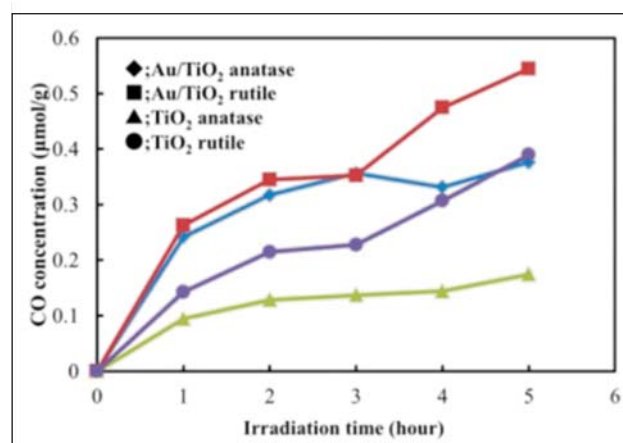


Fig. 5. CO and CH<sub>4</sub> production efficiencies (mol/gh) of the four types of catalysts. Irradiation time: 2–5 h.

Found that CH<sub>4</sub> production was enhanced by Au loading, independent of the crystal structure of TiO<sub>2</sub>, and that the CH<sub>4</sub> production ratio was dependent on the crystal structure of TiO<sub>2</sub>. The photocatalytic ability of Au/TiO<sub>2</sub> (rutile) was comparable to that of Au/TiO<sub>2</sub> (anatase). Therefore, Au/TiO<sub>2</sub> (rutile) can be used a photocatalyst for CO<sub>2</sub> reduction under sunlight.

## CONCLUSION

In this paper, an Analysis of Co<sub>2</sub> Photoreduction Using Au Nano particle on TiO<sub>2</sub> Catalyst is proposed. The crystal structures are verified using a scanning electron microscope and the loaded Au nano-particles had no effect on the surface structure. Fourier transforms infrared spectroscopy used to evaluate the photoreduction products. CO and CH<sub>4</sub> were the major products detected in the bare rutile and anatase TiO<sub>2</sub>, respectively. It was observed that the deposition of Au NPs on the TiO<sub>2</sub> catalyst surface quantitatively enhances the reduction of CO<sub>2</sub> to methane.

**Ethical Clearance:** Taken from AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Application of Bio-Inspired Swimming Robot for Marine Aquaculture

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## ABSTRACT

This paper exhibits the advancement of a bioinspired swimming robot from idea configuration to reproduction for marine aquaculture applications. In light of examination of a few fish movements, the Manta beam is observed to be the most appropriate taunt question since the fluttering pectoral balance includes long-continuance, low commotion, high payload limit, great dependability and mobility. Through a far reaching examination of the structure of Manta beam, the shape corresponding connection between the body and the pectoral balances is gotten. Despite the fact that the idea configuration rearranges the structure, major utilitarian parts are held. By applying two degrees of flexibilities to each fragment of the pectoral balance, the drive component enables the mechanical fish to swim in 3D. Likewise, a push investigation is performed for a decent comprehension of the fish's oceanic velocity guideline. The fluttering movement is disintegrated into two orthogonal waves and acknowledged on the automated fish, taking points of interest of sine generators. Reproduction tests including movement examination, speed and turning tests check the rightness of the mechanical fish's structure and its drive systems.

**Keywords:** *Swimming Robot, Concept Design, Modeling and Simulation, Marine Aquaculture Applications*

## INTRODUCTION

Marine aquaculture is profoundly established in Norwegian national financial aspects and conventions. Since the appearance of business salmon cultivating around 1970, the aquaculture business has developed to wind up noticeably the second biggest industry in Norway. With a specific end goal to give direct data about Norwegian aquaculture, maintainable creation, sustenance security, cultivated species and the lawful system for aquaculture generation, the conventional angling industry has experienced various changes, particularly in creating and utilizing submerged vehicles. Predominant capacities found in characteristic fish, for example, high proficiency, high speed, quiet swimming, high mobility and high solidness, are the plan objectives for submerged vehicles utilized as a part of aquaculture-related applications<sup>1</sup>. These days, submerged vehicles are being created and connected to increasingly work in testing marine situations<sup>2,3</sup>. A large portion of the current submerged vehicles are propeller driven. Despite the fact that they are anything but difficult to control, their drive mode has a few downsides, for example, noisy commotion, enormous size, low productivity, and in addition moving just at low speed. What's more, another

noteworthy disadvantage identified with marine aquaculture applications is the acoustic clamor brought on by the propeller, it definitely interferes with the bunch of fish and results in low yield. A superior option is to utilize biomimetic innovations with a specific end goal to create angle like robots<sup>4</sup>. As of late, a movement mode from Manta beam has gotten the consideration of specialists worldwide because of its movement productivity, and solidness. Related research in light of this movement design has been examined and new models of fish-like robots have been created<sup>5,6</sup>. Nonetheless, flow look into on this kind of fish-like robots concentrates on propulsive proficiency.

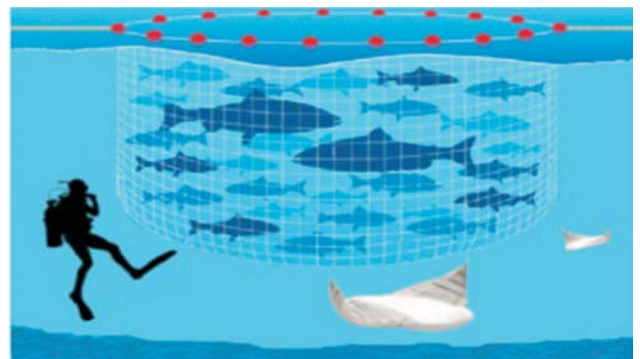


Fig. 1. Concept-design of robotic fish in aquaculture applications.

A conceivable substitute for a human jumper is a kind of fish-like robot enlivened from Manta beam, as appeared in Figure 1. The checking assignment can be acknowledged by using sensors, for example, submerged camera, reverberate sounder and side output sonar on the Manta beam automated fish. This paper principally introduces the outline<sup>7,8</sup> demonstrating and reenactment of the robot, with an accentuation on the best way to effectively remove highlights from Manta beam notwithstanding enhance<sup>9, 10</sup>propulsive effectiveness.

**METHODOLOGIES**

The methodologies includes for the proposed work are listed below:

**Design and Modeling of Manta-Ray-Like Robotic Fish**

To start with, import the forms into 3ds Max and set the measurements. The longitudinal length L, the most extreme body width w and the greatest body thickness H are set to 450mm, 300mm and 105mm, individually. The outline system is appeared in Figure 2. The body molding begins from the body form from top view.

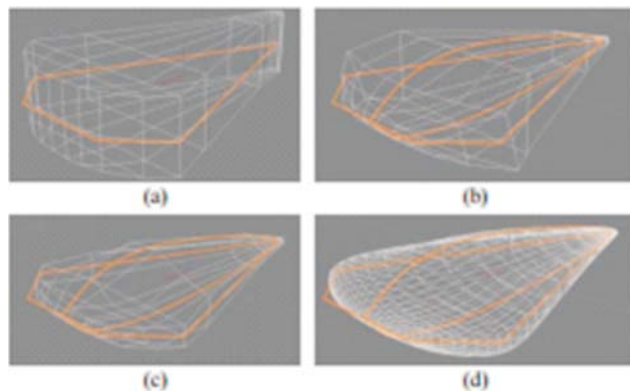


Fig. 2. The body shape design process. (a) Extrude the contour. (b) Reshape the body to be corresponding with the lateral contour. (c) Make a smooth transition. (d) Refine the mesh.

The shape is redrawn to get a smoother bend in front and a thin tail toward the end. At that point it is expelled to the greatest thickness of the body. From that point onward, we reshape the body to be relating with the shape from the sidelong view. So as to encourage the further alteration, it is ideal to keep the work of the body as basic as conceivable at this stage. Finally, we make a smooth move from the body to the edges of pectoral blades by decreasing the thickness of the body from the center to the parallel. Efficacy of Probiotics on *Litopenaeus vannamei* Culture through Zero Water Exchange System. Journal of Fisheries and Aquatic Science<sup>11</sup> for marine agriculture.

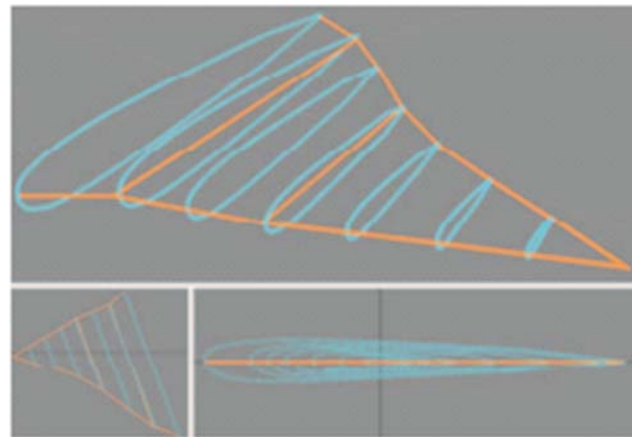


Fig. 3. Frames of the pectoral fin with identical intervals.

The states of the pectoral balances are displayed by making a few casings at indistinguishable interims, as appeared in Figure 3. The lengths of the casings are limited by the shape of the blades. To show signs of improvement hydrodynamic execution, the horizontal perspectives of the casings are torpedo-formed. The subsequent stage is to make the work as per the edges. In this way the casings will be used to completely control the misshapening of the balances. Likewise with the body forming, the last stride is to refine the work to get a smooth surface. Biopreservation of value added marine fishes under different storage conditions using bacteriocin from *Lactobacillus*<sup>12</sup> for developing the marine agriculture.

**RESULTS AND DISCUSSIONS**

To keep the mechanical fish staying under the water its thickness is set to be the same as the thickness of water and its focal point of mass is put a tiny bit lower than the geometric focus.

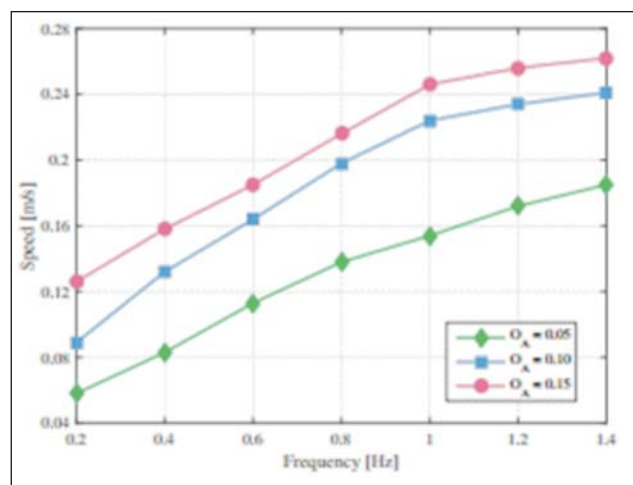


Fig. 4. Forward swimming speed test.

The speed increments monotonically with expanding adequacy and recurrence. The following blunder of the PD controller additionally increments because of engine torque confine. The speed augment accordingly diminishes as the recurrence increments. The most astounding rate at 1.4Hz is around 0.262m/s, which compares to 0.58 body length/s.

### CONCLUSION

In this paper exhibited how to build up a bioinspired swimming robot from idea configuration to recreation. In the first place, as indicated by the requests in marine aquaculture applications, prevalent abilities performed by Manta beams are researched. At that point, the body, the pectoral balance and the impetus instrument of Manta beams are completely dissected. Next, a streamlined outline of Manta-beam like mechanical fish is examined. The body is a precious stone shape and the pectoral blade is comprises of seven fragments. The drive of the robot is accomplished by applying the sine generator to each of the fragment. Ultimately the recreation comes about demonstrate that the proposed approach for automated fish configuration is right and powerful in acknowledging fluttering swimming.

**Ethical Clearance:** Taken from AMET University.

**Source of Funding:** Self.

**Conflict of Interest:** NA

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# Glaucoma Classification Based on Contourlet Transform

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## ABSTRACT

An ocular disorder caused due to improved fluid pressure in the optic nerve is known as Glaucoma. It causes progressive degeneration of optic nerve fibers and leads to structural changes of the optic nerve and a simultaneous functional failure of the visual field. Automatic screening will help the doctors to quickly identify the condition of the patient in a more accurate way. Hence this research aims to develop an automatic system for the detection of glaucoma using digital fundus image based on Contourlet Transform (CT). Contourlets is used to form multiresolution directional tight frame designed to efficiently images made of smooth regions separated by smooth boundaries and texture features are obtained from the transform. These features are utilized by the classification of normal and glaucoma images using Support Vector Machine (SVM) classifier.

**Keywords:** Glaucoma Classification, CT, Texture features, SVM.

## INTRODUCTION

Haralick texture features based automated diagnosis of glaucoma is presented in <sup>[1]</sup>. Glaucoma detection using a haralick texture features from digital fundus images and K-Nearest Neighbors (KNN) classifier is used to carry out supervised classification. Texture and Higher Order Spectra Features based glaucoma diagnosis is discussed in <sup>[2]</sup>. SVM, sequential minimal optimization, random-forest, and naive Bayesian classifiers are used to execute supervised classification. Glaucoma detection based on Discrete Wavelet Transform (DWT) using optical coherence tomography images is described in <sup>[3]</sup>. With the help of t-test class separability criteria, important wavelet co-efficient are selected after DWT decomposition and fed into the SVM classifier for automated diagnosis.

Survey about automated classification and detection of glaucoma using fundus images is described in <sup>[4]</sup>. Variety of risks and eye diseases are detected using this procedure. Size measurement, Neuroretinal rim and optic cup shape are involved in glaucoma identification. Wavelet energy features based glaucoma classification is explained in <sup>[5]</sup>. Texture features is used to extract the features using energy distribution over wavelet sub bands and probabilistic neural network is used to classify the images. Daubechies, symlets, and

biorthogonal are the wavelet filters used and the energy obtained from the complete coefficients can be used to differentiate between normal and glaucomatous images. Diagnosis of glaucoma using digital fundus images is presented in <sup>[6]</sup>. Plotting the person's eye colour with database consisting of normal as well as abnormal is the main task. Observation will show the person is affecting or not by measuring the colour pixels in the affected area. An outcome of periodized small side games with and without mental imagery on playing ability among intercollegiate level soccer players is also describes that <sup>[7]</sup>. Image Super Resolution Using Wavelet Transformation Based Genetic Algorithm explained in <sup>[8]</sup>. Computer aided diagnosis of glaucoma detection using digital fundus image is explained <sup>[9]</sup>. Glaucoma image classification using discrete orthogonal stockwell transform is explained <sup>[10]</sup>.

## PROPOSED SYSTEM

The proposed system uses the CT as well as texture features. The CT is a competent directional multiresolution image representation. The sub-bands in the CT are linearly independent and so uncorrelated. Energy distribution over sub bands is applied to find these important transform features. A novel technique used to extract energy feature obtained by using CT is proposed. Effectiveness of the proposed system is based on extracted features using a SVM classifier.

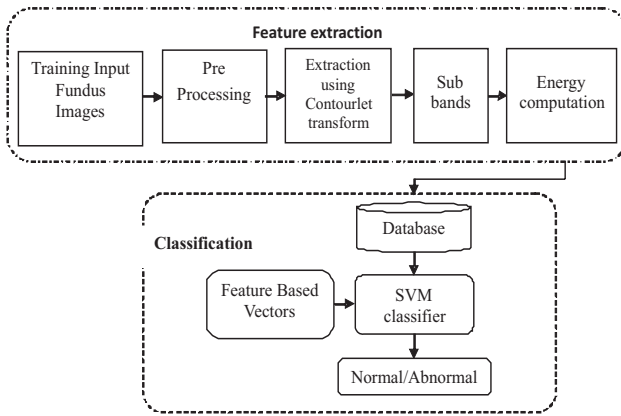


Fig. 1. Block Diagram of the proposed system using CT and SVM

## MODULES

### Pre-processing Module

The R, G, B components and gray scale of fundus images are subjected to CT. The R, G, B components of image consist of significant details in the form of variation of gray pixel intensities. The information present in R, G, and B components are used to extract features for automated diagnosis of glaucoma. Pre-processing is the essential stage. Conversion of RGB to Gray is done in pre-processing.

### Feature Extraction Module

The texture feature has been used as feature in the proposed methodology. In reviewing texture features for use in classification and segmentation schemes this chapter therefore has two main objectives:

- (i) To identify research on the effect of variation in illuminant direction on texture classification and segmentation, and
- (ii) To select three sets of feature measures for further investigation as regards changes in illuminate slant and tilt.

### Classifier Module

Classification is the final stage of the proposed method. SVM classifier is used to classify the images from feature extraction stage. SVM is a machine learning classifier that analyze data and recognize patterns for regression analysis. SVM model is a revelation of the examples as points in space. New examples are then mapped into that similar space and predicted to belong to a category. SVM can well perform a non-linear classification using kernel trick, implicitly mapping their inputs into high-dimensional feature spaces.

## EXPERIMENTAL RESULTS

In this section, the experimental results of the proposed system are discussed and verified. A set of 46 images with normal and abnormal are generated. These images are decomposed using CT technique. Texture features are obtained from the decomposed image. Then the features are classified using SVM classifier. Normal is 98% and abnormal is 100% using a novel SVM classifier. Accuracy comparison of the proposed and existing is shown in the given table.

Table 1: Comparative Analysis

Methods	Classifier Accuracy (%)
DWT+SVM [3]	90.7
HOS+SVM [2]	91
Wavelet features + PNN [5]	95
GLCM+K-NN [1]	98
Proposed System	99

## CONCLUSION

An approach for glaucoma classification based on texture features and SVM classifier is presented in this paper. CT technique is presented in this system for decomposition. Texture features are used for feature extraction in the proposed system. The proposed methodology need to test for huge database and also can be extended to diagnose glaucoma at an early stage. From the experimental results, it is cleared that the classification accuracy of glaucoma is very reliable. Overall accuracy of the proposed system is 99%.

**Ethical Clearance:** Taken from AMET University committee

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Design and Implementation of Digital Medical Prescription Device

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## ABSTRACT

The project aim is to design a digital medical prescription device for doctors and medical professionals to enable the creation of hand written digital prescriptions in real time. By utilizing Tablet PC technology, doctors can create, edit and store the hand written prescriptions directly into a digital medium hence creating a patient record for future reference. The device has built-in Online Character Recognition software which is able to recognize the characters written by the doctor on the Touchscreen GUI. A doctor can study the patient prescription from history simply by entering the patient's medical ID.

**Keywords:** Digital, Recognition, GUI, Medical ID

## EXISTING SYSTEM

The present circumstance is that the specialist composes a remedy physically on the paper frame. Notwithstanding that, the specialist gathers a report demonstrating the number and sort of remedies he has composed. Quiet conveys the paper medicine to the drug store where the drug specialist enters the remedy into the drug store's data framework, and after that issues the solution. The existing framework is that the revealing procedure required from the specialists and drug specialists is exceptionally tedious. Specialists commit errors identified with the confounded undertaking of sponsorships to medicines, and mistakenly figured appropriations will be later deducted from their wages. Moreover, patients need to make another arrangement to see the specialist again off chance that they have lost their physically composed paper solution.

## INTRODUCTION

Programmed penmanship acknowledgment turns into a subject of research from the 1960s. The systems in this field have been uncontrollably utilized as a part of a few applications, for example, programmed address perusing, bank check handling, and acknowledgment of content filled in by hand on structures. The space of penmanship acknowledgment can be separated into on-line and disconnected acknowledgment <sup>[1]</sup>. To reinforce the execution of penmanship acknowledgment has been a noteworthy objective in this field. Other than the essential penmanship

acknowledgment calculations, different postprocessing strategies are proposed to enhance the exactness of acknowledgment. The procedures for on-line and disconnected acknowledgment might be very unique, however the postprocessing strategies are possible of similarity between them. Digital prescriptions bring many advantages to those involved in the process. Doctors can forward an electronic prescription to the national database<sup>[2]</sup>. The e-prescription is then immediately accessible in every pharmacy on a patient's request. The patient only needs to know a nationwide secure medical ID in order to have the medicines delivered to them. Patients can be more confident that they receive the right medicines, and the risks of misinterpretation of the prescription by the chemist and subsequent medical errors disappear. The prescriptions can neither be lost nor forgotten. The technology also reduces paper usage that indirectly makes the planet a little greener<sup>[3]</sup>.

## METHODOLOGY

Figure.1 demonstrates the work process of our framework. For the most part, the application contains two units: on-line penmanship acknowledgment and medical information based postprocessing <sup>[4]</sup>. In the acknowledgment unit, the specialist's manually written scripts are perceived and changed to content. At that point the perceived content is broke down and re-established in the postprocessing unit to shape the last penmanship content<sup>[5]</sup>.

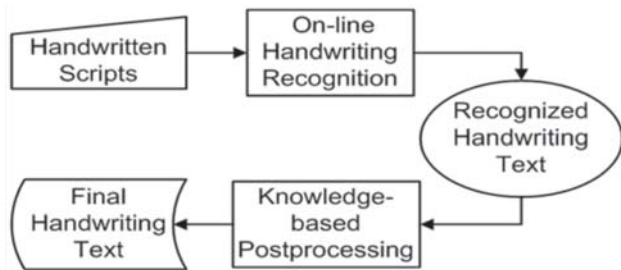


Fig.1.Overall system workflow

**Working Principle**

The gadget is worked around a 65K Color QVGA TFT Touchscreen Graphics LCD going about as the fundamental UI. Advanced medicines are put away in FAT-32 designed 2GB MicroSD memory card. The gadget is controlled by a 32-bit ARM Cortex-M3 microcontroller that handles the Graphics Library for Touchscreen show, runs EFSL (Embedded File System Library) that makes, alter and spare remedy records into the capacity medium. The errand of word acknowledgment step is to discover all the substantial sections of the library that match the drawing of the word. To do that, a pursuit tree is fabricated guided by the lexicon which contains more than 9500 words [6]. Every hub of the inquiry tree contains a window of the stroke grouping and the relating character perceived by the past stride. Really the utilization of dynamic programming calculation has been proposed. In that paper, for each word, just the competitor that best matches the scripts is chosen as the outcome, which has the principle effect from our calculation. For our situation, we yield all the word hopefuls perceived amid the acknowledgment system for a given drawn word.

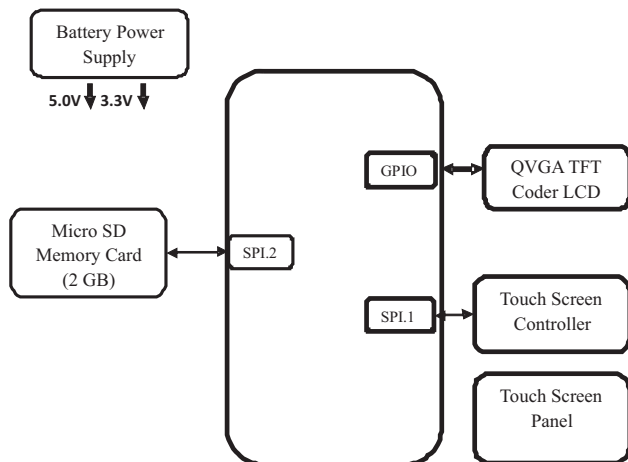


Fig. 2. Hardware Deign

**CONCLUSION**

In this paper, we executed a Digital Prescription framework to take care of the present issues through giving the solution and announcing an electronic arrangement. As an auxiliary need the Digital Prescription ought to for all intents and purposes make it unthinkable for the specialists to commit errors and for the patients to lose their remedy.

**Ethical Clearance:** Taken from AMET University.

**Source of Funding:** Self

**Conflict of Interest:** NA

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# A Robotic Vehicle with GPS Guided autopilot Navigation for Accident Prevention

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## ABSTRACT

A unique number of vehicle mishaps are brought on by human driver mistakes for reasons including occupied driving or forceful driving. The principle issue behind this is the human reaction time is restricted, and subsequently, these occurrences are inherently unavoidable. Our project is called Driver-LESS, that aims to remove the human driver from the equation and build a self-driving vehicle. The project implements an advanced autopilot system, which is able of driving the car from one point to another without a human worker.

**Keywords:** *Driverless, Robot, Motor, Sonar*

## INTRODUCTION

The historical background of driverless auto is over 30 years. The Line Tracing car, for example, has been used as a piece of modified creation lines for an extended timeframe <sup>[1]</sup>. At introduce vehicle makers are considering to some degree motorized vehicles, for instance, ADAS to help the human drivers. In that limit, an entirely self-decision auto is up 'til now a detachment away. Regardless, the industry is right now forefront to such an extent, to the point that both GPS sensor progressions and better dealing with propels are beginning than outperform the necessities that are relied upon to produce based autonomous vehicles <sup>[2]</sup>. The past was obviously a Wild West affair, while the latter was much the same as a road test for the driver(less) allow in the city. Enlivened by these models, we started this examination <sup>[3]</sup>. The best way to split robots into types is a partition by their application. 1. Industrial robots – These robots bring into play in an industrialized manufacturing atmosphere. Typically these are articulated arms mainly created for applications like- material handling, painting, welding critical applications. So many accidents occurred in welding so that robot application applied in welding process <sup>[7-8]</sup> and others. Robotic Fire

Detection System is presented in this paper <sup>[9]</sup>. In this paper described that the robotic functions and involvement used in welding process <sup>[10]</sup>.

## PROPOSED TECHNIQUE

Our wander is called Driver-LESS, that intends to remove the human driver from the condition and fabricate a self-driving vehicle. The wander completes a moved autopilot system, which is prepared for driving the vehicle beginning with one point then onto the following without a human head <sup>[4]</sup>.

The vehicle contains the MCU framework that includes locally available sensors and course guide of the range in which the engine car works. Inside the vehicle, the traveler will be furnished with a touch screen interface to choose their goal and the car begins its route. Utilizing the on-board PC, sensors and pre-recorded way-point information the car keeps away from the obstructions and takes the travelers on the right course and achieve where they need to go. Figure 1 portrays driverless auto framework. Accordingly, we can see that this vehicle can bring enhanced security, decreased movement and contamination and in this way change street transport as we probably are aware it.

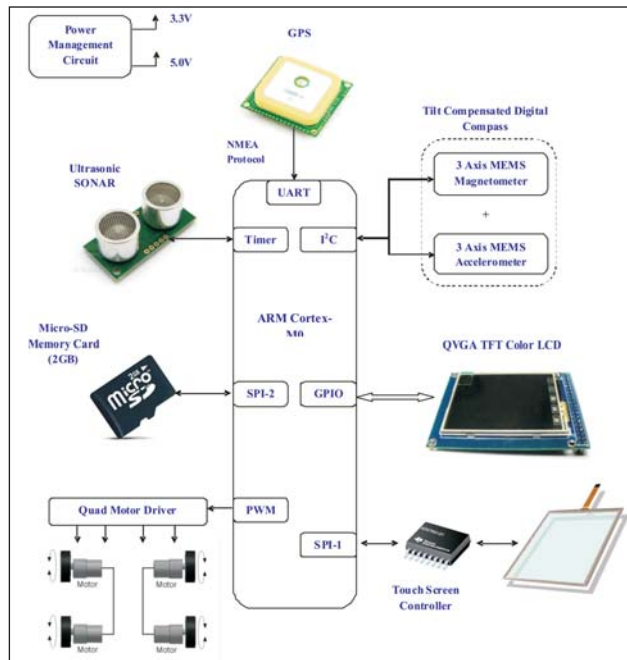


Fig. 1. Block Diagram of Driverless CAR

### A. Autopilot Navigation

The autopilot system consists of a GPS guidance system<sup>[5-6]</sup>, a suite of onboard sensors and a 32-bit microcontroller, using which functions such as way-point detection, obstacle escaping and motion control is incorporated and carried out.

### B. Working Flow Diagram

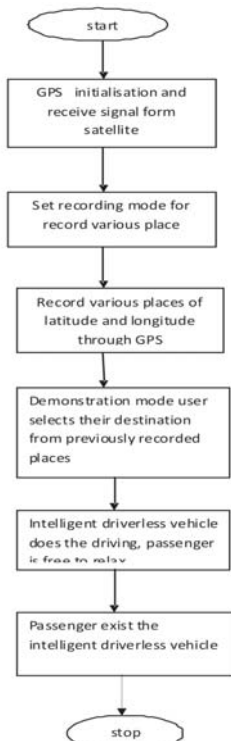


Fig. 2. Flow Diagram of Driverless CAR

## RESULT AND IMPLEMENTATION

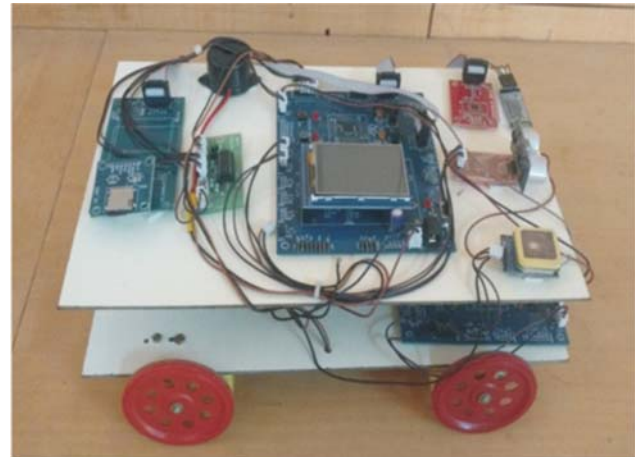


Fig. 3. Driverless CAR

- The implementation of Driverless car includes implementing robot with GPS for a driverless car.
- DC motors are used as front wheel and rear wheel actuators respectively.
- First Robot check code will run and then we have to set destination location like A, B, and C.
- Ultrasonic Sensor is additionally called as SONAR. It is used to sense the obstacle before the driverless car, if an obstacle is coming before the driverless car it automatically stop and after moved obstacle only it will move.
- Any obstacle detected means automatically the buzzer is ON.
- MEMS compass used to sense the direction of the robot.

## CONCLUSION

Driver error is the most common cause of traffic accidents. With cell phones, in-car entertainment systems, more traffic and more complicated road systems, the problem seems bigger than ever. In this issue overcome by this paper. The autopilot system consists of a GPS guidance system, a suite of onboard sensors and a 32-bit microcontroller, using which functions such as way-point detection, obstacle escaping and motion control is incorporated and carried out. If any obstacle is coming front of Driverless car means it will stop and after moved obstacle, it will go, and We can select the location customer where he/she go. We can improve this module in wireless

monitoring the driverless car for multiple driverless car purposes.

**Ethical Clearance:** Taken from Vinayaka Missions University

**Source of funding:** Self

**Conflict of Interest:** Nil

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# Design and Implementation of Smart Plug with Energy Monitoring System using IoT

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## ABSTRACT

Internet of Things (IoT) is the expansion of web administrations. The SimpleLink gadget gets the system certifications of new advancements in IoT condition are expanding quickly. A Smart Home is additionally one of the uses of IoT. A Smart Switchboard constrains customer's execution in watching home settings and controlling home machines. This paper shows an approach to managing the progression of Smart Home applications by consolidating IoT with the Web Server and Cloud organize. The approach concentrates on (1) implanting insight into sensors utilizing Energia stage[7]; (2) Creating collaborations with brilliant things using Blynk-Cloud stage; (3) expanding information trade proficiency. At the point when these family unit gadgets in excellent homes interface with the web utilizing legitimate design, then entire framework can be called as Smart Home in IoT condition or IoT-based Smart Homes. Keen Homes contains family unit gadgets/home apparatuses could screen and control remotely. Also, we execute three cases to show the approach's possibility and productivity, i.e., measuring home conditions, observing electrical machines, and monitoring home robotization.

**Keywords:** Smart Switch Board, Internet of Things, Blynk-Cloud Platform, Energia

## EXISTING SYSTEM

Utilizing a cell phone, we can right away know the climate state of London or the stocks and oil costs in US market or make a video call to our family and companions anyplace on the globe. Be that as it may, we can't control the electrical gadgets exhibit in our home/office once we are out of the building. We don't have a clue about the vitality devoured by an electrical apparatus in our home/office. We have no real way to know and turn OFF a light or a clothes washer or an aeration and cooling system that is left ON after some person leaves the room. We can't set power on/off planning for these gadgets.

## INTRODUCTION

Smart Switchboard System is an intelligent, energy conscious with a Wi-Fi connection that can monitor the energy consumed by appliances and also allows the user to control those electrical devices from anywhere in the world using a smartphone or mobile device interface<sup>[1]</sup>. It can power up to six different devices. The conventional devices are thus made smart and operated efficiently. This can reduce the monthly electrical bills and makes the planet a greener place to

live. Our Smart Switchboard can control up to six different appliances. Those household appliances will connect to the switch modules. It includes any module which changes its position as it got the flag. Change module associated with the gadget such that when it changes the express, the condition of family unit device interfaces with it will likewise change. Transfers can be utilized as a switch module. It is an electromagnetic device or regularly called as hand-off switch. It separates two circuits electrically and interfaces them attractively. In essential transfer there are three contactors which are typically Open (NO), ordinarily shut (NC), and regular (COM). COM is usually associated with the NC. At normal condition when family unit gadgets are not in working mode then hand-off is on NO state. When it gets flag, then it changes the state to NC, and the gadget will get in working state.

Switch Module will associate with the Smart Microcontroller. It will go about as interface device between family unit devices and Cloud Server. Home automation is the important thing in our day to day life to save energy. For example wind and solar power for used to generate electricity at the same time monitor the power from the remote areas. It is a primary source of renewable energy, and its technologies are broadly

characterized as either passive solar or active solar depending on how they capture and distribute solar energy or convert it into solar power. Active solar techniques include the use of photovoltaic systems, concentrated solar power<sup>[6]</sup> and solar water heating to harness the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light-dispersing properties, and designing spaces that naturally circulate air. Wind energy is a form of solar energy<sup>[7]</sup>. Wind energy (or wind power) describes the process by which wind is used to generate electricity<sup>[8]</sup>. Wind turbines convert the kinetic energy in the wind into mechanical power. A generator can convert mechanical energy into electricity.

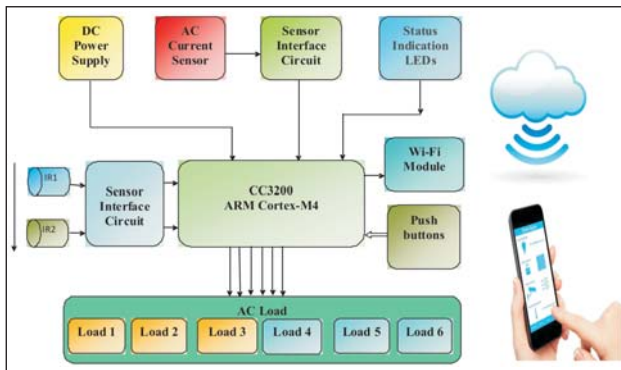


Fig. 1. Energy Monitoring System

### RELATED WORKS AND METHODOLOGIES USED

IoT-based Smart Switchboard is portrayed in light of Layered Architecture. The wise Switchboard system is isolated into three layers: application layer, sort out layer and distinguishing layer. Beginning from the base, detecting layer is in charge of information gathering from all the home apparatuses, and it sends information to the center layer that is arranged layer. System layer utilizes the web for sending information to the uppermost application layer which has diverse applications on the various level for different purposes. For data aggregation and data get ready at the different layer it used microcontroller – CC3200 from Texas Instruments is the world’s first Wi-Fi guaranteed single chip microcontroller unit (MCU) shown[Fig. 2(a)]. It incorporates an elite ARM Cortex-M4 processor subsystem running at 80 MHz and a Wi-Fi subsystem. The Wi-Fi subsystem includes a conferred ARM MCU, an 802.11b/g/n radio, baseband, and MAC with proficient crypto engine for snappy, secure Internet affiliation. CC3200 chip bolsters Station, Access Point, and Wi-Fi Direct modes. It additionally supports WPA2

individual and undertaking security and WPS 2.0. Various provisioning techniques are supported including Smarty config, AP mode, and WPS. It fuses embedded TCP/IP stack, and various Internet traditions for primary web get to. It expends little power, and as per TI, it can keep running for over a year from a single coin-cell battery.

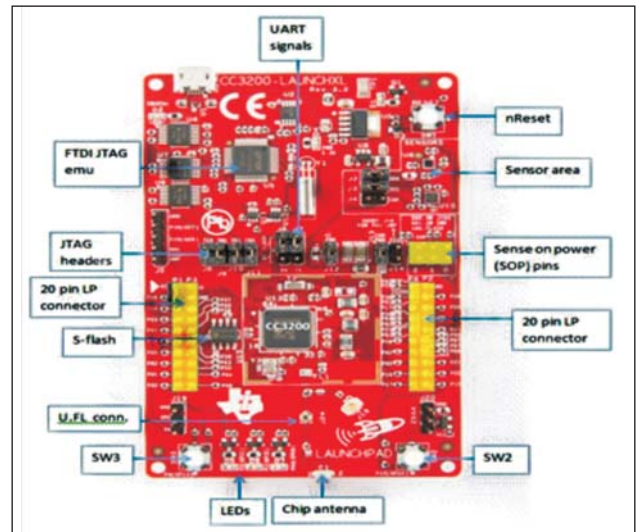


Fig. 2(a) TI-CC3200 Launchpad

There are three noteworthy parts to this application. They are the gadget, cloud server and the versatile application. Each of these elements and the advancements utilized as a part of this venture is clarified underneath <sup>[2]</sup>. Blynk is a cell phone application that enables the designer to make a custom application as indicated by the application demonstrated [Fig. 2(b)]. It uses the assets of a cell phone, for example, the touch screen to give an arrangement of gadgets that help to make a custom UI to control the device remotely. It comprises of two fundamental components, an application running on Android and a library good with the Wiring structure with our venture board.



Fig. 2(b) Blynk App



The gadget utilizes a lobby impact based AC Current sensor and a transformer based AC voltage sensor to locate the prompt power utilization<sup>[4]</sup>. This esteem is the aggregate of all the vitality devoured by every one of the gadgets at present fueled from it. This information can be observed continuously from the versatile application. Power Scheduling highlight enables the client to make and set the on/off timings for every gadget. It can be utilized to mimic nearness of people in the home and keep the robbers away. Inhabitation identification highlight which is used Sharp IR Sensor to distinguish the guest tallies so as to confine the heaps. Given the guest number, we can lessen the wastage of energy and the Electricity Bill. Blynk appeared in [Fig. 2(c)] goes about as a centerman and handles the information interpretation between the gadget and the cell phone application. Once the venture application is enrolled the server issues a token which must be incorporated into the fundamental experiment code. It additionally empowers the gadget to convey between each other and furthermore between other web applications over the internet<sup>[3]</sup>.

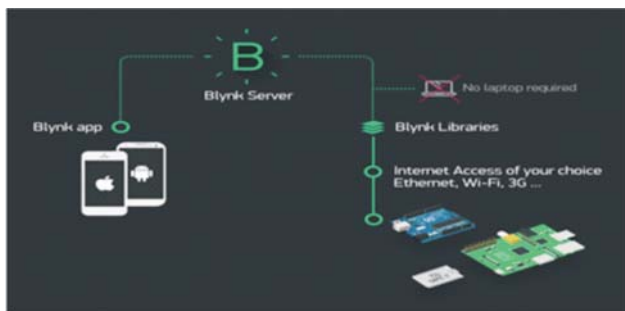


Fig. 2(c) Blynk-Cloud Platform

Before associating the gadget to a get to access point, it needs to join the system safely. The process of connecting a new Wi-Fi device (station) to a Wi-Fi network is called as Wi-Fi provisioning. The provisioning process involves loading the channel with the network name referred to as SSID and its security credentials. The user needs to send the predefined password. Although there are other methods such as Access point method and WPS method, here we are going to use SmartConfig method for Wi-Fi provisioning our device because of its ease of use. SmartConfig is a TI proprietary provisioning process designed for headless SimpleLink devices such as Smart Switchboard device. It utilizes a portable application to communicate the system accreditations from a cell phone or a tablet to an unprovisioned Wi-Fi gadget<sup>[5]</sup>. After the system certifications are gotten by the SimpleLink gadget, it associates naturally to the

system. The user can download the Android mobile app from Google Play.

## CONCLUSION

IoT has various applications in different regions. It has been made for Smart Switchboard System. This paper examined Smart Switchboard through dealing with IoT with a Web Server and Cloud Platform. Our approach included bringing learning into sensors utilizing Energia sort out, enabling trades with smart things using Cloud associations for fundamental access in various ranges, and redesigning information trade suitability. The approach was sensibly used for demonstrating relationship for measuring home conditions, checking electrical machines, and controlling home robotization. The establishment can be gotten for or changed by various applications.

**Ethical Clearance:** Taken from Vinayaka Missions University

**Source of Funding:** Self

**Conflict of Interest:** Nil

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# Environmental Monitoring System in Marine using IoT Technology

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## ABSTRACT

In this paper, the marine characteristic watching structure in perspective of the Internet of Things advancement is investigated and outlined. At, to begin with, the system principal and the general structure of the marine normal checking system appear. By then, the paper looks at the issues of how surface and submerged remote sensor frameworks work in structure building, and how to apply techniques for ZigBee and CDMA in the structure. Finally, the paper clarifies the requirements of information subsystem in the marine typical watching structure.

**Keywords:** *Internet of Things Advancement; Marine Characteristic Checking; Remote Sensor Organize*

## INTRODUCTION

Starting late, with the progression and utilization of marine resources, marine condition defilement and marine cataclysmic occasions have been well ordered extend, achieving huge money related hardship and social impact and making it sincere to secure marine health<sup>[1]</sup>. Remembering the ultimate objective to ensure the perfect progression of ocean resources and marine disease, it is vital to improving the particular level and capacity in regular marine watching<sup>[2]</sup>. Environmental monitoring is an important thing for energy for example wind and solar energy. It is a major source of renewable energy, and its technologies are broadly characterized as either passive solar or active solar depending on how they capture and distribute solar energy or convert it into solar power. Mechanical Signature Analysis (MSA) - A Condition monitoring tool for gear box machinery in this concept presented in this paper<sup>[7]</sup>. Active solar techniques include the use of photovoltaic systems, concentrated solar power<sup>[8]</sup> and solar water heating to harness the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light-dispersing properties, and designing spaces that naturally circulate air. Wind energy is a form of solar energy<sup>[9]</sup>. Wind energy (or wind power) describes the process by which wind is used to generate electricity<sup>[10]</sup>. Wind turbines convert the kinetic energy in the wind into mechanical power. A generator can convert mechanical energy into electricity.

## THE REQUIREMENT AND OVERALL FRAMEWORK OF MARINE ENVIRONMENTAL MONITORING SYSTEM

### Necessities of Marine Environmental Monitoring System

As the 1970s, the United States, Canada, the European Community and other maritime powers have been focus marine modified watching development. Taking after a lengthy time of inventive work, the marine watching parts are:

- 1) Oceanic hydrological and meteorological parameters: speed, bearing, breeze speed, heading, flourish, water temperature, air temperature, indistinct pressure, et cetera.
- 2) Water quality basic state parameters: PH, saltiness, dissolvable oxygen, chlorophyll content, mixed oxygen use, regular, phenol substance, et cetera.
- 3) Physical and complex parameters: a collection of overpowering metals, supplements (phosphate, nitrate, nitrite, et cetera.), nuclear radiation, et cetera<sup>[3]</sup>.

For these records, a couple of parameters are gotten by surface sensor framework, and a couple of parameters can be obtained by submerged sensor sort out. Along these lines, the checking remote sensor structures should be parcelled into two characterizations including the surface one and the submerged one<sup>[4]</sup>.

The assembled data are sent to the shore through the remote module to the Internet so that differing customers can read or use these marine biological checking data. In consent to the system need, this paper uses the Internet of Things advancement to meet the solicitations of the marine normal checking structure<sup>[5-6]</sup>.

## THE MARINE ENVIRONMENTAL MONITORING SYSTEM REMOTE SENSOR NETWORK

### Remote Sensor Network Building

All things considered, the marine natural watching sensor sort out includes space-based satellite framework, arrive based pass on the outline, surface and submerged sensor mastermind et cetera.

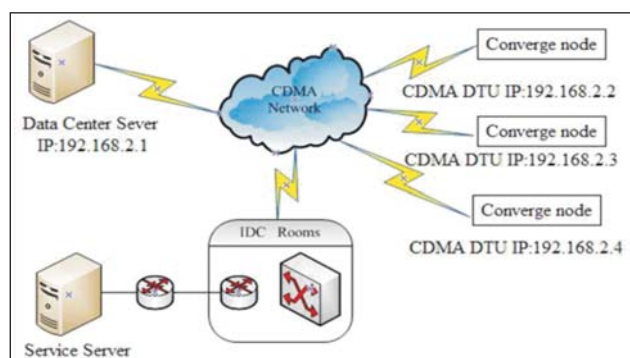


Fig. 1. Wireless Sensor Network for Marine Environment Monitoring.

This paper just talks about the standard marine typical looking at sensor sort, which is disconnected into surface sensor coordinate and submerged sensor make in context out of the sensor position Whether it is surface remote sensor engineer or submerged remote sensor deal with, when the system is common sea life natural watching remote sensor arrange, there are a noteworthy measure of issues, for example, exceptional channel assets, stunning channel condition, high transmission mess up rate, phenomenal multipath influence, low different get to ampleness, troublesome focus point sending, amazing yield data cost, et cetera. These are two or three issues that should be considered in structure building.

### Surface Wireless Sensor Network

Surface remote sensor organizes passes on the sensor focus focuses on first look, make the net, and chats with each other in perspective of remote correspondence headway.

The qualities of the structure are high transmission speed, low centrality utilizes, stable transmission, sun based criticalness control supply, using cautious GPS for orchestrating, and direct correspondence with satellites, et cetera. It is for the most part utilized as a part of checking the wind, wave, tide, water temperature, light, water spoiling and so forth. What's more, as the join base point is all on set on the surface for the practical structure examination, it is beside consolidated into the surface remote sensor plan. Accordingly, the surface remote sensor system is besides in charge of the data transmission with submerged sensor arrange. Precisely when the surface remote sensor structure is gathered, the issues which ought to be considered are focus point setup, time synchronization part, and system security. 1) Converge focus course of action The run parts of join focus point are: to discuss information with sub focus point and information gatherer, to pick up the power charge from PC, to send control sales to sub center point, to send the information collected by sub focus to information pro, to relate the remote sensor system and flexible correspondence compose as a portal.

## CONCLUSION

With the brisk progress of data headway, the entire world is breathing life into the change of marine digitalization. The change of data foundations in toward the sea has been expanding, and the ocean pushed data improvements have been quickly spread. The data advantage confine has additionally been absolute pushed ahead. All these have set up a framework for the great change of the mechanized sea. Notwithstanding, more related moving parts ought to be resolved in the progress of the Internet of Things headway. In this manner, this paper driving forces and unpretentious components fitting specific gauges, enhances the association of marine information, manufactures general particular help mastermind, and looks into the key advancement of data dealing with and sharp organization, and analyzes the relationship means and membership modes, with a specific genuine goal to plan for the expansive change of forefront sea.

**Ethical Clearance:** Taken from Vinayaka Missions University

**Source of Funding:** Self

**Conflict of Interest:** Nil

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# Raspberry Pi Based Home Automation Control

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## ABSTRACT

The meander proposes a fruitful execution for IoT (Internet of Things) utilized for checking and controlling the home machines by techniques for World Wide Web. Home computerization framework uses the adaptable contraptions as a UI. They can chat with home robotization organize through an Internet entry, by procedures for low power correspondence conventions like Zigbee, Wi-Fi. This meander goes for controlling home gadgets by techniques for Smartphone utilizing Wi-Fi as communication custom and raspberry pi as server framework. The client here will move coordinate with the framework through an electronic interface over the web, while home mechanical congregations like lights, fan and entry jar are remotely controlled through direct site page. An additional fragment that updates the segment of security from chimney calamities is its ability to sleuth the smoke all together that inside the occasion of any smokestack, relates a cautioning message and a photograph is sent to Smartphone. The server will be interfaced with hand-off equipment circuits that control the mechanical gatherings running at home. The correspondence with server enables the client to pick the sensible gadget. The communication with server empowers the client to pick the estimable contraption. The server converses with the differentiating trades. On the off chance that the web association together is down or the server isn't up, the installed framework board still will direct and work the machines locally. By this, we give a climbable and cost persuading Home Automation framework.

*Keywords: Raspberry Pi; Internet of Things; Web Server; Home Automation*

## INTRODUCTION

Today, advancement has transformed into an organized some segment of people's lives. It has, and continues influencing various parts of step by step life and has allowed better social coordinated effort, effortlessness of transportation <sup>[1]</sup>, the ability to appreciate beguilement and media and has helped in the headway in medicine. The making of various devices, for instance, mobile phones and PCs have made numerous people rely on upon advancement to communicate with their sidekicks, store information, for instance, pictures, movies, Chronicles, and music. Home automation is the important thing in our day to day life to save energy. For example wind and solar energy for used to generate electricity at the same time monitor the energy from the remote areas. It is an important source of renewable energy, and its technologies are broadly characterized as either passive solar or active solar depending on how they capture and distribute solar energy or convert it into solar power. Active solar techniques include the use of photovoltaic systems, concentrated solar power<sup>[8]</sup> and solar water

heating to harness the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light-dispersing properties, and designing spaces that naturally circulate air. Wind energy is a form of solar energy<sup>[9]</sup>. Wind energy (or wind power) describes the process by which wind is used to generate electricity<sup>[10]</sup>. Wind turbines convert the kinetic energy in the wind into mechanical power. A generator can convert mechanical power into electricity.

## INTERNET OF THINGS

The Internet of things (IoTs)<sup>[2]</sup> can be portrayed as the partner the diverse sorts of things like PDAs, PC and Tablets to the web, which gets shiny new kind of correspondence among things and people and besides between things. With the introduction of IoTs, the creative work of home motorization is getting the chance to be perceptibly well known in the present days<sup>[3]</sup>. Some of the contraptions are controlled and checked for helps the individual. Moreover, unique remote advances help in a partner from remote spots to upgrade

the information of home condition. A pushed arrangement of IoT is being encircled when an individual need connecting with various things. IoTs advancement is used to come in with the creative idea and wonderful improvement for splendid homes to upgrade the desires for ordinary solaces of life [4].

**IoTArchitecture**

The IoT-based building gives irregular state adaptability at the correspondence and data. It is an approach which is gigantic in a broad assortment of conditions, for example, quiet watching structure, security, advancement flag control or controlling different applications. The IoT would like to portray out the assorted chances of utilizing IPv6 and other related models to beat the drawbacks utilizing of the Internet of Things [3]. The IoT meanders demonstrate an extraordinary and raised examination of all sensible functionalities, structures and particular conventions that can be utilized for building IoT models however interconnections may happen between all by and large fantastic IoT applications.

As in the structures association field, where two or three approaches Rose at his most prompt stages to leave place to a common illustrate, the TCP/IP convention suite, the rising of a normal reference show up for the IoT run and the perceiving proof of reference diagrams can instigate a speedier, more attracted change and an exponential expansion of IoT-related courses of action. These strategies can give a key favored perspective to make economies, as new plans of action can use those innovative blueprints offering space to economic change.

**PROPOSEDSYSTEM**

Every customer who is recognizable by the present system may consider a structure that may incorporate more noteworthy flexibility and continue running with some common applications, for instance, Android. This work is sketched out in such a way to deal with keeping up a vital separation from the obstructions of the present system. The proposed system supports more prominent adaptability, comfort point of confinement and prosperity.

The essential target is to plot and to execute a pragmatic and open source home robotization structure that is prepared for driving most by far of the home and keep up the house motorization system. The conventional structure contains a mind-boggling adaptability by using remote trustworthy development

to interconnect distinctive modules to the server of home computerization system. This hence diminishes the association cost; will add to the versatility of progress, and system reconfiguration. The conventional structure can make use of remote LAN(Local Space Network) relationship between various sensor, gear modules and server, and distinctive correspondence traditions among customers and server[4].

The piece graph of proposed framework appears in Fig. 1. The Infrared sensor (IR) is a negligible exertion infrared dissent revelation unit that we can be associated at home using IR LEDs. It gets trigged when the light is recognized. Precisely when the sensor is distinguished, it sends a banner to the raspberry pi. From the raspberry pi, by techniques for wifi plan and IoT thought we could slaughter ON/ the light. Like IR, the PIR sensor is used to perceive the personal closeness, and in like the way the fans are turned ON/OFF. The lights and fans can be controlled by making web server in PC, tablet or we can make an application in adaptable.

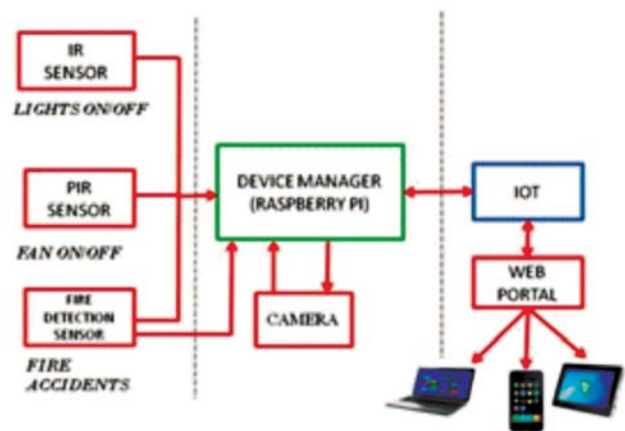


Fig. 1. Architecture of proposed solution

**SYSTEMDESIGN**

**Sensor and Camera Interfacing**

The IR sensor module is straightforward for operation. IR sensors recognize infrared light, which is used to turn ON/OFF of lights. Uninvolved Infra-Red (PIR) sensor has been used to perceive human. The PIR sensors are tuned to recognize when an individual or an animal gets in contact in their closeness. [6].

The fire acknowledgment sensor includes a Light Dependent Resistor (LDR) which gets recognized when the fire is recognized. This will take incite exercises if there is any fire incident [7]. A camera is joined by which

if the release is being recognized, the camera makes the delineation of the accident and sends it to cutting edge cell by which the customer can make the incite move.

**RaspberryPi**, The Raspberry Pi, is a straightforwardness Visa measured single-board PC made by the raspberry pi foundation. Raspberry Pi is controlled by a modified variation of Debian Linux improved for the ARM building. The focal point of the home robotization system is this minicomputer.

**Wifi Router Configuration**

The wifi unit gives the medium to correspondence. It can be likewise arranged to make security administrations. The wifi ought to be designed with a specific address and client orders will coordinate through wifi unit. We may utilize Sudonano/and so on/system/interfaces for designing wifi with raspberry-pi. The Raspberry Pi setup utilizing rapid-config summon appears in the Fig. 2

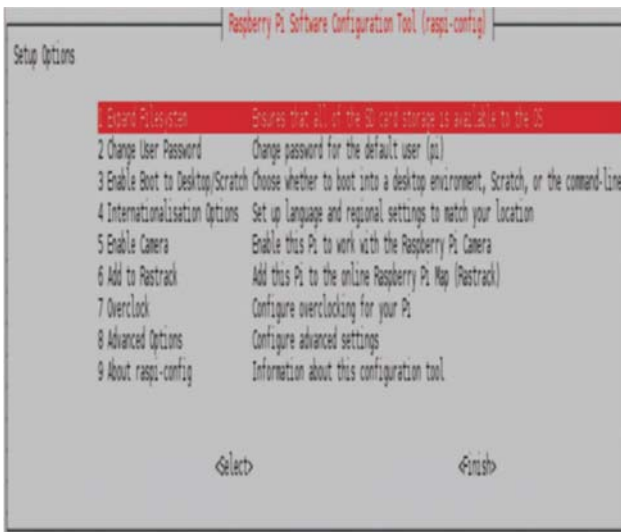


Fig. 2. Raspberry Pi Configuration

**Proposed IoT Architecture**

The physical layer comprises of the gadgets which are to be controlled. The information interface layer comprises of IoT entryway switch, gadget administrator and different correspondence conventions. The gadget chief will be the piece of raspberry pi. The raspberry pi is utilized as the IoT portal which imparts to PC or advanced mobile phone by means web in the system and transport layer. The application and introduction layer comprises of the web-based interface which is only planning a site page by which we can control the different machines. The machines can likewise be controlled by making an application in a cell phone

which is like web-based interface. Advanced mobile phones can be utilized to make the quick move if there is a crisis and it will consequently interface with the adjacent fire station in the event of any fire mishaps. The layer of IoT for the proposed arrangement appears.

**Web Server**

Different applications situated at home can be remotely controlled or observed by embedding the gadgets with the web server. The static and dynamic data are put away in implanted framework, and it satisfies the requests on web programs. Such kind of web servers is called implanted web server. It's not exclusively that we will utilize the Raspberry Pi to actuate the data from servers using the web; notwithstanding it likewise, can go about as a server itself. There are numerous option web servers that might introduce on the Raspberry Pi. Antiquated web servers, similar to Apache, serve the documents from Raspberry Pi board to buyers. Raspberry Pi likewise can serve sound, video, workable projects, and far a considerable measure. Be that as it may, there's another type of apparatuses that achieve programming dialects like Python, Ruby, and JavaScript to make net servers that progressively produce the hypertext increase dialect once they get correspondences convention demands from an online program. An example website page appears in the Fig. 3.

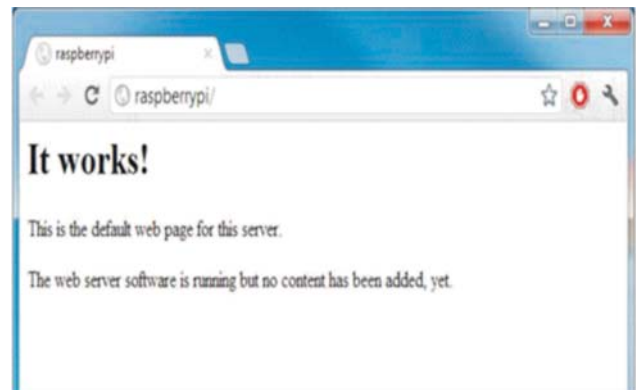


Fig. 3. Sample Webpage

**User Interface**

UI is everything that the client will see and act with. Amid this module, the android empowered telephone makes control of the house robotization framework. Android based Smartphone gives a scope of pre-manufacture program parts like organized design questions and program controls that empower us to make the graphical program for our application. Android likewise gives other User interface modules to



extraordinary interfaces, for example, exchanges, notices, and menus. The interface ought to empower the client to take a gander at the gadget status and to direct gadget.

### IMPLEMENTATION DETAILS

The execution of this work begins with choosing the working framework that we incline toward. In this venture, we have chosen the lesbian working framework. Presently, we need to boot the working framework that we have chosen with the fundamental setups. The different arrangements which should be possible are, for example, changing the secret key for default client, picking whether to boot into a desktop domain, scratch, or the order line, empowering camera and so on. The design settings re done by the clients require.

After the arrangement settings are done, the Python program is to be written in the leaf cushion. Leaf cushion is made by document supervisor >right click->create->blank record >enter a document name.py-> Click alright. The leaf cushion appears. Next, the program is spared, and it is executed by methods for the LX-terminal which is appeared. LX-terminal is utilized to see the status of different interfaces and consequences of the considerable number of sources of info given to the raspberry pi.

The various sensors are interfaced utilizing Python programming dialect with Raspberry Pi, and the yield is seen in PC. The different sensor interfaces appear.

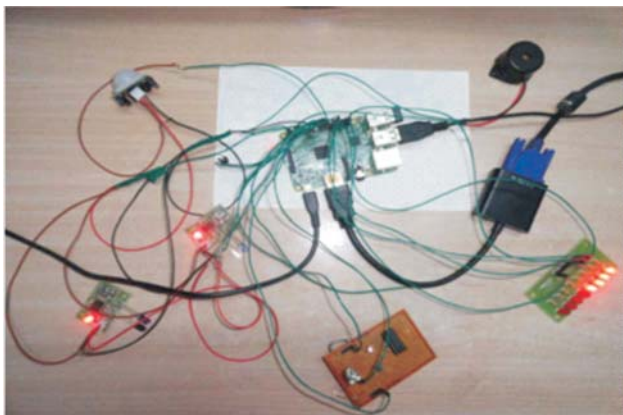


Fig. 4. Sensor Interfacing

After all the sensor being interfaced, by utilizing the idea of IoT innovation, the different gadgets like Lights ON/OFF, Fan ON/OFF and so on can be controlled. A web-based interface is being made where the gadgets can be controlled and observed. The same can be

executed in the Android advanced mobile phone for ceaseless observing and control. On the off chance that there is any sudden fire assault, we can see the picture of the mischance and how unsafe it is, at the same time a scheduled call to the adjacent fire station is executed. The raspberry pi landing page where the client can sign in with their username and watchword appears in the Fig. 4.

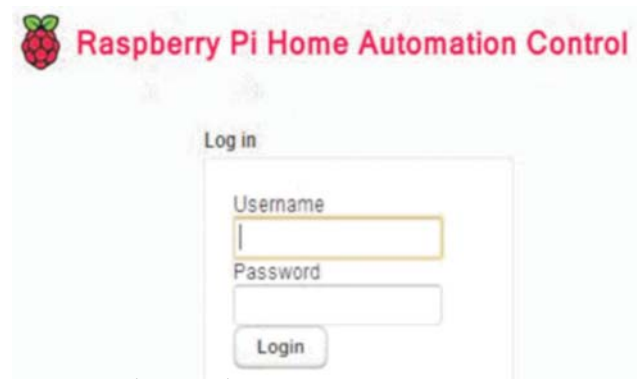


Fig. 5. Raspberry Pi home page

In the wake of getting signed into home mechanization framework by methods for client name and watchword, the different rooms are unmistakable with different gadgets. We can see the state of all lights and fans in each of the room whether they are turned ON/OFF. The same can be actualized in a mobile\home for nonstop observing. We can see every one of the rooms in the home with different gadgets, where we can choose the rooms which we need to control.

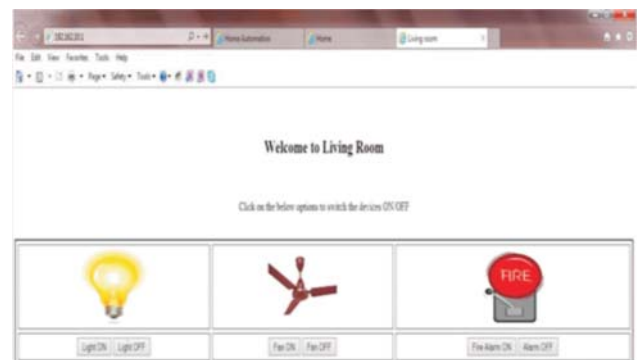


Fig. 6. Living room with various devices

The family room with different gadgets to be controlled in found in the Fig. 5. Currently, the gadgets can be turned ON/OFF by methods for the clients wish. The GPIO (General Purpose Input Output) is utilized by which the client can interface the different sensors to the Raspberry Pi. So when the sensors are detected, the GPIO is empowered. Accordingly, we can see the adjustment in the status of the gadgets by methods for Smartphone and PC.

## CONCLUSION

In this paper, we have presented the occasion of a home administration and security framework misuse utilizing Raspberry Pi and Internet of Things innovation. The framework is reasonable for constant home security observing and for remotely controlling the home apparatuses and insurance from flame mischances with prompt arrangements. The framework might be utilized in many spots like banks, doctor's facilities, labs and so forth that drastically reduced the peril of unapproved section. Confirmation might be given to the security office if any robbery issue happens. The different future applications might be used by controlling various family unit gadgets of the house with the web, Industrial robotization and administration through the network, machine-driven chimney leave frameworks and change of security issues into a large degree limited zones.

**Ethical Clearance:** Taken from Vinayaka Missions University

**Source of Funding:** Self

**Conflict of Interest:** Nil

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# Self Driving Robotic Car Based on Embedded with Imageprocessing

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## ABSTRACT

Human driver errors cause a major number of vehicle accidents for reasons including distracted driving or aggressive driving. The main issue behind all this is that the human response time is limited and hence these incidents are innately unavoidable. Our solution is to construct a fully self-driving robotic car that is capable of sensing its environment using an advanced vision sensor and navigates itself intelligently and autonomously without human input. Several image processing and sensor blending techniques are used to do this.

**Keywords:**

## INTRODUCTION

At present car manufacturers are coming up with partially automated cars such as ADAS to assist the human drivers. As such, a fully autonomous car is still a distance away<sup>[1]</sup>. But the industry is now advanced to such an extent that both camera sensor technologies and high-performance processing technologies are beginning to exceed the requirements that are needed to build fully based autonomous cars.

The project uses an advanced camera sensor, ultrasonic and motion sensors and a cortex-m4f microcontroller<sup>[2]</sup>. The microcontroller unit handles multiple tasks such as reading the image from the camera, doing vision processing and sensor fusion, communicating with the smart phone and controlling the robotic car<sup>[3]</sup>. An ideal approach to part robots into sorts is a partition by their application. 1. Mechanical robots – These robots acquire into play an industrialized assembling climate. Ordinarily, these are explained arms especially made for applications like-material taking care of, painting, and welding a critical application. Such a large number of accidents happened in welding so that robot application connected in welding process<sup>[7-8]</sup> and others. Automated Fire Detection System is introduced in this paper<sup>[9]</sup>. In this paper portrayed that the mechanical capacities and inclusion utilized as a part of welding process<sup>[10]</sup>.

## PROPOSED SYSTEM

The robotic vehicle is capable of doing the following listing of tasks on its own.

- 1) *The lane tracking* – Lane tracking algorithm detects lane boundaries and continuously controls the vehicle to keep the vehicle in the lane center.
- 2) *Obstacle detection* – barrier detection algorithm detects another vehicle or any other obstacle along the path and automatically applies the brake to mitigate the collision<sup>[1]</sup>.
- 3) *Traffic signal detection* – The system can recognize and interpret the traffic signal lights and smartly takes the decision to obey the traffic rules<sup>[4]</sup>.
- 4) *Driverless parking* – Automated parking is an essential requisite for a driverless car. The system can robotically look for a parking space, and upon finding one, parks itself by touching into the found space. It also includes a self-retrieving feature. This demo involves both camera and ultrasonic sensors.
- 5) *Reverse pedestrian detection* – When the vehicle is changing, it is important not to hurt walking or standing pedestrians, and the pedestrian detection functionality is carried out using a rear camera helps this cause. An ultrasonic sensor assists this process.
- 6) *Theft prevention alert* – When the vehicle is parked, the system continuously monitors the surrounding space for unwanted intruder motion using a vision sensor and also looks for abnormal motion using vehicle movement sensors. This feature is automatically activated as long as the car is parked. Here the system sends an alert message or ringtone to the user mobile if it detects one.

An arrangement of primary vision is preparing calculations, for example, shading acknowledgment, edge recognition, and picture examination are utilized to extricate data from the caught camera photos.

OV2640 camera image sensor is utilized as the essential vision sensor [5] in this venture. It can yield images at resolutions extending from QQVGA up to SVGA. The framework ought to be equipped for handling at least five outlines for each second to accomplish a decent execution on a moving vehicle. Here, small determination pictures will be utilized to achieve the quick vision preparing needs in this venture.

Locally available MEMS accelerometer sensor is utilized to distinguish a vehicle burglary scene. It likewise has to bolster for putting away camera pictures on a memory card in such a case. A SONAR separate sensor helps snag location and driverless stopping highlight. An RGB will be utilized as an activity light, to exhibit the movement flag acknowledgment capacity of the vehicle. A four-wheeled mechanical vehicle is utilized to demonstrate the demo. Each wheel is controlled by a DC engine using h-connect engine driver chips.

The framework can speak with a cell phone application using Bluetooth. This enables the client to send control orders from a handheld cell phone and work the mechanical vehicle.

**Embedded RTOS**

A real-time operating system is necessary to handle the timely events and other multitasking requirements of the project. Here FreeRTOS is chosen to provide us with this ability. FreeRTOS is the most widely used real-time operating system in the world.

**Microcontroller**

A project of this sort needs a very capable microcontroller with a large amount of RAM. Thus STM32F429 from STMicroelectronics is chosen as the primary MCU, which is one of the powerful microcontrollers currently available in the market. This is an ARM Cortex-M4 based microcontroller that can run up to 180 MHz. It has got MB 2 of Flash memory and 256 KB RAM. More importantly, it has got a DCMI (Digital Camera Interface) peripheral to interface with cameras.

**Working principle**

The segmentation, in this case, has the task of sorting out a region of interest in the image based on the color you choose. As each pixel is obtained from the camera, is compared with the threshold values, and the result is stored in the binary image. In the same pixels that are within the threshold will be represented as "logic one," while those outside this threshold will be "logical zero." An example of the binary image is the color green searched.

**Contour Detection Algorithm**

To examine the information from the picture division calculation, the double image is utilized. For this, it is accepted that the film comprises of zeros, where the pixels of shading is of enthusiasm for rationale one.

The calculation created is to divide the district of enthusiasm by denoting the diagram of the present gathering of bordering pixels in the twofold picture, once this is done the outcome is conveyed as maximum cutoff points, lower, right side, left side, and both even and vertical area of the focal point of the protest. The fig. shows how the figuring continues running on a piece of diminishing pixels perceived, the technique begins on the primary line (for this circumstance the fundamental line is 1 pixel in width is recognized, and

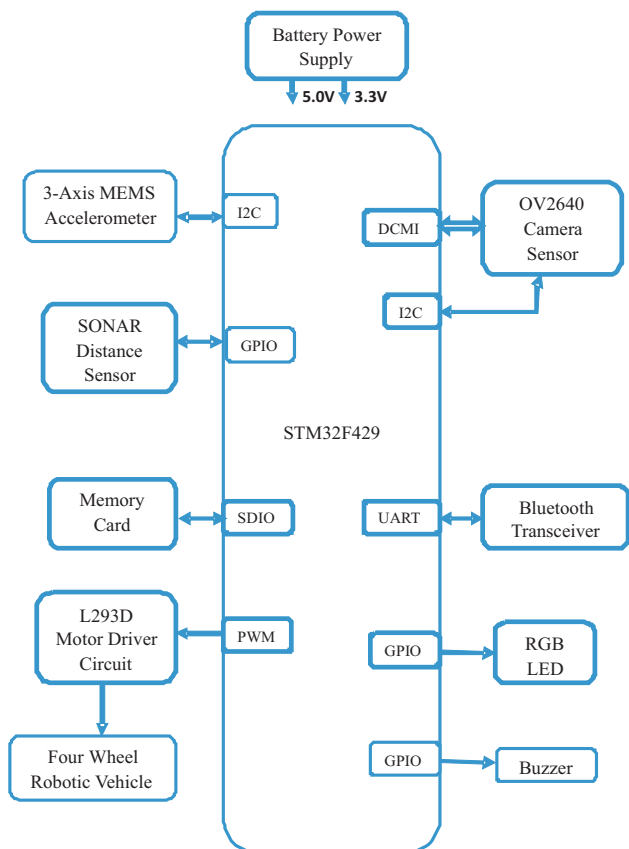


Fig. 1. Block Diagram of Vision Drive

the start is showed up in red) is from here that the shape way begins, if all else fails the estimation starts to search for the accompanying generous counter-clockwise pixel in a 3×3 cross section, starting from an examination of last recognized pixel step. To continue with the frame acknowledgment, the point of convergence of the accompanying network is at pixel examination recognized some time recently.

### Implementation of Vision Drive

The Implementation of missile track done using STM32F429 Microcontroller and Block Detection algorithm in DIP. Kit Demonstration is switch on the STM32 board; it will monitor and go the block color line road.

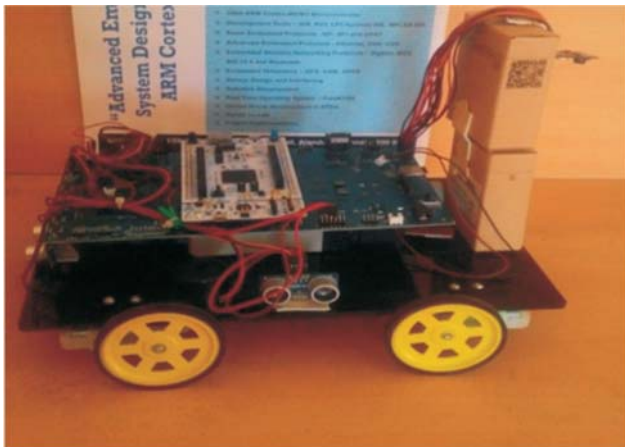


Fig.2. Self Driving Robotic Car Implementation.

### CONCLUSION

This project is an effort to show off and improve our embedded system skills, and thus the robotic car is built to run within indoors using a mock road and not on real roads. There are important works to be done to make this system to become a true end product that could run on a real road in real planet conditions. As such, this is our first step towards that vision of accident-free roads based on self-driving vehicles. A real-time operating system is necessary to handle the timely events and other multitasking requirements of the project. Here FreeRTOS is chosen to provide us with this ability. FreeRTOS is the most widely used real-time operating system in the world.

**Ethical Clearance:** Taken from Vinayaka Missions University

**Source of Funding:** Self

**Conflict of Interest:** Nil

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# A Novel Engraving Planarization Innovation to Rectify Non-Consistency Post Chemical Mechanical Cleaning

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## ABSTRACT

The presentation of 3-D structures and new materials for cutting edge rationale gadgets at greatly fine element measure presents challenges for inside wafer and wafer-to-wafer thickness consistency control that is basic for yield and execution. For customary substance mechanical cleaning innovation, the commonplace thin film consistency over the entire wafer may not meet the coveted variety focus of 2-3 nm  $\pm$  at some basic levels. Besides, wafer-to-wafer consistency variety requires a wafer by wafer way to deal with consistency remedy. In this paper, a novel engraving planarization innovation is exhibited that consolidates an ordinary creation demonstrated engraving process that is temperature delicate with an inductively coupled plasma reactor outfitted with a novel electrostatic toss that gives bite the dust level warm control. Enhanced process control empowers financially savvy consistency upgrades in overabundance of 85%.

**Keywords:** Planarization Innovation, Chemical Mechanical Cleaning, Engraving, temperature, CMC Non-Consistency.

## INTRODUCTION

Planarization innovation has assumed an essential part in semiconductor manufacture. Before the presentation of compound mechanical cleaning (CMC) happening around the 130 nm hub, plasma scratch back was normally utilized for planarization<sup>[1]</sup>. From that point forward, CMC has turned into the standard method for planarization applications because of CMC's capacity to evacuate materials with high throughput while to a great extent wiping out the geology shaped after engraving and fill (e.g., CVD, dissemination, and so forth.). In any case, CMC forms normally abandon some thickness non-consistency, regularly on the request of many nanometers<sup>[2][3]</sup>.

As highlight measurements downsize, many nanometers of thickness non-consistency can be negative to gadget yield. As of late, industry has transitioned from 2D planar gadget to 3D gadgets, to be specific FinFETs. In a FinFET gadget, the entryway wraps around the Fin<sup>[4]</sup>. Contrasted and the planar gadget, the FinFET structure gives improved entryway control over the channel by decreasing short channel impacts and spillage current. For such a gadget, the Fin

tallness decides the viable channel length of the gadget<sup>[5]</sup>. Subsequently, any variety in Fin tallness specifically changes the electrical execution, for example, limit voltage and drive current. Therefore, it is attractive to keep the film thickness varieties in a tight range, for example, 2-3 nm ( $\pm 3\sigma$ ). Since such a level of consistency can't be accomplished by current CMC alone, there is developing enthusiasm for post CMC revision innovations<sup>[6]</sup>. Not exclusively do these remedy innovations need to meet strict consistency prerequisites, they likewise need to represent approaching wafer-to-wafer varieties in consistency post CMC<sup>[7]</sup>.

## Proposed System

A 300mm plasma etcher outfitted with a particular ESC and control calculations to decide particular amendment maps. The engraving chamber is a transformer coupled plasma (TCP) reactor with source power and substrate predisposition control controlled independently, as appeared in Fig. 2. The uniquely planned ESC can give spiral and azimuthal temperature control over the wafer utilizing programming calculations. Contingent upon the material of film to be

planarized, the engraving science may incorporate passivating gasses, for example,  $C_4F_8$  and  $CH_2F_2$ , and other etchant gasses. With those sciences, the engraving rate of Si,  $Si_3N_4$ , and  $SiO_2$  increments when the ESC temperature is raised<sup>[8]</sup>.

One of the key variables to the accomplishment of a temperature delicate planarization approach is an engraving science that is touchy to temperature. Plasma drawing responses are mind boggling and frequently include various carving and passivating gas species that can take after various procedures at the wafer surface. These procedures incorporate adsorption of engraving and testimony antecedents onto a response surface, vitality exchange of particles to the surface, surface responses, and arrival of unstable species from the surface (desorption). Process parameters can be changed in accordance with control fluxes of charged and impartial species, and particle vitality for a wide temperature delicate process window.

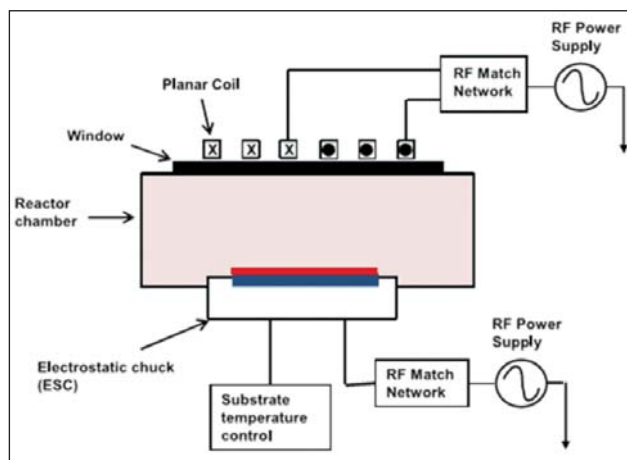


Fig.1. Transformer coupled plasma etch chamber

In fluorocarbon (e.g.,  $C_4F_8$ ,  $C_2F_6$ ,  $CHF_3$ , and so forth) plasmas, testimony and evacuation of fluorocarbon movies happen on the surface of the substrate in the meantime. When all is said in done, unbiased fluorocarbon species including radicals are the fundamental affidavit species, while the loss of the fluorocarbon film is mostly caused by vivacious particle siege and substance responses (e.g., F iota responds with  $CF_x$  to frame unpredictable  $CF_4$ ). The unflinching state thickness of the fluorocarbon film is the aftereffect of these contending forms. It is accounted for that the staying coefficient (or adsorption rate of the affidavit species) increments when the surface temperature is decreased. As an outcome, it is normal that when the surface temperature of the wafer is changed, the

thickness of the fluorocarbon film shaped on the substrate will change as needs be.

The fluorocarbon movies serve two parts. In the principal part, it goes about as dispersion and vitality exchange obstruction anticipating receptive species and lively particles from coming to the engraving front, and engraving items from leaving the surface to enter mass plasma. As a moment part, the film can be a wellspring of receptive animal groups. For instance, C in fluorocarbon movies can respond with O in  $SiO_2$ . Past work by different analysts has demonstrated that the engraving rates of Si,  $SiO_2$ , and  $Si_3N_4$  diminish with the increments in thickness of fluorocarbon movies on the substrate. Based on these discoveries, fluorocarbon science is a decent contender for a temperature delicate process required for planarization.

Planarization carve should be done to draw back  $Si_3N_4$  and  $SiO_2$  at a similar rate until the  $Si_3N_4$  hard cover is totally gone and the door poly is uncovered. Then, the approaching non-consistency is diminished likewise. Once more,  $C_4F_8$ -based science is utilized as a part of the initial phase in which the greater part of the planarization is performed. In this progression, the engraving rate of  $SiO_2$  is higher than  $Si_3N_4$ , while temperature affectability is lower. After this progression, the  $SiO_2$  is more recessed than  $Si_3N_4$ . The second step depends on  $CHF_3$  science that engravings silicon nitride at a speedier rate than silicon oxide. The engraving time step is picked with the end goal that the aggregate engraving sum for  $SiO_2$  and  $Si_3N_4$  is the same after the second step is finished. As the outcome, both  $SiO_2$  and  $Si_3N_4$  wind up at a similar level after engraving. For oxide, the non-consistency 3 $\sigma$  and run are lessened from 21.4 nm and 27.3 nm to 4.2 nm and 8.1 nm, individually, a change of around 80%.

## CONCLUSION

The presentation of 3D structures and new materials for cutting edge semiconductor gadgets may require tight control over thin film consistency that surpasses the planarization ability of traditional CMC innovation. A remarkable engraving planarization innovation has been created with flexible temperature affectability to meet the necessities of various engraving sum and consistency redresses for different materials including silicon, silicon dioxide, and silicon nitride. For  $HB_r$  science, the temperature affectability emerges from the unpredictability of engraving items  $SiBr_4$ . For  $C_4F_8$ -based science, the control of engraving rate and temperature affectability originates from the reliance of

the fluorocarbon film thickness upon the surface temperature. We have effectively exhibited the capacity of this planarization innovation on both cover and examples wafers with film thickness consistency enhancements of more than 85%.

**Ethical Clearance:** AMET University

**Source of Funding:** self

**Conflict of Interest:** NA

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# A Study of Nature Conservation

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## ABSTRACT

The interconnectedness of ladies and nature is seen depicted in legendary accounts and sagas of antiquated period. The idea of 'Mother Earth' and the relationship of ladies and nature used to be a solid portrayal of antiquated writing throughout the hundreds of years. Each living being is identified with each other as per the eco women's activist school of thought. Since ages nature and ladies are seen interlaced, as both are considered as the casualties of abuse. This thought has been examined by numerous authors and researchers of various ages in their abstract works. This paper endeavors to break down nature's contention and the danger gone up against by our condition.

*Keywords: Environment, Earth, Conservation*

## INTRODUCTION

There had been various articles and readings in view of the natural framework and the religion of womanhood. Concentrates that talk about this theme as far as religion culture and legislative issues is additionally a piece of natural reviews managed by the researchers of various ages<sup>[1]</sup>. Environment is a multidisciplinary idea which prompts different contemplations and studies as ecocriticism, ecopolitics, ecoaesthetics, and scholarly biology et cetera. Masterminds, ecological students of history and researchers have seen to be received an interdisciplinary undertaking which is marked as 'natural humanities'. Numerous ecological humanities' drives have seen to be developed over the most recent couple of years. Behind each wander that ought to be a solid drive to encourage the light of accomplishment<sup>[2]</sup>. Maybe these strengths would turn into a solid component of inspiration to the progressive eras. As expressed before the linkage of ladies and condition is seen spoken to even in religious writings and mythologies by famous researchers and artists. This union supposedly is an effective portrayal of servitude between two shocking manifestations of heavenly nature. This union apparently is extended since ages, when lady herself turns into the guard of nature<sup>[3]</sup>.

Indian ladies writers liked to be subjective and the vast majority of these artists are believed to be impacted by numerous women's activist developments. Sugathakumari, The very much acclaimed South Indian artist, earthy person and dissident portray the

existential issues of current ladies and furthermore her sheer challenge against the misuse of nature by man. Her feelings and sentiments are intensely spoken to in her works. Her hatred towards the self-centeredness and mercilessness of people is fearlessly brought out through her words. Evaluation of leaf and root extracts of *Meliadubia* L. against larvae of *Culex quinquefasciatus* and five important human pathogens is presented in <sup>[4]</sup>. In vitro Assessment of Antimicrobial Properties in Different Concentration Crude Extracts of Ascidian *Didemnum granulatum Tokioka* is discussed in <sup>[5]</sup>. Human Personal attribute towards industrial social contribution and human behavioral aspects are valued through the PVQ (Personal Value Questionnaire) psychological test scoring is presented in <sup>[6]</sup>.

## Save Silent valley

Our reality has seen numerous social and biological developments which gone for shielding nature. 'Spare Silent valley' is an open development (1973) seen as one of the momentous individuals' development in Kerala. An evergreen tropical timberland Silent valley, in the Palakkad area of Kerala saw a social development which stood emphatically for the faultless evergreen woodland. Stream Kunthipuzha streams over the valley from North to South. The State Government reported the development of a dam over the stream Kunthipuzha. The specialized specialists' proposal of creating hydel control from the waterway turned into a risk to the widely varied vegetation. In spite of the fact that there were no dissents at first, a steady uprising of

the general population could be seen when the wander caught the consideration of numerous earthy people. Sugathakumari's part in this Save Silent Valley dissent merits saying. Her effective words mirrored her quality and energy against the dangers which gravely influenced the earth.

### Silent Valley

She communicates her assumptions and feelings towards this evergreen woodland in this lyric. A feeling of fulfillment is seen reflected here. At first, the writer considers Earth as her mom yet eventually she understands that she turns into the mother who is to nurture her girl, the nature. Here, as expressed before ladies nature relationship is utilized. People have a tendency to obliterate the nature heartlessly. This heartlessness is indefensible as indicated by the essayist. A winged animal communicates its tension in its dialect which passes on the unfeeling activities of people. Earth is not just for people, it is a haven for all the living creatures, the manifestations of Almighty.

She communicates her passionate love and worry for her own particular country when she remains in the midst of variation types of trees which are new to her. Here she depicts the safe feeling she encounter similarly as she feels in her local soil when she ends up with the trees in California. This suggests esteeming nature ends up plainly irreplaceable for the quiet presence of humankind. The quintessence of woodlands is the same all around. Regardless of which species the trees or plants have a place with. They all have a similar immaculateness.

### CONCLUSION

There are numerous activists who are the propagators of the essentialness of sustaining the Mother earth. Numerous eco women's activists see that the split that exists between the nature and culture could be mended just by the female intuition to cultivate nature's procedures. Rise of urbanization brought about situating man at the middle and every one of the

components of nature is intended to be vanquished by man. Thus nature was misused all things considered. When we experience the works of Sugathakumari we can see the variation periods of natural musings. The abuse of nature and the possibility that nature shouldn't be the casualty of the predominance of people are unmistakably spoken to. Through her sharp words she is triumphant in imparting Mother Earth and the need to moderate her. Artists and scholarly famous like Sugathakumari through their commitments have made an incredible effect in general society circle.

**Ethical Clearance:** AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Age Estimation of Polymeric Insulation in Absorption of Chemical Components

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## ABSTRACT

The investigation of the lifetime execution of polymeric insulator is frequently in light of deficient information. Specialists confront difficulties of not having long perception time to accumulate finish lifetime information so as to make forecast with conviction. In this paper, we are proposing to utilize the best fitting polynomial interpolation method to deal with decide the lifetime show and extrapolate data towards the period of polymeric insulators. To assemble the data, for example, the change of convergence of substance component of polymeric insulation because of various anxiety conditions, high temperature vulcanized (HTV) silicone rubber examples were subjected to quickened debasement utilizing an Accelerated Weathering Tester (QUV). Every example was subjected to quickened maturing cycle in agreement to ASTM G154 cycle 4 for an aggregate of 3000 hours. The maturing cycle experiences a cycle of 70 °C and bright introduction at light power of 1.55 W/m<sup>2</sup> for eight hours taken after by four hour buildup at 50 °C. Chemical component focuses, for example, Carbon, Oxygen, Silicon and Aluminum were acquired and assessed utilizing a Scanning Electron Microscope (SEM) with energy dispersive xray (EDX). The convergences of chemical components are broke down utilizing polynomial interpolation strategy for different requests. In the first place request to fifth request polynomial interpolation techniques are examined to decide the best fitting bend without essentialness difference from the genuine esteem or genuine esteem. The interpolation curve is utilized to gauge the age of an obscure matured specimen. This examination has uncovered a novel technique for deciding a model that could portray the lifetime of polymeric insulators and extrapolation strategy for evaluating the age for polymer insulator.

**Keywords:** Polymeric Insulation, Chemical Components, High Temperature Vulcanized (HTV), Scanning Electron Microscope (SEM), Energy Dispersive Xray (EDX), Accelerated Weathering Tester, Polynomial Interpolation Strategy.

## INTRODUCTION

Outdoor and indoor insulation frameworks that are introduced within the sight of high mugginess, extraordinary temperature, halfway releases (PD) and mechanical overemphasize prompt lifetime lessening<sup>[1]</sup>. As of late, encasings made of polymeric materials have been utilized broadly around the globe<sup>[2]</sup>. When contrasted with the customary porcelain material, polymer has a few preferences, for example, lightweight, simple establishment and high imperviousness to extraordinary climate conditions<sup>[3]</sup>. For example, high temperature vulcanized (HTV) silicone rubber is developing in significance as a high voltage cover material<sup>[4]</sup>. HTVs Silicone rubber has high dielectric quality and magnificent thermo-mechanical

properties<sup>[5]</sup>. It is a standout amongst the most utilized materials because of its electrical, mechanical and concoction execution with prevalent maturing time<sup>[6]</sup>. Numerous analysts have concentrated the concoction centralization of examples assembled from the field utilizing Attenuated Total Reflectance (ATR-FTIR), X-ray Photoelectron Spectrometer (XPS) and SEM<sup>[7]</sup>. Nonetheless, the maturing of examples in field is subjected to numerous wild weathering components and no two specimens are indistinguishable<sup>[8]</sup>.

The aim of this examination is the estimation of the time of silicone rubber in light of the chemical components fixation and polynomial interpolation approach. Matured examples of HTV silicone rubber insulator are set up under controlled ecological

condition utilizing an Accelerated Weathering Tester (QUV) in light of ASTM G154<sup>[9]</sup>. Examples are subjected to stresses, for example, warm, ultraviolet radiation and condensation. The rate amount for chemical components in the surface was measured and registered utilizing Philips XL-30 SEM with EDX. The outcomes from SEM with EDAX are then used to perform bends fitting utilizing distinctive request of polynomial. The polynomial capacities depict the adjustment in the convergence of concoction substance of HTV silicone rubber over the entire life cycle. Correlation between polynomials of various requests is performed to decide the best fitting curve. The polynomial capacity can be utilized to extrapolate the concentration of chemical components over the entire life cycle<sup>[10]</sup>.

### PROPOSED SYSTEM

The objective of this paper is to build up a lifetime model of HTV silicone rubber example in light of polynomial interpolation technique. Three examples were corrupted inside QUV weathering analyzer utilizing cycle D (ASTM G154 cycle 4) in QUV/splash display. This cycle contains two stages. Right off the bat, the examples were matured under a steady temperature of 70 °C and an UVA-340 nm bright source with a radiation level of 1.55 W/m<sup>2</sup> for 8 hours with various introduction times (1000h, 2000h and 3000h). Also, the examples were matured under buildup for 4 hours with a consistent temperature 50 °C with no bright source.

To assess the adequacy of the proposed lifetime demonstrate utilizing polynomial interpolation strategy, a harm example of obscure age is readied. To accomplish this, another example was subjected to an abnormal state of simulated surface contamination and various flashovers. The contaminant comprises of a blend of 10g of NaCl with 40 g of Kaolin for every 1L of refined water. The arrangement conductivity was 61 µS and the temperature of the contaminant was 24.6°C, which was measured utilizing a conductivity meter (HANNA HI8633N). In agreement to IEC507 and AS4436, the contamination level was named overwhelming (>50 µS). The sullyng was showered over the surface of the new specimen and the example was set in the middle of two electrodes invigorated with high voltage as appeared in Fig. 1. Flashover was delivered between two electrodes. This procedure was rehashed for fifty times to guarantee that the example surface was seriously corrupted. The electrical testing

of the example displayed demonstrates that the aftereffect of the breakdown voltage of the specimen was decreased by 17 % contrasted with the new specimen. On the off chance that this measure of debasement is to happen in general 22 kV protectors, the separator won't ready to manage the working voltage.



Fig.1. Flashover on silicone rubber specimen

Estimation of the chemical concentration was performed on the examples after the quickened maturing procedure was connected. The atomic rate was resolved utilizing EDS (Energy Dispersive x-ray Spectroscopy) inside the SEM. A Philips XL-30 furnished with an EDAX Silicon Drift Detector X-ray finder demonstrate 500 Apollo X was utilized, which has a strong state identifier. This kind of locator has contributed a lower force mistake for measurement comes about, which implies a relative statistical error for the component peak intensity. XL-30 filtering electron microscopy was worked in spot estimate 6.0 at speeding up voltage 5 KV in high vacuum. To expel test charging, the examples were covered with carbon before examination, utilizing Accuracy Etching and Coating System show 682 with Thickness Monitor demonstrate 681.2. Before examination all examples were cleaned in an ultrasonic cleaner for 180 seconds utilizing ethanol.

### CONCLUSION

The outcomes in this paper recommend that the proposed approach could be connected to anticipate the age for an obscure matured example in view of the normal of chemical concentration examples. These examples were matured for 0, 1000, 2000, 3000 hours inside QUV utilizing cycle D (ASTM G154). Normal of the chemical concentration was gotten from XL-30 SEM with EDS. Interpolation polynomial strategy with various request were connected to the chemical

concentration to decide the coefficients elements, which is imperative to evaluate or anticipate the age for an obscure matured example.

**Ethical Clearance:** AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# An Environment and Ionosphere to Examining Optical and Radio of Lightning-Related Wonders

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## ABSTRACT

The observing as well as sounding of lightning releases and their related phenomena (mesospheric optical outflows and so on.) has been performed by radio and optical estimations. We focus on the winter lightning in the Hokuriku region (Japan Sea side) of Japan, since it is critical to explore whether lightning releases in the Hokuriku territory (entire spatial scale is generally little in correlation with the traditional summer lightning in the US) could trigger the mesospheric optical emanations. The optical perception of those mesospheric emanations and the comparing radio sounding by ELF and VHF radio waves of their parent lightning, have been accounted for. The watching frameworks are initially exhibited, and our most recent observational certainties on the mesospheric outflows in the Hokuriku territory, their parent lightning and some PC recreations on the sprite start, are introduced.

**Keywords:** *Lightning, Mesospheric Emissions, Optical Measurement, Ionosphere.*

## INTRODUCTION

Lightning releases are the release phenomenon in the climate, and this theme is presently getting to be plainly a standout amongst the most basic issues in the field of material science, too<sup>[1]</sup>. Since there are various types of principal phenomena are including molecule speeding up (runaway electrons), cloud-to-ionosphere releases and furthermore air ionosphere-coupling<sup>[2]</sup>.

An extra TGE (transient glowing event) named mythical people (discharge of light and VLF irritations because of electromagnetic pulse sources) is found<sup>[3]</sup>. In spite of the fact that it has been conjectured and as of late concurred that mythical beings are because of the coupling of the electromagnetic pulse (EMP) of lightning release with the lower ionosphere, there have been proposed a few era systems for sprites by various creators, including the semi-electrostatic (SE) field demonstrate in which a solid optional electric field over the cloud is forced after the positive CG release, prompting the era of sprites<sup>[4]</sup>. This SE model is observed to be suitable in clarifying some broad naturally visible qualities of sprites, however different viewpoints like the fine structure of sprites (called streamers or ringlets) which are getting to be plainly fundamental subjects, require encourage hypothetical review and we believe that comprehension of these fine elements are extremely

basic and imperative while considering the era component of sprites<sup>[5]</sup>.

We give careful consideration to the lightning releases in the Hokuriku zone of (Japan Sea side) amid winter, since we realize that the winter lightning in this region is basically unique in relation to those of the mainland lightning<sup>[6]</sup>. The structure of winter thunderclouds in Japan is diverse in that the cloud top is just situated at a couple of kilometers and the cell is generally little in size<sup>[7]</sup>. We demonstrate a couple of all the more basically intriguing components for their electrical qualities: (1) +CG is as various as - CGs; (2) moderately huge charge evacuation, and so on., as contrasted and the late spring mainland lightning in the US, for example, extensive scale MCSs<sup>[8]</sup>.

## Proposed System

The paleochannel system is analyzed in 3-D tomographic seismic inversion of a paleochannel system<sup>[9]</sup>. Optical estimations by recorded films with exceptionally touchy cameras are performed at Shimizu (Shizuoka, geographic directions; 34.99 °N, 138.51 °E) and Chofu (Tokyo; 35.66 °N, 139.54 °E) in Japan. Fig. 1 is the piece graph of our optical perception framework (comprising of a camera, a picture intensifier, a CCD, a video recorder, and so forth.) at Shimizu and Chofu.

The relative area is Hokuriku zone and optical locales of Shimizu and Chofu. The survey territory from each optical site is outlined by bring forth. The point of field (FOV) is  $56^\circ$  for Chofu, and  $36^\circ$  for Shimizu. Both cameras were synchronized with a GPS clock and the GPS-construct time stamp was superimposed in light of video casings.

The underwater electrical parameters are studied in the Oscillating Water Column (OWC) Wave Power Caisson Breakwaters, the Present Status, Need For New Developments, and the Problems Ahead. In Coasts, marine structures and breakwaters: Adapting to change:<sup>[10]</sup>. The most vital change amid this battle was that the improvement of frameworks in Figs. 1 empowered us to do persistent estimations amid night for a couple of months keeping in mind the end goal to build the quantity of occasions. Further, dissimilar to the past exhausting visual checking of recorded recordings, we have built up a framework in which the watched pictures are digitized and we can distinguish any sprites viably by utilizing our own particular created calculation in the PC.

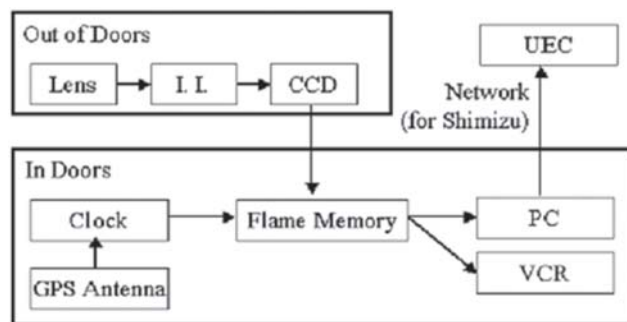


Fig. 1.

Lightning flashes are confined by the SAFIR interferometric lightning framework in two measurements (X, Y), which comprises of three VHF reception apparatuses (recurrence: 110 to 120 MHz, transfer speed: 0.6MHz) and LF to MF collectors (300 kHz to 3MHz). When they get lightning radiation, its stage contrasts are identified by a blend of a few receiving wire components with a specific end goal to decide the wave entry heading. The blunder in azimuth estimation of this SAFIR is under  $0.3^\circ$  rms in two measurements.

The area of lightning is controlled by a triangulation technique by utilizing those three VHF reception apparatuses. At the same time, LF-MF waveforms used to separate the extremity of CG are recorded with a 12 bit simple to-advanced load up whose examining rate is 8MHz. The inspected waveform is contrasted with the standard lightning waveform, and after that the

extremity of the CG and the pinnacle current are assessed consequently. The SAFIR can recognize lightning releases in a scope of a few hundred kilometers from every reception apparatus. This SAFIR framework has been sent around the Komatsu air base in the Hokuriku district.

The limit reception apparatus has been utilized to quantify vertical electric field (Ez) with inspecting frequency of 4 kHz, and its band disposal channels are introduced at 50, 100, and 150 Hz for expelling power line symphonious frequencies. The cutoff frequency of Ez is 4.25 Hz (lower), and 870 Hz (upper). We have been measuring level attractive fields (Bx and By) by methods for acceptance curl radio wires, and the examining recurrence is 4 kHz and we have no consonant channels. The frequency scope of high affectability is from 0.1 Hz to 1 kHz. Upper piece of the cutoff frequency is 1.3 kHz (with no channel for lower part).

## CONCLUSION

Lightning and its related phenomena (counting mesospheric optical emanations, and so on.) have been observed by a consolidated utilization of optical and radio (ELF and VHF) estimations. New discoveries on the Japanese winter sprites in the Hokuriku zone and the qualities of their parent lightning have been watched, and those are contrasted with our own PC reproductions with study the era system of sprites.

**Ethical Clearance:** AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Arsenic Separations from Water by using Highest Absorption Capacity

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## ABSTRACT

Arsenic is a substantial metal and exists in an oxidation condition of -3, 0, +3 or +5 which the As (III) is more dangerous than other. Because of the outrageous danger of As(III) in drinking water many research was done to discover normal and sparing adsorber for expelling it from the water. Permeable carbonaceous nanostructural materials have been generally utilized as a part of the adsorption of debase water, gas stockpiling, division, and sanitization. By unique trial strategy were delivered in Beshel Enacted Carbon Industry (BACI) another carbon adsorber material (BACI-2017) with nanopores, for expulsion of As (III) in polluted water. Due to existing a proper pores and surface territory, the new adsorber has demonstrated a high inclination for adsorption of Arsenic (III) from water. Test: Two distinctive molecule sizes, work 4x8 and work 100 and more noteworthy than 100 work, were utilized. The partition of As(III) were finished with 0.5 gram of BACI-2017 with work 4x8 and 0.1 gram of BACI2017 with 100 work and more prominent than 100 work and six unique centralizations of As(III) arrangement, 5, 10, 20, 30, 50, 100 and 100, 200, 300, 400, 500, 1000 ppm individually. In all trials the pH was around 8.5. The outcomes demonstrated that the most extreme adsorption limit of As(III) figured from Langmuir isotherm was discovered 41.48 mg/g for 0.5 gram of GRG-2017 with work 4x8 and 0.1 gram of BACI-2017 ascertained from Freundlich isotherm was 455 mg/g for 100 work and more prominent than 100 work. The contact time in all examinations was 15 minutes. The examination demonstrated that the adsorption limit of arsenic is unequivocally relying upon the molecule size of adsorber. The outcomes: The BACI-2017 nanopores adsorber for evacuation of As (III) from watery arrangement demonstrated that the As (III) can be isolated from water with a high limit of 455 mg/g or 455 g of As (III) per kg of adsorber BACI-2017. This is a world record with most elevated adsorption limit in examination with different investigations till now, March 2017.

**Keywords:** Nano Adsorber, Carbon with Nano Pores, Arsenic (III), Separation, Water, Beshel Activated Carbon.

## INTRODUCTION

Arsenic can be displayed in water in an oxidation condition of -3, 0, +3 or +5, contingent upon the pH and redox capability of the water happens arsenic regularly in trivalent. The nearness of arsenic in water is because of normal weathering process or other mechanical and anthropogenic exercises [1-3]. As (III) is more dangerous than arsenic (V), since arsenic (III) ties to single yet with higher proclivity to vicinal sulfhydryl gatherings that responds with an assortment of proteins and hinders their action. Arsenic(III) is more steady than As(V) in light of the fact that of electronic design<sup>[4]</sup>. Long haul ingestion of arsenic sullied drinking water causes skin, lungs and kidney malignancy, gastrointestinal ailment, bone marrow issue, cardiovascular infections and different ailments<sup>[5]</sup>. Due to the outrageous

poisonous quality of arsenic in drinking water, World, Wellbeing, Environmental Protection Agency has set 0.01 mg/L and 0.05 mg/L (10-50 ppb) as the greatest reasonable breaking point of arsenic in drinking water<sup>[6]</sup>. Numerous regular procedures for partition of arsenic like adsorption and coagulation, co-precipitation particle trade [and and oxidation reduction prepare have been accounted for. Among all the prepare, the adsorption is one of the promising strategies.

## METHODOLOGIES

### Reagents and Chemicals

All chemicals were utilized of investigative review and are gotten from Merck. All arrangements are set up in refined water. 1 Liter stock arrangement of arsenic(III)

was set up by dissolving 1.73 g sodium arsenic oxide (AsNaO) and weakened to 1 L, 1.00 ml=1.00 mg arsenic(III), standard arsenic(III) arrangement were arranged for examination by weakening of stock arrangement. The new NanoAdsorber with the name of BACI-2017 gotten from Beshel Activated Carbon Industry.

### Adsorption Experiments

The examination was done by blending of 0.5 or 0.1 gram of adsorbent with 50 ml of arsenic (III) arrangement with diverse fixations in 500 ml Erlenmeyer glass with plug. The blend was shaken for one moment overwhelmingly by hand and afterward following 15 minutes maintenance time arsenic arrangement was filtrate. In all analyses the pH was around 8.5 what's more, contact time was 15 minutes. The convergence of As (III) measured with a nuclear assimilation spectrophotometer (AAS) which were aligned before estimation of test (Figure 1).

## RESULTS AND DISCUSSIONS

Table 1: Adsorption analysis

Sample Numbers	C0	BACI	Time	Ce	Adsorb
1	150	0.1	15	1	99
2	200	0.1	15	4	97
3	230	0.1	15	8	96
4	320	0.1	15	11	94

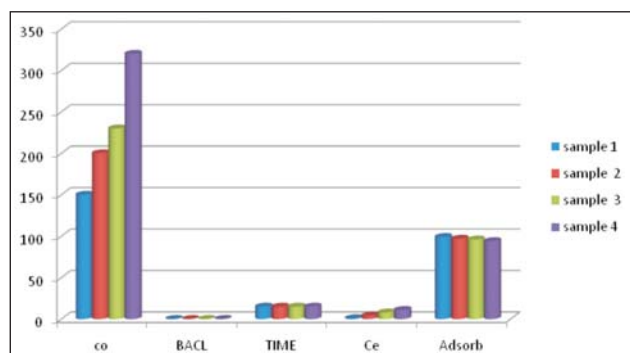


Fig.1. Results for adsorptions

## CONCLUSION

In this investigation another carbonaceous nano auxiliary material BACI-2017 were created in research center scale in R&D and mechanical scale in Beshel Activated Carbon Industry, utilizing electrical heater and rotating heater for the expulsion of As(III) from water. The most extreme expulsion effectiveness of As(III) was 91% of 0.1 g of adsorbent and with As(III) centralization of 1000 mg/L with pH 8.5, contact time

of 15 min and work size of 100 and more noteworthy than 100 work. The adsorption information are best upheld in the Freundlich display with most extreme adsorption limit of 455 mg/g, which is the most astounding adsorption limit till now March 2017. The investigation appeared, of course, with diminishing of molecule estimate the adsorption limit was significantly expanded from 4.91 mg/g to 455 mg/g. From the above examination it is plainly inferred that the material can be appropriately utilized for evacuation of arsenic with most noteworthy adsorption limit. The present adsorber material BACI-2017 is set up in lab and modern scale for expulsion of arsenic (III) from water with most noteworthy adsorption limit which is not announced anyplace in the writing. This is a novel domain inviting common material which can be used in little scale to expansive scale water treatment for arsenic evacuation.

**Ethical Clearance:** AMET University

**Source of Funding:** self

**Conflict of Interest:** NA

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# Biodiesel Production

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## ABSTRACT

The bothers of the ordinary strategy for biodiesel creation by soluble catalysis recommends look into towards elective strategies, with the non-synergist transesterification utilizing liquor at supercritical conditions proposed as a promising system for biodiesel generation. The alleged supercritical strategy (SCM) has intense points of interest over regular strategies, for example, quick response rates, feedstock adaptability, generation effectiveness and naturally agreeable advantages. Be that as it may, utilization of this philosophy has a few confinements, such as working conditions (hoisted temperature and weight and higher measures of liquor), which result in high vitality expenses and debasement of the items produced. In this audit paper the best in class in connection to the utilization of the SCM for biodiesel generation is accounted for and talked about, depicting the attributes of the strategy, the impact of operational parameters on the ester yield, licenses accessible in the field and the viewpoints for use of the procedure.

**Keywords:** Petro Chemical, Fuel Alternative, Fuel Efficiency, SCM.

## INTRODUCTION

Research into elective wellsprings of sustainable power source has been to a great extent fortified by the expanding vigorous request and the need to bit by bit decrease the utilization of petroleum products because of their inconvenient impact on the earth. Biodiesel, unsaturated fat ethyl (FAEE) or methyl (FAME) esters, has been perceived as an important option fuel to mineral diesel, either as an added substance or substitution, in view of the notable natural and prudent advantages. Its benefits incorporate a non-poisonous, biodegradable, locally created and sustainable asset<sup>[1-3]</sup>. Plus, this biofuel has a cetane number higher than diesel from oil and a superior ignition emanations profile, for example, diminished levels of particulate issue and carbon monoxide and, under a few conditions, nitrogen oxides. Considering the writing study, the point of this work is to give a concise audit on the generation of biodiesel by a non-synergist prepare under supercritical conditions. This audit concentrates on the examination on biodiesel creation, assessing the part of process factors, for example, temperature, weight, oil to liquor molar proportion and home time. The diverse designs of response frameworks, contrasting

options to decrease the high procedure conditions, the impact of water and free unsaturated fats in the response medium, decay of unsaturated fats and a gathering of fundamental licenses enlisted for the utilization of this technique are assessed.

It is derived from triglycerides (vegetable oil and animal fates) by transesterification process<sup>[4]</sup>. It is biodegradable and renewable in nature. Biodiesel can be used more efficiently in semi adiabatic engines (Semi LHR), in which the temperature of the combustion chamber is increased by thermal barrier coating on the piston crown. In this study, the piston crown was coated with ceramic material (TiO<sub>2</sub>) of about 0.5 mm, by plasma spray method<sup>[5]</sup>. In this present work, the experiments were carried out with of Pongamia oil methyl (PME) ester and diesel blends (B20 & B100) in a four stroke direct injection diesel engine with and without coated piston at different load conditions. The results revealed 100% bio diesel, an improvement in brake thermal efficiency (BTE) and the brake specific fuel consumption decreased by about 10 % at full load<sup>[6]</sup>. This paper investigate the use of neat biodiesel on a large scale is raising certain constraints, both in terms of long-term availability of feed stock, and high

NO<sub>x</sub> emissions. However, HC and NO<sub>x</sub> emissions of neat biodiesel are still on the higher side. The main aims of the present work is to carry out an experimental evaluation of single cylinder diesel engine by adding 10% di-ethyl ether (DEE) with Karanja methyl ester (KME) in order to further improve performance and emission characteristics of biodiesel<sup>[7]</sup>.

### DECOMPOSITION OF FATTY ACIDS

Amid supercritical transesterification, the high temperatures (over 573 K) utilized and long response periods for the most part cause a reduction in the ester content. assessed the outcomes acquired for the transesterification of soybean oil in supercritical methanol and presumed that the explanation behind the diminishing in response yield is the abatement in the substance of unsaturated esters, caused by isomerization, hydrogenation and warm disintegration that devour such esters, particularly C18:2 (linoleic) and C18:3 (linolenate) that are more powerless to warm deterioration contrasted with mono-unsaturated and immersed esters. The warm strength of various examples of biodiesel and unsaturated fat esters under various conditions and found that warm corruption is more articulated for the unsaturated esters over 573 K and 19 MPa and warm steadiness of immersed esters is likewise influenced. The advancement of the molar proportion between methyl linoleate and methyl palmitate (the principle unsaturated and soaked FAMES produced, separately); the outcomes demonstrated that the molar proportion between these FAMES diminished with the response time at 573 K/26 MPa or more: the higher the temperature, the lower the molar proportion.

### Innovative Technology in Biodiesel Production By Scm

As seen from the examinations displayed in Table 1, high transesterification yields require high temperature, high weight and high liquor to oil molar proportion. To be sure, high temperature and weight require high beginning speculations (hardware costs) for the usage of such procedures and wellbeing administration strategy. Because of the high liquor to oil molar proportion, more noteworthy vitality utilization in the reactant preheating and reusing steps is unavoidable. Besides, the high measure of liquor in

the biodiesel item impedes the biodiesel-glycerol stage partition. In this way, the utilization of those unique parameters brings about high capital expenses, particularly for the reactor and pump, being fairly higher than for the novel synergist strategies. To build the specialized and temperate attainability of supercritical strategy, additionally thinks about are required to decrease the vitality utilization and working parameters of this procedure.

### CONCLUSION

Esterification of ethylene glycol with acidic corrosive within the sight of corrosive impetuses as Seralite SRC-120 and Molecular Sieve 13x(as Zeolite) has been completed for the most part in two back to back strides. To begin with ethylene glycol with acidic corrosive to created ethylene glycol mono acetic acid derivation then back to back stride shape ethylene mono-acetic acid derivation with acidic corrosive to ethylene glycol di-acetic acid derivation. However the most critical outcome was gotten from try and reenactment information. The most noteworthy ethylene glycol transformation was acquired 91.21% out of 5 hour and for the most part it was changed over entire in 10 hours over seralite SRC-120 and 1.5wt% impetus stacking with temperature at 353 K. Also the transformation of acidic corrosive was observed to be 46.12 %. Around 65 to 66 rate selectivity of EGDA has been accomplished with measure of 0.5wt% Seralite SRC-120 as an impetus. However the past work has been accounted for the 54 to 56 rate of EGDA selectivity. From figure 5.3.7 was demonstrated the most minimal enactment vitality around 31.99KJ/mol which is better for speediest esterification response. Because of low actuation vitality hydrolysis response can be controlled well.

**Ethical Clearance:**AMET University

**Source of Funding:** self

**Conflict of Interest:** NA

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# Brisk Mechanized of OSTE Polymer RF-Mems Components

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## ABSTRACT

This paper reports the first RF-MEMS component in OSTE polymer. Three OSTE-based ridge gap resonators were fabricated by direct, high aspect ratio, photostructuring. The OSTE polymer's good adhesion to gold makes it suitable for RF-MEMS applications. The OSTE ridge gap resonators differ in how they were coated with gold. The OSTE-based devices are compared to each other as well as to Si-based, SU8-based, and CNT-based devices of equal design. The OSTE-based process was performed outside the cleanroom, and with a fast fabrication process (~1 h). The OSTE-based device performance is on par with that of the other alternatives in terms of frequency, attenuation, and Q-factor.

**Keywords:** Polymer, Photostructure, Communication, Band Width, OSTE

## INTRODUCTION

The rapid development of wireless technology increases the need for high-frequency components. Higher frequencies tender wider bandwidths and are needed for technologies such as elevated data rate wireless media communication [1], and automotive car radars [2]. At lower frequencies, electromagnetic components are typically made with micro-milling, which is an expensive serial manufacturing process.

surface allows easy manufacturing of multilayer devices with low stress and low deformation [5]. The material allows fast prototyping by high aspect ratio direct photo structuring [6]. OSTE components can be reaction injection moulded with short cycle times [5], allowing for scaling up of component production. Compared to the polymer SU8, the OSTE polymer's mechanical properties can be tuned to be stiff or flexible [4], and contains sulphur, which enables easy bonding of gold to OSTE.

	Manufacturing methods			
	Si	SU8	Milling	OSTE
Low Cost	-	+	--	++
Time	+	+	-	++
Mass producible	+	+	--	+
Au adhesion	+	-	-	++

However, when designing these components at higher frequencies, above 100 GHz, micro-milling is lacking in resolution. Microfabrication of RF-MEMS components with structure sizes larger than 100  $\mu\text{m}$  are typically manufactured with relatively slow and expensive processes, such as silicon etching, or SU8 lithography [3], and the processes have long design cycle iteration times, Tab. 1. There is a need for a fabrication method that can offer high aspect ratios, short design cycles, and low-cost processing.

In 2011 a new polymer the Off-Stoichiometry Thiolen (OSTE) polymer was designed for fabrication of microfluidic devices [4]. The OSTE polymer's reactive

In this paper the first RF-MEMS component in OSTE polymer has been fabricated and evaluated. The OSTE polymer is used to fabricate a ridge gap resonator operating at 280 GHz [7]. The OSTE-based resonator is compared to previous Si-based [7], SU8-based [8] and carbon nanotubes (CNT)-based [9] ridge gap resonators of equal design. 9-[4-(Azidomethyl) phenyl]-9H-carbazole-3-carbonitrile was described in [11]. Synthesis and molecular docking studies of ethyl 1-benzenesulfonyl -2-[(E)-2-(2 methylphenyl) ethenyl] indole -3-carboxylate with human renin complexed with inhibitor was proposed in [12].

## DESIGN

The ridge gap resonator is based on gap waveguide technology. By using a metamaterial that forms an artificial magnetically conductive (AMC) surface, together with a perfect electrically conductive (PEC)

surface less than a quarter wavelength apart, a stop band for a certain frequency range can be achieved<sup>[10]</sup>. Here, the AMC surface is a “bed of nails”<sup>[11]</sup>. By incorporating a guiding structure in between the AMC, in this case a ridge, the waves can propagate along the ridge without leaking away.

The resonator consists of a conductive ridge surrounded by an AMC surface. On the long sides of the ridge, two rows of pins are present to create the stopband, and on the short sides of the ridge (the connecting sides), only one row of pins is present. The conductive lid is placed 167  $\mu\text{m}$  above the ridge. The pins and the ridge are 329  $\mu\text{m}$  high. The ridge is 2059  $\mu\text{m}$  long and the pins are 167  $\mu\text{m}$  wide.

### FABRICATION

The 280 GHz ridge gap resonator is fabricated in two layers of OSTE polymer followed by a gold coating. The fabrication process is presented in Fig. 2.

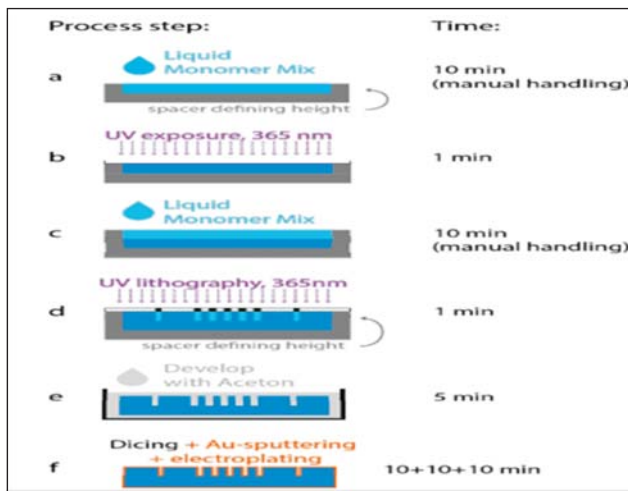


Fig. 1. Manufacturing process, showing the process steps and respective process time.

The entire device is formed using two different OSTE polymers. An unstructured base layer is made in Ostemer221, that provides good bonding properties to the microstructured layer and a relatively high Young’s modulus. The microstructured layer uses Ostemer 220 Litho, in order to obtain good lithographic definition.

For the base layer, 240  $\mu\text{m}$  spacers are placed on a microscope glass slide and Ostemer 221 (Mercene Labs AB, Sweden) is poured onto the microscope glass, Fig 2a. The polymer is squeezed by a top lid consisting of another microscope glass and a transparency film in between. The layer is UV cured (Collimated Hg-lamp, OAI, Millpitas, USA) for 60 sec at 10 mW/cm<sup>2</sup> at 365

nm. Fig. 2b. The top transparency film and microscope glass is removed, leaving a flat UV cured Ostemer 221 surface. 390  $\mu\text{m}$  thick spacers are placed on the Ostemer 221, and the polymer Ostemer 220 Litho (Mercene Labs, Sweden) is poured on top, Fig. 2c. Both layers are now squeezed by a photomask consisting of a microscope glass with a repro- printed transparency film. The photomask is protected by a Teflon film to avoid stiction of the polymer to the mask. The entire stack is placed on top of black paper during UV exposure (365 nm) to avoid reflection. The stack is UV exposed for 60 sec, Fig. 2d. The photomask is removed and the polymer stack is developed in an acetone bath with ultrasonic agitation for 3 min, Fig. 2e. The OSTE stack is sputtered with a seed layer of 180 nm Au from the top. Unlike all polymer alternatives, OSTE contains sulfur that enables direct covalent bonding to gold, resulting in very strongly attached gold layers, therefore no adhesion layer such as Ti or Cr is needed. The OSTE stack, including the microscope glass, is electroplated in a gold ion solution (Enthron Neutronex) for 5 min at 38  $^{\circ}\text{C}$ , still attached to the microscope glass. The bottom microscope glass is removed and the OSTE-based resonators are diced with a diamond saw into separate chips. Three OSTE chips (A, B, and C) was processed with slightly different coating parameters. Each chip is sputtered with a seed layer of 180 nm Au from the back. OSTE chip A and OSTE chip B were electroplated for 5 min, at 43  $^{\circ}\text{C}$  and 40  $^{\circ}\text{C}$  respectively.

### MEASUREMENT RESULTS

The OSTE-based resonators were compared to previous resonators of the same design in Si, SU8 and CNT, the attenuation was extracted from the resonances as in<sup>[12]</sup>. The three OSTE-based ridge gap resonators were measured between 220-325 GHz. Two resonance peaks were detected for all three devices, the measurements together with the simulated data of an ideal ridge gap resonator, is presented in Fig. 6.

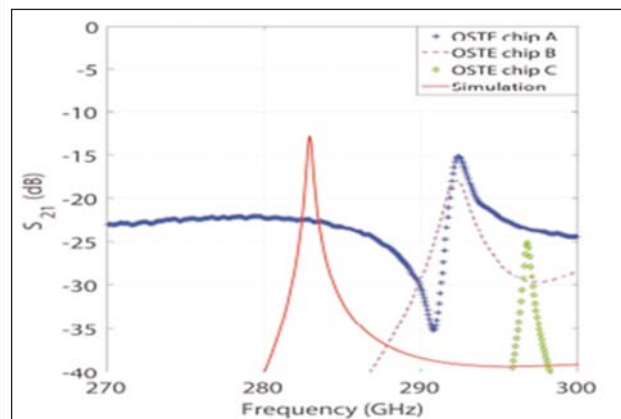


Fig. 2. Measurements results of the three OSTE resonators and the simulations at 270-300 GHz.

The loaded Q-values (QL) were extracted from the measured resonances. QL is defined as the ratio between the center frequency of the resonant cavity and its 3-dB bandwidth, Eq. 1, [13].

$$QL = fc$$

Where the  $f$  is the propagation constant. The calculated QU-values and attenuation values for the OSTE-based resonators, together with measured values for the previous Si-based, SU8-based and CNT-based resonators, are presented in Tab. 2.

	Materials						
	Simulation	Si <sup>[8]</sup>	SU8 <sup>[8]</sup>	CNT <sup>[9]</sup>	OSTE A	OSTE B	OSTE C
Frequency (GHz)	234	234	233	236	239	238	243
Q <sub>o</sub> -value	859	642	319	274	608	314	782
Loss (dB/mm)	0.025	0.033	0.067	0.079	0.036	0.064	0.028
Frequency (GHz)	284	284	283	289	292	292	297
Q <sub>o</sub> -value	992	597	628	518	308	210	785
Attenuation (dB/mm)	0.026	0.043	0.041	0.051	0.087	0.127	0.034

### CONCLUSION

The first RF-MEMS component in OSTE polymer has been presented. The attenuation of the OSTE resonators differ somewhat from each other, due to differences in the gold-coating process step, but they are as good as previously reported resonators in other materials. The OSTE resonators with the lowest measured attenuation performed better than previous reported resonators at values comparable to simulations of an ideal ridge gap resonator. The OSTE process is fast compared to other known processes. Additionally, no cleanroom is needed to perform the process, the process is mass producible, and OSTE's good adhesion to gold offers many applications for RF MEMS.

**Ethical Clearance:** AMET University

**Source of Funding:** self

**Conflict of Interest:** NA

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# Concoction Component Analysis of Electrical Treeing in Polyethylene by Micro-Infrared Spectroscopy

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## ABSTRACT

Regular infrared spectroscopy is utilized to research the debasement locale after electrical treeing in polymers. Be that as it may, the measurement of the infrared light spot is too vast contrasted and the tree channel and the position of the light spot is uncertain. Thusly, the smaller scale infrared spectroscopy is proposed in this paper, which is plan to do synthetic investigation for electrical tree range in polyethylene at a micrometer scale. An inclined air conditioning voltage was connected for electrical tree initiation in polyethylene, using a wire-plane terminal structure. Cuts of tests with electrical trees were then examined through small scale infrared spectroscopy. The trademark bunch dispersion inside a chose treeing zone was given through smaller scale infrared mapping. The examination comes about demonstrated the presence of C=O, C-OH and C-O-C gatherings, and the substance of C-OH and C-O-C gatherings was more than C=O gathering. The presence of C=O gathering was went with the C-OH gathering, and the last absorbance is higher, so it is construed the C=O assemble have a tendency to debase additionally as per the Norrish sort II administration. What's more, not all the electrical tree region had the oxygen containing gatherings. The material corruption amid electrical treeing was examined with and without oxygen.

**Keywords:** Oxygen, Spectroscopy, Concoction.

## INTRODUCTION

Diverse ghastly examination strategies have been utilized to break down the tree zone of protecting materials, which add to concentrate the arrangement of the corruption district. For instance, polyethylene tests with electrical trees were observed to be rich in electron turn reverberation signals, which typically remained for nothing radicals Low-thickness polyethylene LDPE ÿ tests with wire plane anode were utilized as a part of this paper<sup>[1]</sup>. The wire-plane anode was first displayed in, and the technique utilized as a part of this work was like that in the main distinction was that a straight tungsten wire was utilized here rather than a circular segment one<sup>[2]</sup>.

The electric field dissemination in such geometry was ascertained by PC recreation, with 1 kV connected to the wire, the most noteworthy field is 13.2 kV/mm. Since the measurement of the tungsten wire is considerably littler than alternate measurements in the specimen, an unmistakable diagram of the electric field

circulation can't be introduced in one figure, yet the field around the tungsten wire inverse to the center of the ground cathode with the most noteworthy field was appeared. Obviously the different field around the wire is very nearly a coaxial conveyance<sup>[3-5]</sup>.

A run of the mill review of the electrical trees amid the constant perception was appeared in for the most part, trees initially started at the tungsten wire inverse to the ground cathode. In some uncommon cases, a couple trees initially started past the perception scope, yet with the expansion of the voltage, trees still can be found in the normal range. Also, when a third tree was watched, the voltage was inclined down to zero<sup>[6,7]</sup>.

## PROPOSED METHOD

The science examination of treeing debasement locale has turned out to be deliberate and point by point with the current advancement in phantom investigation. Confocal Raman spectroscopy, optical microscopy and filtering electron microscopy were

joined to investigate the structure and science of electrical trees, and the recognized cluttered graphitic carbon has been proposed to constrain the incomplete release in tree stations and frame diverse tree structures. Raman spectroscopy and infrared spectroscopy, which are both sub-atomic vibration spectra, are successful in concentrate sub-atomic structures. The vibration of a gathering uncovers Raman or infrared action contingent upon the adjustments in the dipole minute. At the point when changes in the dipole minute are expansive amid vibration, the gathering demonstrates a solid infrared ingestion top. Despite what might be expected, the Raman range pinnacle will be solid. In this way, unearthly examination for electrical treeing is led on the premise of the concerned trademark gatherings.

Past reviews uncovered the nearness of a carbonyl gathering (C=O) in electrical trees, and such condition is appropriate to apply the infrared spectroscopy. So the infrared spectroscopy is proposed to concentrate the corruption area amid electrical treeing in this paper. Amid the estimations, the tried region was chosen under a magnifying lens, and after that separated into little regions as indicated by the gap measurement. Each little region was measured by moving the specimen. Such development was controlled by the PC. The progression separation of the development was likewise  $10\ \mu\text{m}\times 20\ \mu\text{m}$ , which empowered the estimation of the whole chose range. The small scale infrared spectroscopy comes about demonstrated that not all the electrical tree area had oxygen containing gatherings, it is found the material debasement amid electrical treeing can happened without oxygen.

### CONCLUSION

The miniaturized scale infrared spectroscopy with a high spatial determination was utilized to concentrate the material corruption of electrical trees in this paper. The region of each test point is  $10\ \mu\text{m}\times 20\ \mu\text{m}$  (the extent of gap), which is equivalent with the measurement of tree channels. The absorbance of each test point can be thought about straightforwardly after the bound together standard rectification and standardization of

all the spectra in one test range, so it is conceivable to known the appropriation of the qualities bunch in an electrical tree territory.

The material debasement amid electrical treeing was delineated in light of the smaller scale infrared spectroscopy. Both the oxidation response and the immediate bond scission of polyethylene can prompt electrical tree start and development. It is trusted the oxidation response will quicken the treeing procedure, since alkyl can be naturally duplicated amid the oxidation response.

**Ethical Clearance:** AMET University

**Source of Funding:** self

**Conflict of Interest:** NA

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# Condensable Supersonic Jet Capability for Analysis of Temporary Low-Temperature Gas Kinetics and Plasma Chemistry of Hydrocarbons

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## ABSTRACT

LEMPUS-2 office is composed and worked to think about procedures of bunch arrangement and plasma-compound responses that incorporate ions, atoms, and groups, in supersonic planes. The office is outfitted with current diagnostics devices and molecular beam, electron beam, mass spectrometer, spectrometer, and laser frameworks for testing and tweaking innovative procedures in a research facility condition. One of the key focal points of the talked about office is that in a solitary framework and a solitary examination, it consolidates the apparatuses for the enactment of transient and steady state supersonic stream with self-supporting or nonself-maintaining release, and stream investigation utilizing electron-pillar spectroscopy and atomic shaft mass spectroscopy. Dry roughing and high vacuum directs empower precise diagnostics of synthetically responding forms in for all intents and purposes any gas blend, including hydrocarbons. A beam stream administration controlled by created in-house fast valves gives an effective approach to analyze semi stationary streams at genuinely high stream rates, with huge material and vitality investment funds. The office fills various needs, from group surface cooperation thinks about with thin film and surface structure arrangement, to high-weight stream extensions that imitate shuttle spouts at high elevations, to innovative process advancement, essentially centered around hydrocarbons. Points of interest of key uses of the office are introduced that incorporate the gas flow of group flies, the arrangement of heterogeneous bunches, the investigation of plasma-science of hydrocarbons, and the thin film affidavit.

**Keywords:** Aerospace Test Offices, Grouping Techniques, Electron-Pillar Applications, Particle Beam Applications, Petroleum Gas.

## INTRODUCTION

Essential and innovative parts of concoction responses in low-temperature plasmas have been contemplated broadly in the most recent decades, with many devoted gatherings and expansive number of documented distributions focusing on the field. One of the less secured, yet in any case essential themes is plasma science in gas bunches. It is well Manuscript got August 22, 2016; acknowledged December 22, 2016. To start with, little groups are shaped amid the nucleation procedure, which at that point develop into bigger buildings through monomer-bunch and cluster-cluster impacts<sup>[1]</sup>. Assist downstream, the quantity of crashes is sufficiently little for the stream to wind up plainly basically solidified, with bunch properties not evolving. By changing the gas weight  $P_0$  and

temperature  $T_0$  in the stagnation chamber, it is conceivable to control the procedure of buildup of a supercooled stream and study bunches with various properties. This makes supersonic planes the essential hotspot for the group arrangement inquire about. The LEMPUS-2 office expands on beforehand created framework LEMPUS<sup>[2]</sup>. The new framework, additionally created at the Department of Applied Physics of the Novosibirsk State University, has every one of the devices for the examination of gas flies in an extensive variety of physical conditions and group parameters. It gives a testbed to concentrate physical and substance forms in supersonic bunch streams and empowers advances in light of such procedures. Groups might be of various sorts, sizes, and vitality states, and conditions of conglomeration; constituent monomers, either particles or atoms, may have distinctive degrees

of excitation. The arrangement of heterogeneous bunches is additionally conceivable.

### PORTRAYAL OF LEMPUS-2 FACILITY

The general course of action of the office is appeared in Fig. 1. Note that LEMPUS-2 is composed in a customary multisection format, where particular segments are altogether associated with the principle chamber. The fundamental (essential) chamber (1), which is a vacuum chamber, is a 700-mm breadth, 1200-mm long flat barrel. Toward one side, the barrel is fixed with a spine that has a window along its longitudinal hub. The flip side is connected with a two-area atomic bar module through ISO250 vacuum bolt. The vacuum drawing arrangement of the chamber comprises of a promoter turbo sub-atomic pump (2) TMP2203 made by Shimadzu, and a helium cryogenic pump (3) Cryo-Torr8 by Helix Technology. They give an aggregate directing rate of upThe vacuum chamber has a 500-mm measurement incubate on the sidewall to give simple access to the internal volume. At inverse divider there are ribs with 160-mm breadth optical windows (8). The windows are therefore organized in two segments opposite to the longitudinal hub of the chamber at a separation of 300 mm from each other. Other than the visual examination of the parts and units inside the chamber, the windows are utilized to pass the radiation flag initiated in the gas stream by electron shafts that cross at the longitudinal hub of the vacuum chamber. The pillars are produced by two back to back electron sources introduced in the upper piece of the chamber. Both electrons sources have their own counterbalance volumes, pumped by turbomolecular pumps TMP 303 (9) by Shimadzu. Electron source #1 (10) made by SumyElectronOptics, found nearer to the spout unit, has a lanthanum hexaboride warmed cathode and a quickening framework that gives yield electron vitality in the range from 30 to 60 keV and a current up to 1 A. The principle reason for this gadget is to energize and ionize gas particles in supersonic stream. Electron source # 2 (11) by Elyon restricted obligation organization is set downstream from the primary source. That source is an empty cathode framework that radiates a very much engaged electron bar with energies up to 10 keV and a current up to 100 mA. It gives the ability to electron-shaft spectroscopy of supersonic planes [3]-[5]. Characterization of aviation turbine fuel with spindle oil, Crystallographic, experimental (FT-IR and FT-RS) and theoretical (DFT) investigation are done and analysed using [6]. UV-Vis, MEP, HOMO-LUMO and NBO/NLMO of (E)-1-[1-(4-Chlorophenyl)

ethylidene] thiosemicarbazide and the analysis of Molecular Docking Studies of Nitrocefin and It's Analogs with PBP2A of *S. aureus* [7,8].

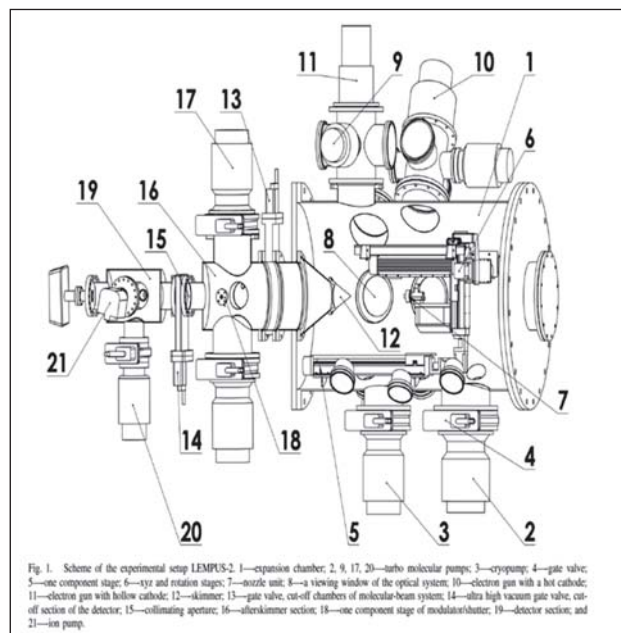


Fig. 1. Scheme of the experimental setup LEMPUS-2. 1—expansion chamber; 2, 9, 17, 20—turbo molecular pumps; 3—cryopump; 4—gate valve; 5—one component stage; 6—size and rotation stages; 7—nozzle unit; 8—a viewing window of the optical system; 9—electron gun with a hot cathode; 10—electron gun with hollow cathode; 11—skimmer; 12—gate valve; 13—cut-off chamber of molecular-beam system; 14—ultra high vacuum gate valve, cut-off section of the detector; 15—collimating aperture; 16—after-skimmer section; 18—one component stage of modulator/shutter; 19—detector section; and 21—ion pump.

The vacuum chamber is likewise outfitted with various vacuum bays. The end rib of the chamber, which keeps up the longitudinal hub symmetry of the office, has a replaceable cone-formed empty aperture-skimmer. It removes the centerline part of the gas fly development. Two therefore associated vacuum segments of the sub-atomic shaft unit, isolated from the development chamber by sliding entryway ISO250, are additionally isolated by high-vacuum sliding door CF100 before which at the backside of the main segment there is a replaceable collimating stomach. Both areas of the sub-atomic shaft unit are furnished with autonomous high-vacuum pumping frameworks. The to start with, after-skimmer, segment is a level barrel with a width of 260 mm and a length of 325 mm, pumped by a Shimadzu turbo sub-atomic pump TMP 1003 at a rate of 1000 L/s, and a helium cryogenic draw like the extension chamber pump. In this segment, there is a molecularbeam modulator introduced on a committed unidirectional facilitate component. On the off chance that sub-atomic pillar ionization is vital, a low-vitality electron firearm or an optical channel for laser radiation might be connected. All spines of the recognition segment of the molecularbeamsegment are fixed with copper gaskets keeping in mind the end goal to keep up high vacuum. The pump framework comprises of a Shimadzu ultrahigh-vacuum turbomolecular pump

TMP 303 (20) and a sorption PS-100 ION pump (21) made by ThermionicsNorthwest. The most minimal weights achieved in two areas of the atomic bar module are  $1 \times 10^{-5}$  and  $3 \times 10^{-7}$  Pa, separately. Sub-atomic shaft estimations are directed in the recognition area. For this reason, one of the framework mass spectrometers is utilized: a period of-flight RTOF300 by AtomSciences Inc., which gives diagnostics of gas species in the mass range from 1 to 5000 amu; a quadrupolarHidenAnalytical EPIC1000 by Hiden with the range from 1 to 1000 amu; or a quadrupole RGA300 by ExTorr with the mass range from 1 to 300 amu. A 356 Micro-IonPlus ionization indicator may likewise be utilized if necessary. An excimer laser CompexPRO50F created by Coherent might be utilized to bring an optical flag into the afterskimmer and location areas. The laser discharges motion in the UV run with a wavelength of 193 nm (argon-fluorine blend) or 248 nm (krypton-fluorine blend). Because of wellbeing contemplations, the laser is introduced in a different room, and the flag is led to atomic bar module by means of an optical. Advances for preparing of unstable hydrocarbons are accessible, however they are reactant, for example, the Fischer-Tropsch procedure, and for the most part require committed off-site stationary handling. This, and also fluid item transport, make an on location handling of unstable hydrocarbons not down to earth in remote areas. Related mechanical need attracts much enthusiasm to methane compound changes, principally its transformation to fluid hydrocarbons and oxygenates. One of the alluring methodologies seems, by all accounts, to be the improvement of direct change of normal and related oil gasses into fluid hydrocarbons, skirting any syngas stages, all performed in a reduced and productive office. The fluid item must be transportable through a pipeline, and hence ought to have an immersion vapor weight not surpassing 0.5 atm.

### CONCLUSION

An atomic pillar vacuum office, LEMPUS-2, is introduced, outlined and worked at the Novosibirsk State University. The office is outfitted with present day indicative instruments alongside sub-atomic shaft, electron-pillar, massspectrometric, spectrometric, and laser frameworks. The office gives a testbed to itemized

investigation of innovative procedures in lab. One of the key points of interest of the office is its capacity to use, in a solitary exploratory run, distinctive ionization and excitation frameworks to ponder transient and enduring state supersonic planes, both gathering and gas-just, utilizing electron-pillar spectroscopy and sub-atomic bar mass spectroscopy. Its beat administrations give vitality and material proficiency. The office is being utilized to think about supersonic under-extended planes, crest surface associations, radical and particle development, excitation procedures and substance response in gas and particulate stages, group arrangement forms, and numerous other. The applications go from shuttle impetus to material handling to hydrocarbon changes.

**Ethical Clearance:** AMET University

**Source of Funding:** self

**Conflict of Interest:** NA

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# Determination of Nicotine from Tobacco

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## ABSTRACT

Another superior fluid chromatography combined with mass spectrometry technique (LC/MS/MS) for measurement of nicotine from tobacco was explained. It was used an Atlantis HILIC, 100 mm x 3.0 mm i.d., 3 µm segment with a versatile stage containing acetonitrile/arrangement 0.2% formic corrosive in water. The ionization was upgraded utilizing ESI(+) and improved selectivity was accomplished utilizing couple mass spectrometric examination. The antecedent to item particle moves of  $m/z$  163 > (105.8, 131.8) were utilized to quantify the nicotine focuses. The evaluation was made utilizing the outside standard strategy. The adjustment bends were made on run 0.044 µg/ml. Nicotine content was resolved in 40 brands of cigarettes accessible in Romania. With our system, we got estimations of nicotine in tobacco in the vicinity of 7.5 and 17.6 mg/g.

**Keywords:** Nicotine, Tobacco, Smoking, Chromatographic.

## INTRODUCTION

Tobacco has been smoked for at any rate the last three thousand years. Christopher Columbus discovered it when he arrived in the Americas in 1492, yet antiquated sanctuary carvings demonstrate tobacco being smoked in Central America as long back as 1,000 BC. Nicotine, (S)-3-(1-methyl-2-pyrrolidinyl) pyridine, is the most plentiful of the unstable alkaloids in the tobacco leaf. The essential business wellspring of nicotine is by extraction from the plant *Nicotiana glauca* and *Nicotiana glauca*<sup>[1-3]</sup>. Nicotine follows up on nicotinic cholinergic receptors, influences most organ frameworks in the body and is a profoundly addictive medication. Nicotine regularly makes up around 5 percent of a tobacco plant, by weight. Cigarettes contain 8 to 20 milligrams (mg) of nicotine (contingent upon the brand), however just roughly 1 mg is really invested in the human body. Around 70% of smokers who need to stop smoking can't and around 83% of smokers smoke each day<sup>[4-5]</sup>. An examination done by the Center for Health Policies and Services in Romania demonstrated that 39.9 percent of Romanians smoke every day. The measure of data in regards to nicotine content in cigarettes is slight and just a couple of studies have been done to convey light to this subject<sup>[6]</sup>. There were portrayed HPLC techniques for the assurance of nicotine from pharmaceutical definitions and HPLC-tandem mass spectrometry

strategies for assurance from natural examples. The point of our examination was to expand a fast and basic LC/MS/MS technique reasonable for evaluation of nicotine in countless examples<sup>[7]</sup>.

## Sample preparation

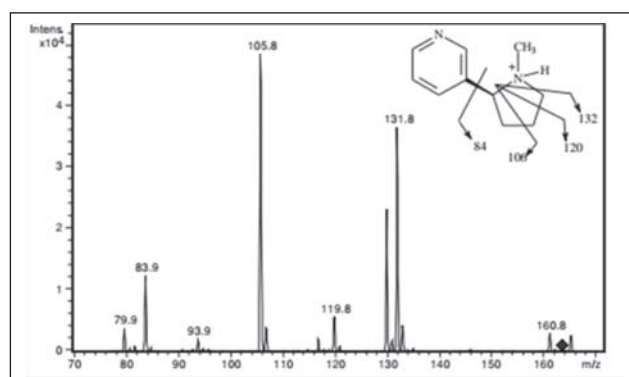
Around 50 mg tobacco were precisely weighted and presented in a 15 ml rotator tube. 2 ml of H<sub>2</sub>SO<sub>4</sub> 0.1M arrangement were included and the blend kept in ultrasonic shower for 10 seconds. At that point, the axis tube was presented in a water shower at 70 °C for 10 minutes. In a 2 ml Eppendorf tube, 50 µl of concentrate were weakened to 1 ml with acetonitrile. The tube was centrifuged for 6 min at 5000 rpm and 50 µl of supernatant was weakened to 1 ml with portable stage. 5 µl from conclusive arrangement were infused in chromatographic framework.

## RESULTS AND DISCUSSIONS

It is outstanding that ESI-LC/MS/MS identification is an exceptionally particular and touchy systematic procedure for evaluation of effectively ionisable natural mixes. In EI-MS procedure, the compound is ionized after contact with high-vitality electrons and the M<sup>+</sup> particle is first gotten and quickly divided into girl particles. Any natural structure can be broke down along these lines. Be that as it may, if there should be an



occurrence of ESI-MS examination, the procedures are altogether different. To begin with, just intensifies that are ionisable in arrangement can be identified. The ionization happens effortlessly when the compound of intrigue has either essential or acidic capacities and the pH of media is balanced appropriately. Second, the particles framed in arrangements are dependably adducts like  $(M+H)^+$  or  $(M-H)^-$ . These particles can be segregated by mass spectrometer and afterward divided by "s haking" them at high vacuum, in nearness of argon, utilizing a voltage particular for  $m/z$  estimation of the particle. Different strides of isolation/fragmentation should be possible, that permit acquiring purported MSn spectra ( $n=2\dots 5$ ), which are regularly more useful than established EI-MS spectra.



## CONCLUSION

The point of this examination was to expound a fast and straightforward LC/MS/MS strategy for measurement of nicotine in tobacco. Chromatographic, identification and extraction parameters were streamlined with a specific end goal to get high selectivity and a short run-time. The methodology of test handling technique was additionally streamlined, permitting readiness of an awesome number of tests in a brief span.

**Ethical Clearance:** AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Effects of Acid Rain on Environment

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## ABSTRACT

This paper concentrates on components and impacts of air contamination on air. It's been said that the most reasons for our reality's worldwide environmental change are very surprising conditions. Among them, acidic rain is one among the unending issues for the worldwide environmental change and natural mishappening of our environment. It's been done that more often than not, precipitation that incorporates a pH 5.6 is considered as air contamination. It's designed, once sulfur oxides and gas oxides responded with water all through rain and as gasses or fine particles. This air contamination influences a spread of plants and creatures in our environment. since it is specified higher than underneath methods for obstacle acidic rain on condition; it's been decreased by pack up smokestacks and fumes pipes besides as exploitation choices vitality hotspots for vehicles, fuel station and power era for different reason in order to gauge in an exceedingly protected and proper climate without worry of overall warming and unpracticed house gasses.

**Keywords:** *Environment, Acid Rain, Contamination, Air, Vehicles.*

## INTRODUCTION

Corrosive rain is a wide term used to portray a few ways that acids drop out of the environment. A more exact term is corrosive affidavit, which has two sections: wet and dry. Wet statement alludes to acidic rain, haze, and snow. As this acidic water streams over and through the ground, it influences an assortment of plants and creatures. Dry statement alludes to acidic gasses and particles. About portion of the sharpness in the climate falls back to earth through dry testimony<sup>[1]</sup>. The wind blows these acidic particles and gasses towards structures, autos, homes and trees. Dry kept gasses and particles can likewise be washed from trees and different surfaces by rainstorms. At the point when that happens, the overflow water adds those acids to the corrosive rain, making the mix more acidic than the falling precipitation alone. Precipitation that has a pH estimation of under seven may contain acidic rain. This is because of the nearness of acidic oxide discharges in the air from enterprises and vehicles. In any case, a precipitation that has a pH estimation of under 5.6 is considered as corrosive rain<sup>[2]</sup>. It is shaped when sulfur dioxides and nitrogen oxides, as gasses or fine responds with rain water. Particles in the climate consolidate with water vapor and encourage as sulphuric corrosive or nitric corrosive in rain, snow, or haze. Hence, the

fundamental target of this paper was to evaluate the impact of corrosive rain on condition and to recommend the techniques for avoiding corrosive rain. Additionally, to survey what have done on corrosive rain earlier and to conjecture what will have done later on. This is the main period of the exploration. It will proceeded with additional on exploratory outcome in the second period of the paper.

## METHODOLOGY

### How do we measure acid rain?

Corrosive rain is measured utilizing pH meter from 1 to 14 esteem scales with a pH of 7.0 being unbiased, 0 to 7 being acidic, and 7 to 14 fundamental<sup>[3]</sup>. At the point when the PH esteem brings down, the causticity idea of rain increments. Unadulterated water has a pH estimation of 7. In any case, typical rain is marginally acidic in light of the fact that diverse acidic oxide outflows respond with rain that brings down the pH esteem around 5.6. As per 2000 report, the most acidic rain falling in the US has a pH of around 4.3<sup>[4]</sup>. This corrosive rain's pH and the chemicals that cause corrosive rain are observed by two systems that are upheld by EPA. The National Atmospheric Deposition Program measures wet affidavit, and its Web website

highlights maps of precipitation pH (take after the connection to the isopleths maps) and other vital precipitation science estimations. The Clean Air Status and Trends Network (CASTNET) measures dry testimony. Its site highlights data about the information it gathers, the measuring destinations, and the sorts of gear it utilizes<sup>[5]</sup>.

## DISCUSSIONS

### Components of acid rain

The significant parts of corrosive downpours are sulfur dioxide/sulfur trioxide, carbon dioxide and nitrogen dioxide breaks up in rain water. These parts are stored as dry and wet affidavits. At the point when these toxins are broken down in water amid rain it frames different acids (Figure 1). The synthetic responses of these contaminations are examined as takes after.

- $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$  (carbonic acid)
- $\text{SO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_3$  (sulphurous acid)
- $\text{NO}_2 + \text{H}_2\text{O} \rightarrow \text{HNO}_2$  (nitrous acid) +  $\text{HNO}_3$  (nitric acid)

### Causes for the formation of acid rain

Common sources and human exercises are the primary driver for the development of corrosive rain on the planet. Common source causes are emanations from volcanoes and natural procedures that happen on the land, in wetlands, and in the seas contribute corrosive delivering gasses to the environment; and Effects of acidic stores have been distinguished in frigid ice a great many years old in remote parts of the globe. Though, exercises of people are consuming of coal, utilizing Oil and petroleum gas in control stations to create power, cooking reason and to run their vehicles are emitting oxide of sulfur, oxides of carbon, oxides of nitrogen, lingering hydrocarbons and particulate issues to nature. These outflows blend with water vapor and water in the air creating powerless arrangements of sulphuric and nitric acids, which fall back as corrosive rain to the sea, lake and land.

### Hydrodesulphurization (HDS)

Hydro treating is a reactant concoction handle broadly used to expel sulfur mixes from refined oil based goods, for example, gas or oil, stream fuel, diesel fuel, and fuel oils. One reason for expelling the sulfur is to lessen the sulfur dioxide emanations coming about

because of utilizing those energizes in car vehicles, air ship, railroad trains, ships, or oil consuming force plants, private and modern heaters, and different types of fuel ignition.

Another vital purpose behind expelling sulfur from the transitional item naphtha streams inside an oil refinery is that sulfur, even in to a great degree low focuses, harms the honorable metal impetuses platinum and rhenium in the synergist transforming units that are therefore used to overhaul the of the naphtha streams<sup>[8]</sup>.

### Effects of acid rain on environment

**Harmful to aquatic life:** This is because of expanding the acidity character in water bodies that Stops eggs of specific living beings (e.g. angle) to quit bring forth, Changes populace proportions and influences their biological community<sup>[9]</sup>.

**Harmful to vegetation:** Vegetables are destructed because of expanded corrosiveness in soil, Leeches supplements from soil, and abating plant development, harming plants, makes darker spots in leaves of trees, obstructing photosynthesis, enables living beings to contaminate through broken takes off<sup>[10]</sup>.

**Affects human health:** Causes respiratory issues, asthma, dry hacks, cerebral pains and throat disturbances; Leeching of poisons from the dirt by corrosive rain can be consumed by plants and creatures. At the point when expended these poisons it influence human's life seriously, which cause mind harm, kidney issues and Alzheimer's illness have been connected to individuals who eat meat of "lethal" creatures/plants by these contamination.

**Effect on transport:** Currently, both the railroad business and the plane business need to spend a considerable measure of cash to repair the destructive harm done by corrosive rain. Moreover, spans have crumpled in the past because of corrosive rain erosion. Corrosive rain disintegrates the stonework and mortar of structures (particularly those made out of sandstone or limestone). It responds with the minerals in the stone to shape a fine substance that can be washed away by rain.

### How do we prevent our environment from acidic rain?

**Clean up smokestacks and exhaust pipes:** Almost the majority of the power that forces present day life originates from consuming non-renewable energy sources like coal, flammable gas, and oil. In any case,

deplete emanation of these fills are the fundamental driver of corrosive testimony that discharged into the air. Coal fuel represents most US SO<sub>2</sub> and a substantial segment of NO<sub>x</sub> emanations. Sulfur is available in coal as a pollution, and it responds with air when the coal is scorched to shape SO<sub>2</sub>. Interestingly, NO<sub>x</sub> is framed when any petroleum product is singed. There are a few choices for decreasing SO<sub>2</sub> discharges, including utilizing coal containing less sulfur, washing the coal, and utilizing gadgets called scrubbers to synthetically expel the SO<sub>2</sub> from the gasses leaving the smokestack and reusing to use as a crude material.

**Use alternative energy sources:** There are different wellsprings of power other than petroleum derivatives, for example, atomic power, hydropower, wind vitality, geothermal vitality, and sun based vitality. Of these, atomic and hydropower are utilized most broadly; wind, sun based, and geothermal vitality have not yet been tackled on a vast scale. There are likewise elective energies accessible to control cars, including petroleum gas controlled vehicles, battery-controlled autos, energy components, biofuels and biodiesel and mixes of option and gas fueled vehicles.

**Liming:** Powdered limestone added to water and soil to kill corrosive. It is ordinarily utilized as a part of Norway and Sweden. In any case, it is more costly and here and now cures. Corrosive affidavit infiltrates profoundly into the texture of an environment, changing the science of the dirt and also the science of the streams and narrowing, at times to nothing, the space where certain plants and creatures can survive. Since there are such a variety of changes, it takes numerous years for biological communities to recoup from corrosive affidavit, even after outflows are diminished and the rain winds up noticeably ordinary once more.

## CONCLUSION

For the most part, precipitation that has a pH esteem under 5.6 is considered as corrosive rain. It is framed when sulfur dioxides and nitrogen oxides responded with water amid rain and as gasses or fine. Acids rain

is depicted as far as wet and dry testimonies. The wet statement alludes to acidic rain, frog and snow though dry testimony alludes to acidic gasses and particles. This corrosive rain influences an assortment of plants and creatures (Harmful to sea-going life, Harmful to vegetation, influences human wellbeing and Transport) in our condition. As it is talked about above under Methods of anticipation of acidic rain on condition; we decrease it by Clean up smokestacks and fumes pipes as wells as utilizing elective vitality hotspots for vehicles and power era for various reason keeping in mind the end goal to live in a protected and appropriate condition without passage of an unnatural weather change.

**Ethical Clearance:** AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Electrochemical and Sensor Based Schiff Metal Complexes Overview

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## ABSTRACT

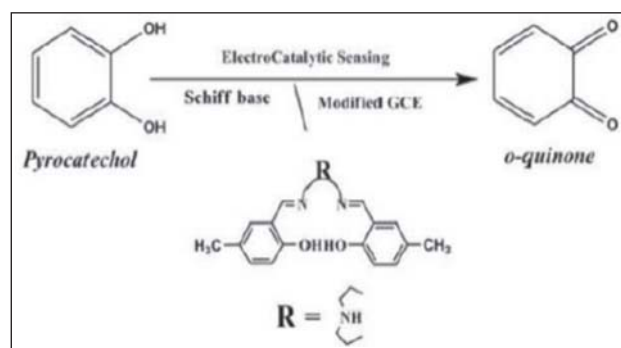
Schiff bases and their metal buildings are utilized for some applications aside from the organic exercises; it can be utilized as sensors anodes, vitality capacity gadgets, sun oriented cells and ecological sensor. This survey bargains more about their utilization in electrochemical and sensor viewpoints.

**Keywords:** Schiff Base, Metal Mind Boggling, Electrochemical, Sensor.

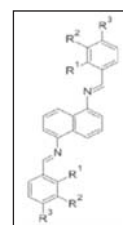
## INTRODUCTION

Schiff bases are buildup results of essential amines with carbonyl mixes furthermore, they were first detailed by Hugo Schiff in 1864. The basic auxiliary component of these mixes is the azomethine aggregate with a general equation  $RHC=NR'$  where R and R' are alkyl, aryl, cyclo alkyl or heterocyclic gatherings which might be differently substituted. These mixes are otherwise called anils, imines or azomethines. Schiff bases have wide applications in nourishment industry, color industry, investigative science, catalysis, fungicidal, agrochemical and organic activities<sup>[1-2]</sup>. As of late, the consideration of Schiff bases and their metal buildings are expanding due to their exceptional organic and pharmacological applications.<sup>[3-6]</sup> They are utilized for numerous applications separated from the organic exercises; it can be utilized as sensors, cathodes, vitality stockpiling gadgets, sun powered cells<sup>6</sup> and ecological sensor. It tends to tie with the metal iota and frame the buildings with diverse oxidation states.<sup>[7]</sup> The Schiff bases are containing distinctive heterocyclic moieties also, they are essential class of mixes in natural science. Also, Schiff base can be utilized for the substantial metal detecting, and evacuation of toxin in nature Design and performance analysis of MIMO-OFDM system using different antenna configurations is discussed in <sup>[8]</sup>. They are great spectrophotometric and flourimetric operators Application of numerous new diagnostic gadgets requires the nearness of natural reagents as basic mixes of the measuring framework. Schiff base ligands are utilized as a part of optical and electrochemical sensors, and moreover in a few chromatographic techniques, to make conceivable location of upgrade selectivity and

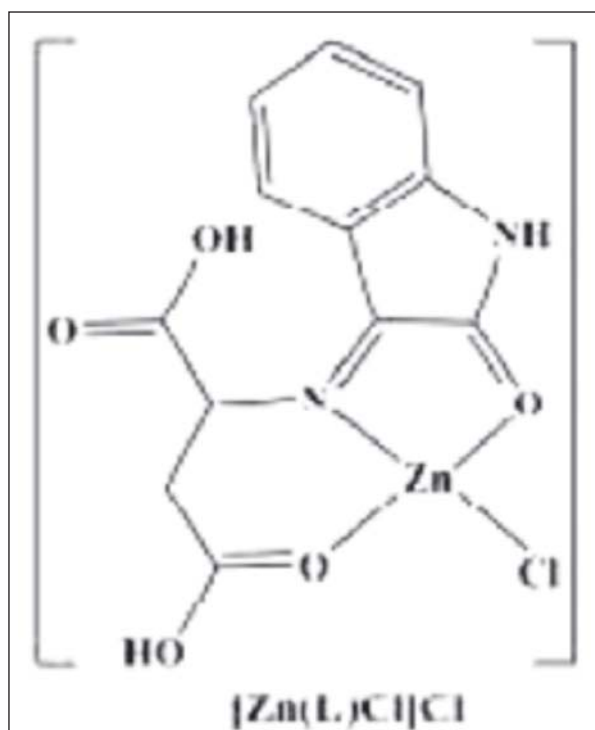
sensitivity. Schiff base ligands can be effectively integrated by responses of buildup of essential amines and carbonyl mixes in which the azomethine bond is shaped and they can utilized as perplexing arrangement responses (assurance of amines, carbonyl mixes and metal particles); or using the variety in their spectroscopic qualities Reactive Power Pricing Using Group Search Optimization in Deregulated Electricity Market is explained in <sup>[9]</sup>. An awesome number of metal buildings of the Schiff bases (non-cyclic or cyclic) have been arranged, and they have given a massively rich universe of chemistry<sup>13</sup>. This paper audits the employments of metal complex of Schiff bases in electrochemical and sensor angles.



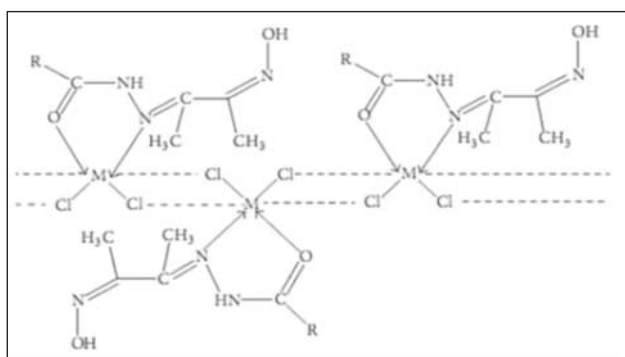
Graphical representation of electro-catalytic reaction.



Proposed structures of the synthesized Schiffbase compounds



Synthesis of L and [Zn(L)Cl]Cl



Suggested structure for [Co(C<sub>17</sub>H<sub>15</sub>O<sub>3</sub>N<sub>3</sub>)]

## CONCLUSION

The conclusion can be drawn that the Schiff based macrocyclic buildings give a appropriate grid for the manufacture of film sensors for anions. These film terminals are particular to particular anions and can be effectively utilized as pointer terminals in the immediate examination of manufactured and additionally genuine examples. These electrochemical sensors likewise have enough lifetimes for estimation of samples. Schiff bases have been utilized as transporters in the planning of mpotentiometricsensors for deciding cations and anions<sup>28-37</sup>. Aruthenium(III) Schiff base complex was utilized as a part of the manufacture of chloride PVC-based film sensor<sup>38</sup>. The

sensor with a synthesis of 30% PVC, 62% benzyl acetic acid derivation, 5% ruthenium(III) Schiff base complex and 3% hexadecyltrimethyl ammonium bromide shows close Nernstian conduct over a wide focus run. It indicates high selectivity toward chloride particles more than a few natural and inorganic anions and was effectively connected for the assurance of chloride in serum tests. It could likewise be utilized as a marker cathode in the potentiometric titration of chloride particles with silver nitrate arrangement. As of late, there is a write about a potentiometric aluminum sensor in view of the utilization N,N'- bis(salicylidene)- 1,2-cyclohexanediamine as an impartial transporter in poly(vinyl chloride) lattice. It was effectively connected for coordinate assurance of aluminium(III) in natural, modern and ecological samples. The anode could be utilized as a part of the pH scope of 2.0–9.0 and blends containing up to 20% (v/v) non-fluid substance. It has been utilized as a pointer anode in potentiometric titration of aluminum particle with EDTA. The Schiff base, N,N<sub>2</sub>,N<sub>3</sub>,N<sub>3</sub>''- 1,5,8,12-tetraazadodecane-bis(salicylaldiminato), has been utilized as ionophore for get ready Mn<sup>2+</sup> specific sensor<sup>40</sup>. The sensor was observed to be adequately particular for Mn<sup>2+</sup> over a number of antacid, basic and substantial metal particles and could accordingly be utilized for the assurance of manganese in different examples by coordinate potentiometry.

**Ethical Clearance:** AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Essential Investigation and Removal assets using LaserInduced Breakdown Spectroscopy in Silicone Rubber

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## ABSTRACT

With laserinduced breakdown spectroscopy (LIBS), the basic sytheses of the room temperature-vulcanized silicone rubber and the high temperature-vulcanized silicone rubber recently arranged examples were broke down in this paper. The LIBS spectra demonstrated that carbon (C), oxygen (O), aluminum (Al), silicon (Si), press (Fe), and zinc (Zn) were contained in the specimens; predictable with the energy dispersive X- ray spectroscopy (EDS) comes about. With scanning electron microscopy (SEM), the micromorphology and the profundity of the removal pits were watched. The pits' sizes were just around 200?400  $\mu\text{m}$ , and there was about no distinction between the hydrophobicity of the nonablated zone and the removed territory, and the static contact edge of the cavities was considerably bigger than that of the nonablated region, implying that the LIBS examination was practically nondestructive. The profundity of the removal pits indicated linearity association with the laser heartbeat number that would help a considerable measure in the in situ investigation. Expanding the laser energy of the shot, the force of spectra lines of unequivocal component and the electron number density would increment in the meantime. The review result demonstrated that the LIBS would be a promising component investigation method of silicone rubber particularly on line, and the piece of the composites could be plainly watched.

**Keywords:** *Laserinduced Breakdown Spectroscopy (LIBS), Scanning Electron Microscopy (SEM), Silicone Rubber, Energy Dispersive X- Ray Spectroscopy (EDS),.*

## INTRODUCTION

Silicone rubber composites have been generally utilized as a part of the field of high-voltage insulation, for example, the room temperature-vulcanized (RTV) rubber coatings connected to the surface of artistic or glass encasings and the high temperature-vulcanized silicone rubber (HTV) utilized as a shed material in composite insulators<sup>[1]</sup>. Contrasted and porcelain and glass, silicone rubber composites have better surface hydrophobicity and hydrophobicity exchange and, along these lines, have better execution in antipollution flashover<sup>[2]</sup>. Plus, silicone elastic composites have different points of interest, for example, lightweight and harm countermeasure<sup>[3]</sup>. In spite of every one of these focal points, a far reaching comprehension of the connection between surface hydrophobicity and the synthetic creation had not been obtained yet<sup>[4] [5]</sup>.

Working circumstances and climate conditions brought about silicone rubber composites maturing, prompting diminishes in hydrophobicity and the capacity of hostile to contamination flashover<sup>[6] [7]</sup>. Subsequently, the investigation of the substance creation and microstructure of silicone rubber composites on line even in transmission lines would help a great deal to screen the working execution of the composite materials, regardless of whether they have hydrophobicity or not<sup>[8]</sup>.

The potassium boro-succinate analysis is explained in the Synthesis, growth and characterization of novel semiorganic nonlinear optical potassium boro-succinate (KBS) single crystals <sup>[9]</sup>. As of late, studies on silicone rubber composites had utilized a wide range of strategies for the examination of the chemical arrangement and microstructure, including energy



dispersive X-ray spectroscopy (EDS), Fourier transform infrared spectroscopy (FTIR), thermogravimetric investigation, scanning electron microscopy (SEM), and X-ray diffraction (XRD). EDS and FTIR for the investigation of the silicone rubber composite from field-matured insulators and found the distinction in oxygen fixations among tests and the lessening in polymeric gatherings comparing to Si-CH<sub>3</sub>. Watched and measured the width of the splits of air conditioning and dc crown treated silicone rubber composite specimens utilizing SEM. The precious stone structures of fluid silicone rubber examples with XRD and found that the gem structures framed in pulverization layers

### Proposed System

Laser induced breakdown spectroscopy (LIBS) is a mainstream strategy for the basic examination of materials as of late, growing quick. Contrasted and other scientific techniques, LIBS has numerous good components, for example, quick examination speed, no requirement for test planning, and appropriateness for almost a wide range of materials. In addition, as a compact diagnostic framework, LIBS could be connected outside on location. Conventional LIBS framework comprises of a laser, a fiber, a spectrometer, an indicator, a PC, and a focal point. Amid the examination, a pulsed laser with flexible energy is centered on the objective specimen surface, energizing atoms and creating plasma, of which the emission spectrum will be caught by the spectrometer and the detector. Lines of various wavelengths compare to various components, while the force of each line compares to the relative centralization of the relating component; hence, the essential investigation of the objective is gained. The plasma could be gotten in the climate. The analysis of the 4-methylimidazolium picrate is stated in the Crystal growth, perfection, linear and nonlinear optical, photoconductivity, dielectric, thermal and laser damage threshold properties of 4-methylimidazolium picrate: an interesting organic crystal for photonic and optoelectronic devices<sup>[10]</sup>.

In this paper, the impacts of pulsed laser on RTV and HTV were concentrated, for example, the profile of the removed pit and the removal profundity of single pulse. The spectra lines were examined to break down the component structure of silicone rubber materials. With SEM and EDS strategies, the micromorphology and removal properties of tests surface and the chemical arrangement were watched.

Two kinds of recently arranged RTV, and one kind of recently arranged HTV gathered from various organizations were decided for the investigation. For every sort of material, a specimen in size of 50 mm × 50 mm × 4 mm was made for laser removal.

An Nd: YAG laser (Quantel) was decided for discharge pulsed laser with the wavelength  $\lambda = 1064$  nm, the pulsewidth of 7 ns, and the frequency of 2 Hz, and concentrated on the surface of the specimens by a 50-mm central focal point. A distance across of the laser beam at the surface of the specimen was 100  $\mu$ m. The energy of single pulse was customizable from 40 to 90 mJ. Associated with the laser, the identification part caught the discharge spectra of the plasma each shot in air.

The micromorphology and the component appropriation were portrayed by checking electron microscopy (SEM, MIRA3 TESCAN) and energy dispersive spectroscopy (EDS, BUKER). As per the point examining comes about by the EDS, the components dissemination of the specimen surface would be watched. What's more, the profundity of the laser removal opening would be measured by SEM with a cross-sectional picture.

With pulsed laser (laser wavelength  $\lambda = 1064$  nm, 7-ns pulsewidth, 2 Hz frequency, and a solitary pulse energy of 70 mJ) concentrating on the surface of tests, recently arranged RTV and HTV were removed. The morphology of the removed cavity was seen through SEM. the morphology of the pits on the surface of the recently arranged RTV and HTV.

The consequence of EDS had demonstrated that the example contained carbon (C), oxygen (O), aluminum (Al), silicon (Si), and iron (Fe) and zinc (Zn). In the EDS result, O component had the most astounding substance, and the substance of C component was higher than Al. An issue for applying quantitative investigation with LIBS is that, for a specific component, there were a few diverse phantom lines with a specific wavelength go, while the pinnacle force of the distinctive component could be utilized for the computation of the component content.

### CONCLUSION

In conclusion, the discharge spectra of a few silicone rubber composites were examined with the LIBS test and different materials examination method. The

removal properties demonstrated that the LIBS examination was practically nondestructive and the profundity of the cartons would be direct with the shot number. This would help the in situ and layer-by-layer perception of the specimen organization. The discharge spectra of the specimens outlined that carbon (C I), oxygen (O I), aluminum (Al I), silicon (Si I), iron (Fe I), and zinc (Zn I) were contained in the example, and this was likewise affirmed by the EDS result. Force of ghostly lines could mirror the substance of the comparing component, yet additionally study, for example, hardware scaling down, quantitatively examine, and maturing procedure is as yet required. Expanding laser vitality prompts increment in the power of ghostly lines and the electron number density.

**Ethical Clearance:** AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Hydroxyl Radical Rinse Water Technology using Ozone Ultrasonic and Ultraviolet Oxidation Process

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## ABSTRACT

The exact instruments, for example, incorporated circuit and semiconductor is effortlessly tainted. The contaminants that are connected to the instrument, for example, oil, metals and natural are generally cleaned by synthetic fluid reagents. Be that as it may, they cause water optional contamination and need a considerable measure of cost. By and by objective of the audit is that ideal the contaminants by hydroxyl radical. However, the hydroxyl radical is routinely conveyed by the reaction of split up ozone. Hydrogen peroxide or splendid light is used for deterioration of the split up ozone. Nevertheless, the radical creation adequacy of the common system is not high. Subsequently, a high-capability hydroxyl radical era procedure is longed for. In light of this need, new development of the hydroxyl radical which be made by ozone-water, brilliant, MHz ultrasonic and TiO<sub>2</sub> was delivered.

**Keywords:** Hydroxyl Radical; Rinse Water; Tio2 Nano Tube; Ultraviolet Irradiation; Mhz Ultrasonic

## INTRODUCTION

The hydroxyl radical is the nonpartisan type of the hydroxide particle, and the hydroxyl radicals have an unpaired electron on an open shell setup. A covalent obligation of the hydroxyl radical has two electrons, one electron is provided by oxygen molecule, and one is from hydrogen particle. The portrayal of hydroxyl radical is •OH. Hydroxyl radicals are exceedingly responsive and, as a result, fleeting; be that as it may, they shape a vital piece of radical science<sup>[1-2]</sup>. Most notably hydroxylradicals are produced from the decomposition of hydroperoxides(ROOH) or, the reaction of excited atomic oxygenwith water in atmospheric chemistry. Now our objective of thisstudy is the development and technical analysis of washingdevice of hydroxyl radical water generated by 'O<sub>3</sub>-water/ultraviolet/MHz ultrasonic/TiO<sub>2</sub> (titanium dioxide photocatalyst)'and we expect this method can be used for cleaningsemiconductor device as environment-friendly as we can<sup>[3-5]</sup>.

## HYDROXYL RADICAL GENERATION DEVICES

The improvement of multi-innovation, that is about photocatalyst, bright and ultrasound. As indicated by the innovation advancement of the intricate response

of bright radiation and MHz ultrasonic radiation with new TiO<sub>2</sub> photocatalyst that is TiO<sub>2</sub> nano container of nano response field dissimilarity sort of locale specifically taking metal particles, clean sullying of Si wafer of ultra-fine semiconductor, do the essential research about making wash water which has high cleaning limit and creating model of the hydroxyl radical flush water era gadget<sup>[6-7]</sup>. The gadget is appeared as figure 1.



Fig. 1. Original hydroxyl radical generation device

Discharge oxygen gas from the oxygen tank into the ozone producing gadget, in the meantime, make the ultra-unadulterated water stream into the ozone creating gadget, then ozone water can be created by

ozone generating device. We make the ozone water stream into the hydroxyl radical flush water era gadget that is appeared as figure 2. A piece of development of the wash gadget is made of photocatalyst of titanium dioxide. Also, this gadget can create the wash water, for example, hydroxyl radical by bright light illumination and ultrasonic shed<sup>[8]</sup>. Hydroxyl radical has the capacity of deterioration by bright light illumination and ultrasonic shed.



Fig. 2. Mobile hydroxyl radical rinse water generation device

### Ozone ultraviolet and ultrasonic oxidation process

The hydroxyl radical oxidation potential is stronger than ozone and chlorine, and it can also cut the organic C-C bond, C=C, C=O and so on, it is shown such as figure 3, so the organic matter can be completely decomposed by hydroxyl radical, most of eventual products are kindly for our environment.

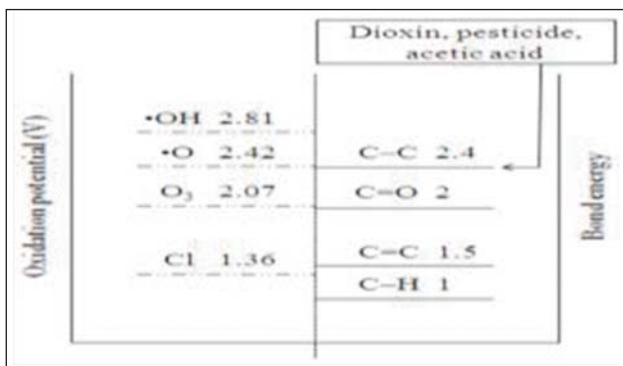
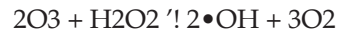
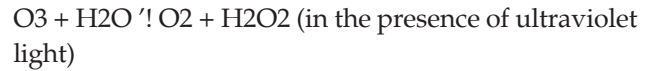
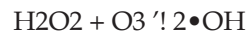


Fig. 3. Oxidant potential of oxidants

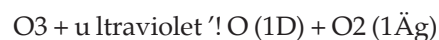
In the ultraviolet ozone process, photons in the ultraviolet spectrum convert ozone in the presence of water to oxygen and peroxide. The peroxide then reacts with the ozone to form the hydroxyl radical. A simplified reaction sequence is shown below:



Ultrasonic works mostly by energy released from the collapse of millions of microscopic cavitations near the dirty surface. The bubbles made by cavitations collapse forming tiny jets directed at the surface. Ultrasonic is a source of radicals, especially the hydroxyl radical. The hydroxyl radicals are very strong and nonspecific oxidizing species which escapes out of the bubble and react rapidly with compounds in solution. A simplified reaction sequence of generating hydroxyl radical by ultrasonic is shown below:



In science, photocatalyst is the quickening of a photoreaction within the sight of an impetus. In reactant photolysis, light is consumed by an adsorbed substrate. In photocatalysis, the photocatalyst synergist movement relies on upon the capacity of the impetus to make electron-hole sets, which create free radicals (hydroxyl radicals: •OH) ready to experience the optional responses. Its perception has been made conceivable as far back as the revelation of water electrolysis by methods for the titanium dioxide. Business utilization of the procedure is called Advanced Oxidation Process. There are a few strategies for accomplishing Advanced Oxidation Process that can yet don't really include TiO<sub>2</sub> or even the utilization of bright light. For the most part the characterizing component is the creation and utilization of the hydroxyl radical. A disentangled response arrangement of creating hydroxyl radical by bright and photocatalyst is demonstrated as follows.



### EXPERIMENT RESULT

In this experiment, we utilized the first hydroxyl radical flush water era gadget. TiO<sub>2</sub> nano container of nano response field difference kind of area specifically

taking metal particles as a preparatory stride of photocatalyst, it is that TiO<sub>2</sub> was showered by cool splash of rapid on the aluminum fiber to frame photograph synergist film. It was produced by Fuji Corporation Ltd. We explore the era of oxidants, for example, ozone (utilization of iodine) and hydrogen peroxide, and so forth (potassium permanganate utilization) that can bring about radicals deliver by ultrasound and bright light with photocatalyst, and the conduct of breaking down the natural compound of dimethyl sulfoxide or methanol, that is as the assessment of a cleaning devices capacity as shown in figure 4.

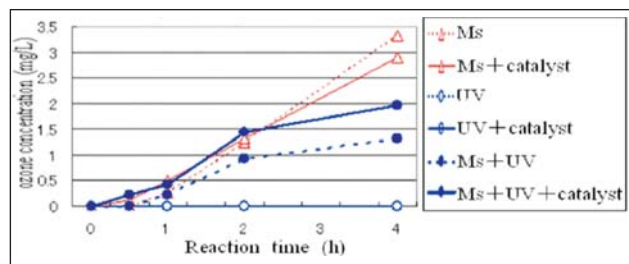


Fig. 4. Consumption's variations of potassium permanganate (H<sub>2</sub>O<sub>2</sub>, etc) with time

The utilization of potassium permanganate, (for example, hydrogen peroxide) is impacted by ultrasonic, yet when we utilize bright emanating, despite the fact that with impetus, the utilization of potassium permanganate is shut to zero. On the off chance that ultrasound is utilized alone, the utilization of non-impetus test is higher. For bright and ultrasonic are concurrent, the impact of impetus identifying with bright could be seen in 4h later, yet the specimen transmitted alone by ultrasound, the utilization of potassium permanganate is high.

## CONCLUSION

Radicals can be produced by ultrasound and bright illumination, and ultrasound has impact on the life of the radicals. The free radical flush water can be created by the 'O<sub>3</sub>-water/bright/MHz ultrasonic/TiO<sub>2</sub>'. It is affirmed that the impetus can viably expand radical

generation. For dimethyl sulfoxide, the flush impact of hydroxyl radical water is superior to anything ozone water. As the semiconductor nanostructures flush water, hydroxyl radical water can expel metal particle, particulate and natural substance, it can be demonstrated by our different examinations.

**Ethical Clearance:** AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# In 3.9 GHz Mock Cracks for Hybrid Physical Chemical Vapor Declaration of Magnesium Diboride

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## ABSTRACT

Magnesium diboride (MgB<sub>2</sub>) is viewed as a possibility for the cutting edge superconducting radio recurrence (SRF) cracks because of its higher basic temperature T<sub>c</sub> (40 K) and expanded superheating field (H<sub>sh</sub>) contrasted with other ordinary superconductors. These properties can prompt diminished BCS surface resistance (RBCSs) and remaining resistance (R<sub>res</sub>), as indicated by hypothetical reviews, and upgraded accelerating field (U<sub>acc</sub>) values. We have examined the likelihood of covering the inward surface of a 3.9 GHz SRF pit with MgB<sub>2</sub> by utilizing a hybrid physical-vapor Declaration (HPCVD) framework intended for this reason. To recreate the real 3.9 GHz SRF crack, we utilized a stainless steel deride depression for the review. The film qualities were portrayed on little substrates that were set at the chose positions inside the crack. MgB<sub>2</sub> movies on stainless steel foils, niobium pieces, and SiC substrates demonstrated move temperatures in the scope of 30-38 K with a c-hub arranged crystallinity watched for movies developed on SiC substrates. Dielectric resonator estimations at 18 GHz brought about a quality variable of more than 30 000 for the MgB<sub>2</sub> film developed on a SiC substrate. By utilizing the HPCVD method, a uniform film was accomplished over the pit inside, exhibiting the achievability of HPCVD for MgB<sub>2</sub> coatings for SRF cracks.

**Keywords:** Magnesiumdiboride (MgB<sub>2</sub>), Superconducting Radio Recurrence (SRF), Hybrid Physical-Vapor Deposition (HPCVD), Superheating Field (HSH).

## INTRODUCTION

Superconducting radio frequency cracks are one of the primary segments of a straight atom smasher, and a mass niobium is normally utilized for SRF depressions. Be that as it may, niobium depressions uncover two principle obstructions<sup>[1]</sup>. To start with, the high immaculateness niobium is costly. Second, the mass niobium cavities have achieved the confinement of inherent niobium properties. The rfmagneticfield in the niobium cracks has moved toward the superheating field of niobium, which is the restricting field of the quickening field<sup>[2]</sup>. New methodologies supplanting mass niobium depressions with cracks utilizing slight movies may give cost investment funds to the future quickening agent offices. Covering superconducting film inside a copper hole can lessen the cost of SRF offices, and the high thermal conductivity of copper can enhance the thermal steadiness of the cavity<sup>[3]</sup>.

MgB<sub>2</sub> is viewed as one of the solid possibility for SRF cracks in light of its low remaining resistance, high move temperature, non-frail connection conduct and high superheating basic field anticipated by hypothetical reviews<sup>[4]</sup>. These elements make MgB<sub>2</sub> a fascinating material for SRF cracks.

As of now, among numerous systems creating MgB<sub>2</sub> movies, the hybrid physical-chemical vapor Declaration is the most reasonable process for SRF depressions<sup>[5]</sup>. Keeping in mind the end goal to coat MgB<sub>2</sub>, the inside of the depressions, an essentially changed HPCVD framework was composed. Beforehand, we have tried film testimony in a 6 GHz depression effectively as portrayed<sup>[6]</sup>. Since liquid progression assumes a basic part in HPCVD, scaling up to coat the 3.9 GHz SRF depressions of considerably greater physical sizes requires huge examination. In this paper, we portray the statement of MgB<sub>2</sub> movies

inside a mock crack, comparable fit as a fiddle to 3.9 GHz SRF cracks, in a changed HPCVD framework<sup>[7]</sup>. Great superconducting properties were found in MgB<sub>2</sub> movies on little substrates,<sup>[8]</sup> and uniform coatings were accomplished on the inward crack divider.

### PROPOSED SYSTEM

The magnesium vapor from magnesium pieces set beside the substrates responds with boron deteriorated from diborane (B<sub>2</sub>H<sub>6</sub>) gas to shape MgB<sub>2</sub> on the substrates. As per the past reviews, the most imperative issues for manufacturing excellent MgB<sub>2</sub> movies are perfect conditions without oxygen and sufficiently high magnesium vapor around the substrate. To supply high magnesium vapor, magnesium pieces ought to be put close-by substrates, and a top concentrating magnesium vapor has additionally been accounted for. Evacuating oxygen is expert by utilizing hydrogen gas as the bearer gas.

So as to coat the inside of a crack, the HPCVD framework was altered and tried for little size 6 GHz cavities in past. In this work, the HPCVD framework was like the 6 GHz framework aside from that the size was bigger to oblige the bigger size of the 3.9 GHz holes. Rather than the level specimen organize warming the substrates in the standard HPCVD framework, a barrel shaped warmer was embraced for the crack covering framework, as delineated in Fig. 1(a). Resistive warming components were utilized for the radiator, and thermocouples were appended to gauge the warmer temperature. The warmer was part into two sections with the goal that it could be open for introducing the hole for testimony. A tube-molded molybdenum broiler was utilized for the magnesium vanishing source. The resistive warming component wrapped around the broiler and the temperatures of the stove were freely controlled by the external tube warmer. The magnesium broiler remained on the base of the vacuum chamber. A thermally protected gas spout is embedded from the highest point of the chamber for the conveyance of diborane gas. The warm protection is urgent on the grounds that diborane gas is unsteady at high temperatures. The 5% diborane in hydrogen gas blend was presented through this spout while the hydrogen transporter gas could be presented through both this spout and the other tube from outside of the hole.

Contrasted with the little 6 GHz hole utilized, the 3.9 GHz has a more drawn out length (17 cm versus 10 cm for the 6 GHz hole) and a greater internal measurement of the equator (9 cm versus 4.5 cm). The

HPCVD framework was adjusted in like manner. The tube radiator for the 3.9 GHz depression covering framework is 46 cm long and 14 cm in distance across. The finish of the gas spout was found 7.5 cm over the magnesium broiler. The magnesium broiler was extended from 10 cm in the 6 GHz framework to 20 cm in the 3.9 GHz framework. Twenty pellets of magnesium pieces with 0.25-inch width and 0.25-inch length were utilized for every testimony.

The mock crack was at first situated to such an extent that the top zone of the pit was covered first. At that point, it step by step moved upward so that the equator and the lower some portion of the cavity were covered. Little substrates of c-cut SiC, stainless steel thwart of thickness 0.05 mm and high immaculateness niobium pieces were mounted inside the deride pit at various areas by spot welding stainless steel strips above them. The three substrate areas inside the taunt pit are set apart in Fig. 1(a).

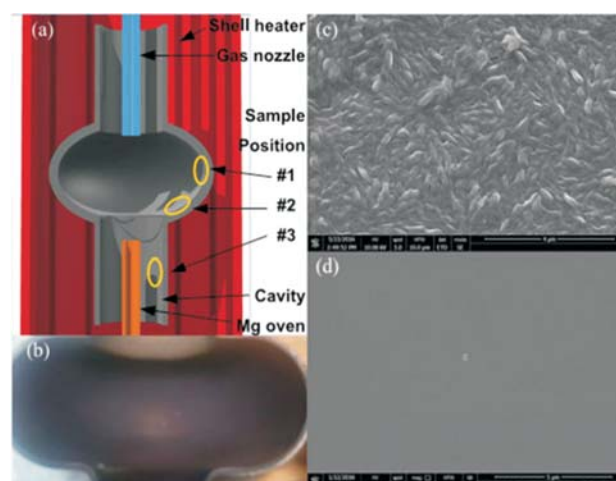


Fig.1. (a) diagram of a cavity coating system (b) mock crack after declaration (c) a stainless steel foil attached in position #3 of 3.9 GHz stainless steel cavity (d) SiC substrate located in position #2.

Figure 1(b) is a photo of the inside of the taunt hole at the equator area. A uniform covering of purple shading, normal for MgB<sub>2</sub> movies, is watched. Figure 1(c) and (d) indicate surface SEM pictures of MgB<sub>2</sub> movies on a stainless steel thwart connected at position #3 and on a SiC substrate situated on position #2, individually. The film on stainless steel demonstrates a granular structure steady with the polycrystalline MgB<sub>2</sub> movies on stainless steel saved utilizing a standard HPCVD framework. The film on the single crystalline SiC substrate is smooth as those epitaxial thin movies were developed utilizing the standard HPCVD framework.

## CONCLUSION

A stainless steel deride hole was utilized as a part of request to test  $MgB_2$  covering of the inside of 3.9 GHz SRF holes utilizing an altered HPCVD framework. SiC, stainless steel, and niobium substrates were put at different positions within the deride cavity.  $MgB_2$  movies developed on stainless steel foils have bring down qualities contrasted with the movies on SiC and Nb substrates, which demonstrated  $T_c$  esteems around 38 K. The film on SiC demonstrated c-hub situated crystallinity. Dielectric resonator estimation at 18 GHz affirmed the high  $T_c$  of the film on SiC.

**Ethical clearance-** AMET university

**Source of funding-** self

**Conflict of Interest** NA

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# Investigations of Transient Low and Plasma Chemistry of Hydrocarbons-Condensable Supersonic Jet Facility

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## ABSTRACT

Lempus-2 office is planned and worked to study procedures of bunch development and plasma-synthetic responses that incorporate ions, particles, and groups, in supersonic planes. The office is outfitted with current diagnostics apparatuses and sub-atomic shaft, electron-pillar, mass-spectrometer, spectrometer, and laser frameworks for testing and tweaking mechanical procedures in a research center condition. One of the key favorable circumstances of the talked about office is that in a solitary framework and a solitary investigation, it joins the apparatuses for the enactment of transient and relentless state supersonic stream with self-supporting or nonself-managing release, and stream examination utilizing electron-pillar spectroscopy and sub-atomic shaft mass spectroscopy. Dry roughing and high-vacuum directs empower exact diagnostics of artificially responding forms in for all intents and purposes any gas blend, including hydrocarbons. The office fills various needs, from bunch surface collaboration examines with thin film and surface structure arrangement, to high-weight stream extensions that copy rocket spouts at high heights, to mechanical process advancement, principally centered around hydrocarbons. Points of interest of key utilizations of the office are exhibited that incorporate the gas flow of group streams, the arrangement of heterogeneous bunches, the investigation of plasma-science of hydrocarbons, and the thin film affidavit.

**Keywords:** *Aerospace Test Facilities, Clustering Methods, Electron-Beam Applications, Ion Beam Applications, Natural Gas.*

## INTRODUCTION

Crucial and innovative parts of synthetic responses in low-temperature plasmas have been examined widely in the most recent decades, with many devoted meetings and expansive number of authentic distributions tar-getting the field. One of the less secured, however regardless imperative subjects is plasma science in gas bunches. It is outstanding that the free development of gas blends in supersonic planes brings about sharp reduction of gas translational gum based paint true<sup>[1]</sup>. As the temperature drops to cryogenic esteems, the gas moves to supersaturation state. The buildup procedure starts when the quantity of impacts between gas particles in the extension is adequately huge. To begin with, little bunches are shaped amid the nucleation procedure, which then develop into bigger buildings through monomer-group and cluster-cluster impacts<sup>[2]</sup>.

The LEMPUS-2 office expands on already created framework LEMPUS<sup>[3]</sup>. The new framework, likewise created at the Department of Applied Physics of the Novosibirsk State University, has every one of the instruments for the examination of gas streams in an extensive variety of physical conditions and bunch parameters. It gives a testbed to concentrate physical and concoction forms in supersonic bunch flies and empowers innovations in view of such procedures<sup>[4]</sup>. Groups might be of various sorts, sizes, and vitality states, and conditions of accumulation; constituent monomers, either particles or atoms, may have distinctive degrees of excitation. The arrangement of heterogeneous groups is likewise conceivable. The chemical decomposition and contribution for 2-Bromo-1-(1-phenylsulfonyl-1H-indol-3-yl) propan-1-one - Acta Crystallographic was described in<sup>[5]</sup>. Crystal growth, spectral, thermal and optical properties of an organic

single crystal-Dye doped hippuric acid was illustrated in [6].

## DESCRIPTION OF LEMPUS-2 FACILITY

The general arrangement of the facility is shown in Fig. 1. Note that LEMPUS-2 is designed in a traditional multisection layout, where specialized sections are all connected to the main chamber. The main (primary) chamber (1), which is a vacuum chamber, is a 700-mm diameter, 1200-mm long horizontal cylinder. At one end, the cylinder is sealed with a flange that has a window along its longitudinal axis<sup>[7]</sup>. The other end is linked with a two-section molecular-beam module through ISO250 vacuum lock. The vacuum pumping system of the chamber consists of a booster turbo molecular pump (2) TMP2203 manufactured by Shimadzu, and a helium cryogenic pump (3) Cryo-Torr8 by Helix Technology. They provide a total pumping rate of upto 3500L/sinN<sub>2</sub>, with there sidual gas pressure in the vacuum chamber ranging from 10<sup>-4</sup> to 100 Pa<sup>[8]</sup>.

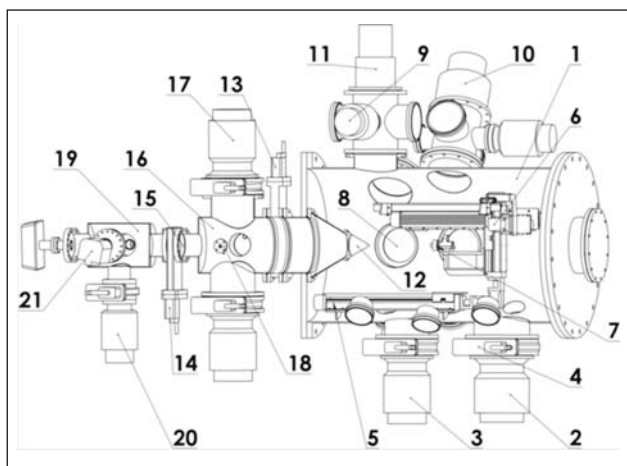


Fig. 1. Scheme of the experimental setup LEMPUS-2.

1—expansion chamber; 2, 9, 17, 20—turbo molecular pumps; 3—cryopump; 4—gate valve; 5—-one component stage; 6—xyz and rotation stages; 7—-nozzle unit; 8—a viewing window of the optical system; 10—electron gun with a hot cathode; 11—electron gun with hollow cathode; 12—skimmer; 13—gate valve, cut-off chambers of molecular-beam system; 14—ultra high vacuum gate valve, cut-off section of the detector; 15—collimating aperture; 16—after-skimmer section; 18—one component stage of modulator/shutter; 19—detector section; and 21—ion pump.

The chamber residual pressure is monitored with vacuum gauges 356 Micro-IonPlus and 275 MiniConvectron (Granville-Phillips). To prevent failure of the vacuum pumping systems due to power loss or extreme operating parameters, all vacuum pumps are equipped with vacuum sliding gates (4) and pneumatic valves manufactured by high-tension cable [9]. An uninterruptible power supply unit (UPS-6000) and an automated control system of chamber pressure ensure emergency operation, including a programmable sequential disabling of all diagnostic and vacuum systems. There are two coordinate positioning devices (LinTech) inside the expansion chamber. The unidirectional positioning device (5) is fixed at the sidewall of the chamber, allowing the translation of auxiliary devices along the chamber axis at a distance of up to 500 mm with a spatial accuracy of 150  $\mu$ m. The four-directional positioning device (6) has three translational degrees of freedom (500 and 200 mm in the longitudinal and transverse directions, respectively), with the same positioning accuracy of 150  $\mu$ m, and the rotational degree of freedom in the plane of the chamber axis with rotation angles of  $\pm 90^\circ$ .

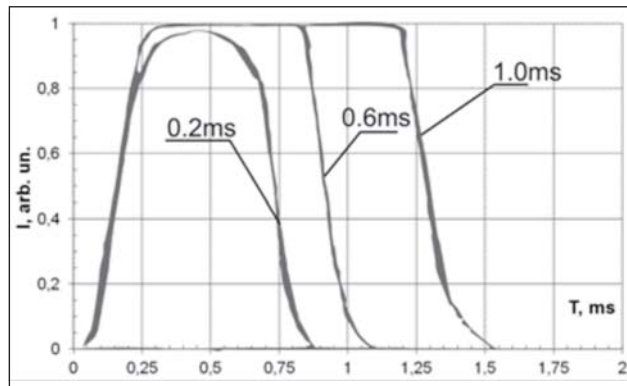
## APPLICATIONS OF LEMPUS-2

The facility is developed to study processes of cluster formation in supersonic jets of gases and gas mixtures, plasma-chemical reactions, including those involving clusters, cluster jets interaction with surface and the formation of various films and structures at the surface; supersonic jets with high stagnation-to-background pressure ratios that emulate space-craft nozzles, and technological processes involving hydrocarbons. Some details of these studies are given below.

### High Flow Rate Nozzle Expansions

Cluster formation in supersonic chemically reacting gas jets typically requires high densities of expanding gases and, consequently, high flow rates, while maintaining high vacuum in the expansion chamber. Note that first quantitative studies of cluster formation processes in supersonic jets date back to mid-20th century. Most often, the restrictions that vacuum pumping systems impose on the flow rate of expanding gases were overcome by pulsing the gas expansions, with research in this field still ongoing. The opportunities that pulsing of a supersonic jet may provide were first shown in [9]. The advantages of such a pulsing are well recognized, as it allows for the following:

- 1) Flow rates, temperatures, and gas densities not possible in steady-state jet;
- 2) Relatively low performance vacuum pumps to be used;
- 3) High efficiency when costly carrier or trace gases are used.



Moreover, higher background gas pressure in the vacuum chamber reduces that time. Therefore, the use of valves with low-duration gas pulses may result in a fully transient (and thus poorly characterized) flow at the point of interest downstream from the gas source, even though the flow in the vicinity of the nozzle exit is quasi-stationary.

### Gas-Surface Interactions

The vacuum and diagnostic capabilities of the LEMPUS-2 facility can be used to study the gas-surface interaction processes, and to investigate the formation of various films, layers, and structures on the surface. The electron-beam method allows excitation and ionization of molecules and atoms, which in turn stimulate elementary chemical reactions, including radical formation, inside the jet.

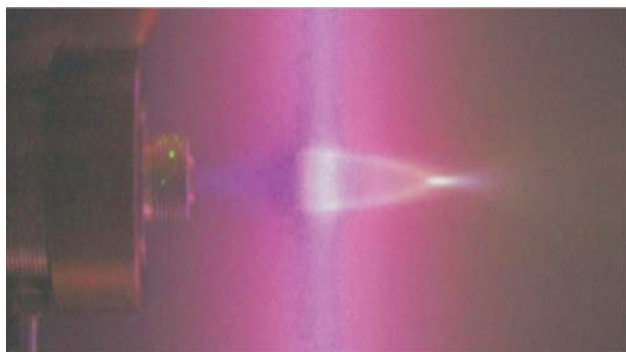


Fig. 3. Nitrogen. Supersonic nozzle:  $d'' = 0, 215$  mm;  $D = 3, 80$  mm;

$l = 17, 0$  mm.  $P_0 = 0, 7$  MPa; and  $Ph = 16, 4$  Pa.



Fig. 4. Argon. Supersonic nozzle:  $d'' = 0, 215$  mm;  $D = 3, 80$  mm;

$l = 17$  mm.  $P_0 = 0, 5$  MPa; and  $Ph = 6, 72$  Pa.

### Visualization of Supersonic Jets

The electron-beam equipment of LEMPUS-2 allows real time visualization of supersonic jets expanding into vacuum or background gas through sonic or supersonic nozzles. The method of flow visualization by electron-beam-induced radiation emission to study the shape and structure of supersonic gas jets has been used. Fig. 3 presents an example of flow visualization for a nitrogen jet expanding through a supersonic conical nozzle (a stagnation pressure of 0.4 MPa at room temperature). We can observe jet structure by afterglow initiated defocused electron beam. The flow structure typical for under-expanded plumes is clearly visible: a spindle-shaped bow shock structure followed by a small Mach disk and the reflected shock. Much more unusual flow pattern is illustrated in Fig. 4, where an expanding flow of condensing argon is presented.

Analysis of the structure of this trail, conducted with molecular-beam mass spectrometry, showed that the central part of the trail consists of large clusters. The size of the clusters gradually decreases off the centerline. The periphery of the trail is mainly small clusters.

### CONCLUSION

A sub-atomic bar vacuum office, LEMPUS-2, is displayed, outlined and worked at the Novosibirsk State University. The office is furnished with current demonstrative apparatuses alongside sub-atomic bar, electron-bar, mass-spectrometric, spectrometric, and laser frameworks. The office gives a testbed to itemized examination of mechanical procedures in research facility. One of the key preferences of the office is its capacity to use, in a solitary trial run, distinctive ionization and excitation frameworks to study transient and enduring state supersonic planes, both gathering and gas-just, utilizing electron-pillar spectroscopy and sub-atomic bar mass spectroscopy. Its beat administrations give vitality and material proficiency.

The office is being utilized to concentrate supersonic under-extended planes, crest surface associations, radical and particle arrangement, excitation procedures and concoction response in gas and particulate stages, bunch development forms, and numerous others. The applications go from shuttle drive to material handling to hydrocarbon transformations.

**Ethical Clearance:** AMET university

**Source of Funding:** self

**Conflict of Interest:** NA

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# Methane Inclusion Into Fluid Fuel By Non-Symmetry Plasma Discharges

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## ABSTRACT

The customary methods for handling petroleum gas into more efficient and practical fills ordinarily have either low change rate or low vitality efficiency. In this paper, another approach of methane liquefaction is proposed. Rather than direct treatment of just gaseous petrol, plasma-initiated methane is responding with fluid fuel. Along these lines, methane particles are straightforwardly fused into fluid fuel to accomplish liquefaction. Nanosecond-beat dielectric obstruction release and environmental weight sparkle release are utilized here to guarantee no nearby warming in gas bubbles. Impacts of both releases on methane response with fluid fuel are examined, and mass and concoction changes in fluid are watched. Preparatory outcomes indicate fixation of methane in fluid fuel.

**Keywords:** *Aerospace Atmospheric Pressure Glow Discharge, Nanosecond Dielectric Barrier Discharge (DBD), Natural Gas Liquefaction, Vibrational Excitation*

## INTRODUCTION

With the expanding disclosure of shale gas assets everywhere throughout the world, modest petroleum gas has turned into an important option fuel. The utilization of petroleum gas in power era, warm, transportation, treatment, and different applications is expanding. The fundamental deterrent that makes it a less attractive alternative for industry is its vaporous state. Serious research endeavors in the range of direct methane transformation into more important fluid hydrocarbons have been made. All the more as of late, plasma compound change of petroleum gas has been examined, including era of syngas and vaporous hydrocarbons <sup>[1]-[10]</sup>. For instance, Wang and Xu <sup>[1]</sup> have shown that within the sight of impetuses, it is conceivable to accomplish over 60% methane change into vaporous C<sub>2</sub> hydrocarbons utilizing frosty plasma response. They contend that the significant procedure is the development of CH<sub>3</sub> radicals with era of ethane and ethylene. Sentek et al. <sup>[2]</sup> have tried various impetuses in blend with DBD plasma for change of methane-CO<sub>2</sub> blends into higher hydrocarbons and alcohols. Comparable reviews in <sup>[3]</sup> have been directed; they exhibited plausibility of era of fluid fuel utilizing DBD release lighted in methane-CO<sub>2</sub> blend. Conversely, Indarto et al. <sup>[4]</sup> couldn't recognize any

methane liquefaction impact of skimming bend release, with hydrogen and acetylene being the primary products. Here, we propose another conceivable component of methane liquefaction by its joining into fluid hydrocarbons fortified by nonthermal plasma. When all is said in done, consolidation of methane atoms may take after two conceivable response ways: immersion of a carbon twofold bond or polymerization. The response that happens amid this procedure—immersion of sweet-smelling hydrocarbons  $R_1 = R_2 + CH_4$  (H = "0.5eV/mol) is exothermic, and vitality cost is not more 0.3 eV/mol of CH<sub>4</sub>. Every single other response amongst hydrocarbons and nonthermal plasma, (for example, polymerization and separation) are unequivocally endothermic and in this manner not intriguing for powerful direct liquefaction handle. 9-[4-(Azidomethyl) phenyl]-9H-carbazole-3-carbonitrile was described in <sup>[11]</sup>. Synthesis and molecular docking studies of ethyl 1-benzenesulfonyl-2-[(E)-2-(2 methylphenyl) ethenyl] indole-3-carboxylate with human renin complexed with inhibitor was proposed in <sup>[12]</sup>.

## MATERIALS AND EXPERIMENTAL METHOD

Barometrical Pressure Nanosecond-Pulsed DBD System

Dielectric boundary release (DBD) was touched off in a coaxial cylinder reactor (Fig. 1). For that, a quartz chamber (3.7 cm ID, 4 cm OD, and 15.2 cm long) was filled with fluid hydrocarbons, while gas blend bolstered through a dielectric Ultra high atomic weight polyethylene tube (3.5 cm OD) scattered into <math>< 1\text{-mm}</math> distance across air pockets utilizing earthenware air stone fixed at the base of the framework. Copper woven wire work (0.4-mm wire breadth) was wrapped around inward and external surfaces of the quartz tube filled in as two terminals. The internal work cathode was associated with the high-voltage (HV) yield of the power supply, and the outside one was grounded. HV (+10.1 kV beat) beats with term of 10 ns (90% sufficiency), rise time of 2 ns, and recurrence of 490 Hz were connected utilizing FIDTech control supply by means of a 15-m-long coaxial link RG393/U. Adjusted back current shunt was mounted in a center of the link and was utilized for control of connected voltage and power estimations (single heartbeat release vitality was measured to be 3 mJ when power supply is set to +10.1 kV). Methane and nitrogen gasses were nourished into the framework utilizing Alicat M-arrangement mass flow controller at the rate of 0.2 slpm.

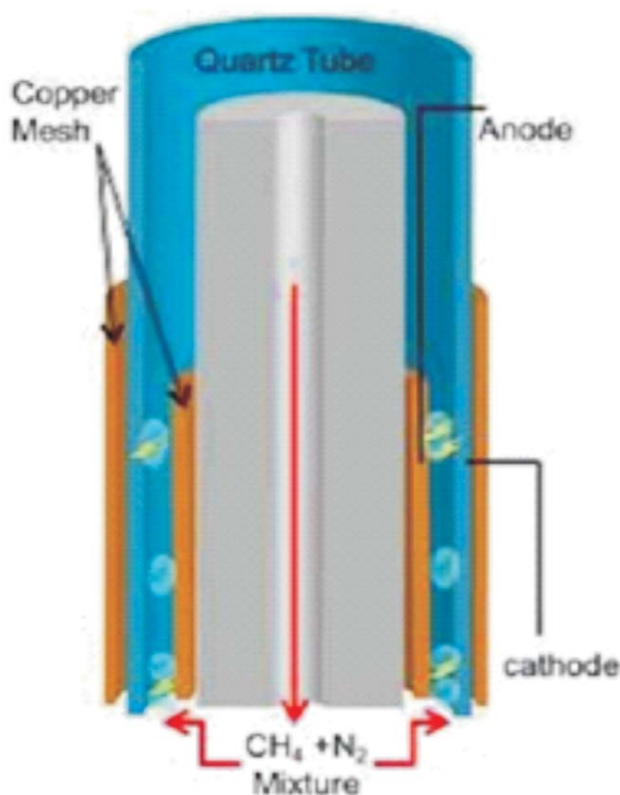


Fig.1. Dielectric barrier discharge reactor system.

## Atmospheric Pressure Glow Discharge System

Schematic of climatic weight gleam (APG) plasma process is appeared in Fig. 2. Release was started between ground pole cathode and tubular HV terminal through which gas blend was scattered as rises into fluid hydrocarbon blend. The APG reactor comprised of a polyvinyl chloride tube with OD 42 mm, ID 31 mm, and 4 terminal match which were orchestrated in two levels 15 mm separated. Every terminal match had a ground and a HV anode. The ground anode comprised of a copper bar with 3.2 mm width and the HV terminal was made off a copper tube with OD = 3.2 mm and ID = 0.9 mm. Each HV anode was associated with a HV control supply (PS, Universal Voltronics BRS 10000) through 10 M resistor. The gas blend was provided through a HV cathode comprised of 0.27 slpm of N<sub>2</sub> and 2.7 slpm of CH<sub>4</sub> and flow was controlled by Alicat mass flow controllers MC-5SLPM-D. The fluid fuel was low sulfur diesel (weight 50 g). The provided gas made a rise between two terminals where release happened. Voltage and current were measured by DPO3014 oscilloscope and Pearson 6165 current screen.

## EXPERIMENTAL RESULTS AND ANALYSIS

### Mass Balance

One of the most straightforward approaches to exhibit methane joining into fluid hydrocarbons is mass adjust investigation. For that, the heaviness of the DBD reactor containing at first 30 ml of fluid diesel was measured prior and then afterward analyzes. Amid investigation, methane/nitrogen blend at rate of 0.2 slpm (0.1 slpm of methane and 0.1 slpm of nitrogen) was sustained through the DBD release. Weight was measured each 10 min utilizing a Satorius Entris adjust, which has determination of 20 mg; 100 records were taken and arrived at the midpoint of in every estimation, and three estimations were taken and found the middle value of for every information indicate limit the instrumental mistake. Another treatment of a similar measure of new diesel test with 0.2 slpm nitrogen flow was done as a control explores. The outcomes are appeared in fig 2.

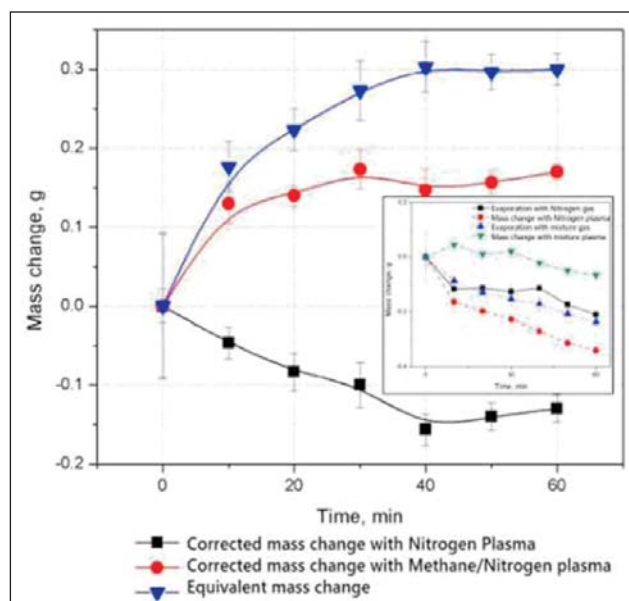


Fig.1. Dielectric barrier discharge reactor system.

## CONCLUSION

Another approach of methane liquefaction by direct joining of energized methane into fluid hydrocarbons utilizing nanosecond-beat DBD and environmental weight sparkle release has been tried. NMR and FTIR examinations of regarded fluid examples and in addition GC investigation of gas stage demonstrate fixation of methane in fluid fuel, abatement of methane focus in gas stage, and auxiliary changes in fluid hydrocarbons (immersion of twofold securities and opening of hydrocarbon rings). Logical model of this procedure is proposed. Despite the fact that these outcomes are conceivably encouraging, additionally research is required, since numerous unanswered inquiries and crevices in understanding remain.

**Ethical Clearance:** AMET University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Micro Bubble Creation Using Single Layer Graphene Heating Elements

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## ABSTRACT

Graphene has already been verified to have potential applications in sensor development due to its unique properties, such as large specific surface area, high carrier mobility, conductivity and optical transparency. Here, we discuss our development of a micro bubble generator that could be used to generate and actuate micron-scale bubbles based on monolayer graphene made from chemical vapor deposition (CVD). This micro bubble generator could generate bubbles with diameter of 2 ~ 65 microns in water. The bubble nucleation power and energy of a graphene heater (7  $\mu\text{m}$  by 30  $\mu\text{m}$ ) are 16 mW and 1.6 mJ, respectively. This power is comparable with that of the bubble generator using metal heating elements and carbon nanotubes. Moreover, the resistance-temperature and the current-voltage properties of the fabricated graphene heater are also reported. The experimental results also demonstrated that the monolayer graphene could be used for bubble generation with controllable micro bubble sizes.

**Keywords:** Heating Elements, Graphene, Micro Bubble Creation

## INTRODUCTION

Micro bubble generation has been applied in different fields recently, such as measuring system acceleration (e.g., bubble-based micro-accelerometer<sup>[1]</sup>), driving mechanical parts in microelectromechanical systems (MEMS) devices (e.g., thermal bubble ink-jet printer<sup>[2]</sup>, bubble micro-actuators<sup>[3]</sup>, and bubble-powered pumping and valve effects<sup>[4]</sup>). Different kinds of heating elements, i.e., Polysilicon, Platinum, and Carbon Nanotubes (CNTs), are used to improve the performance of the bubble generator, where the total input energy of the CNTs heat elements could initiate bubble generation as small as 0.3~5 mJ<sup>[5]</sup>. Here, we used a monolayer graphene as the heating element to generate micro bubbles, aiming to produce an extreme low power and high efficiency bubble generator. The graphene is a remarkably stable material with great mechanical strength and fascinating electronic properties<sup>[6]</sup>. In this paper, we described the fabrication process of the graphene bubble generator and characterized the electrical properties of the micro bubble generator. The minimum power of the bubble generator to initial the bubble generation is also investigated. Investigations on Preparation and

Characterization of Certain Co-polyesters are analysed and the results are discussed in<sup>[8]</sup>.

## CURRENT RESULTS

The monolayer chemical vapor deposition (CVD) graphene (provided by Wuxi Graphene Film Co., Ltd.) was grown on one side of the copper film. The polymethyl methacrylate (PMMA, average Mw < 996 000, Sigma-Aldrich, dissolved in chlorobenzene with a concentration of 20 mg/mL) is used for the graphene sheet transfer process. Fig. 1(a1^7) shows the process of transferring CVD graphene from the copper film to the target substrate, i.e., SiO<sub>2</sub>/Si substrate. Firstly, liquid PMMA is spin coated on one side of graphene/Cu surface (the side with graphene) at 3000 rpm for 30 sec. Then, the PMMA/graphene/Cu membrane is allowed to dry at room temperature. The underlying Cu foil is etched away using aqueous copper etchant (FeCl<sub>3</sub>, 0.1 g/mL), resulting in free-standing PMMA/graphene membrane floating on the surface of the etchant. Then, the PMMA/graphene membrane is washed by DI water for a few times and then moved to the dilute HCl solution (2%) for 1 h to further etch the Cu particles.



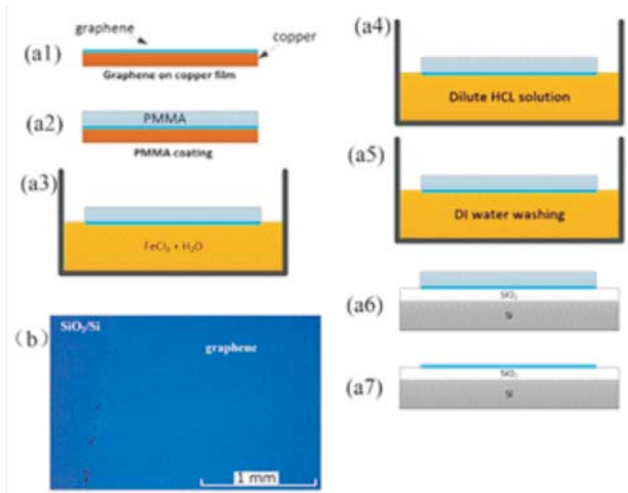


Fig. 1. The graphene (right side of (b)) transferred onto a SiO<sub>2</sub>/Si substrate (left side of (b)).

The PMMA/graphene membrane is then washed by DI water for 5 ~ 6 times before moving onto the target substrate or on top of the micro-electrodes. The PMMA/graphene/substrate membrane is kept at room temperature for 12 h to dry and then baked at 150 °C for 15 min to improve the contact between the stack and the substrate. Finally, the PMMA is removed by acetone followed by IPA washing and blow-dry (Figure. 1b). The graphene/substrate is baked at 200 °C for 15 min to further improve the graphene/substrate contact. The graphene heater is patterned using standard photolithography process and etched by oxygen plasma. A picture of the final bubble generator is shown in Fig. 2.

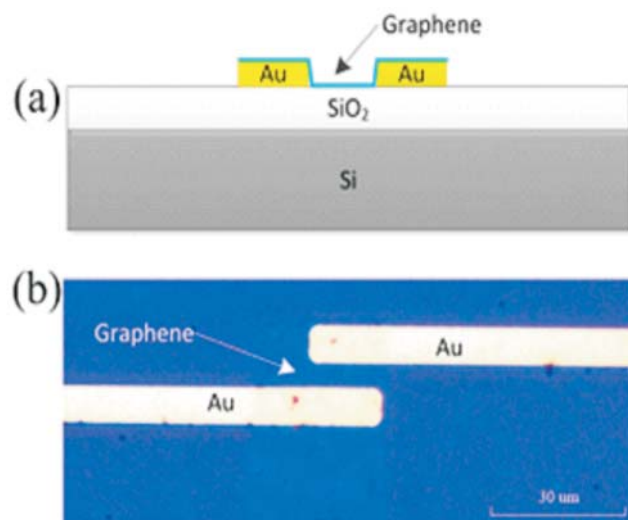


Fig. 2. Illustration of the assembled micro bubble generator device. (b) Top view of an assembled micro bubble generator under an optical microscope.

The temperature-resistance characteristic of the graphene heater is firstly investigated. The heater is put inside a natural convection oven with the temperature monitored by a thermometer (LTLutron TM-906A). The resistance is measured by a precision source/measurement unit (Agilent B2912A). The sampling frequency *f* and sampling time *t<sub>s</sub>* is 50 Hz and 20 s, respectively. Fig. 3 shows the resistance of the device at different temperatures varied from 20 °C to 170 °C. The experiment was repeated 4 times. The resistance increases with increasing temperature. After 120 °C, the resistance increases almost linearly with the temperature, corresponding to a temperature coefficient of resistance (TCR) of 0.105%/°C. Note that, the resistance variance of the last test is higher than that of the previous tests. One reason may due to the annealing effect which improves the contact between the graphene and the metal electrodes, thus reducing the contact resistance [7]. Fig. 4 shows the typical I-V characteristic of the micro bubble generator. The current is varied from 0.1 mA to 12 mA and the voltage measurement is performed with 1 min delay at each current with *f* = 50 Hz, *t<sub>s</sub>* = 40 s. The I-V characteristic exhibits a profound nonlinearity at V of 2.5 – 4.0. This could be partly due to heat conduction from the heat element to the substrate is low and partly due to the temperature of the self-heated heating elements grows rapidly. The calculated resistance is 301.3 Ω.

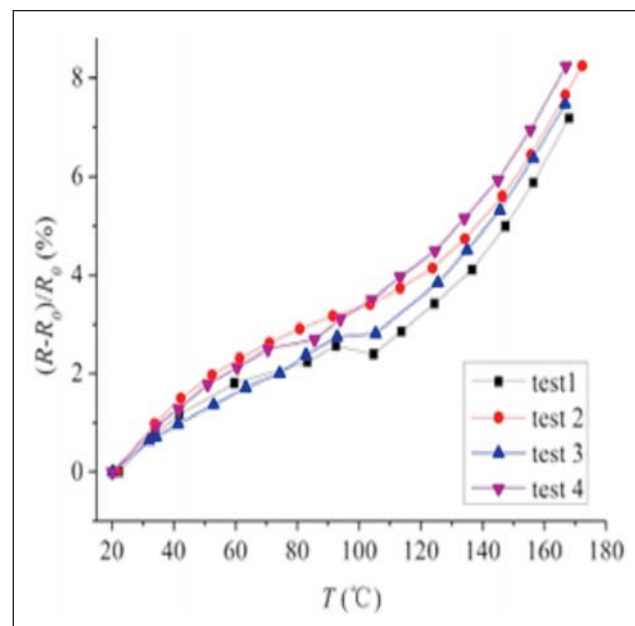


Fig. 3. Dependence of  $(R - R_0)/R_0$  (%) on temperature, *T* (°C), for a heating element from 4 consecutive tests. *R*<sub>0</sub> is the device resistance at room temperature.

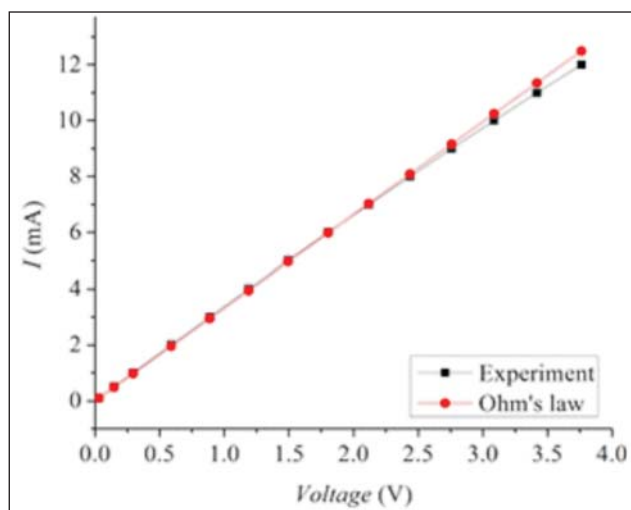


Fig. 4. Current–voltage (I–V) curve of a monolayer graphene heat element. The calculated resistance is 301.3  $\Omega$ .

For demonstration of the bubble generator using the fabricated graphene heater, a pulsed current is applied between the two electrodes of the micro bubble generator under a micro-probe station. Current applied was gradually increased, with the pulse width fixed at 0.1 s, for determining the minimum bubble nucleation power. The minimum instantaneous power ( $V \times I$ ) measured for bubble nucleation is about 0.016 W (which equals to 1.6 mJ). Detailed fabrication process and characterization results of the graphene-based micro bubble generator will be presented at the conference.

### CONCLUSION

A monolayer graphene based micro bubble generator was used to generate and actuate micron-scale bubbles for the first time. The graphene heater could initiate bubble nucleation with low power consumption (power and energy of a graphene heater are 16 mW and 1.6 mJ, respectively). The maximum bubble size could be controlled by changing the applied current.

**Ethical Clearance:** AMET University

**Source of Funding:** self

**Conflict of Interest:** NA

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# Microalgal Carbonic Anhydrase- A Tool for Carbon Capture

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## ABSTRACT

The increasing carbon dioxide level due to increased utilization of fossil fuel and other sources pose a serious threat to the environment. Many strategies are used to reduce the emission and capture the carbon dioxide from the atmosphere. Microalgae has been utilized widely as one of the capture mechanism. Several physiological and biological processes are involved in capturing the carbon from the atmosphere. Hence, one of the potential mechanisms of carbonic anhydrase enzyme for the capture of carbon by microalgae is discussed in this review.

**Keywords:** Microalgae, Carbonic Anhydrase, Carbon Capture

## INTRODUCTION

### Microalgae

Microalgae is small microscopic organism consist of numerous speies. Some of the common species possess carbonic anhydrase. *Chlorella* is a genus of single celled green algae belonging to the phylum Chlorophyta. It is spherical in shape, about 2 to 10  $\mu\text{m}$  in diameter. In 1965, the Russian CELSS experiment BIOS-3 determined that 8  $\text{m}^2$  of exposed *Chlorella* could remove carbon dioxide and replace oxygen within the sealed environment for a single human. *Chlorococcum* is unicellular with spherical or slightly oblong cells of varied size. The cells may be solitary or in irregular clumps,<sup>[1]</sup> sometimes forming films on moist or submerged surfaces. Both ultrastructural and molecular data have revealed that *Chlorococcum* is polyphyletic. *Coelastrum* is a genus of algae in the Scenedesmaceae family and of the kingdom plantae. *Scenedesmus* is a genus of algae, specifically of the Chlorophyceae. *Scenedesmus* is one of the most common freshwater genera; however, the extremely diverse morphologies found among species.

### Carbonic anhydrase: as a tool for CO<sub>2</sub> sequestration

When thinking of photosynthetic and carbon fixating microorganisms of significant industrial relevance, alga is perhaps the most likely one that stands out. Diverse and found widely throughout the biosphere (large sized macro algae and small sized micro algae). Photosynthesis is the main metabolic model of the

microalgae,<sup>[2]</sup> a process that had a central role in the rise in the oxygen level of the terrestrial atmosphere during the evolution of the current biosphere. Nevertheless these microorganisms have great versatility in the maintenance of their structures, using different energy metabolisms such as respiration and nitrogen fixation. Some genera of microalgae have high concentrations of pigments,<sup>[3]</sup> including chlorophyll *a*, considered essential for photosynthesis. Another two pigment classes involved in light energy capture are the carotenoids and phycobilins. Carbonic anhydrase converts carbon dioxide into carbonates and bicarbonates.

The enzyme is classified into three independent CA gene families designated  $\alpha$ -,  $\beta$ - and  $\gamma$ - (Roberts et al., 1997; Tripp et al., 2001). Little sequence similarity occurs between the families indicating that the genes have evolved independently at least three times. The " $\alpha$ -CAs are found primarily in animals, but homologues have also been identified in the bacterium *Neisseria gonorrhoeae* and in the periplasmic space of the green alga *Chlamydomonas reinhardtii*<sup>[4]</sup>. This is the most extensively studied CA family and includes the mammalian CA isozymes. The  $\beta$ -CAs were first found in the stroma of higher plant chloroplasts (Syrjänen et al., 2010). Conversely the  $\gamma$ -CAs are a newly discovered gene family, with the enzyme from *Methanosarcina thermophila* being the only  $\alpha$ -CA isolated and characterised thus far. Related sequences have been found in several eubacteria and in Arabidopsis,<sup>[5]</sup> but it is not yet known if they encode functional CAs.

## STRUCTURE OF CARBONIC ANHYDRASE

### **$\alpha$ -carbonic anhydrases**

There is extensive homology in the primary structures of mammalian CAs I, II and III, each having a molecular mass of approximately 29 kDa. Human CAs I and II show a 59 % identity in amino acids, while human isozymes I and III show 56 % identity. In addition, the crystal structures have shown that the secondary and tertiary structures are also similar. The crystal structures of human CA I (HCA I) and II, bovine CA III, and a truncated form of murine CA V, expressed in *E. coli*, have been determined, and were seen to be very similar. They are ellipsoidal molecules of approximately 5 x 4 x 4 nm<sup>3</sup>, [6] which could be considered one-domain proteins, were it not for the loosely connected amino terminal region of about 24 amino acids. A 10-stranded, twisted  $\beta$ -sheet is the dominating secondary structure, which divides the molecule into two halves: The upper half includes the N-terminal helical region and the active site, while the lower half contains a large hydrophobic core. The 10  $\beta$ -strands are connected by hairpin loops and some helices, and are all antiparallel, with the exception of two pairs of parallel strands.

### **$\beta$ -carbonic anhydrases**

No crystal structures of  $\beta$ -CAs have yet been determined. They do, however, differ considerably from animal  $\beta$ -CAs in many respects. Most striking is the entirely different primary structure, making it impossible to identify any active site residues from sequence similarity assignments. HCA II contains only one cysteine residue per molecule, while bovine CA contains none. The four sequenced plant CAs all have a higher cysteine content, [7] and in the pea there are five cysteine residues per subunit. Spinach CA has been reported to contain 7 cysteine residues per subunit. In addition, evidence from X-ray absorption spectroscopy and mutagenesis suggests that the zinc ion in the spinach enzyme has a Cys-His-Cys-H<sub>2</sub>O co-ordination sphere, in contrast to the  $\alpha$ -CAs (Sawaya et al., 2006)

### **$\gamma$ -carbonic anhydrases**

Very recently, the structure of the  $\gamma$ -CA from *M. thermophilus* was presented by Kisker and associates. This CA is a trimeric molecule, which is completely different from the  $\alpha$ -CAs, emphasizing its separate ancestry. Each subunit is dominated by seven turns of a left-handed  $\beta$ -helix, with three short strands per turn.

Thus there are three nearly flat  $\beta$ -sheets, two with seven,<sup>[8]</sup> and one with eight parallel strands.

### **Carbonic anhydrase in microalgae**

The growth of the algal bloom lowers the concentration of dissolved inorganic carbon (DIC), whereas it raises the pH value of the lake water. To modulate the low concentration of the dissolved inorganic carbon, some species use carbon concentrating mechanisms (CCM) to maintain rapid growth rates. One important component of CCM is carbonic anhydrase (CA), which is essential to CCM in increasing the steady-state flux of CO<sub>2</sub> (aq.) from inside the plasmalemma to the site of Rubisco and reducing leakage of CO<sub>2</sub> from the intracellular pool (Rubisco) (Heinhorst et al., 2006). Furthermore, it is involved in maintaining a concentration close to or higher than equilibrium concentrations of CO<sub>2</sub> (aq.) at the cell surface by dehydration of HCO<sub>3</sub><sup>-</sup>. The function of CA in algae, [9] as in higher plants, is generally considered in terms of the photosynthetic assimilation of inorganic carbon (Ci). Green microalgae have been shown to possess an inducible inorganic carbon concentrating mechanism (CCM) that ultimately acts to raise the intracellular CO<sub>2</sub> concentration to a level far in excess of that present in the surrounding environment.

### **Carbon concentrating mechanism in microalgae**

The way in which the different species of microalgae adapt to a wide range of carbon dioxide concentrations is related to an essential biophysical mechanism denominated the carbon concentration mechanism (CCM), which concentrates the carbon dioxide at the photosynthetic carboxylation sites. This mechanism corresponds to complex metabolic pathways, since different forms of inorganic carbon are involved in these biological processes (Yadav et al., 2012).

The function of the carbon concentration mechanism is to raise the intracellular inorganic carbon levels, compensating for limitations in the carbon dioxide supply that could reduce the photosynthetic rates. This mechanism is responsible for pumping CO<sub>2</sub> to the carboxylation sites.

In which the enzyme carbonic anhydrase converts bicarbonate into carbon dioxide, and rubisco uses this compound as a substrate to produce phosphoglycerate. The rate of this reaction may be slow due to limited carbon dioxide production. Thus the elevated efficiency

of the enzyme carbonic anhydrase, capable of increasing the intracellular carbon dioxide levels to concentrations 1000 times higher than those in the external fluid, results in an efficiency carbon fixation reaction in these organisms. These mechanisms are consistent with various results found in the literature about microalgae with high carbon dioxide requirements and capable of accumulating high internal levels of inorganic carbon (Favre et al., 2009).

Carbon dioxide derived from this internal pool is used by the enzyme ribulosebiphosphate carboxylase (Rubisco) to initiate the first reaction in the Calvin cycle, the carboxylation of ribulosebiphosphate. The  $C_i$  transport system and CA are of central importance to the functioning of the CCM. Studies of *Chlamydomonas reinhardtii* have leads to a broader understanding of the CCM in eukaryotic algae, including the role of CA. The extracellular  $C_i$  has to cross the cell wall, the plasmalemma and the membranes of the chloroplast envelope before it reaches the pyrenoid containing Rubisco Until recently bicarbonate was often assumed to be the carbon species actively transported across the plasmalemma or chloroplast envelope .However,<sup>[10]</sup>active  $CO_2$  uptake system, have revealed that plastids are able to actively transport  $CO_2$  and  $HCO_3^-$ . It is also proved that  $CO_2$  rather than  $HCO_3^-$  is the  $C_i$  species actively translocated across the plasmalemma. On the other hand, active  $CO_2$  transport may only occur at the chloroplast level, thus creating a  $CO_2$  sink so that  $CO_2$  entry into the cell may occur by passive diffusion (Favre et al., 2009).

Traditional methods of biosequestration includes Storage in depleted oil field and old gas, Depleted oil and gas fields do not, have the capacity to store the amounts of carbon dioxide that eventually will need to be sequestered. By some estimates, the world will need reservoirs capable of containing a trillion tons of carbon dioxide by the end of the century. The other method includes sedimentary brine formations would be those more than 800 meters deep — far below sources of drinking water, and at a depth where high pressure will maintain the carbon dioxide in a high-density state. Sedimentary rocks that contain brine are abundantly available, but the concern remains whether they will be secure enough to store carbon dioxide for centuries or millennia (Maroto-Valer et al., 2005).

### Obstacles to Further Development

A number of challenges have emerged to the further development of biosequestration practices, Biological

fixation of carbon dioxide is an attractive option because plants naturally capture and use carbon dioxide as a part of the photosynthetic process. Terrestrial plants sequester vast amounts of carbon dioxide from the atmosphere. However, because of the relatively small percentage of carbon dioxide in the atmosphere (approximately 0.036%), the use of terrestrial plants is not an economically feasible option. Microalgae have the advantages of efficient photosynthesis superior to C4 plants (those plants that form four carbon stable intermediates in the photosynthetic process; generally associated with agricultural and large terrestrial plants), fast proliferation rates, wide tolerance to extreme environments, and potential for intensive cultures. These advantages promise high performance in the reduction of carbon dioxide (Favre et al., 2009). Once harvested, microalgae can serve as a product to offset some of the costs that have been incurred. Potential uses for the algae include biodiesel, biofuel for use in electricity production, fodder for livestock, food and chemicals, colorants, perfumes, and vitamins.

### Recent advances

Research on bioprocess engineering of algae has expanded greatly in recent years, both in scope and diversity. Advances made span across all stages of large-scale algal cultivation, from  $CO_2$  supply to product extraction. Worthy of note, life cycle analysis of large-scale bio-diesel production from algae was also reported using commercial data available. The technological diversity suggests that any economically viable CCU using biological system can only be a result of interdisciplinary collaboration.

### CONCLUSION

In this paper, Microalgal Carbonic Anhydrase is used for Carbon Capture Many strategies are used to reduce the emission and capture the carbon dioxide from the atmosphere. A microalga has been utilized widely as one of the capture mechanism. Several physiological and biological processes are involved in capturing the carbon from the atmosphere. The technological diversity suggests that any economically viable CCU using biological system can only be a result of interdisciplinary collaboration.

**Ethical Clearance:** AMET university

**Source of Funding:** self

**Conflict of Interest:** NA

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# Microwave Resounding Hole as a Reactor For the Enzymatic Hydrolysis of Sucrose

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## ABSTRACT

We display here the plan and examination of a microwave resounding hole to assess the impact of RF electromagnetic field on catalyst responses. The pit has been first planned utilizing CST. At that point, its conduct in the real utilizes has been assessed utilizing the COMSOL multi-material science.

*Keywords:* Microwave Resounding Hole, Enzymatic Hydrolysis, Sucrose, Electromagnetic, COMSOL.

## INTRODUCTION

It is outstanding that every single biochemical response includes electrical powers between the charged parts of the responding atoms. Truly, synthetic restricting is close to a matter of electrical connections, thought at tiny scale; it is of nothing unexpected, in this way that an outer electromagnetic field can associate with such responses<sup>[1]</sup>.

However, the utilization of microwave innovation in organic chemistry has not yet been completely misused. The fundamental reason of this may be on the grounds that an exact temperature control is considerably more troublesome in microwave illuminated reactors, while chemicals are extremely delicate impetuses and can't be subjected to not notable response conditions<sup>[2] [3]</sup>. As respects chemical responses, enhanced yields that can't be expected just to a warm impact have been enlisted as a rule, similar to isomerase and amylase catalyzed responses or Iypase catalyzed transesterification (for biodiesel creation)<sup>[4]</sup>. In any case, the instrument of the adjusted enzymatic action (and whether it is warm or non-warm) is as yet vague.

A conceivable instrument is that the electric field would prompt introduction impacts of dipolar particles and of dynamic destinations of the chemical,<sup>[5]</sup> which result in a nearer remove and a stricter coordination

with the receptive gatherings in substrate atoms, in this manner prompting higher productivity and specificity in enzymatic responses<sup>[6]</sup>. The nearness of non-warm impacts amid synthetic, biochemical and organic procedures under microwave light can't be effortlessly illustrated,<sup>[6]</sup> as a result of the intrinsic challenges in directing such investigations. Truth be told, non-warm impacts (on the off chance that they exist) work simultaneously with warm ones. In any case, taking a gander at an extensive piece of the writing comes about, microwave control has not been checked or was sufficiently high to give a temperature ascend in the medium: in these conditions, it is extremely hard to make a quantitative qualification amongst warm and non-warm microwave impacts.

## Proposed System

Point of this paper is to plan and examine the EM conduct of a microwave resounding cavity bolstered at the apportioned recurrence 2.45 GHz. At that point, the depression will be utilized to assess of the impact of the electromagnetic work on natural material and to the natural response rate.<sup>[7-8]</sup> Specifically, we will concentrate our consideration on catalyst homogeneous catalyzed responses performed in a polar (water) medium; as a reenactment case, the enzymatic hydrolysis of sucrose into glucose and fructose has been picked.

So as to assess the impacts of the piece to electromagnetic fields both for substance mixes or natural tissues, a reasonable presentation contraction is required. We portray here such a mechanical assembly, in light of a round and hollow cavity tuned to work at 2.45 GHz (i.e., the recurrence designated for modern applications) in working conditions. Truly, the materials under test are uncovered in fluid arrangement, so that the hole must incorporate a reasonable holder for them. With a specific end goal to test the adequacy in concoction forms, we chose to uncover a ceaseless stream of arrangement, utilizing a reactor made of eight plexi glass tubes assigned into the pit (Fig. 1). The reactor is focused as for the depression, guaranteeing a uniform ingestion of the electromagnetic radiation by the fluid. An outer pumping framework has been utilized, so that the tubes breadth has been picked as to lessen essentially the scattering of the field outside the depression. Since the dielectric properties of the liquid under test are basically the same as those of unadulterated water, we have considered the liquid (from the electromagnetic (EM) perspective) as water, utilizing the Debye demonstrate with temperature-subordinate parameter. The depression length has been energized a mode free from the azimuthal facilitate, keeping in mind the end goal to illuminate similarly every one of the tubes.

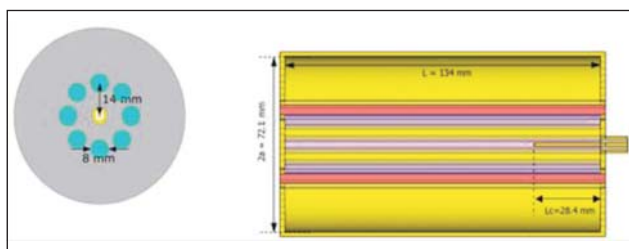


Fig. 1. (a) Cavity bottom and top view (b) cavity side views.

We have decided for the cavity barrel shaped side a business estimate, with a width  $2a=72.1$  mm. Utilizing, the tallness  $h$  of the depression, having thunderous recurrence at 2.45 GHz, is equivalent to 102.3 mm. However the above model does not consider the inhomogeneous dispersion of the water (and the spatial variety of the electric field). Really, a right approach would be supplanted by a normal weighted by the electric field power. Additionally, the nonexistent piece of the dielectric consistent of water can't be dismissed at 2.45 GHz. In this way the full recurrence of the pit of Fig. 1 with  $h=102.3$  mm is not quite the same as (and equivalent to 3.046 GHz) Since the current application requires a pit tuned at (or near) 2.45GHz, a tuning of the hole length  $h$  has been performed.

## CONCLUSION

In this article, the outline and portrayal of a resoundinghole, working at 2.45 GHz and its utilization as a chemical reactor is depicted. A multi-material science reenactment has permitted contemplating all the associating wonders in such a reactor. Among them, the heartiness of the resounding recurrence permits to utilize a settled recurrence microwave generator.

**Ethical Clearance:** AMET university

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Novel Peroxide Crosslinked Polyethylene for Cable Insulation

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## ABSTRACT

Peroxide crosslinked polyethylene is the bona fide affirmation material utilized as a bit of today's electric associations passing on voltages more than 5 kV. Peroxide-interceded crosslinking presents interface making challenges in that there is a loving for awkward crosslinking in the extruder. Polyethylene protection mixes crosslinked utilizing these new included substances shown shocking scattering segment and dielectric solid respects, demonstrating guarantee for requesting high voltage confirmation applications. Novel natural peroxides and crosslinking coagent advances have been intended to address these difficulties. A novel peroxide, isopropenyldicumyl peroxide, was found to incredibly enhance the imperviousness to singe. A novel coagent, 2-methoxy-4-allylphenyl allyl ether, gave basically higher scorch retardance at a given level of crosslinking when stood out from synthesis without coagent.

**Keywords:** Crosslinked Polyethylene, Peroxide, Coagents, Scorch

## INTRODUCTION

Over 50 years ago, polyethylene was introduced as an insulation material for electric power cables. Polyethylene's inherent characteristics of toughness, resistance to chemicals and moisture, low temperature flexibility, and excellent electrical properties, along with low cost and easy processability, make it a very desirable material for insulating electric power cables<sup>[1-3]</sup>. Since its introduction, there have been a number of significant advances in materials technology that have contributed to polyethylene's continued position as the material of choice for insulating electric power cables. Though the production of peroxide crosslinked polyethylene cables via extrusion processing has been practiced for many years, the extrusion of these materials is still a complicated art in which process and material formulation technology are very much interrelated. One such interrelationship is between the organic peroxide and the extrusion<sup>[4-6]</sup>. The dominant organic peroxide utilized for crosslinking of polyethylene is dialkyl peroxide. In the case of insulation materials for medium, high, and extra high voltage cable insulation, the most widely used peroxide is dicumyl peroxide<sup>[7]</sup>. Although dicumyl peroxide is well suited for this application, state

of the art insulation material formulations often rely on other additives that are used in conjunction with dicumyl peroxide to inhibit scorch, and in some cases to provide crosslink boosting effects (cure boosters). Collectively, nonperoxide additives that boost cure and/or inhibit scorch are collectively referred to herein as coagents<sup>[8]</sup>.

The removal of the peroxide mediated crosslinking by-products is performed in a separate degassing process after the cable is manufactured. This degassing process generally requires a minimum of 7 days before the cable production can be completed. A novel organic peroxide and crosslinking coagent technology have been designed to address these challenges. We will review the chemistry of these novel materials and their suitability for electrical applications<sup>[9]</sup>.

## PEROXIDE CROSSLINKING OF POLYETHYLENE

The peroxide crosslinking process for polyethylene is initiated with the first order thermally driven homolytic cleavage of the peroxide bond, as shown in Figure 1 for the case of dicumyl peroxide. The resulting alkoxy radical can either abstract a hydrogen from the

polymer to form a polymer radical or undergo beta scission to form a methyl radical and acetophenone. In turn, the methyl radical can also abstract a hydrogen atom from the polymer to form a polymer radical. Two of the resulting polymer radicals can combine to form a covalent carbon-carbon bond between polymer chains resulting in crosslinked polymer.

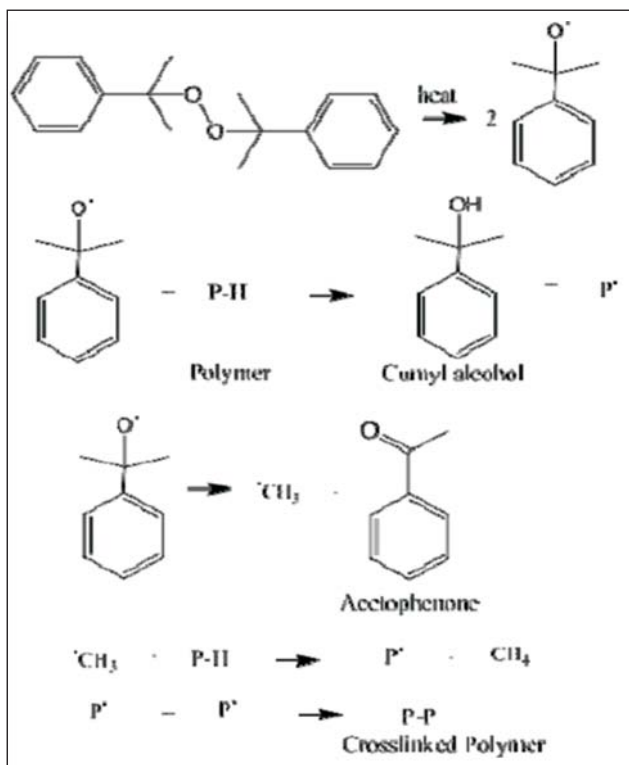


Fig. 1. Peroxide Crosslinking Reaction Sequence in Polyethylene

Although it is the intention of the cable manufacturer to initiate the crosslinking reaction in the post-extrusion vulcanization chamber rather than during extrusion, some crosslinking will inevitably be initiated by heat present in the molten polymer during extrusion. This crosslinking during extrusion is known as scorch. A consideration of the peroxide half-life demonstrates this point. Dicumyl peroxide has a half-life in polyethylene at 140°C such that during a typical extrusion operation at 140°C, about 5-10% of the available peroxide crosslinking capacity in a dicumyl peroxide-containing product will be initiated. And any stagnant spots, areas of low flow, or hot spots in the extruder may experience even higher levels of crosslinking, which will lead to cable defects and shorter production runs.

## NOVEL PEROXIDE STRUCTURE

While dialkyl peroxides are the peroxides of choice for crosslinking polyolefins, coagents in view of terminal carbon-carbon twofold bond usefulness are an especially viable class of added substances that are utilized together with peroxides in crosslinkable polyethylene mixes [2]. Along these lines, it was important to investigate dialkyl peroxides that contain bunches with terminal carbon-carbon twofold bonds. Peroxides related structurally to dicumyl peroxide were functionalized with isopropenyl groups based on the hypothesis that they would provide cure coagent functionality as well as lower the concentration of peroxide decomposition byproducts by grafting of the carbon-carbon double bond to the polymer during crosslinking. To test this hypothesis, we prepared and evaluated isopropenyl dicumyl peroxide Figure 2.

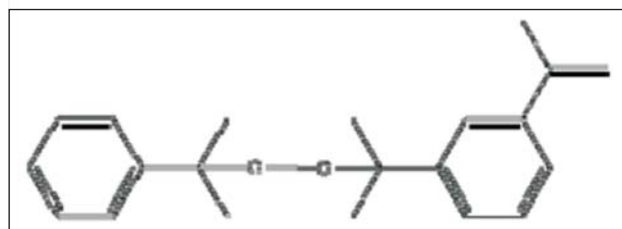


Fig. 2. Isopropenyl Dicumyl Peroxide (IDP) Structure

Crosslinking efficiency including scorch retardance was assessed using the accepted industry techniques for analyzing data from a moving die rheometer (MDR) [3],[4],[5],[6] as well as a hot elongation test under a 20 N/cm<sup>2</sup> load at 150°C [7]. The hot elongation test is conducted at 150°C because it is above the polymer's melting temperature (of 110°C) and insufficiently crosslinked material would have a high hot elongation at this temperature. The wire and cable industry specifications require less than 175% elongation at 150°C. A novel coagent has been created that has both scorch hindrance and cure boosting traits. This new coagent is 2-methoxy-4-allylphenyl allyl ether (MAPAE). Both of the terminal carbon-carbon twofold securities in MAPAE can respond with the polymer radicals to form a transitional radical, as represented in Figure 3 for one of the twofold bonds. The early phases of this response, for example, that which happens amid expulsion, give burn retardance.

**Table 1: Crosslinking Efficiency of Novel IsopropenylDicumyl Peroxide**

Sample	A	B
<b>Formulation</b>	wt %	wt %
LDPE	97.8	98.6
Dicumyl Peroxide		1.4
Isopropenyl Dicumyl Peroxide	2.2	
<b>Crosslinking Results</b>		
Hot Elongation % @ 150°C	68	65
<b>MDR (182°C, 0.5° arc)</b>		
Max Torque (in-lb)	2.9	2.9
T90 (minutes)	4.1	3.6
<b>MDR (140°C, 0.5° arc)</b>		
TS1 (minutes)	82	49

Be that as it may, at later stages both twofold bonds take an interest in radical responses and the subsequent radical adducts take part in extra proliferation and crosslinking responses. This outcomes in an expansion in cure productivity as watched when contrasted with crosslinking without a coagent.

### ELECTRICAL PROPERTIES

For use in demanding cable insulation applications, electrical properties are critical. Dielectric constant and dissipation factor, two key electrical properties for cable insulation applications, were measured as a function of temperature for compositions containing the new IDP peroxide and the MAPAE discussed above. Figure 4 shows results for the two compositions from Table 1. Figure 3 shows results for a scaled up compound related to the formulations, which contains 1.49 wt % DCP and 0.17 wt% MAPAE. The results shown in Figure 3 demonstrate that the materials crosslinked with IDP, DCP, and DCP/MAPAE have similar electrical performance and meet the industry requirements for demanding high voltage insulation applications.

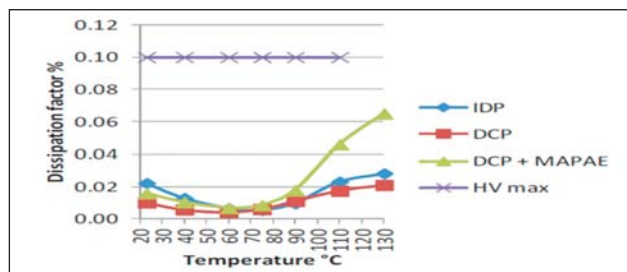


Fig. 3. Dissipation factor of polyethylene compounds

### CONCLUSION

The use of peroxide crosslinked polyethylene in electric powercables rated for 5 kV or higher applications continue to grow. Peroxide-mediated crosslinking presents cable manufacturing challenges in that there is a propensity for premature crosslinking in the extruder. The overwhelming natural peroxide used for crosslinking of polyethylene is dicumyl peroxide. Novel sciences have been recognized that are reasonable for link protection and address the difficulties exhibited by today's science. A novel peroxide science has been recognized, isopropenyldicumyl peroxide, that conveys enhanced burn resistance and can diminish the link degassing prerequisites. Polyethylene insulation compounds crosslinked using these new additives demonstrated excellent electrical properties that meet the demanding high voltage insulation requirements.

**Ethical Clearance:** AMET university

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Performance of Electron Collisions and Plasma Chemistry from Oceanic Diesel Engine

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## ABSTRACT

In this paper, electron collisions and plasma chemistry from oceanic diesel engine has been proposed. The microwave generators are used in NTPR for nitrogen oxide and sulphur gas of 250kW oceanic diesel engine was tested and analyzed. NO<sub>x</sub> and SO<sub>x</sub> are used to analyze numerical from oceanic diesel engine has been performed. The presentation of electron collisions and plasma chemistry has been proposed for the low temperature application. The mean electro energies are studied in the efficiency of NO<sub>x</sub> and SO<sub>x</sub>, which directly involved in the electron collision constant. In the proposed method has been designed by using COSMOL multi physics.

**Keywords:** Non-Thermal Plasma Reactor (NTPR), Nitrogen Oxide (NO<sub>x</sub>), Sulphur (SO<sub>x</sub>).

## INTRODUCTION

Worldwide shipping traffic presents itself nowadays as a significant challenge concerning collision on environmental condition and health of human which involves substantive profitable outcomes. The diesel engines fueled with generally heavy-fuel oils (HFO)<sup>[1]</sup> are the vast power plants. The low cost HFO is the advantages presently being challenged by gathering of the substantial air pollutants emitted. SO<sub>x</sub>, NO<sub>x</sub> are the most important air pollutants emitted<sup>[2]</sup> by oceanic diesel engines.

Air pollutants are formed by the ship engine of gaseous and particulate forms. It is the main concern of environmental atmosphere and it cause important coverage to risk of people living in the neighboring coastal areas. In this paper<sup>[3]</sup>, electron collision and plasma chemistry from oceanic diesel engine has been proposed. The proposed solution in the oceanic diesel engine is used to control<sup>[4]</sup> the non thermal plasma process. Nonionic surfactants for minimizing surface adsorption as an Improved Oil Recovery (IOR) process<sup>[5]</sup> for improve the engine life time. Reduction of Exhaust Emissions on a Biodiesel fuelled Diesel Engine with the Effect of Oxygenated Additives<sup>[6]</sup> for oceanic diesel engine.

## Proposed NTPR using microwave system from oceanic diesel Engine

The microwave cavity to generate the NTP for a specified flow charge has been designed by using COMSOL software. The major principle in the processing design has been produced high electric field intensity and plasma is produced. To avoid the Microwave system leakage, the gas inlet and outlet ports are conical in shape.

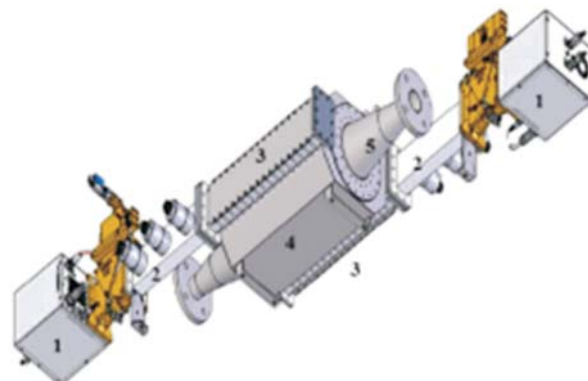


Fig. 1. Brunel Pilot scale NTPR and MW set-up.

To improve the simulation speed without losing accuracy is given below in the following steps: Does not involved in the magnetron, water cooling and

isolator in the model. The perfect conductor is considered as a multimode cavity, outlet/inlet ports. In all boundaries, the energies are not lost. From the magnetron, all MW power were going to the waveguide

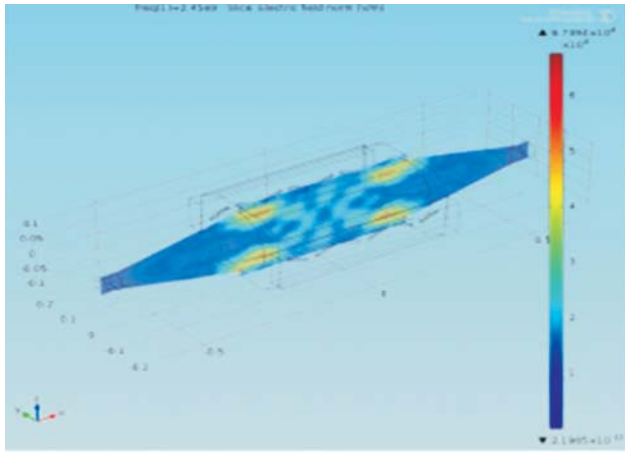


Fig. 2. Modeling of Electric Field in NTPR

**RESULTS**

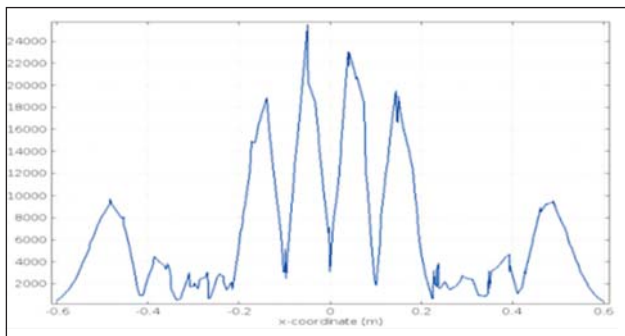


Fig. 3. Line Scan in the middle of NTPR

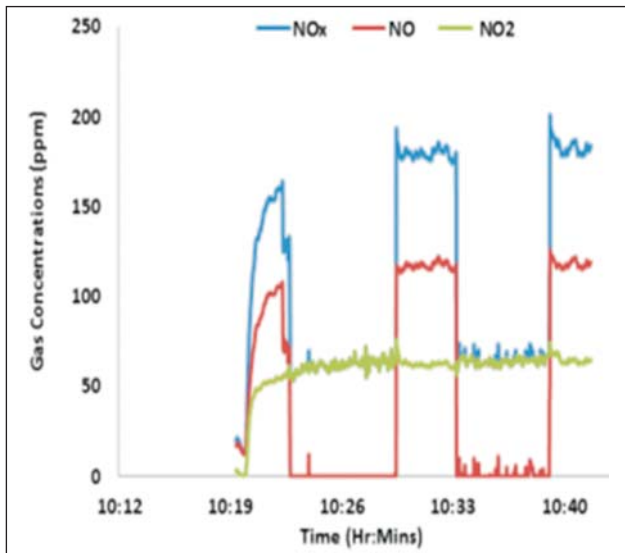


Fig. 4. NO reduction in MW plasmas

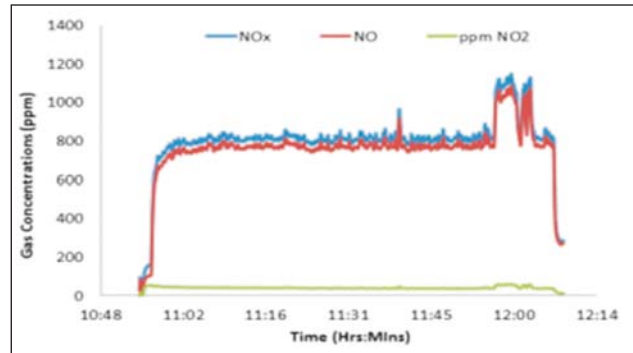
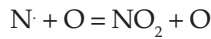


Fig. 5. NO and NO2 increase in purple plasma



**CONCLUSION**

In this paper, the performance of electron collision and plasma chemistry from oceanic diesel engine has been proposed. The NTPR has maintained the changes in temperature and high flow rate. The NTPR was analyzed and tested in different condition of operations and different type of plasmas depending on the MW electric field strength. Yellow plasma is used to detached NO entirely, purple plasma is used to perform harmfully by rising NO concentration.

**Ethical Clearance:** AMET University

**Source of Funding:** self

**Conflict of Interest:** NA

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# Properties of COO.5CDO.5FE204 Nano Ferrite Particles Based on Structural and Magnetic

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## ABSTRACT

Cobalt Cadmium Ferrite, COo.5Cdo.5Fe204 nanoferrite powder with the suitable stoichiometric ratio was prepared by using co-precipitation method. As prepared sample was characterized by using powder X-ray diffraction (XRD), Scanning Electron Microscope with EDX and Vibrating sample magnetometer (VSM). At room temperature the specific saturation magnetization (Ms) of the prepared material was measured. From the powder XRD data, the average crystallite size was calculated. SEM images showed the surface morphology of prepared nanoferrite sample along with chemical mapping.

**Keywords:** COO.5CDO.5FE204 Nanoferrite. Co-precipitation, Magnetic Properties, Powder X-ray Diffraction.

## INTRODUCTION

The preparation and fictionalization of Ferrite nano materials has been an interesting area of study because of its possible applications in a variety of widely diversified areas ranging from information technology to nano-technology<sup>[1]</sup> obtain nano crystalline ferrite nano particles such as sol-gel<sup>[9]</sup>, chemical co-precipitation<sup>[10,11]</sup>, micro emulsion<sup>[12]</sup>, and hydrothermal<sup>[13]</sup>. The co-precipitation method is chosen in the present work for preparing Co-Cd mixed ferrites. In the present work, cobalt (Co Cd Fez04) nano ferrite - particles were synthesized by using the co-precipitation method at reaction temperatures between 20 and 80°C. The obtained samples were characterized by magnetic measurements, SEM with EDAX and XRD. The magnetic properties were investigated using a vibrating sample magnetometer (VSM) with a maximum applied field of 20 k Oe. Crystal growth, spectral, thermal and optical properties of an organic single crystal-Dye doped hippuric acid was proposed and their properties are discussed in<sup>[14]</sup>.

## EXPERIMENTAL SECTION

1. Synthesis of Co<sub>0.5</sub>Cd<sub>0.5</sub>Fe<sub>204</sub> and Nano ferrite particles z+3+

Initial molar proportion of salts Me /Fe was 0.5, where MZ+Fe/+ 04 (M = Mn, Mg, Zn, Ni, Co, Cd,

etc.) attract the Me z+ = z++Cd z+). Aqueous solutions of CoCl<sub>2</sub>, CdCl<sub>2</sub> and research interest because of their versatile practical applications such as electric motors, electric guitar pickups, loudspeakers, automotive and electronic sensors, actuators, hall effect sensors, magnetron, reed switches, TWT amplifiers, communication, vehicle signage, shelf and bin marking, crane, hobby, toys, industrial automation equipment, transformers, rotating transformers, pulse transformers, catalysts and adsorptive materials<sup>[2]</sup>.

The technological and medical applications require that the nano-particles should be super-paramagnetic with sizes smaller than 20 nm<sup>[3]</sup>. Co-ferrites have attracted much attention in recent years as one of the candidates for high-density magnetic recording and magneto-optical recording media because of their unique physical properties such as high Curie temperature, large magnetic anisotropy, moderate magnetization, excellent chemical stability and large Kerr and Faraday rotations<sup>[4,5]</sup>. In the case of cobalt ferrite material, cobalt ions results in an increase in coercivity, which is due to the coupling of the spins of cobalt and iron ions<sup>[6,7]</sup>. However, the most important point of research is making Co-ferrite with high coercivity, perpendicular anisotropy and small grain size for high-density magnetic recording media.

The preparation method plays a very important role with regard to the chemical and structural properties of the spinel ferrite<sup>[8]</sup>. Among the various preparation techniques used to FeCl<sub>3</sub> in their respective stoichiometry (100 ml of 0.5M CoCl<sub>2</sub>, 100ml of 0.5M CdCl<sub>2</sub> and 100ml of 2M FeCl<sub>3</sub> were mixed and kept at 60°C. This mixture was added to the boiling solution of NaOH (0.63M dissolved in 1200ml of distilled water) after adjusting the pH to be around 12, within 10s under constant stirring. The solutions were maintained at 85 °C for 12h. This duration was sufficient for the transformation of hydroxides into spinel ferrite. Sufficient amount of fine particles were collected at this stage by using filter separation. These particles were washed several times with distilled water followed by acetone and dried at room temperature (RT). Crystallographic, experimental (FT-IR and FT-RS) and theoretical (DFT) investigation, UV-Vis, MEP, HOMO-LUMO and NBO/NLMO of (E)-1-[1-(4-Chlorophenyl) ethylidene] thiosemicarbazide was discussed in<sup>[15]</sup>.

### Characterization Techniques

The X-ray powder diffraction (XRD) pattern were recorded on a X-ray diffractometer (PANalytical X'Pert PRO diffractometer) unit using Cu-Ku radiation (λ=1.543 Å). The surface morphology of composite was analyzed using CARLZEISS EV018. Chemical elemental stoichiometry was examined based on energy dispersive X-ray analysis. The magnetic properties of Co<sub>0.5</sub>Cd<sub>0.5</sub>Fe<sub>2</sub>O<sub>4</sub> ferrite material was measured at room temperature using a vibrating sample magnetometer (Lakeshore VSM 74 [0]) in a maximum applied field of 20 kOe.

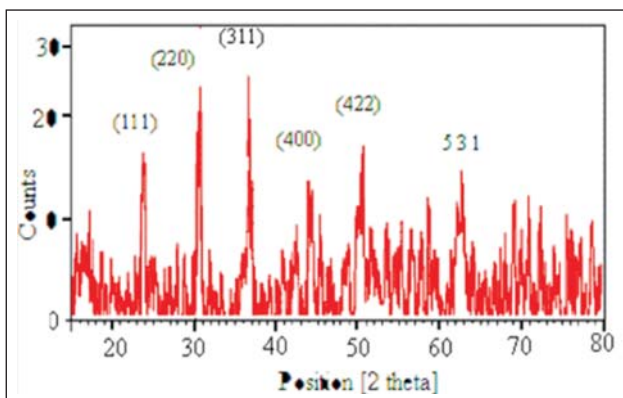


Fig. 1. X-ray powder diffraction pattern of Co<sub>0.5</sub>Cd<sub>0.5</sub>Fe<sub>2</sub>O<sub>4</sub> ferrite sample at room temperature.

## RESULTS AND DISCUSSIONS

### XRD and SEM with EDX Analysis

The Powder X-ray diffraction pattern of prepared sample is shown in Fig.1. The peaks are well indexed with the standard pattern reported in JCPDS file no:(22-1086) card to the crystal plane of cubic spinel ferrite. The lattice cell parameter a = 0.840 nm. The XRD patterns were in agreement with the literature [15]. From the powder XRD data, the average crystallite size was evaluated from the full-width at half- maximum (FWHM) in the (311) reflection peak (strongest reflection) by using Scherrer's equation [16].

$$D = 0.9 \lambda / \cos \theta$$

Where D is the crystallite size (nm), λ is the X-ray wavelength, Δy is the full width at half maximum intensity and θ is the diffraction angle. The average crystallite size was found to be about 29 nm. The diffraction pattern of as obtained sample shows poor crystallinity and single phase formation of the material [5].

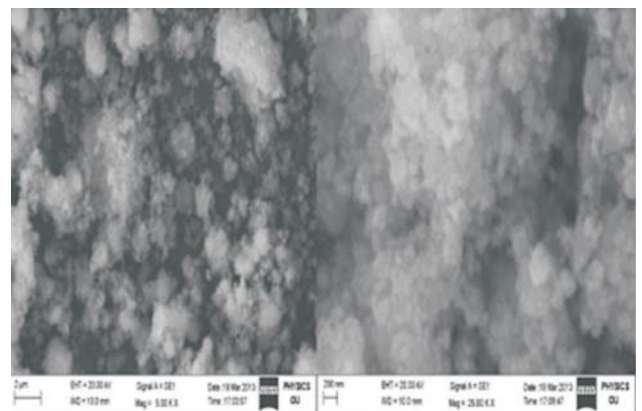


Fig. 2. Scanning electron micrographs of Co<sub>0.5</sub>Cd<sub>0.5</sub>Fe<sub>2</sub>O<sub>4</sub> sample at different magnifications.

### Study of Magnetic Parameters

Figure A shows magnetization versus magnetic field (M-H) curve recorded at RT. From the figure M-H curve clearly indicates Retentivity (Mr) and Coercivity (Hc), which suggest as prepared material shows Super Paramagnetic nature [7, 8]. The Crystalline size of ferrite magnetic materials become nano sized the nanostructure magnetic moment is strongly affected. The structural properties of Cobalt Cadmium Ferrites affect their magnetic properties depending on the size of crystallites. So the hysteresis loop is very narrower. The saturation magnetization (Ms) has been obtained by extrapolation of M versus field curve. The magnetic properties measured by vibrating sample magnetometer at RT for Co<sub>0.5</sub>Cd<sub>0.5</sub>Fe<sub>2</sub>O<sub>4</sub> sample are listed in Table I.



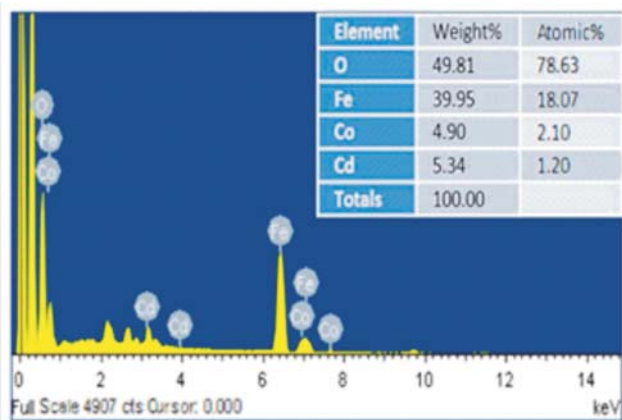


Fig. 3 Energy Dispersive Analysis of Co<sub>0.5</sub>Cd<sub>0.5</sub>Fe<sub>2</sub>O<sub>4</sub> sample.

The magnetization of spinel cadmium ferrites originates from the difference in the magnetic moments of the ions at the octahedral lattice sites and those at the tetrahedral lattice sites, and thus directly reflects the distribution of the magnetic 3+ and non-magnetic Cd<sup>2+</sup> ions between the two sub lattices. In fact, the magnetic properties of cadmium ferrite materials are influenced mainly by the preparation route, cation distribution, grain size and sintering conditions [9]. From these measurements, it indicates that the prepared particles are confirmed in nano range, which is also confirmed from the x-ray diffraction.

### CONCLUSION

Co<sub>0.5</sub>Cd<sub>0.5</sub>Fe<sub>2</sub>O<sub>4</sub> nanoferrite powder sample has been synthesized by co-precipitation method. The average crystallite size was found to be 29 nm. The SEM micrographs shows the particles are arranged in irregular in shape. From the obtained hysteresis loops, the saturation magnetization (M<sub>s</sub>), remanence magnetization (M<sub>r</sub>), coercivity (H<sub>c</sub>) were determined. The prepared sample shows typical super-paramagnetic behaviour.

**Ethical Clearance:** Taken from AMET University.

**Source of Funding:** Self

**Conflict of Interest:** Nil

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# Quality in the Production of Sugarcane Ethanol

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## ABSTRACT

It is earnest to propel the dialog on the rules that Brazil should embrace to enhance vitality sources with a specific end goal to lessen reliance what's more, advance the substitution of non-renewable energy sources. This is one of the fundamental approaches to diminish the effectively harmful negative effect that human exercises are causing to nature. This motivation incorporates the improvement of innovations for the extension of sugarcane bioethanol and its change into a universally focused ware, as the best way to guarantee the nation around the world advertise initiative. All things considered, sugarcane ethanol is at exhibit the main fuel fit for meeting developing interest for sustainable power source effortlessly and earth benevolent. For instance, vaporous emanations from consuming ethanol are around 60% lower contrasted with emanations from consuming gas.

**Keywords:** Ethanol, Sugarcane, Renewable, Precipitation

## INTRODUCTION

The "plant stick" relates from the roots to the blooms and as a living being is liable to activity of ecological components that cause changes in quality control of the plant, the photosynthetic effectiveness and particularly the hormonal adjust that impacts and influences the advancement of the plant<sup>[1-2]</sup>. In its essential piece as of now specified in the past area, the juice is in charge of the biggest segment. Its constitution in water (75% to 82%) and solvent solids (10% to 25%) that are spoken to generally by sugar (15.5% to 24%) and diverse mixes, for example, natural acids and phenolic mixes, may change due to a few variables. We highlight the climatic conditions, assortment and age of the plant, temperature, precipitation, trim wellbeing, gathering, stacking and transportation frameworks. Different markers, for example, the nearness of poles in the plant, liquor, high acidity and measure of dextran, soil, consuming time and the bore ought to be contemplated to expand the effectiveness of maturation<sup>[3-5]</sup>. Suggested esteems of these pointers, by and by, are not really achieved also, the quality parameters ought to be extended. Unique consideration ought to be given to the issues caused as far as irritation

assaults, as the bore because of the loss of fermentative productivity. These assaults disturb the plant, giving the creation of resistance phenolic mixes, and an expansion in the acidity by its hormonal framework, which result in danger to fermentative microorganisms. The phenolic mixes are evacuated by elucidation of the stock, yet the business does not process the loss of suitability of yeast occurred because of the assault of vermin<sup>[6]</sup>.

The nuisance control as the "frohopper" these demonstration by diminishing the extent of the stems of the plant additionally expanding the substance of phenolic mixes, is a noteworthy test to overcome, since the pattern is that ending the training of consuming of sugarcane. This irritation is favored with the utilization of crude (stick that is collected without consuming)<sup>[7]</sup>. Other than the harmful impact caused by the assault of nuisances, the reuse of microorganisms is troublesome on the grounds that the nearness of guard Crude Material Quality in the Production of Sugarcane Ethanol 555 mixes, for example, phenolic mixes changes the morphology of organisms. The disintegration is additionally a component of temperature as on account

of crystallization of sucrose seen in the field as an element of split caused by warm contingent upon consuming time. Another test to be overcome is the stick field administration, which makes a great deal of soil stick together in the crude material all through the entire procedure of maturation. For each kilogram of soil there are around 1011 microorganisms that add to the arrangement of lactic corrosive expanding the causticity of nature and endangering the last yield. One of the systems thought about the activity of bacterial metabolites is the im-permeability of the mass of yeast caused by them with subsequent diminishing in cell feasibility<sup>[8]</sup>. Notwithstanding these antagonistic impacts, the land appended to the stick conveys minerals which some way or another can contribute to the aging as the investment of these metabolites on the enzymatic exercises, distinctive on account of sugar generation since the nearness of minerals is very undesirable. The time length in which the crude material is put away after reap can add to its disintegration, as an expansive stockpiling time empowers the improvement of lactic corrosive microscopic organisms. For the situation of sugarcane "bisada" (which develops amid two summers in the field), this is more sinewy and has more sugar, which makes it be heavier amid reap conveying more contaminations to the production line. The use of maturing operators (development hormone inhibitor) additionally prompts the amassing of sugars at the tip of the plant because of the photosynthesis process and if connected in overabundance can cause demise because of corruption of the apical bud of the plant which gives advancement undesirable microorganisms. This method is unpleasant for the plant which must be adjusted against different components for example, absence of precipitation that is another anxiety consider. The consolidated activity of these two variables bargains the nature of crude material. Nonetheless, there is no connection to the utilization of development for the creation of dextran and what may impact its generation is the lacking administration of developed stick because of the gathering of sugar on the tip of the plant.

## CONCLUSION

Different contentions and proposition on enhancing the profitability of ethanol of original and the incorporation of bagasse and waste or straw (buildup left on the field after collect stick) to deliver second-era ethanol. The fundamental focuses to consider which can fill in as parameters for utilize of assets in innovative work pointed at expanding the nation's aggressiveness in the generation of biofuels, are highlighted underneath: Both the manual reaping of consumed sugarcane or unburned stick motorized collecting adds to the weakening of the stick, notwithstanding when contrasting the two techniques the reap unburned stick (crude) is better. Doubts exist about the requirement for division of straw at the season of reap and there is additionally proposition to utilization of bagasse and straw together. Care ought to be taken amid the arrangement of the straw and bagasse and recalling that boilers were not intended for the utilization of straw. The advancement of technology for collecting machines that meet the new reaping practices will permit more prominent accessibility of straw for use in vitality generation, ethanol or, on the other hand different chemicals.

**Ethical Clearance:** Taken from AMET University.

**Source of Funding:** Self

**Conflict of Interest:** Nil

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# Silver Extraction From Hypo Fixer Solution

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## ABSTRACT

Silver could likewise be a valuable and imperative metal. So use of silver from waste arrangements of X-beam facilities, picture takers could likewise be a beneficial business. Silver could likewise be a noteworthy esteem a piece of photographic movies. Each film either X-beam or photographic, alternatives a thin covering of silver over it. All through picture development, silver exchanges from picture bit of movies and includes the repairing answer brought as 'hypo fixer'. Attributable to redundancy of settling strategy of the many movies in same answer, a lot of and a lot of silver continues dissolving in hypo fixer reply. Once the quantity of broke up silver compasses to immersion level, not a lot of settling of movies could likewise be drained such answer. This depleted waste answer is that the central stuff for business of extricating immaculate silver.

**Keywords:** Silver, Extraction, Hyperbolic, Photographic

## INTRODUCTION

Silver is each associate degree Industrial Metal and a valuable. As associate degree industrial metal, Silver has several thousands of uses because of its outstanding qualities is explained in [1-3]. Silver has the very best electrical and thermal physical phenomenon of any component. Silver was vital to the photographic business yet as paper and printing business. Though over the past 10 years the availability through production and scrap of silver has increase by twenty six percentages, the demand has enlarged by solely ten %. However a decent proportion of this production is irretrievable through photographic material and different industrial use. However silver bullion inventories have fallen dramatically whereas silver investments area unit increasing steady with a enchant silver value currently wanting bright as mirrored within the steady rising silver value is explained in [4]. Production ought to hurry to stay up with the hyperbolic demand.

### Photographic Waste

In the review of the papers [5-7], the Photographic waste is that the waste generated by the photographic process machine in paper and printing industries. X-ray film is also one in every of the photographic wastes generated by hospital and organic

chemistry work. Photographic waste contains silver that's the most material use to transfer image. It contains soluble silver thiosulfate advanced and smaller quantity of silver sulfite. Alongside the decreasing quantity of silver natural resources, the costof silver productions has up speedily and also the price of silver within the market has hyperbolic perpetually. The acetic acid of the marine systems is explained in the Production of Indole Acetic Acid and Plant Growth Promotion by Rhizobacteria from a Less Studied Marine Ecosystem [8].

### X-ray Film Waste

Electrolysis is that the most run of the mill procedure utilized for separating silver. In this strategy a chrome steel instrumentality with current pulls the silver towards itself. The silver is peeled off the instrumentality and furthermore the item that is left is circulated for any refinement. And furthermore the silver you get is ninetieth to ninety fifth unadulterated. The Nitrocefin analysis is presented in the Molecular Docking Studies of Nitrocefin and It's Analogs with PBP2A of *S. aureus* [9].

Another system is by including changed chemicals and it makes the silver make a type of slime. At that point it's dried and refined any. Be that as it may, the ooze is essentially half-hour unadulterated in this way

it needs any refinement. Silver fixtures may even be acclimated recoup silver from bound stock. Silver fixtures zone unit compartments with cartridge, fixer channels through the holder and the staying silver are gathered in the cartridge. So these were different strategies to concentrate silver. You should keep one thing in your mind that every one of these strategies can't be actualized in home.

Presently to put it straightforward I would reveal to you well ordered strategy to extricate or recoup silver in a simple way.

### RAW MATERIAL (HYPO)

The grouping of silver is hypo arrangement fluctuates from procedure to process and time to event. In this photographic film preparing, silver drains into the fixer arrangement (sodium thiosulphate) from the photographic film and structures silver thiosulphate complex particles. For the most part hypo arrangement is rich in silver (6-10gm/lit.).

A little silver estimation paper is plunged in the arrangement and after that the change is shading is contrasted and the shading outline going with it. By this strategy silver focus can be resolved in gms/liter inside 5 seconds. Price tag of fixer can be assessed as needs be. Also it decides the gainfulness and decrease the hazard calculate.

### ELECTROLYTIC METHOD

Silver might be separated from hypo exploitation self-loader or completely programmed machines. The chief adequate model of such machine might be choose per our working and fiscal capacity.

Anode used in such machine is shaped from carbon or plumb past and Cathode is basically made from substantial unsullied steel or entirely unexpected composite plates. By filling the waste answer into the machine and interfacing with the power mains, machine begins in operation. Silver blessing among the arrangement begins saving once again silver accumulation plates.

The machine got the opportunity to be worked till all the silver blessing among the arrangement gets stored on cathode plates as dark pieces. The strategy time is additionally definite by checking silver openness exploitation silver estimation paper time to time all through operation.

### CONCLUSION

Silver was with achievement stripped and recuperated in sensible yield and adequate virtue from the utilized photographic movies by the quickening agent system. This approach is clear and minimal effort however it's some aversion the unfortunate scent and consuming stride at high temperatures. The chemical, gotten from *Bacillus globigii* NCIM 2724, isn't thermophilic and its action is high at a pH scale near nonpartisan. In this way it might be imagined that thermophilic and alkaliphilic chemicals can yield sensible end in the revealing of the gelatin-silver layer.

**Ethical Clearance:** Taken from AMET University.

**Source of Funding:** Self

**Conflict of Interest:** Nil

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# Single Wall Carbon Nanotubes Using Polycyclic Aromatichydrocarbons from Environment

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## ABSTRACT

Strong state functionalization of single divider carbon nanotubes with hydrocarbons including polycyclic fragrant hydrocarbons is an intense reasonable approach for portrayal of new nano-organized materials as well as location of polycyclic sweet-smelling hydrocarbons at nanoscale. The proposed green functionalization prepare clears a knowledge that the atomic dispersion is specifically connected with the accessibility of delocalized pi-electrons of hydrocarbons. The perception clears a vital sign to plan polycyclic fragrant hydrocarbon sensor at strong stage.

Index Terms- Polycyclic aromatichydrocarbon sensors, Solid statechemistry, single wall carbon nanotubes,green functionalization.

**Keywords:** Nanotubes, Carbon, Polycystic Tubes

## INTRODUCTION

The solubilization of single divider carbon nanotubes (SWNTs) in various solvents <sup>[1]</sup> including natural solvents <sup>[2]</sup> is of awesome enthusiasm for nanotube control. Hypothetical investigations demonstrate that fragrant mixes collaborate effectively with the graphitic dividers of nanotubes <sup>[3]</sup> which can be a potential approach for immobilizing substance or biochemical particles on CNTs <sup>[4-6]</sup>. Sweet-smelling mixes communicate firmly with graphitic sidewalls of SWNTs through  $\pi$ - $\pi$  stacking <sup>[7, 8]</sup>. It comes about solubilization of SWNTs in various sweet-smelling solvents <sup>[9, 10]</sup> or surfactants <sup>[11]</sup> or polymers <sup>[12]</sup>. Polycyclic sweet-smelling hydrocarbons (PAHs, for example, anthracene<sup>[8]</sup>, pyrene<sup>[13]</sup> and phthalocyanine<sup>[14]</sup> subsidiaries are helpful for immobilization of various synthetic and organic particles onto SWNTs. The interstitial space of carbon nanotubes are tight in dry state subsequently the entire surface of SWNTs can't be successfully accessible for adsorption. Subsequently, this examination is profoundly reliant on readiness of nanotubes-natural atom composite. Dealing with carbon nanotubes in the arrangement may be one of the elements for absence of the exploratory reports in this

field. Accordingly the fictionalization techniques significantly impact the first physical and synthetic properties of the nanotubes.

## MATERIALS AND METHOD

### Chemicals

Sodium dodecyl sulphate (SDS),Naphthalene, Anthracene was purchased from sigma Aldrich, Milli Q water, capillarytubes, glass slides, cover slips etc.

### Synthesis of SWNTs

SWNTs were synthesized by catalyticchemical vapor deposition method (CCVD).

### Simple solid-state means offunctionalizing SWNTs

Water scattered SWNTs was integrated by corrosive treatment. The adulterations of the gasoline is explained in A physicochemical study of the adulteration of motor gasoline with a mixture of aliphatic and aromatic hydrocarbons [15].To make the SWNTs water scattered, first SWNTs have been dealt with in a blend of nitric corrosive and sulphuric corrosive taken in 2:1 proportion (v/v) and kept for overnight. Later the

overabundance corrosive has been expelled by refining lastly the functionalized SWNTs has been dried and additionally utilized. At last such dried SWNTs and natural particles taken in proportion 1:5 (w/w) are permitted to associate in strong state in inactive climate as prior. The whole examinations were completed at room temperature and ordinary weight. The gallstone analysis is presented in the Chemical and structural analysis of gallstones from the Indian subcontinent [16]. The interface area was isolated and scattered in water (see Figure S1) on sonication by Heilscher US200S Ultrasonic Processor with 70% plentifulness and 0.8 cycles. A common time required for sonication was 15 minutes. The blend was centrifuged to isolate the water solvent functionalized SWNTs from the unfunctionalized SWNTs and unreacted natural substances. The natural atoms and SWNTs were accelerated upon centrifugation and the supernatant conveying the functionalized SWNTs. At last, the examples were refined appropriately and gathered for additionally thinks about.

#### Fourier transform infra-red (FT-IR) imaging

The imaging study was observed by a FTIR magnifying instrument (JASCO FT/IR-6300) in dormant air at room temperature and typical weight. Infra-red light outputs each pixel of the chose district covering SWNTs, natural particles and the interface area and gives the whole data about the topological and phantom data of that locale. The imaging was proceeded for very nearly 2 hours. The pool of FT-IR imaging information gives us the whole data on dissemination example of the interface locale.

#### Fluorescence study

Fluorescence studies of different hydrocarbon functionalized SWNTs were carried out by Photon Quantmaster TM 40.

#### Transmission electron microscopy (TEM) study

To comprehend the morphology of perfect SWNT test and functionalized SWNT tests, a little drop of the specimens was put on copper lattices and kept overnight to dry in a chill hatchery. At long last the examples were described by TEM (FEI, Tecnai G2 Spirit BIOTWIN) worked with a voltage of 43 kV, 200 KV (for HRTEM) and amplification 200-300 kx for better comprehension of the nano-get together.

## RESULTS AND DISCUSSIONS

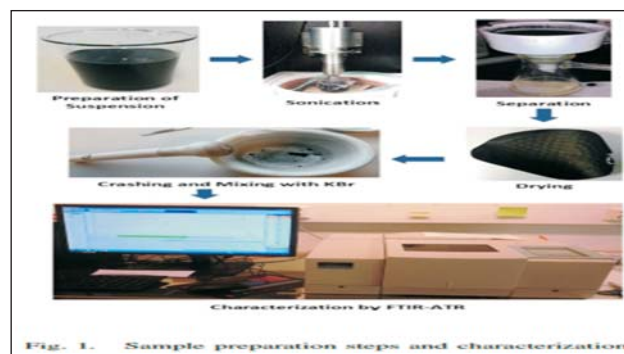


Fig. 1. Sample preparation steps and characterization. Response of defect ratio (ID/IG) with different concentrations (ppm) of hydrocarbons (blue for SDS, pink for naphthalene and green for anthracene).

Figure 1 demonstrates that the deformity proportion (ID/IG) increments with expanded hydrocarbon focus. Strikingly, the expansion in imperfection proportion achieves a pleatue after a specific focus level. The reaction bend fundamentally contrasts for aliphatic hydrocarbon in examination with fragrant hydrocarbon. Furthermore, the expansion in imperfection proportion is more for PAHs and it increments with increment in benzene rings i.e. accessibility of delocalized pi-electrons.

## CONCLUSION

SWNTs can be functionalized noncovalently with hydrocarbons by a green, single pot technique. In light of the idea of sub-atomic collaboration, aliphatic hydrocarbons can be separated from sweet-smelling hydrocarbons utilizing such basic strong state fictionalization. This perception opens up another heading to outline PAH sensor without concoction multifaceted nature.

**Ethical Clearance:** Taken from AMET University.

**Source of Funding:** Self

**Conflict of Interest:** Nil

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# The effect of Ultrasonic Diffusion on the Peripheral Chemistry of Carbon Nanotubes in the Jeffamine D-230 Polyetheramine Standard

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## ABSTRACT

This paper thinks about changes in the surface science of carbon nanotubes (CNTs) where they are under ultrasonication prepare in Jeffamine D-230 polyetheramine medium. Jeffamine is utilized as a curing specialist in the nanocomposite fabricating process. In the nanocomposite innovation, ultrasonication handle is utilized as a strategy for scattering of CNTs in a suspension. This examination tries to research the impact of ultrasonic scattering with various time and vitality at first glance science of CNTs by Fourier change infrared (FTIR) spectroscopy. The outcomes indicate ultrasonication of CNTs in the Jeffamine medium prompts noteworthy oxidation and hydration along making new compound bonds on the CNTs surface.

**Keywords:** Nano Tubes, Ultrasonication, Jeffamine

## INTRODUCTION

Nowadays, carbonaceous nanomaterials perform critical part in the nanoscience and nanotechnology. About, carbon nanotube (CNT), because of their one of a kind properties, for example, electrical, warm and mechanical properties, is known as a perceptible material in the nanotechnology. Where practical properties are concerned, surface science of CNTs assumes essential part. Useful gatherings situated on the surface of CNTs influence dissolvability, electrical and warm conductivity, and mechanical practices. Useful gatherings and synthetic species on the surface of CNTs can be examined by various portrayal methods. Infrared spectroscopy (IR) is one of most well known strategies for accomplishing this objective. <sup>[1]</sup> <sup>2</sup>Nanocomposite innovation is one of the businesses that utilizes CNTs. While CNT is utilized as a segment of a composite structure, uniform scattering of CNTs

particles in the entire structure is important. Ultrasonication or sonication system is one of the real techniques for getting a uniform scattering of CNTs in a suspension. However this methodology for scattering can change surface science of CNTs particles as a reaction. <sup>[3-6]</sup> The whole objective of ebb and flow inquire about is investigation of the adjustments in the surface science of CNTs where they are scattered by ultrasonication technique in the Jeffamine D-230 polyetheramine medium. In the nanocomposite business, Jeffamine is utilized for polymerizing the carboxylated CNT because of its capacity to make bonds with the amino gatherings and carboxyl gatherings of CNT which gives a sap utilized as polymeric grid for nanocomposite structure. <sup>[7, 8]</sup> Crystallographic, experimental (FT-IR and FT-RS) and theoretical (DFT) investigation, UV-Vis, MEP, HOMO-LUMO and NBO/NLMO of (E)-1-[1-(4-Chlorophenyl) ethylidene] thiosemicarbazide was described in <sup>[11]</sup>.

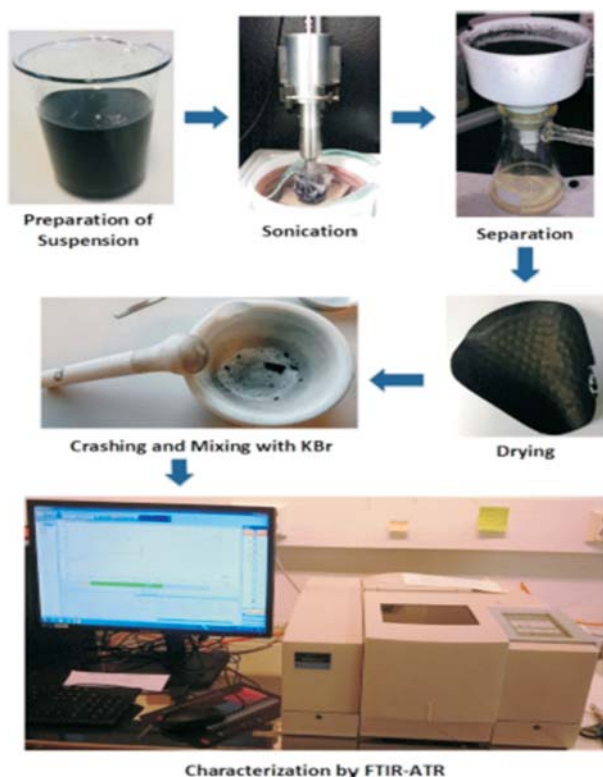


Fig. 1. Sample preparation steps and characterization

### Test Preparation

Figure 1 speaks to schematically the example planning steps completed in this exploration. Initial, 10 suspensions of JD230-CNT with consistent proportion of 0.25% (wt) for sonication organize are readied. Next, every suspension is sonicated for particular vitality running 10-90 kJ (2-15 min) (sufficiency: 100%). Gadget utilized as a part of the present venture for sonication prepare is "QSonica-Q700". Greatest temperature of suspension amid sonication handle is balanced at 70 C. At that point, CNTs sonicated are isolated from JD230 fluid. For accomplishing this objective, a filtration framework including Buchner channel, permeable plate, channel paper, Buchner cup, and vacuum pump is utilized. After detachment of JD230 fluid, for evacuating JD230 totally, tests are washed by 500 cc water in the Bchner filtration framework. Water can illuminate the majority of the JD230 stayed in the sonicated CNTs tests. In the long run, Samples are dried at 50C for 5 hrs.

### Portrayal

Useful gatherings and synthetic species situated on the CNTs surface are described by FTIR-Attenuated

Total Reflection (ATR) strategy. The utilized crystal is precious stone zinc selenide (Di-ZnSe). Table I speaks to spectroscopic parameters of FTIR-ATR spectroscopy estimations. The most basic test amid this exploration was high darkness and radiation ingestion of CNT. High murkiness of CNT prompts abatement of vitality throughput, and furthermore decrease of unearthly flag to-clamor (S/N) proportion. For taking care of this issue and expanding S/N proportion, potassium bromide (KBr) powder as a straightforward material is blended with CNT tests. The (mCNT/mKBr) proportion is improved to 1% as indicated by Figure 2.

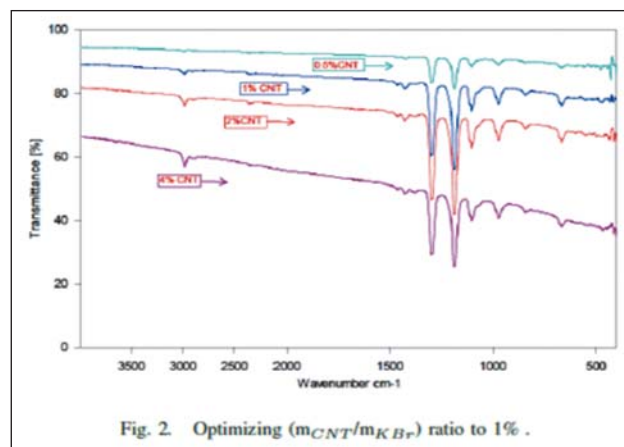


Fig. 2. Optimizing (mCNT/mKBr) ratio to 1% .

### RESULT

The adjustments in the surface science of CNTs in view of contact with JD230 and after that sonication procedure in this fluid are considered by FTIR spectroscopy. Table II speaks to useful gatherings and compound bonds for three vital specimens. IR spectroscopy of the examples entitled PCNT (immaculate CNTs), J0 (non-sonicated CNTs (responded with JD230)) and J90 (CNTs sonicated with most extreme vitality (90kJ)) uncovers impact of sonication prepare at first glance science of CNTs obviously. IR spectroscopy demonstrates that simply contact of JD230 fluid with CNTs prompts diminishment of the useful gatherings on the CNTs surface. This impact is huge for carboxyl gatherings. In any case, by beginning sonication prepare toward the starting focuses (even 10 kJ vitality or 2 min), hydration and oxidation of the CNTs are begun. Moreover, quantitative examinations of IR spectra are done to accomplish a superior point of view. Notwithstanding, it ought to be stressed that quantitative examination, where the powder test is researched by FTIR-ATR system, is not solid on the grounds that few quantities

of factors can influence the outcomes. Consequently, in the present examination, quantitative investigation is utilized to acquire a general view, not for a trustworthy understanding. These estimations are done in view of Beer-Lambert law "(1)". where  $c$  is convergence of synthetic bonds which ingest infrared radiation,  $l$  demonstrates way length, and " $\epsilon$ " presents absorptivity consistent. The parameters  $I_0$  and  $I$  are figured by distracting benchmark technique. In the flow look into, to the extent estimation of focus is unthinkable specifically, changes in the measure of the assimilation ( $A_n$ ) of every individual useful gathering are computed for contemplating changes pattern of fixation. [10] (clarified in view of IR assimilation) of C-H and COOH practical gatherings situated on the CNTs surface amid expanding of sonication vitality. As indicated by Figure 4, albeit subsequent to beginning sonication centralization of useful gatherings does not encounter exceptional change before all else focuses, this pattern is changed in the wake of applying 70 kJ (12.5 min) sonication. After this point, sonication handle prompts critical increment in centralization of - H and COOH gatherings. Besides, speaks to changes in centralization of C-O and C=O gatherings while sonication handle is advancing. As per spoke to diagram, by beginning sonication prepare, CNTs surface encounters sensational oxidation, albeit after which it vacillates sporadically. In any case, it's implied that in a general pattern by expanding sonication vitality, oxidation is rising.

### CONCLUSION

To compress, ebb and flow explore concentrated on examination of reactions of ultrasonic scattering of CNTs particles in the Jeffamine D-230 polyetheramine medium through investigation of functionalization and changes in measure of imperfections by FTIR and Raman spectroscopy amid sonication handle. In the light of given confirmations, sonication of CNT/JD230 suspension prompts expanding imperfections and clutters, as well as huge hydration and oxidation on the CNTs surface (particularly subsequent to applying 70 kJ vitality), nitration was not watched however.

**Ethical Clearance:** Taken from AMET University.

**Source of Funding:** Self

**Conflict of Interest :** Nil

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# Ultra-Intense X-Rays communication with Substance Utilizing Nonlinear Optical Phenomena

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## ABSTRACT

New nonlinear optics in the X-rays locale is normal at the ultra-serious field of an engaged X-rays liberated electron laser. We report the principal exploratory proof of nonlinear phenomena in the multi-keV area.

**Keywords:** Nonlinear Optics, X-Beam, Electron Laser, Phenomena

## INTRODUCTION

X-rays from a liberated electron laser (XLEL) are exceptionally appealing for new research on material at extraordinary conditions<sup>[1]</sup>. Exceptionally, with centering we can achieve stunning X-ray power in correlation with conventional emission sources<sup>[2]</sup>. In Japan, a SASE sort X-ray LEL is working in Harima and now we can center the sub-mJ X-ray vitality to a 50nm distance across spot<sup>[3]</sup>. The genuine pulselength of XLEL is still under dialog, yet by utilizing otherworldly examination and estimation of the pulse term of the electron-pillar, we have sensible proof for 10fs pulse span<sup>[4]</sup>.

From these numbers, the most extreme centered power achieves 1020W/cm<sup>2</sup>. At this force, the rate of photo ionization of K-shell electrons surpasses the Auger rate in which an opportunity in the K shell is re-possessed by L-shell electrons<sup>[5]</sup>. This implies we can make an "empty molecule strong", in which practically every iota in the strong has just a single K-shell electron. In this circumstance, we expect a huge adjustment of the vitality levels in the strong<sup>[6-7]</sup>. For instance, the 1s electron opening expands the coupling vitality for the rest of the 1s electron. In this manner, the Kshell ingestion edge will be moved to higher vitality<sup>[7,8]</sup>. In this change, we can expect a substantial change of the optical constants in x-ray district. In this paper, we report the principal test comes about for ultra-high force x-ray laser matter cooperation. We indicate cases of two nonlinear optical wonders in multi-keV x-ray locale. Optical and electrical studies of non-linear optical crystal<sup>[9,10]</sup> for x-ray application.

## Proposed System

There are a few forecasts for nonlinear optical wonders in x-ray locale. By utilizing as of late created x-ray lasers, multi-photon excitation and laser pick up are seen in a gas medium. Energy move in Ká discharge in Al strong thickness plasma was seen at  $\hbar\omega=1.5\text{keV}$ . Be that as it may, there is no report of nonlinear wonders in the strong for multi-keV x-ray. On the off chance that we create nonlinear optics in the strong state medium, many fascinating dynamic gadgets will be conceivable. We can expect change of optical constants because of the high thickness of particles, and we can likewise utilize the adjustment in Bragg diffraction, which is the biggest intelligent component in the multi-keV x-ray area.

A first objective for these nonlinear optical investigations of strong targets is to watch a transmission change because of a sudden move in the energy levels of the electron frameworks. For creating opportunities of 1s electrons in a strong, the episode x-ray ingestion rate ought to surpass the ensuing unwinding procedure, for example, Auger impact and Ká discharge. This implies the ionization rate of the 1s electrons by the x-ray laser flux ought to be bigger than unwinding rate. The rate for Auger impact is an element of the nuclear number. With the as of late created x-ray laser, we can utilize 5~10keV photon vitality so that the hopeful particles in which K-shell ionization vitality coordinates the X-rays will incorporate Ti(Z = 22) ~ Zn(Z = 30).

What's more, to obtain clear confirmation for such vitality change in the strong because of 1s electron opening, the x-ray pulse length ought to be sufficiently short. After KLL Auger process, course or other unwinding process happen and extensive arbitrary movement (as in plasmas) will wreck the strong state precious stone request. The L-shell is opening likewise influence the vitality level of a K-shell electron. Because of extensive assortment of designs of the electron framework, every molecule has alternate ingestion edge energy for the K-shell electron. In this way, we can't expect a straightforward move of the K-shell ingestion edge. In this sense, despite the fact that present pulse span (10fs) of SACLA facility is not as short as sought, regardless we have an opportunity to watch the edge move.

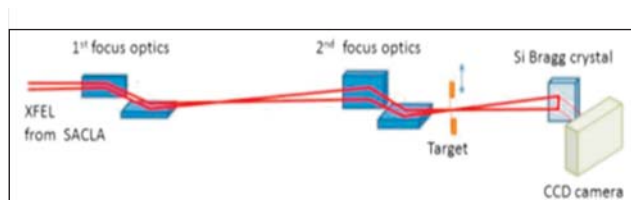


Fig. 1. Setup of 50nm focusing optics in SACLA facility

To comprehend the circumstance of ultra-extreme x-ray laser collaboration with substance, the transmission range of strong iron movies has been examined. A schematic drawing of the exploratory setup is appeared in Fig.1. For getting data about the adjustment in K-edge retention, a moderately expansive X-ray laser range collaborates with strong iron movies and the transmitted range is seen with Si precious stone spectrometer. The range data transfer capacity is around 40eV and this is sufficiently vast to watch the retention edge structure from low to high assimilation. The Rayleigh range for this 50nm centering optical framework is around 50micron with the goal that we can change the force by changing the objective thwart position along Z pivot. A vast addition of the transmission is seen at  $h\nu = 7.13\text{keV}$ .

## CONCLUSION

The nonlinear transmission of x-ray is obviously seen in multi-keV x-ray locale surprisingly. The limit power for this nonlinear transmission concurs with the assessed an incentive at which the rate of the photograph ionization breaks even with the Auger rate.

Force subordinate spatial separating is likewise watched. These nonlinear transmission procedures will be utilized for an ultra-quick x-ray switch in not so distant future.

**Ethical Clearance:** Taken from AMET University.

**Source of Funding:** Self

**Conflict of Interest:** Nil

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# Water and Wastewater Treatment using Bio Filter

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## ABSTRACT

Biofilter is a standout amongst the most critical detachment forms that can be utilized to expel natural contaminations from air, water, and wastewater. Despite the fact that, it has been utilized over a century, it is as yet hard to clarify hypothetically all the organic procedures happening in a biofilter. In this paper, the principal of organic procedures included in the biofilter is basically looked into together with the scientific demonstrating approach. The vital working and plan parameters are talked about in detail with the ordinary esteems utilized for various applications. The most critical parameter which oversees this procedure is the biomass joined to the medium. The relative benefits of various techniques embraced in the estimation of the biomass are talked about. The research facility and full-scale utilizations of the biofilter in water and wastewater treatment are likewise introduced. Their exhibitions regarding particular poison evacuation are highlighted.

**Keywords:** Waste Water, Biofilter, Microorganism

## INTRODUCTION

In a bio filtration framework, the poisons are expelled because of organic corruption instead of physical stressing just like the case in ordinary channel. With the movement of filtration handle, microorganisms (oxygen consuming, anaerobic, and facultative microscopic organisms; growths; green growth; and protozoa) are bit by bit created on the surface of the channel media what's more, frame a natural film or sludge layer known as biofilm<sup>[1]</sup>. The advancement of biofilm may take few days or months depending on the influent natural focus. The vital point for the effective operation of a biofilter is to control and keep up a solid biomass on the surface of the channel. Since the execution of the biofilter generally relies upon the microbial exercises, a steady source of substrates (natural substance and supplements) is required for its predictable and compelling operation. There are three fundamental natural procedures that can happen in a biofilter, (i) connection of microorganism, (ii) development of microorganism what's more, (iii) rot and separation of microorganisms<sup>[2-4]</sup>. As the achievement of a biofilter relies upon the development and upkeep of microorganisms (biomass) on the surface of channel media, it is important to comprehend the components of connection, development and separation on the surface of the channel media. Connection of Microorganisms. The components by which

microorganisms can connect and colonize on the surface of the channel media of a biofilter are (i) transportation, (ii) beginning grip, (iii) firm connection, and (iv). The transportation of microorganisms to the surface of the channel media is additionally controlled by four primary procedures, (a) dispersion (Brownian movement), (b) convection, (c) sedimentation because of gravity, and (d) dynamic portability of the microorganisms<sup>[5-6]</sup>. When the microorganisms achieve the surface, starting attachment happens which can be reversible or irreversible depending upon the aggregate association vitality, which is the total of Van der waals constrain and electrostatic drive. The DLVO (Derjaguin-Landau-Verwey-Overbeek) hypothesis is regularly used to depict the bond of the microorganisms on the surface of the channel media. The procedures of firm connection and colonization of microorganisms rely upon influent qualities, (for example, natural sort and fixation) and surface properties of the channel media. The steric impacts, hydrophobicity of the microorganisms, contact point, and electrophoretic portability values are mulled over to evaluate the connection of microorganisms on the surface of channel media. Substrate Utilization and Biomass Growth<sup>[7]</sup>.

A biofilm is an aggregation of microorganism onto a surface. Since the microorganisms are joined to the surface, the supply of organics or substrate (sustenance) to the microorganisms in a biofilm is predominantly

controlled by the mass and surface transport wonders. The substrate must be transported from the mass fluid to the biofilms external surface where it needs to diffuse into the biofilm for its digestion<sup>[8]</sup>

. The elements that impact the rate of substrate usage inside a biofilm are (i) substrate mass transport to the biofilm, (ii) dispersion of the substrate into the biofilm, and (iii) use energy inside the biofilm. The other key variables that influence the execution of a biofilm procedure are the development yield of the substrate and the physical components influencing the biofilm separation.

Cesses in a biofilter. There are no entire models that can foresee the productivity of the biofilter at various working conditions. directed pilot-scale biofilter tries different things with sewage furthermore, created exact conditions to anticipate the biochemical oxygen request (BOD5) and smelling salts expulsion by the biofilters. It was watched that natural and water driven stacking rates of the biofilter can restrict the natural evacuation effectiveness of the biofilter. Built up a numerical model called BIOFILT, to re-enact the non-enduring state conduct of organically dynamic channels utilized for drinking water treatment. The model is competent of re-enacting substrate (biodegradable natural issue) and biomass (both joined and suspended) profiles in a biofilter as a capacity of time. The model likewise has capacity to mimic the impacts of a sudden misfortune in joined biomass because of channel discharge on substrate evacuation productivity. The model is extremely functional and it joins a large portion of the essential procedures of the biofiltration. A portion of the confinements given an account of this display are: (i) It is a solitary substrate show, (ii) It expect that there is no blending of the channel media amid discharging, (iii) It does not consolidate the adsorption of substrate that happens when GAC is the channel media of the biofilter, and (iv) The model requires information on parameters to play out the reproduction. Notwithstanding these restrictions, the BIOFILT is the main model that fuses the discharging impact in the reproduction, and ought to be considered as the most functional model to date. The mimicked comes about of various parts of a BOM blend in a full-scale biofilter plant are appeared. Albeit, every one of the models depicted above are effective in demonstrating the principal natural procedures of a biofilter, the other imperative parameters that should be tended to in the

biofilter demonstrate are change in: (i) channel bed porosity, (ii) surface zone, and (iii) bed profundity. The model ought to have the capacity to foresee the long haul execution of the biofilter at various working conditions, for example, natural furthermore, pressure driven loadings changes. created a dynamic scientific model for the biodegradation procedure of unstable natural mixes (VOCs) utilizing diatomaceous earth organic bolster media (Celite 6 mm R-635 Bio-Catalyst Carrier). The impact of nitrate fixation, reactor discharging, and change in bed porosity and particular surface region of the channel media have been joined in the model. Displayed the long haul execution of a GAC biofilter with low quality manufactured wastewater fusing both introductory adsorption and biodegradation forms. The model was based on the principal components of transport of substrate in the mass fluid, biofilm development, transport, and biodegradation inside the biofilm, furthermore, adsorption on enacted carbon.

## CONCLUSION

Biofilter can successfully be utilized as a part of an efficient way to create high caliber of emanating because of its steady TOC expulsion effectiveness, long operational life and straightforwardness in operation. The natural movement prompted a predictable profluent natural fixation over a drawn out stretch of time. The day by day discharge for the most part embraced to facilitate the channel bed appears to have no impact on the biomass development rate, and consequently the emanating quality. Its execution however can be influenced by the filtration rate and the influent natural fixation, proposing that the biofilter ought to be worked in similar conditions at which it is acclimatized for its ideal furthermore, reliable natural evacuation effectiveness. A right decision of filtration rate and GAC medium profundity with fitting discharge can prompt a long haul operation with reliable what's more, unrivaled emanating quality. The numerical model should join the biofilter parameters evaluated for various working conditions, (for example, acclimatization filtration rate and starting natural fixation).

**Ethical Clearance:** Taken from AMET University.

**Source of Funding:** Self

**Conflict of Interest:** Nil



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# Reconfigurable Dipole Chaff Elements for Passive Confrontation Finding of Chemical Agents

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## ABSTRACT

Reconfigurable dipole waste components for the remote uninvolved identification of substance operators are exhibited in this paper. Each waste component comprises of a metallic reference dipole, and a location dipole with a switch that progresses conductivity within the sight of a substance analyte. Without an analyte, both dipoles are full at a similar recurrence; be that as it may, when the analyte is available, the reverberation recurrence of the identification dipole shifts. This move in recurrence is remotely identified by means of a RADAR framework.

**Keywords:** Reconfigurable Dipole, Chemical Agents, RADAR Framework, Polyaniline.

## INTRODUCTION

A reconfigurable dipole debris component has been created for the remote inactive recognition of concoction specialists utilizing RADAR. In this plan, one dipole is utilized as a kind of perspective, and the other dipole is utilized for identification of the analyte. The location dipole is a metallic component an indistinguishable size from the reference dipole with a chemoresistive switch toward one side of the identification dipole. At the point when presented to the best possible analyte, the chemoresistive change changes from a condition of low conductivity to a condition of high conductivity. In the condition of low conductivity, the identification dipole has a similar Radar Cross Section (RCS) as the reference dipole. After introduction to a compound analyte, the chemoresistive switch is in a condition of high conductivity making the location dipole electrically more. The discovery dipole's RCS at that point moves down in recurrence<sup>[1]</sup>.

A frequency reconfigurable<sup>[2]</sup> printed Yagi-Uda antenna is presented for cognitive radio applications. A 46% continuous frequency tuning bandwidth is obtained by loading the driver dipole arms and four directors with varactor diodes. This configuration allows a high-gain and an almost constant end-fire pattern to be maintained while the antenna operating frequency is tuned. A parametric study was undertaken

considering the inter-director spacing, director length tapering, and reflector geometry. Three PIN diodes are embedded in the structure of the unit-cell so it can switch between a double split-ring resonator (DSR) and a spiral resonator. Using this reconfigurable metamaterial media, a gain enhancement of about 3 dB is achieved and also the main beam of the antenna can be tilted from -15 to +10 degrees in the E-plane<sup>[3]</sup>. The three microstrip-fed double-dipole antenna designs<sup>[4-6]</sup> to support multi-band, wideband, and single-band operation modes are presented for personal wireless communications. The reconfiguration for the microstrip antennas is carried out by connecting or Reconfigurable Microstrip Double-Dipole Antennas for Personal Wireless Communications 61 disconnecting (switching on or off) appropriate rectangular strips to model the MEM switches

## DISCUSSION AND RESULTS

Standard straight dipoles as a rule have a genuinely broadband RCS. Most RADAR frameworks in military and non military personnel utilize today have usable transfer speeds that are equivalent to or more noteworthy than the standard dipole. Figure 1 demonstrates a schematic graph of a X-band direct metallic dipole component (dark) with a chemoresistive (red) switch set toward one side. The dipole is 1.52 cm long with the switch on (leading) and 1.37 cm long

with the turn off (non-directing). The going with plot demonstrates the RCS per square wavelength in these two states. The broadness of the RCS makes the unmistakable discovery of the two dipole states troublesome utilizing a customary X-Band RADAR framework.

One strategy for decreasing the data transmission of a dipole is by planning an electrically little component. An electrically little reception apparatus has a higher  $Q$ , and thus a smaller transfer speed and RCS. A generally utilized technique for making an electrically little dipole is to put a heap toward the finish of the dipole. Figure 2 demonstrates an end-stacked cross-dipole debris component created with the end goal of recognizing synthetic specialists. The cross-dipole design is utilized to understand a component whose backscatter reaction is basically autonomous of polarization. The dark lines in this figure speak to metallic stripline and the red lines speak to the chemoresistive switches. The collapsed metallic line toward the finish of the dipole significantly decreases its length and transfer speed. The whole component is just 3.2 mm by 3.2 mm square or around a tenth of a wavelength long. The chemoresistive switch material length is exchanged the RCS reaction of the waste component inside a couple of percent of its working recurrence. The debris component appeared in Figure 3 is intended to have an off state at 10.2 GHz and an on state at 9.8 GHz. This recurrence move falls inside the discernible scope of traditional X-band RADAR frameworks. The going with plot in Figure 3 demonstrates the wavelength standardized RCS of the cross-dipole waste component as the conductivity of the sensor material is differed. As the conductivity of the sensor is expanded from a low state by the nearness of an analyte, the RCS reaction of the debris component shifts from the off state to the on state.

Another strategy for outlining a high- $Q$  dipole is to wander the geometry of the whole dipole component utilizing a stochastic technique [1]. By wandering the metallic stripline of the dipole, one can accomplish better control over the radiation properties of the debris component and increment the RCS while as yet keeping up a moderately limit transfer speed. Planning such structures heuristically is exceptionally troublesome so an improvement procedure, for example, a hereditary calculation (GA) is utilized. Figure 3 demonstrates a 1.78 cm by 1.78 cm square cross-dipole waste component intended to work at X-band, whose geometry has been upgraded by means of a GA. The going with RCS plot demonstrates a comparative operation to the end-

stacked cross dipole in Figure 2, however with a bigger RCS in the on and off states.

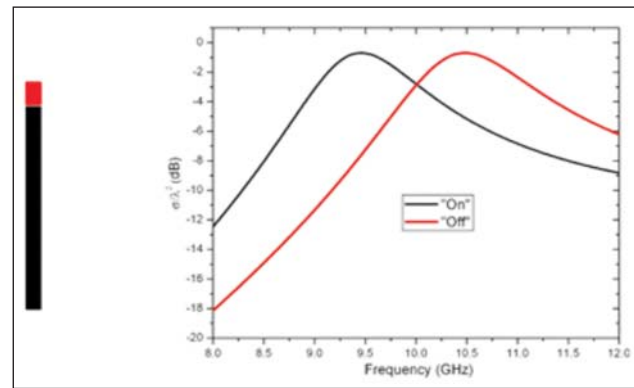


Fig. 1. Metallic dipole element (black) with conductive switch (red) and accompanying RCS per square wavelength in the "on" and "off" states.

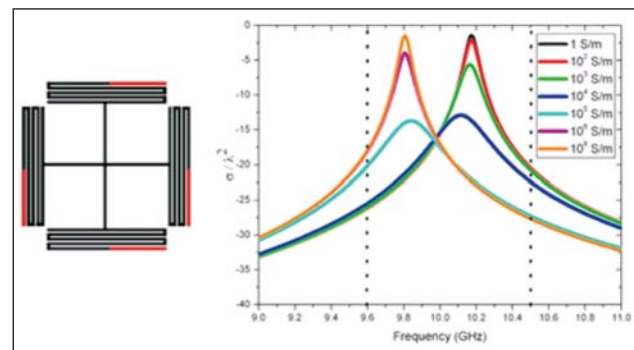


Fig. 2. Metallic end-loaded dipole element (black) with conductive switch (red) and accompanying RCS per square wavelength with varying switch conductivity.

To test the concept of the reconfigurable dipole chaff element, a monopole test setup was devised. This test element consists of a copper monopole on a glass slide substrate surrounded by a rectangle of conducting polymer (Figure 4). The dimensions of the copper monopole and polymer are chosen to provide a good match to 50 ohms in both the on and off states. The copper rectangle is 8 mm by 25 mm, and the polymer is 12.7 mm by 33 mm, with the two rectangles aligned at the bottom of a standard 25.78 mm by 46 mm glass slide. When the polymer is in the conducting state, the electrical size of the monopole is increased and the resonant frequency is lowered. The conductive polymer used in this case is polyaniline (PANI). It is spin-coated on top of the copper monopole/glass slide to a thickness of about 600 nm. The conductivity of PANI increases in the presence of an acid and decreases in the presence of a base. For this test, the monopole was placed on a 0.6 m square ground plane and was measured with a network analyzer. A plastic container with filter paper soaked in formic acid or ammonia was placed over the

monopole to turn it on and off respectively. The plot in Figure 4 shows the measured return loss of the test element in the on and off states compared with a finite element method (FEM) simulation of the devices. In the simulation, the off state has a conductivity of 833 S/m and the on state is 16,667 S/m. Good agreement between the measured and simulated results is demonstrated. The monopole can be switched on and off in a time period ranging from a few to tens of seconds.

of these debris components was measured utilizing full-wave electromagnetic re-enactments. The exchanging execution of the conductive polymer reproduced on the dipole refuse component was approved through estimations utilizing a monopole test setup.

**Ethical Clearance:** Taken from AMET University.

**Source of Funding:** Self

**Conflict of Interest:** Nil

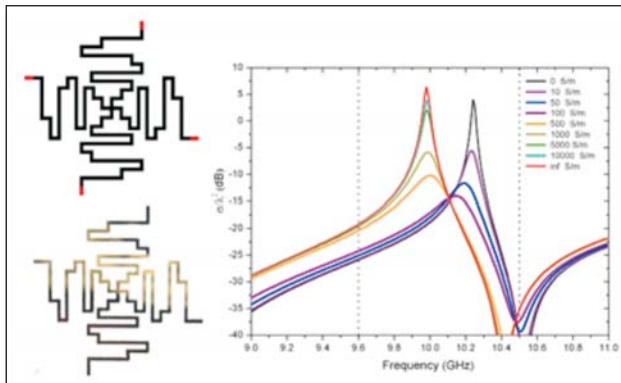


Fig. 3. Top Left: Metallic stochastic dipole element (black) with conductiveswitch (red). Bottom Left: Fabricated gold on glass reference stochastic dipoleelement. Right: RCS per square wavelength with varying switch conductivity.

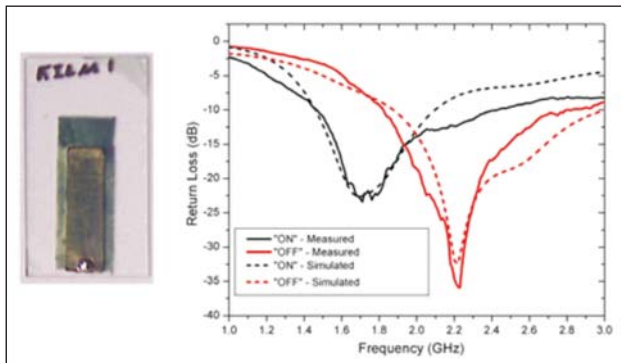


Fig. 4. Copper monopole surrounded by a conducting polymer switch and accompanying measured and simulated return loss.

## CONCLUSIONS

A reconfigurable dipole debris component has been created for the remote uninformed recognition of substance specialists utilizing X-band RADAR. The reconfigurable dipole idea can likewise be reached out to the recognition of organic specialists. The execution

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# The Effect of pH and Ionic Strength on Rate of Reaction of Plasma Albumin with Formaldehyde in Water Solution and Ethanol-Water Binary Mixtures

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## ABSTRACT

The impacts of pH and ionic quality on the rate of response of plasma egg whites with formaldehyde in water and 15% ethanol - water framework were examined in the pH scope of 5.3 - 8.7 and impartial salt range 0.1 - 0.9 moldm<sup>-3</sup> NaCl. The rate constants for the response in water medium have been found to expanded with increment in pH. This has been seen to be comparable with a practically equivalent to aldehyde, glutaraldehyde whose responses with proteins expanded with in increment in pH This conduct is accounted for to show non protonation of the adduct shaped amongst formaldehyde and the plasma egg whites at higher pHs. Also, the rate constants of the response in 15% Ethanol-water blend expanded with increment in pH however not in a smooth form and a similar reason could be attributed to this framework as well. Furthermore it could be declared that adjustments in the interior structure of medium on expansion of ethanol has an impact on the response rate. The aftereffects of the impacts of ionic quality on the response in water arrangement demonstrate that there was a straight rate reliance on the ionic quality of medium and the rate expanded with increment in the ionic quality of the salt. The estimations of rate constants in ethanol arrangement were found to expanded with the expansion in ionic quality and convergence of ethanol, this deviation from the Bronsted hypothesis is as per the writing. The explanation behind such conduct is accounted for to be because of the more prominent impact of ionic introduction for directing the response speed. Ideal ionic communications have been observed to be imperative for authoritative of biomolecular species. The outcome additionally point to the real commitments of support answers for the responses of nonpartisan species.

**Keywords:** Ionic Strength, Ph Variations, Plasma Albumin, Binary Mixures, Bio Molecules

## INTRODUCTION

Formaldehyde is found to cross-connect, inactivate, balance out, or immobilize proteins. It has been accounted for to respond with the amino gatherings of the N-terminal amino corrosive deposits and the side – chains of argine, cystein, histidine, and lysine buildups when treated with proteins<sup>[1]</sup>. Different examinations have discovered that under mellow conditions formaldehyde irreversibly consolidate with the fundamental gatherings of proteins framing cross-connects between the accompanying sets of gatherings: amine and amide, amine and phenol, amine and indole<sup>[2]</sup>. Formaldehyde can't, as they would like to think, frame a steady connection between two amine or two amide gathering. The formaldehyde treatment has

been found to bring about an extensive assortment of compound alterations in proteins, for example, the arrangement of methylol gatherings, Schiff-bases, and methylene spans. Contingent upon the peptide succession, methylol gatherings, Schiff bases, and methylene spans are accounted for to be framed and the most vital adjustment of proteins actuated by formaldehyde is accounted for to be the development of stable methylene bridges<sup>[3]</sup>.

Responses of higher estimations of watery formaldehyde with proteins are accounted for to be founded on established carbonyl-amine response science. Amines and related nucleophiles are found to respond with watery formaldehyde to shape different chemicals and intermediates with at last methylene connecting (-CH<sub>2</sub>-) bringing about obsession or tanning

sort activity. At any rate, essential amines are known to respond to shape moderate hydroxymethyl bunches that drives a basicity misfortune with pKa drops of around 4-5 units. Along these lines, however gradually, lack of hydration or buildup response happens by loss of an atom of water and a methylene connect shapes<sup>[4]</sup>. Likewise conceivably, after introductory responses are dimethylene ether linkages and the decrease of the hydroxymethyl bunches by formaldehyde itself to methyl bunches with creation of formic corrosive as an endpoint item. These diminishing properties of formaldehyde are accounted for to be quickened in basic conditions where formaldehyde is known to hasten the metals of different salts, for example, bismuth, copper and silver<sup>[5]</sup>. There are lacks of reports on the response of plasma egg whites with low groupings of formaldehyde in water arrangement and fluid ethanol arrangements at human body conditions and the relating impacts of ionic quality and pH. This structures the premise of this report.

## MATERIAL AND METHOD

The impacts of pH on the rate of response in water and 15% ethanol - water framework were explored in the pH scope of 5.3 - 8.7. The pH of the reagents was balanced with 0.1 moldm<sup>-3</sup> ammonium hydroxide arrangement by drop-wise expansion to the coveted pH. The rates were resolved as a component of pH in the scope of 5-8.7 while keeping the convergence of the reactants, temperature, and ionic quality steady. The reliance of the response on the pH was built up from a plot of  $\ln(A_t - A_\infty)$  against time at a predefined pHs. Plasma egg whites and formaldehyde being impartial species, the impact of ionic quality on rate of their response was thought to be from the commitment of the nonpartisan NaCl salt and buffers, therefore their impact was explored in the range  $\mu = 0.1 - 0.9$  moldm<sup>-3</sup> NaCl] by expanding the measures of standard plasma egg whites arrangement and formaldehyde with the suitable expansion of corresponding volume of a given groupings of the unbiased salt (NaCl) and the ammonium citrate support at temperature of 37°C. The rate of the responses was resolved as an element of ionic quality in the scope of 0.1-0.9 while keeping the centralization of the reactants, temperature, and pH consistent and the reliance of the response on ionic quality was set up from a plot of  $\ln(A_t - A_\infty)$  against time at a predetermined ionic quality. Utilizing the Debye-Huckel -Bronsted connection  $\log k_2 = \log k_{obs} + ZAZB''\mu$  the reliance of the response on the ionic

quality of the medium and the idea of the enacted complex of the response was set up from a plot  $\log k_1$  versus  $\mu$  and  $\log k_2/k_{obs}$  versus  $\mu$  individually. The chemical decomposition and contribution for 2-Bromo-1-(1-phenylsulfonyl-1H-indol-3-yl) propan-1-one - Acta Crystallographica was described in<sup>[6]</sup>. Crystal growth, spectral, thermal and optical properties of an organic single crystal-Dye doped hippuric acid was illustrated in<sup>[7]</sup>.

## RESULTS AND DISCUSSION PH DEPENDENCE STUDIES IN WATER SYSTEM

Table 1 and Figure 1-4 demonstrate the impacts of pH on the pseudo-first and second request rate steady esteems for the motor of the response between plasma egg whites and formaldehyde in water arrangement. The rate constants of the response in water medium expanded with increment in pH. This has been seen to be comparative with glutaraldehyde whose responses with proteins increments with in increment in pH. This conduct is accounted for to show non protonation of the adduct shaped amongst formaldehyde and the plasma egg whites at higher pHs consequently more free substrate accessible for response. The creators likewise found a leveling impact at high pHs which they watched was because of the protonation of the hydroxymethyl amine adducts framed.

### pH dependence studies in 15 %Ethanol- water system:

Table 2 and Figure 5 and figure6 demonstrate the impacts of pH on the pseudo-first and second request rate steady esteems for the active cooperation between plasma egg whites and formaldehyde in 15% Ethanol-water framework. The rate constants of the response in 15% Ethanol-water blend expanded with increment in pH as in water arrangement however not in a smooth form and indistinguishable reasons from in the water dissolvable framework could be attributed to this framework as well. Also it could be accounted for to show that adjustments in the interior structure of medium on expansion of ethanol do has at consider the response rate.

Experimental results of the effect of pH on the constants for the reaction of plasma Albumin and formaldehyde at varying pH and constant conditions in water medium, Temperature T= 37.0 °C, formaldehyde[0.27 ×10<sup>-1</sup>], Plsma album [0.51x 10<sup>-4</sup>] NaCl[0.5] moldm<sup>-3</sup> pH= (5.3- 8.7) ,  $\epsilon_{max} = 245nm$

Table.1 The effect of pH on the constants for the reaction of plasma Albumin and formaldehyde at varying pH and constant conditions

pH	$k_{obs}$	$k_2$	$\ln k_2$
5.3	0.054	2.0	0.69
6.4	0.061	2.26	0.82
6.8	0.064	2.37	0.86
7.3	0.064	2.37	0.86
8.3	0.071	2.63	0.98
8.7	0.082	3.04	1.11

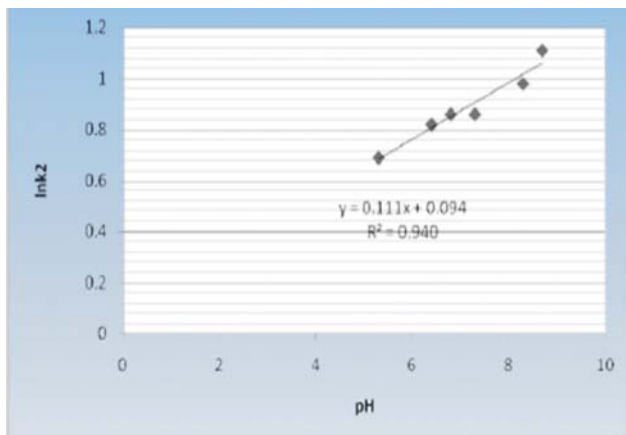


Fig.1. Variation of pH on the rate constants of formaldehyde - Plasma albumin reaction in water system

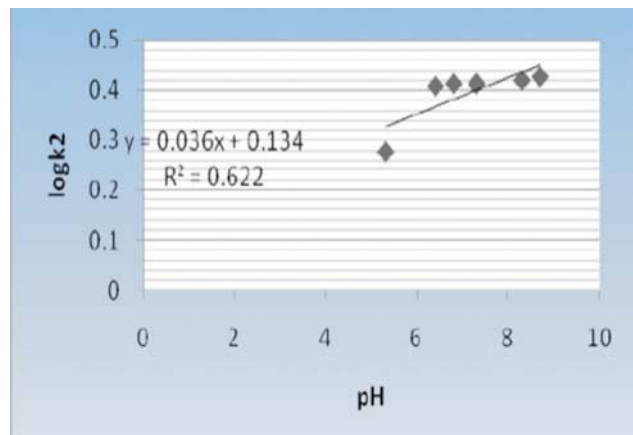


Fig. 2. Variation of pH on the rate constants of formaldehyde - Plasma Albumin reaction in 15% (ethanol-water) system

Table 2: Experimental results

[NaCl]	$\sqrt{\mu}$	$k_{obs}$	$k_2$	$\log k_2$	$\log k_2/k_{obs}$
0.1	0.316	0.057	2.11	0.324	5.69
0.3	0.550	0.066	2.44	0.387	5.87
0.5	0.707	0.072	2.67	0.427	5.92
0.7	0.837	0.072	2.67	0.47	5.92
0.9	0.949	0.073	2.70	0.431	5.91

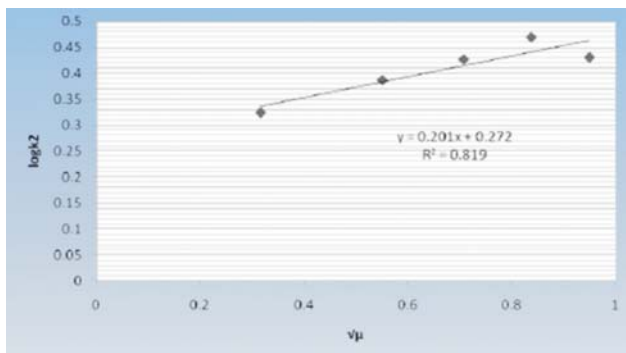


Fig. 3.  $\log k_2$

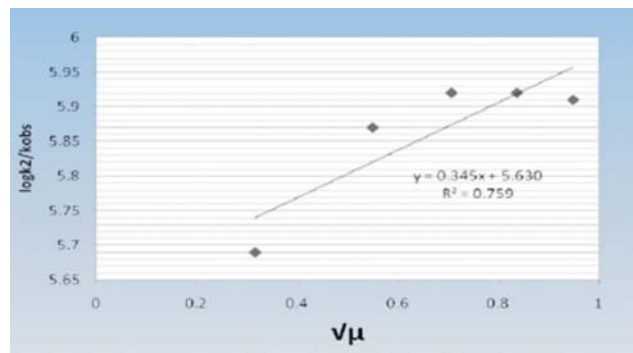


Fig. 4  $\log k_2/k_{obs}$

Table 3: Experimental results 2

[NaCl]	$\sqrt{\mu}$	$k_{obs}$	$k_2$	$\log k_2$	$\log k_2/k_{obs}$
0.1	0.316	0.088	3.26	0.513	5.83
0.3	0.550	0.084	3.11	0.493	5.87
0.5	0.707	0.081	3.00	0.477	5.89
0.7	0.837	0.060	2.96	0.472	7.85
0.9	0.949	0.053	2.74	0.438	8.26

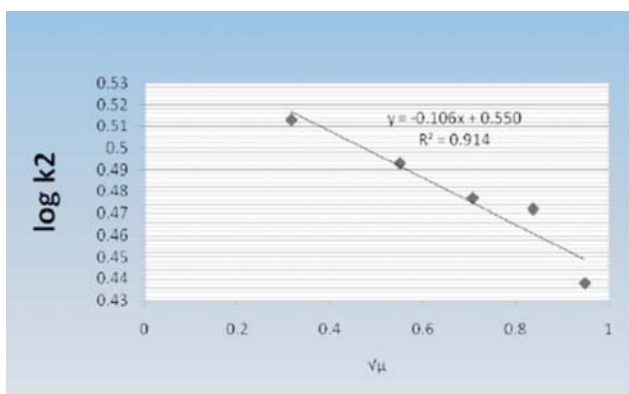


Fig. 5.  $\log k_2$

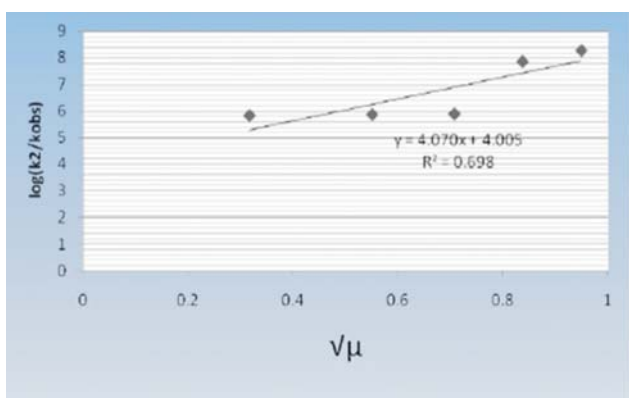


Fig. 6.  $\log k_2/k_{obs}$

### CONCLUSION

The rate constants of the response in water medium have been found to expanded with increment in pH. This has been seen to be comparable with its closely resembling aldehyde, glutaraldehyde whose response with proteins has been accounted for to expanded with increment in pH. This conduct is accounted for to show non - protonation of the adduct shaped amongst formaldehyde and the plasma egg whites at higher pHs. Also, the rate constants of the response in 15% Ethanol-water blend expanded with increment in pH as in water arrangement however not in a smooth design and similar reasons could be attributed to this framework as well. What's more it could be accounted for to show that adjustments in the inside structure of medium on expansion of ethanol reflects on the response rate. The

consequences of the impacts of ionic quality on the response in water arrangement demonstrated that there was a direct rate reliance on the ionic quality of medium and the rate expanded with increment in the ionic quality of the salt. The estimations of rate constants in ethanol arrangement were found to expanded with the expansion in ionic quality and the grouping of ethanol, this deviation from the Bronsted hypothesis is as per the writing. The explanation behind such conduct is accounted for to be because of the more noteworthy impact of ionic introduction for directing the response speed. Great ionic communications have been found to essential for authoritative of biomolecular species. The outcome likewise demonstrates that the ionic impact is from the commitments of the support arrangement in this response and as a rule for impartial animal categories.

**Ethical Clearance:** Taken from AMET University.

**Source of Funding:** Self

**Conflict of Interest:** Nil

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# Validating a Sign to Forecast the Chemistry of the Fuelused in Radioisotope Power Systems

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## ABSTRACT

U.S. radioisotope power systems convert the decay heat from  $^{238}\text{PuO}_2$  fuel into electricity using various forms of thermoelectric conversion technology. When placed in an environment that has low oxygen potential and very high temperatures, the fuel can undergo reduction to a substoichiometric form ( $\text{PuO}_{2-x}$ ). In order to better understand this system, a model was developed that combines the known relationship between stoichiometry (i.e.,  $x$ ), temperature, and oxygen potential with the chemical thermodynamics of graphite, carbon monoxide, and carbon dioxide. Because of the challenges surrounding  $\text{PuO}_2$  experimentation, the model has been benchmarked against a common  $\text{PuO}_2$  surrogate:  $\text{CeO}_2$ . Samples of  $\text{CeO}_2$  were sealed into a reaction tube and allowed to react with graphite using a reaction temperature of 1273 K. When these reaction conditions were used, the model ( $x = 0.268$ ) and experiment ( $x = 0.272 \pm 0.008$ ) found very good agreement. Successful benchmarking of this model suggests that it will be useful in predicting the complex chemical interaction that can occur between the materials inside a radioisotope power system. Kinetic data obtained from these experiments suggests that reaction rates are very slow and that it could take hundreds of hours to reach equilibrium. A change in the rate limiting reaction mechanism is also observed when  $x > 0.25$ , but does not appear to impact the thermodynamic equilibrium. In addition to helping inform a  $^{238}\text{Pu}$  based system, this model may also be useful for predicting the chemistry found inside an  $^{241}\text{Am}$  based system, which is currently under development for the European Space Agency.

**Keywords:** Radioisotope,  $\text{PuO}_2$ , Forecast, Power System

## INTRODUCTION

Radioisotope thermoelectric generators (RTG) currently used in space exploration utilize a  $^{238}\text{PuO}_2$  heat source that is encased in a safety envelope that is primarily constructed out of graphite<sup>[1]</sup>. One of the well-established properties of  $\text{PuO}_2$  at high temperatures and low oxygen pressures is the ability for it to release oxygen and become sub-stoichiometric ( $\text{PuO}_{2-x}$ )<sup>[2]</sup>. Oxygen released by the  $\text{PuO}_2$  is available to react with the nearby graphite and form CO and  $\text{CO}_2$ <sup>[3]</sup>. This situation creates a surprisingly complex chemical environment that is defined by the temperature of the fuel, stoichiometry of the fuel, kinetic and thermodynamic environment of the RTG, and thermodynamics of the CO to  $\text{CO}_2$  ratio. Developing a more complete understanding of the RTG's chemical environment has a number of significant benefits, including: predicting the reactivity of impurities

and contaminants in an RTG, assessing the impact of impurities and contaminants on RTG components, more accurate thermal modelling of the gas phase, and more accurate predictions of the properties of the  $\text{PuO}_{2-x}$  heat source. Unfortunately, the challenge and expense of performing experiments with  $^{238}\text{PuO}_2$  makes basic research and validation of hypotheses on the chemical behavior within an RTG very difficult. As a result, prior to performing experiments on  $\text{PuO}_2$ , it is common to perform experiments on the non-radioactive surrogate,  $\text{CeO}_2$ .  $\text{CeO}_2$  has the same crystallographic space group structure as  $\text{PuO}_2$  (Fm $\bar{3}$ m; #225) and very similar solid state chemistry. This includes the ability to lose oxygen and become sub-stoichiometric ( $\text{CeO}_{2-x}$ ) at high temperatures and low oxygen pressures<sup>[4]</sup>. It therefore makes sense to initially validate a model designed to predict the behavior of  $\text{PuO}_2$  using empirical data obtained from  $\text{CeO}_2$ .

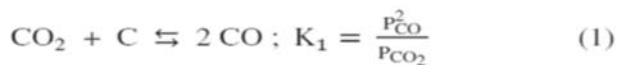
AmO<sub>2-x</sub> is a compound that is under consideration as a heat source fuel for use in a future European RTG. This material exhibits trends in behavior that are similar to CeO<sub>2-x</sub> and PuO<sub>2-x</sub> [5,6]. Benchmarking a model against CeO<sub>2-x</sub> would be a first good step in predicting the behavior of an AmO<sub>2-x</sub> system. This knowledge may prove to be useful as the development of a European RTG progresses.

## THEORY

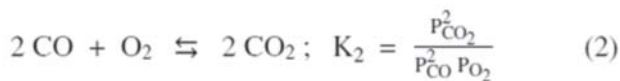
Developing a model that describes the chemical relationship between CeO<sub>2-x</sub>, C, CO, and CO<sub>2</sub> centers on an accurate understanding and calculation of the oxygen potential found within the system. The thermodynamic relationship between oxygen potential, CO, and CO<sub>2</sub> is very well-defined. Similarly, numerous authors have shown that there is a relationship between the "x" in CeO<sub>2-x</sub>, temperature, and oxygen potential. Oxygen potential, therefore, becomes the key to relating how CeO<sub>2-x</sub> interacts with the graphite in this system. The sufferance of the ferrocene is presented in the Experimental investigation on the performance and emission characteristics of diesel engine with the effect of ferrocene as an additive to diesel fuel [8].

### Relationship between CO, CO<sub>2</sub>, and Oxygen Potential

Because RTG systems contain significant quantities of graphite and operate at very high temperatures, it is possible to assume that all oxygen present will react to form CO and CO<sub>2</sub>. The quantities of CO and CO<sub>2</sub> generated by this oxygen can be determined from the Boudouard reaction.



Once the quantities of CO and CO<sub>2</sub> are known, it becomes possible to calculate the oxygen potential via:



Where  $P_i$  is the partial pressure of compound  $i$  and  $K$  is the equilibrium constant for the respective chemical reaction.  $K$  values are thermodynamic constants that depend on the temperature at which the reaction takes place, and can be calculated using power series equations from the literature, such as the JANAF tables [7]. In addition to temperature, Equations 1 and 2 clearly indicate that the partial pressures of CO and CO<sub>2</sub> play a critical role in determining the oxygen partial pressure. Once the oxygen partial pressure is obtained,

it is possible to convert this pressure into an energy term using the standard Gibbs free energy relationship:

$$G = RT \ln P_{\text{O}_2} \quad (3)$$

Where  $G$  is the Gibbs free energy (kJ/mol),  $T$  is temperature (K),  $R$  is the gas constant, and  $P_{\text{O}_2}$  is the oxygen partial pressure (bar). Oxygen potential is frequently discussed using both units of energy and pressure. Equation 3 shows that these are simply two different ways to look at the same property. In this report we will use units of pressure to describe oxygen potential because those values can be more directly utilized in the equilibrium equations. Despite the use of pressure units, it is very important to remember that oxygen potential is actually a description of energy and the ability for an oxidation or reduction reaction to be performed.

### Oxygen Potential Generated by CeO<sub>2-x</sub>

The chemical potential of oxygen generated by CeO<sub>2-x</sub> has been studied by a number of different authors under a wide range of temperatures (680 to 1780 °C) and oxygen potentials (~10-10 to 10-35 bar). This work was then compiled by Lindemer, who used this data to derive a set of semi-empirical equations that accurately describe these relationships [4]. Of specific interest to this work is the following equation:

## MODEL

### Assumptions

The model describing CeO<sub>2-x</sub> behavior in the presence of graphite at high temperatures and low oxygen pressures uses the following assumptions.

- CeO<sub>2-x</sub> is bounded by  $0 < x < 0.5$  – these represent the thermodynamic limits used by Lindemer to generate his semi-empirical equation.
- Closed chemical system – no new chemicals can enter or leave the system.
- Constant thermal profile – the temperatures within the system (isothermal or in gradient) are constant.
- Single oxygen source – CeO<sub>2</sub> is the only source of oxygen in the system.
- No free oxygen – all oxygen released from CeO<sub>2</sub> will instantly and completely react with graphite to form CO or CO<sub>2</sub>.

- Open transport – there are no restrictions to gasphase transport.
- Constant partial pressures – partial pressures of CO and CO<sub>2</sub> are constant throughout the system; though the calculated oxygen potential/partial pressure can vary throughout the system. The analysis of the diesel engine is presented in the Experimental analysis of a Diesel Engine fuelled with Biodiesel Blend using Di-ethyl ether as fuel additives<sup>[9]</sup>.

## RESULTS AND DISCUSSION

### Laboratory Results

Tables 1 and 2 present the results of the laboratory experiments described in this report. Any deviations from standard experimental conditions are

identified in the "Experiment" column of Tables 1 and 2 (e.g., a label of "4 h" indicates that the experiment was run for 4 h, not 24 h). Stoichiometry (i.e., *x*) was obtained from the final modelling result as described in Section 3. Preliminary analysis of the data presented in Tables 1 and 2 indicate that most of the laboratory experiments were not at equilibrium, resulting in *x* values that were lower than equilibrium, and associated oxygen potentials that were higher than expected. Johnson presented a method for calculating the graphite temperature in a similar system using the equilibrium thermodynamics of Equation 1 along with the measured quantities of CO/CO<sub>2</sub><sup>[3]</sup>:

$$T = \frac{170700}{174 - \left( R \cdot \ln \left( \frac{P_{CO}^2}{P_{CO_2}} \right) \right)}$$

**Table 1. Reaction between separated CeO<sub>2</sub> and graphite**

Experiment	<i>x</i>	Equivalent Time (h)	Calculated Graphite T (K)
24 h – # 1	0.132	24	952
# 2	0.130	24	948
# 3	0.129	24	947
# 4	0.133	24	954
# 5	0.131	24	949
Solid Piece	0.111	11.6	923
4 h	0.063	4	843
Graphite x2	0.187	48	1050
Graphite x4	0.222	96	1129
High SA Graphite*	0.217	97	1110
Graphite x8	0.245	192	1197
High SA Graphite x2*	0.238	194	1150

\* Normal surface area = 14.15 m<sup>2</sup>/g; high surface area = 57.18 m<sup>2</sup>/g

**Table 2. Reaction between mixed CeO<sub>2</sub> and graphite**

Experiment	<i>x</i>	Equivalent Time (h)	Calculated Graphite T (K)
24 h – # 1	0.153	24	985
# 2	0.167	24	1009
# 3	0.154	24	989
# 4	0.161	24	999
# 5	0.147	24	975
4 h	0.077	4	870
48 h	0.192	48	1058
Graphite x2	0.199	48	1072
Graphite x4	0.246	96	1204
Graphite x8	0.252	192	1220
48 h–Graphite x4	0.251	192	1220
96 h–Graphite x2	0.258	192	1240
48 h–Graphite x8	0.256	384	1236
96 h–Graphite x16	0.271	1536	1290

Applying Equation given above to a system that is not at equilibrium will result in a calculated graphite temperature that deviates from the actual graphite temperature. In the laboratory experiments presented here, the graphite temperature is fixed at 1273 K, and a deviation from equilibrium in the laboratory experiment will result in a calculated graphite temperature that is too low. As the system approaches equilibrium, the calculated graphite temperature will approach the actual graphite temperature. In this way, the calculated graphite temperature becomes a method for determining how close the system is to equilibrium.

### MODEL RESULTS

Modeling calculations converged at  $x = 0.268$ . Comparison of the modelling and laboratory data indicates that these results are in very good agreement. A detailed discussion and comparison of these results is presented in the Discussion section of this report.

### CONCLUSION

A model was developed that can predict the complex equilibrium that occurs between  $\text{CeO}_2$  and graphite when in an environment with high-temperature and low oxygen potential. This model was successfully validated for conditions where both the  $\text{CeO}_2$  and graphite are isothermal at 1273 K. The equations governing this model are valid for a wide range of temperatures (950 to 2050 K) and oxygen potentials (10-10 to 10-35 bar), suggesting that the model will remain valid within those ranges. This work represents the first step in the development of a model that will accurately predict the chemical behavior of heat source fuel within an RTG. Rate data indicates that the reaction between  $\text{CeO}_{2-x}$  and graphite can take hundreds of hours to reach equilibrium.

When  $x < 0.25$  the reaction rate is limited by the rate of  $\text{CO}_2$  reacting with the graphite, which causes the reaction rate to have a first-order dependence on the surface area of the graphite. When  $x > 0.25$  the rate limiting reaction mechanism changes, and the rate is no longer dependent on the surface area of the graphite. Experiments where the graphite was separated from the  $\text{CeO}_2$  observed a kinetic effect that caused the reaction rate to be slower, but this separation did not impact the final thermodynamic equilibrium.

**Ethical Clearance:** Taken from AMET University.

**Source of Funding:** Self

**Conflict of Interest:** Nil

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# An Efficient Approximation based Adversary Detection (EAAD) mechanism for Wireless Sensor Networks

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## ABSTRACT

Wireless Sensor Networks (WSN) has seen great improvement and utilization in the past few decades. WSN can operate in remote areas without the intervention of human is key factor in the success of WSN. WSN consist of spatially distributed autonomous sensor nodes that collaborate with each other. Large number of existing schemes is available to detect the adversary in wireless sensor networks and each has its own disadvantages. In this paper, An Efficient Approximation based Adversary Detection (EAAD) mechanism is proposed for Wireless Sensor Networks. This scheme uses the input and output data. The input data describes the behavior of the node including selfishness, trust, responsibility and link strength. The output data describes the quality of service obtained by these parameters. Finally, the node is checked for normal or adversary node. Simulation results show that the proposed method performs better compared to the existing method.

**Keywords:** *Wireless Sensor Network, Link Strength, Responsibility, Trust, Selfishness.*

## INTRODUCTION

Wireless Sensor Networks (WSNs) have gained worldwide attention in recent years. These sensors are small, with limited processing and computing resources and they are inexpensive compared to traditional sensors. These sensor nodes can sense, measure, and gather information from the environment and based on some local decision process, they can transmit the sensed data to the user.

Smart sensor nodes are low power devices equipped with one or more sensors, a processor, memory, a power supply and a radio. A variety of mechanical, thermal, biological, chemical, optical and magnetic sensors may be attached to the sensor node to measure properties of the environment. Since the sensor nodes have limited memory and are typically deployed in difficult-to-access locations, a radio is implemented for wireless communication to transfer the data to a base station. Battery is the main power source in a sensor node. Secondary power supply that harvests power from the environment such as solar panels may be added to the node depending on the appropriateness of the environment where the sensor will be deployed.

The rest of this paper is described as follows: Section 2 describes the related work. Section 3 describes the proposed work. The performance and simulation analysis are carried in section 4. Conclusion is described in the section 5.

## Related works

Due to the resource, limitations of sensor nodes, existing network security mechanisms, including those developed for Mobile Ad-Hoc Networks, are inadequate for WSNs. Some security mechanisms are adapted to WSNs for sensor data and network control protocols<sup>[1]</sup>. The misused key detecting mechanism was enhanced in an efficient and effective way. The security analysis shows that the energy consumption is more efficient on the average<sup>[2]</sup>.

A security solution was proposed for detecting compromised and faulty nodes in a WSN. The mechanism also isolates a compromised node from the network so that it cannot participate in any network activity. This mechanism is based on misbehavior classification, behavior monitoring and trust management<sup>[3]</sup>. Sinkhole attack may cause the intruder to lure all or most of the data flow that has to be

captured at the base station. Once sinkhole attack has been implemented and the adversary node has started to work as network member in the data routing, it can apply some more threats such as black hole or gray hole. Ultimately this drop of some important data packets can disrupt the sensor networks completely<sup>[4]</sup>.

An original secure mechanism was designed to defend WSNs against malicious attacks by using the information generated during data communication. The approach is able to protect the data communication in a WSN even if some sensor nodes are compromised by adversary. The above said approach was easy to be implemented and performed in resource-constrained WSN<sup>[5]</sup>. A validation algorithm utilizes the concept of intrusion-aware reliability that helps to provide adequate reliability at a modest communication cost. A security resiliency analysis of the intrusion-aware alert validation algorithm was validated<sup>[6]</sup>.

An application-independent framework for accurately identifying compromised sensor nodes was developed<sup>[7]</sup>. The framework provides an appropriate abstraction of application-specific detection mechanisms and models the unique properties of sensor networks. A lightweight scheme was developed that can be applied to computer networks. Its basic characteristics that nodes monitor their neighborhood and collaborate with their nearest neighbors to bring the network back to its normal operational condition<sup>[8]</sup>.

The algorithms developed for anomaly detection have to consider the inherent limitations of sensor networks in their design so that the energy consumption in sensor nodes is minimized and the lifetime of the network is maximized<sup>[9]</sup>. A mapping function is employed based on the optimal multiuser detection (OMD) to map the received bits into the mapping space where error bits can be distinguished<sup>[10]</sup>. In order to revise error bits caused by MAI, the proposed joint MUD scheme combines the mapping function with suboptimal algorithms.

**PROPOSED SYSTEM**

In this paper, an efficient approximation based adversary detection mechanism is proposed for wireless sensor networks. Initially all the nodes are connected within the network. The source node broadcasts route request to its neighbors.

Figure 1 shows the basic EAAD scheme. In figure, S denotes the source, D is the destination and N

denotes the intermediate node. The connected lines show that the nodes are connected in the network. Those connected nodes are called the neighbor nodes.

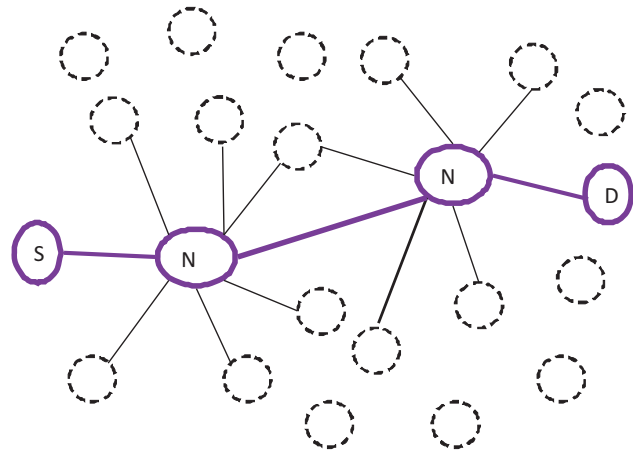


Fig. 1. EAAD scheme

Figure.2 shows that the architecture of the EAAD scheme. In this scheme the node selfishness, node trust, node responsibility such as which node get the RREQ from other node and it send the RREP to node as well as node link strength.

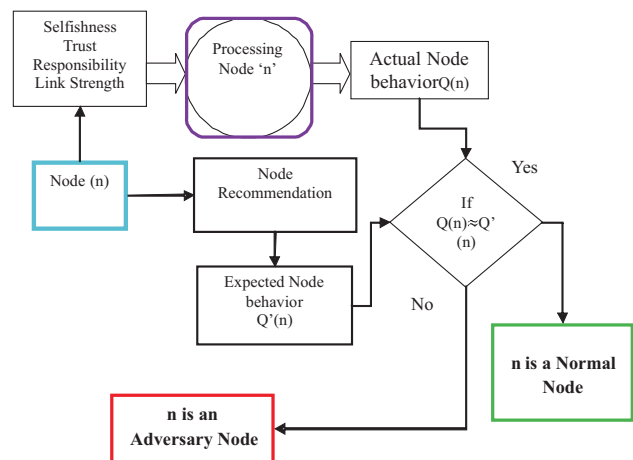


Fig. 2. Architecture of EAAD scheme

This parameter ratio is used to find out the node quality in the WSN. The node Quality  $Q_n$  is measured by equation is given below.

$$Q_n = \frac{T_n + S_n + LS_n + R_n}{4} \quad (1)$$

Where

$T_n$  → Node Trust Ratio

$S_n$  → Node selfishness less Ratio

$LS_n$  → Link strength Ratio

$R_n$  → Responsibility Ratio

The expected node quality  $Q'_n$  is evaluated by neighbor node recommendation. The expected node quality is measured the equation is given below.

$$Q'_n = \frac{T_r + S_r + LS_r + R_r}{4} \quad (2)$$

where

$T_r \rightarrow$  Node Trust Ratio

$S_r \rightarrow$  Node selfishness less Ratio

$LS_r \rightarrow$  Link strength Ratio

$R_r \rightarrow$  Responsibility Ratio

From the above equations the expected and actual node Quality values are compared, If  $Q(n) \approx Q'(n)$ , then the node 'n' is a Normal Node otherwise it is considered as an adversary.

The flowchart of EAAD scheme is shown in figure 3. Initially the source node sends route request to its neighbors. The neighbor nodes receive the route request and send back the route reply back to the source node. While getting route reply, the source node checks the behavior of the node. The behavior of the node includes the following key parameters: selfishness, trust, responsibility and link strength. Also the expected node behavior is calculated.

Compare both the values. If the calculated node behavior is approximately equal to that to the expected node behavior, then the node is the normal node and data is communicated to that node. Else the node is called the adversary node and the notification messages are sent to all other nodes in the network.

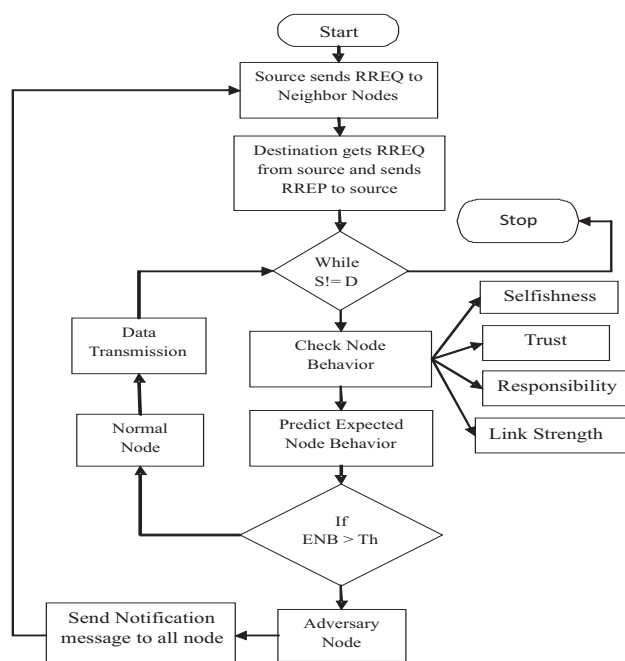


Fig. 3. Flowchart of EAAD scheme

## Performance Evaluation

Evaluation of the protocols EAAD and MUD is achieved using simulations in the network simulator. Such simulations use the common parameters indicated in Table 1. Performance evaluation of the EAAD, MUD protocols are provided by estimating the Packet Delivery Rate, Packet Loss Rate, Delay Rate, throughput in the network.

Table 1: Simulation Parameters of EAAD

Parameter	Value
Channel Type	Wireless Channel
Radio Propagation model	TwoRayGround
Network interface type	WirelessPhy
Antenna Type	OmniAntenna
MAC type	802.11
Simulation Time	50 s
Number of nodes	50
Transmission range	250m
Traffic model	CBR
Simulation Area	1000x1000

The simulation is done by using the simulator NS2. Network simulator is a discrete event time driven simulator. NS2 is open source software which uses C++ and Tool Command Language (TCL) for simulation. C++ is used for packet processing and fast to run. TCL is used for simulation description and used to manipulate existing C++ objects. It is faster to run and change. NS2 is widely used to simulate the networking concepts.

## Packet Delivery Rate

Packet delivery Rate is defined as the ratio of total data packets received by the destination to total send packets by source multiplied with number of receivers. The PDR is calculated by the equation (3).

$$PDR = \frac{\text{Total Pack Received}}{\text{Total Pack Send}} \quad (3)$$

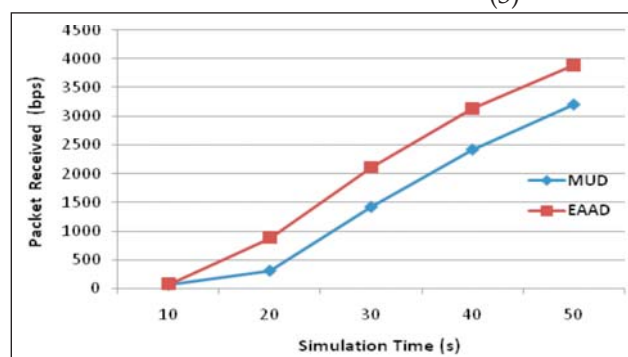


Fig. 4. Packet Delivery Rate



From figure 4, the proposed protocol EAAD that increases the packet delivery rate compared to the existing protocol MUD. In EAAD, transmit the data through the reliable routing path as a result increase the PDR but MUDdecreases PDR because of it transmit the data through the adversary path.

**Packet Loss Ratio (PLR)**

The Packet Loss Rate (PLR) is the ratio of the number of packets dropped to the number of data

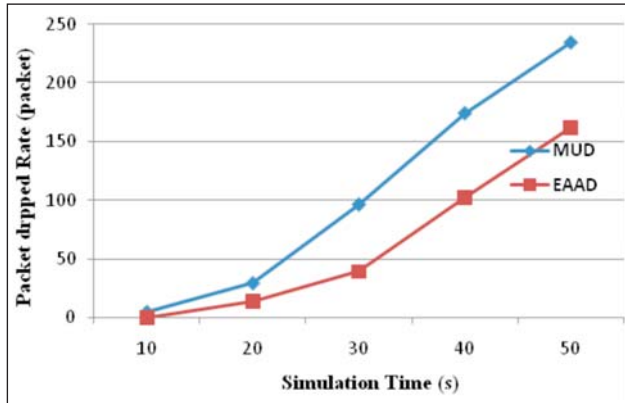


Fig. 5. Packet Loss Rate

packets sent. The PLR is calculated by Equation (4).

$$PDR = \frac{\text{Total Pack Received}}{\text{Total Pack Send}} \quad (4)$$

The figure 5 indicates the packet loss rate of the proposed protocol is lesser than the MUDprotocol showing the efficiency of the EAAD.

**Delay**

Delay is defined as the average time that a packet takes to transmit the network from source to destination. It is measured by Equation (5).

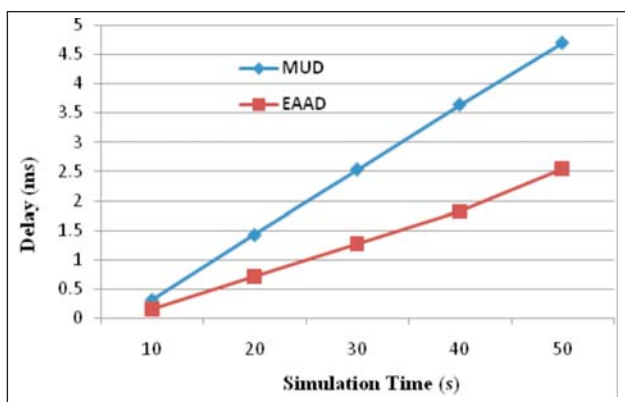


Fig. 6. Delay

$$\text{Delay} = \frac{\text{Pack Recvd Time} - \text{Pack Sent Time}}{\text{time}} \quad (5)$$

Figure 6 demonstrate that the delay of EAAD and MUD. The average delay of the MUD is larger than the EAAD. It indicating the improved performance of the EAAD protocol.

**Throughput**

Throughput is the average of successful messages delivered to the destination. The average throughput is estimated using equation 6 below.

$$\text{Throughput} = \frac{\sum_0^n \text{Pkts Received } (n) * \text{Pkt Size}}{1000} \quad (6)$$

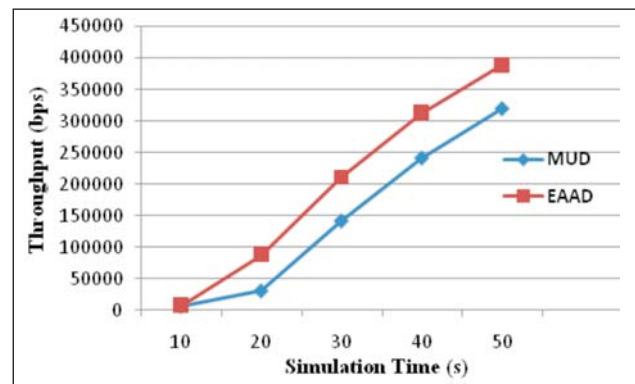


Fig. 7. Throughput

The figure 7 shows the performance of throughput of EAAD and MUD protocols. The throughput of MUD is lesser than the EAAD. It represents the increase in efficiency of the EAAD protocol in the network.

**CONCLUSION**

An efficient approximation based adversary detection mechanism is proposed for wireless sensor networks in this paper. This scheme uses the input and output data. The input data describes the behavior of the node including selfishness, trust, responsibility and link strength. The output data describes the quality of service obtained by these parameters. The node is checked for normal or adversary node. Simulation results are carried out and are shown that the proposed method performs better compared to the existing method.

**Ethical Clearance:** Taken from St. Peters University Committee

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Enhanced three Layer Energy Efficient Clustering (ETLEEC) Algorithm for Wireless Sensor Networks

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## ABSTRACT

Providing route stability is considered to be crucial task in Wireless Sensor Networks (WSNs). Hierarchical topology is considered to preserve the energy of the sensor networks in which the nodes with the higher residual energy is used to gather the data. However, most of the existing methods on clustering have adopted a two-layer hierarchy. This paper proposes an Enhanced Three Layer Energy Efficient Clustering (ETLEEC) algorithm for WSNs. The proposed method uses an extra layer called the lattice head where the cluster head collects the information from sensor nodes and sends it to the lattice head which in turn send to the base station. Simulations are performed in network simulator and the results show that the proposed system is more efficient in terms of energy and quality of service compared to all other existing distributed algorithms.

**Keywords:** *Wireless Sensor Networks, Quality Of Service, Clustering, Network Simulator.*

## INTRODUCTION

Wireless Sensor Networks (WSNs) have recently emerged as a platform for several applications including military surveillance, environmental monitoring, health monitoring, sea monitoring and tide monitoring<sup>[1,2]</sup>. WSNs consists of hundreds to thousands of tiny sensor nodes equipped with sensing, processing data and communication units to perform distributed sensing tasks. Energy conservation is considered as the most important challenge in order to guarantee the connectivity of the network and extend the lifetime of the sensor nodes.

Hierarchical or cluster-based design is an approach to conserve the energy of the sensor devices since only some nodes called cluster heads (CHs) are allowed to communicate with the Base Station (BS). The CHs collect the data sent by each node in that cluster, compress it and then transmit the aggregated data to the BS. By grouping the nodes into clusters with the assistance of data aggregation and fusion techniques, efficient usage of energy resource is obtained since the overall amount of data transmitted to the BS is significantly decreased, intra-cluster communication enables to reduce the transmission distance of non-CH nodes and then reduce energy consumption.

Different approaches are proposed to obtain energy efficient communication for the WSNs<sup>[3, 4]</sup> of which cluster based is one such scheme. Several clustering

schemes have been proposed such as from a system level design<sup>[5]</sup> using energy prediction<sup>[6]</sup> based on position information<sup>[7]</sup> and multi-hop routing consideration<sup>[8]</sup>.

### The main contribution of this paper includes

- Clustering or grouping the nodes in the network.
- Proposing the Enhance Three Layer Energy Efficient Clustering (ETLEEC) algorithm for WSNs.
- Analyzing the efficiency of the ETLEEC algorithm in terms of Quality of Service (QoS) and energy.

This rest of this paper is organized as follows. Section 2 describes the related work. In Section 3, the proposed method (i.e.) Enhanced Three Layer Energy Efficient Clustering (ETLEEC) algorithm for WSNs is presented. The simulation results and comparative performance analysis is given in section 4. Finally the conclusion is presented in Section 5.

### Related Works

A considerable research effort has been observed in recent years on improving the performance of localization in WSNs.

Low Energy Adaptive Clustering Hierarchy (LEACH), a clustering based protocol utilizes

randomized rotation of local cluster based station to evenly distribute the energy load among the sensors in the network<sup>[9]</sup>. LEACH uses localized coordination to enable scalability and robustness for dynamic networks and incorporates data fusion into the routing protocol to reduce the amount of information that must be transmitted to the BS. LEACH can achieve reduction in energy dissipation and is also able to distribute energy dissipation evenly throughout the sensors, doubling the useful system lifetime for the networks.

LEACH-Centralized (LEACH-C) was an improvement of LEACH which uses a centralized clustering algorithm to create the clusters<sup>[10]</sup>. In LEACH-C, the BS collects the information of the position and energy level from all sensor nodes in the networks. Based on this information, the BS calculates the number of CH nodes and configures the network into clusters.

Due to the limitation of power and memory size for WSN, the routing protocol of WSNs must maintain small routing information and reduce the power consumption as much as possible<sup>[11]</sup>. Use for reference of the ideas used in LEACH protocol of reducing power dissipation, a Three Layered routing protocol for WSN based on LEACH (TL-LEACH) was proposed. In the TL-LEACH, the selection of CHs is a bottom-up approach. The layer-1 CHs are selected from the layer-0 sensor nodes and then the layer-2 CHs are selected from the layer-1 CHs. The improved LEACH protocol show that TL-LEACH protocol was with greatly improved WSN lifetime than LEACH protocol.

A centralized clustering protocol were developed using Fuzzy C-Means (FCM) algorithm where the sensor nodes are grouped into clusters with a degree of belonging to each cluster rather than hard partitioning them into only one cluster<sup>[12]</sup>. The FCM algorithm assists to optimize the clusters based on minimizing the distance between the sensor node and the cluster center. This method guarantees a uniform creation of clusters in randomly deployed sensor networks.

Power Efficient Gathering in Sensor Information Systems (PEGASIS) an optimal chain based protocol is an improvement over LEACH protocol<sup>[13]</sup>. In PEGASIS, each node communicates only with a close neighbor and takes turns transmitting to the BS, thus reducing the amount of energy spent per round. Simulation results show that PEGASIS performs better

than LEACH for different network sizes and topologies.

Adaptive Energy Efficient Multi-layered Architecture (EEMA) protocol for large-scale sensor networks divides the network into some layers as well as each layer into some clusters, where the data are gathered in the first layer and are recursively aggregated in upper layers to reach the BS<sup>[14]</sup>. Many criterions are wisely employed to elect head nodes, including the residual energy, centrality and proximity to bottom-layer heads. Performance evaluation is performed via simulations which confirm the effectiveness of the EEMA protocol in terms of the network lifetime and reduced routing delay.

### Enhanced Three Layer Energy Efficient Clustering (ETLEEC) algorithm

In this paper, the first order radio model has been adopted to model the energy dissipation which includes the transmitter energy dissipation model and thereceiver energy dissipation model. The transmitter consumes more energy than the receiver. Let us consider that  $E_{Tx}(m, d)$  is the energy dissipation for transmitting  $m$  bits over distance  $d$  and  $E_{Rx}(m)$  is the energy dissipation by receiving  $m$  bits. The radio energy dissipation model can be formulated by equations 1 and 2.

$$E_{Tx}(m, d) = \begin{cases} E_{elec} * m + \epsilon * m * d^2, & d \leq d_0 \\ E_{elec} * m + \epsilon * m * d^4, & else \end{cases} \quad 1$$

$$E_{Rx}(m) = E_{elec} * m \quad 2$$

where  $E_{elec}$  and  $\epsilon$  are constants decided by the environment,  $d$  is the distance between the receiver and transmitter,  $d_0$  is a threshold value depending on the initiation setting and the exponent  $n$  is determined by comparing the distance  $d$  with the threshold which equals 2 or 4.

The assumptions in the proposed work are as follows:

- After deployment all the sensor nodes and BS are static.
- The radio link is symmetric such that the energy consumption of data transmission from node A to node B is same as that of the data transmission from node B to node A.

- All the sensor nodes have the same amount of initial energy.
- The distance between nodes is computed based on the received signal strength (RSS).

Figure 1 shows the Enhanced Three Layer Energy Efficient Clustering scheme. The network is classified in three layers including the sensor nodes, CHs, LatticeHeads (LHs) and the BS. The layers are classified into layer-3 (BS), layer-2 (LHs), layer-1 (CHs) and layer-0 (sensor nodes). The sensed information is transmitted from the sensor nodes to the BS through the CH and LH layer.

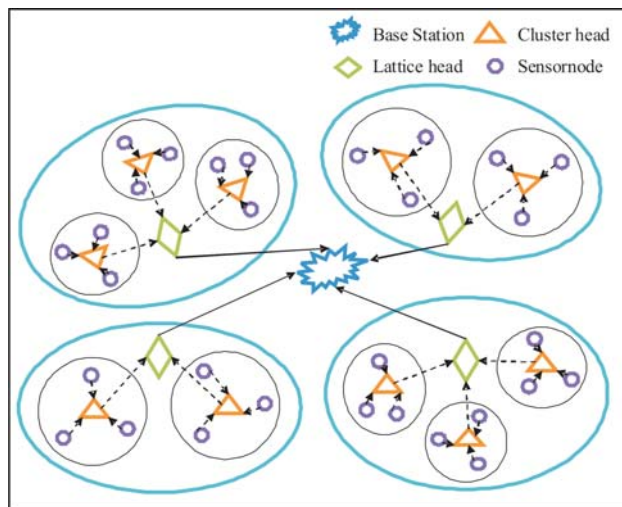


Fig. 1. ETLEEC scheme

The ETLEEC method selects the lattices and clusters in each round as considered to LEACH protocol. Initially all the sensor nodes in the communication network will send the location information to the BS so as to select the LH. After receiving the reply messages from the BS, the sensor node would determine whether the particular sensor node is a LH and the nodes that belong to the particular lattice. If the particular sensor node is a LH, the node would broadcast the LH message and waits for the join request messages from lower level CHs. The remaining non LH nodes in each round select the CHs using the distributed LEACH approach.

As a node has been selected as a CH, it would broadcast the CH-Message and wait for receiving JOIN-REQ messages from the cluster nodes. If a node which is not a CH receives the CH-Message, the node selects the closest CH in the same lattice as its CH and sends a JOIN-REQ request to the head. After a defined period, each CH would create its corresponding Time Division Multiple Access (TDMA) schedule and send

to the cluster members. In the steady-state phase, each sensor nodes could send the data to its CH according to this schedule. The CH will fuse the data from all its sensor nodes and transmit to its corresponding LH using a Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) mechanism. Then the LH will route the packets from the CH directly to the BS without performing data fusion and also use the CSMA/CA mechanism. Simulation is then performed for the proposed ETLEEC scheme.

### Performance Evaluation

The performance of ETLEEC is analyzed by using the Network Simulator version-2 (NS2). NS2 is an open source programming language written both in C++ which is used in back end and Object Oriented Tool Command Language (OTCL) which is used in front end. NS2 is a discrete event time driven simulator which is used to mainly model the network protocols. The nodes are distributed in the simulation environment in the communication network. The parameters used for the simulation of ETLEEC are shown in Table 1. The simulation of the proposed ETLEEC has 50 nodes deployed in the simulation area 1000×1000m.

The nodes are communicated with each other by using the communication protocol User Datagram Protocol (UDP). The nodes are moved randomly within the simulation area by using the mobility model Random Way Point (RWP). The radio wave is propagated by using two ray ground propagation models. The traffic in the network is handled using the traffic model Constant Bit Rate (CBR). All the nodes receive the signal from all direction by using the Omni directional antenna. The performance of the ETLEEC is evaluated by using the parameters packet delivery rate, packet loss rate, average delay, throughput, residual energy and network lifetime.

Table 1: Simulation parameters of ETLEEC

Parameter	Value
Channel Type	Wireless Channel
Simulation Time	50 s
Number of nodes	50
MAC type	802.11
Traffic model	CBR
Simulation Area	1000×1000
Transmission range	250m
Network interface Type	WirelessPhy
Mobility Model	Random Way Point

### Packet Delivery Rate

Packet Delivery Rate (PDR) is the ratio of number of packets delivered to all receivers to the number of data packets sent by the source node in the communication network. The PDR value is calculated by equation 3.

$$PDR = \frac{\text{No of packets received}}{\text{No of packets send}} \quad 3$$

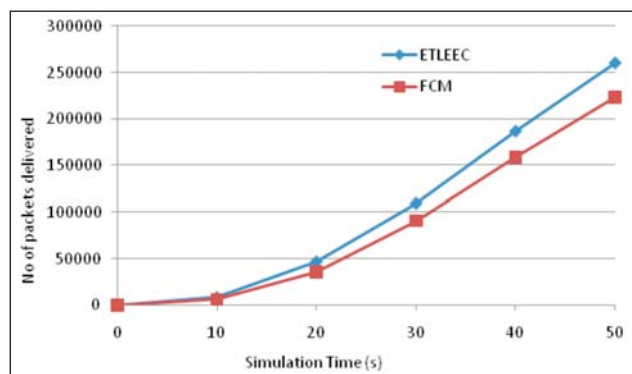


Fig. 2. Packet Delivery Rate

The figure 2 shows the PDR of the proposed scheme ETLEEC is higher than the PDR of the existing method FCM. The greater value of PDR means the better performance of the protocol in the network.

### Packet Loss Rate

The Packet Loss Rate (PLR) is the ratio of the number of packets dropped to the number of data packets sent from the source node in the network. The PLR is calculated using equation 4.

$$PLR = \frac{\text{No of packets dropped}}{\text{No of packets send}} \quad 4$$

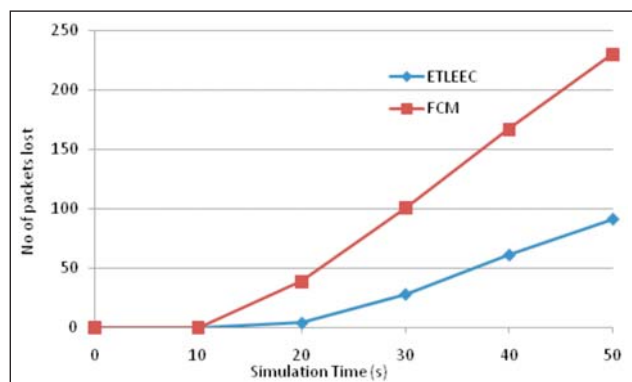


Fig. 3. Packet Loss Rate

The PLR of the proposed scheme ETLEEC is lower than the existing scheme FCM in Figure 3. Lower the PLR indicates the higher performance of the network.

### Average Delay

The average delay is defined as the time difference between the current packets received and the previous packet received. The delay in the network degrades the performance of the network. The average delay in sending data from source to destination is calculated by equation 5.

$$\text{Delay} = \text{Current pkt rcvd Time} - \text{Prev pkt rcd time} \quad 5$$

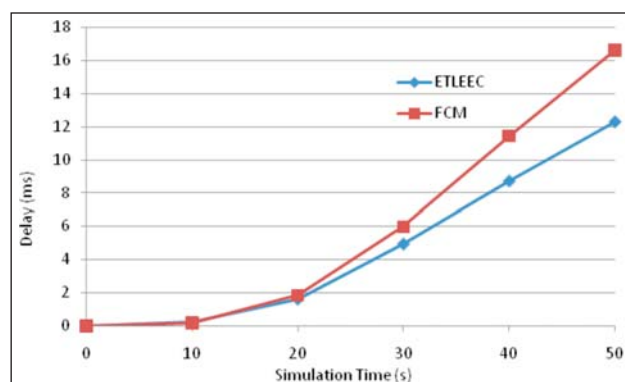


Fig. 4. Average delay

Figure 4 shows that the delay value is low for the proposed scheme ETLEEC than the existing scheme FCM. The minimum value of delay means that higher value of the throughput of the network.

### Throughput

Throughput is defined as the average of successful messages delivered from the source to the destination. The throughput is defined using equation 6.

$$\text{Throughput} = \text{Pkts Received (n)} * \text{Pkt Size} * 100 \quad 6$$

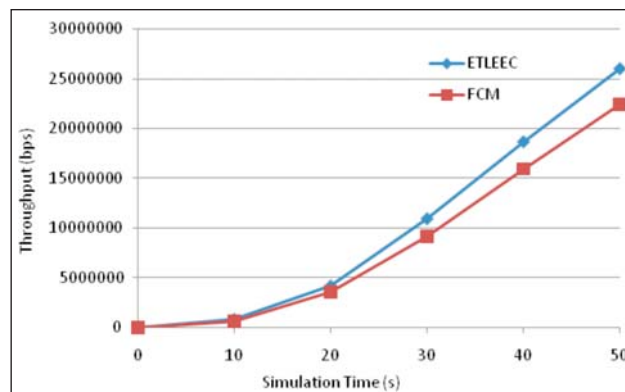


Fig. 5. Throughput

Figure 5 shows that proposed scheme ETLEEC has greater throughput when compared to the existing scheme FCM.

### Residual Energy

The amount of energy remaining in a node at the current instance of time is called as residual energy. A measure of the residual energy gives the rate at which energy is consumed by the network operations.

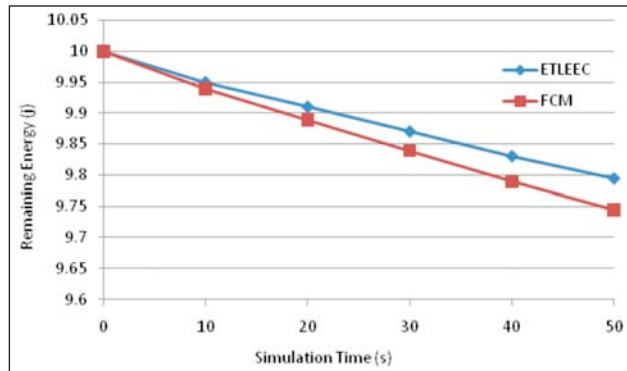


Fig. 6. Residual energy

The residual energy of the communication network is better for the proposed ETLEEC when compared with the existing scheme FCM as in figure 6.

### Network Lifetime

Network lifetime is defined as the number of the data collection round until the first sensor node of the network dies as a result of depleting its energy resources.

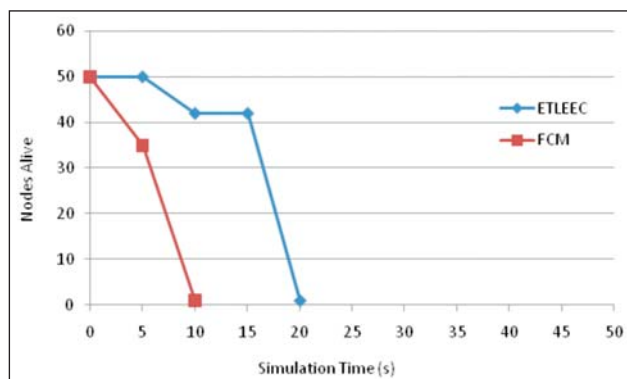


Fig. 7. Network Lifetime

Figure 7 shows that both the ETLEEC and the FCM curves fall steeply after the death of the first node. This is a clear indication that there is maximum utilization of nodes' energy before the entire network dies.

## CONCLUSION

The main intend of this proposed work is to prolong the lifetime of a sensor network for a given fixed amount of energy. Based on a three-layer hierarchy, this paper has proposed a semi-distributed clustering approach by considering a hybrid of centralized gridding at upper levels and distributed clustering at lower levels. Simulation results show that ETLEEC algorithm improves the lifetime of the network and is more efficient than other fully distributed algorithms LEACH and TL-LEACH.

**Ethical Clearance:** Taken from St Peter's University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Placement of Supportive Jammers for Secured Communication Protocol in Wireless Network

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## ABSTRACT

Jammers are placed in the network in order to block the eavesdropper's signals to the users. The physical layer should be prevented from the deceptive and random attacks possessed by the adversary nodes. The main objective is to provide secured information from the source to destination by placing cooperative jammer nodes. Reactive-Supportive jammers with selective relays are proposed for providing physical layer security. To reduce high computational complexity in the upper layer protocol stack security is provided in the physical layer. Based on receiving signal strength the signal to noise ratio is determined. Message encryption is done in the physical layer stack so that anonymous users cannot inject their false data in the original message. Here supportive jammers are used to hinder the eavesdropper from intercepting the exact message generated by the source.

**Keywords:** Reactive-Supportive Jammers, Physical Layer Security, Cooperative Jammer Nodes, Wireless Networks.

## INTRODUCTION

In modern wireless communication security and privacy have become an increasingly indispensable part. Wireless sensor nodes in the network are deployed in order to transmit sensitive information such as financial data, health monitoring, civilian and military application. Hence securing the information and preventing from the adversaries is essential. Adversary nodes are malicious attacker nodes which injects false information into the network to collapse the entire scenario.

Commonly cryptographic methods are used to provide security at the upper layer of network protocol. However the computational complexity is higher while computing in the application layer. Cryptographic techniques involve private key exchange for providing security and this leads to additional complexities and redundancies. These computational complexities are reduced by using physical-layer security method. Providing security in physical layer ensures secure communication by taking advantage of the physical characteristics of wireless channels, has attracted increasing attention.

An efficient solution to meet up this challenge is to improve the legitimate transmission by cooperative relaying or confuse the eavesdroppers via supportive jamming. Confidentiality rate and outage probability are determined for the physical layer security based on the received signal strength.

## Related Works

An adversary node can repeatedly transmit a radio signal in order to block any legitimate access to the medium and/or interfere with reception of the incoming information. This act is called jamming and the malicious nodes are referred to as jammers<sup>[1]</sup>. The jammers cause the effective network activity factor and hence the interference among the BSs to be doubled. In particular, a non-trivial behavior is seen that indicates that the number of jammers required to attack the wireless network must scale with the BS density only until a certain value beyond which it decreases<sup>[2]</sup>.

Wormhole Attack Detection Algorithms<sup>[3]</sup> used to detect wormholes and show its correctness rigorously. Distributed detection Algorithm against Wormhole coding systems (DAWN) exploring the change of the

flow directions of the innovative packets. DAWN guarantees a good lower bound of successful detection rate. Depends on the node density the robustness in the network can be found, and this provides a necessary condition to achieve collusion-resistance.

Efficient Cooperative Watchdog Monitoring method <sup>[4]</sup> efficiently detects pollution attacks in a lossy wireless environment. This method cooperatively share the packet information, reduce the overhead to normal transmission nodes, and rather than retransmitting all lost packets among watchdogs. Watchdogs use randomly generated Vander monde hashes to detect corrupted packets and capable of detecting successive colluded adversaries. In addition, it achieves low computational complexity and communication overhead.

Secrecy Rate Optimization for Secure multicasting Scheme <sup>[5]</sup> transmitter broadcasts the similar information to a group of legitimate users in the presence of eavesdroppers. This scheme functions are minimized the power and maximized the secrecy rate. These jammers charge the transmitter for their jamming services based on the amount of the interference caused to the eavesdroppers. Stackelberg equilibrium is derived to maximize the revenues of both the transmitter and the private jammers.

Source-Based Jamming (SBJ) scheme <sup>[6]</sup> is proposed to improve the secrecy performance of untrusted relay networks. In this scheme, the direct link is utilized in secure transmission and provides flexibility cooperation. The average secrecy capacity is maximized by using SBJ scheme, from which the power of the information and jamming signals; power of the source and relay nodes are optimally allocated.

Secure Communication approaches <sup>[7]</sup> establish data confidentiality and reliable communication directly at the physical layer of a communication network by taking the properties of the noisy channel into account leading to unhampered security regardless of the computational capabilities of eavesdroppers. Particularly in wireless communication systems the provision of accuracy in channel state information is a major challenge, mainly information about the channels to eavesdroppers. In addition, there might be malevolent adversaries (attackers) who jam or influence the channel of the legitimate users.

Authentication framework with Conditional Privacy-preservation and Non-repudiation (ACPN) <sup>[8]</sup>

protocol was introduced; here public-key cryptography (PKC) with the pseudonym generation ensures legal third parties to accomplish the non-repudiation of vehicles by finding the vehicles' real IDs. The self-generated PKC-based pseudonyms are also used as identifiers instead of vehicle IDs for the privacy-preserving authentication. The ID-based signature (IBS) scheme and the ID-based online/offline signature (IBOOS) scheme are used to authentication between the Road Side Units (RSUs) and vehicles, and the authentication among vehicles, respectively.

Ant Colony Optimization <sup>[9]</sup> analyzed with the application of shortest path algorithm in Virtual Private Network. Distributed jammer network (DJN) [10] that analyze the impact of jammer on the connectivity of the target network, and provide lower and upper bounds for the percolation of the target network. The scaling analysis of the jamming performance was provided in relation to the jammer node density with the power density constraint.

Anti-jamming Interference Alignment (IA) <sup>[11]</sup> is an effective method for battling adversarial jammers for IA networks. An anti-jamming opportunistic IA (OIA) scheme with wireless EH (Energy Harvesting) that optimizes the transmission rate and minimize the energy consumption in the networks. This scheme used to make the anti-jamming IA network feasible. The transmit power and power partition coefficient are jointly optimized to minimize the total transmit power of the OIA network. This scheme reduces the computational complexity of the joint optimization. An anti-jamming channel hopping approaches without pre-shared secrets have gained more and more research interests. An anti-jamming channel hopping scheme, Sec-CH. Sec-CH has bounded time to rendezvous and can work without role pre-assignment<sup>[12]</sup>.

Security-Reliability Tradeoff for Friendly Jammer Assisted User-Pair Selection explored the physical-layer security in a wireless network consisting of multiple user pairs in the face of multiple eavesdroppers that are deployed by an adversary for tapping the confidential transmissions of the user pairs deliberately. A friendly jammer-assisted user-pair selection (FJaUPS) scheme used to improve the security-reliability tradeoff (SRT). Friendly jammer is used to transmit the artificial noise that is specially designed onto the null space of the main channel for the sake of not interfering with the destination. The impacts of the friendly jammer on the legitimate user

transmissions and eavesdroppers are taken into account for evaluating the wireless SRT performance that are quantified by the so-called self-interfering factor and jamming factor, respectively [13].

**PROPOSED METHOD**

Physical layer security approach initially implemented by Shannon and later developed by Wyner by exploiting randomness and reciprocity of wireless channels in order to ensure the secrecy of the transmitted message. The cross layered protocols is implemented for physical layer security and this protocols are designed with the combination of cryptographic techniques. To compute the security of the message computational cost is considered. Message secrecy rate and the probability of achievable secrecy rate of the message are computed.

Privacy key is generated in the physical layer stack so that the adversary node cannot inject false information in the middle process. Reactive-Supportive Jammers (RSJ) are selected from the network and these jammers continuously send jamming signals to block the signals emitted from the adversary node. The jammers cannot block all the eavesdropper signals however the multiple eavesdroppers with unknown location information. The efficient secrecy rate and outage probability is computed at the layer 1 level to transmit the secured message. Message secrecy rate and outage probability is determined so that the actual achievable secrecy rate can be determined.

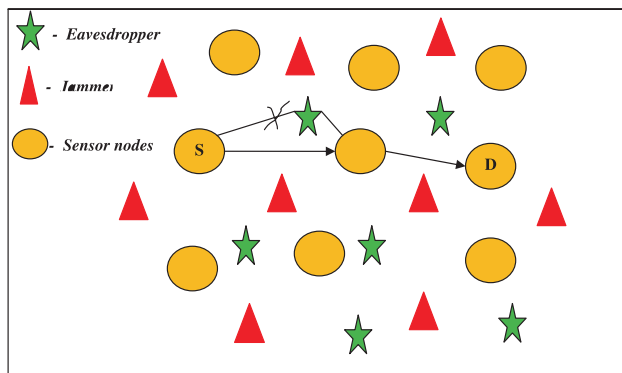


Fig. 1. Jammers and Eavesdroppers

**Message Secrecy Rate**

The achievable secrecy rate of the transmitted message from the source node to destination node over the wireless channel is measured and this rate should be entirely hidden from the eavesdroppers. Through

this the performance reliability is evaluated in terms of its probability of error while the source node s transmits the message to the destination node at certain secrecy rate  $R_{sd}$ .

$$R_{sd} = [\log_2(1 + \theta_{sd}) - \log_2(1 + \theta_{se})]^+ \quad 1$$

The performance reliability is measured in terms of its error probability. The transmitted messages from source to destination are passed at certain secrecy rate  $R_{sd}$ . The achievable secrecy rate can be improved if the jammer-eavesdropper channel is strong enough (i.e., jammer should emit high jamming signal comparing to the eavesdropper signal).

**Outage Probability**

The outage probability is the measure of performance of successful achievable message secrecy rate. This can also be measured by finding the probability that a specific transmission rate is not supported. The outage probability is commonly defined as the probability that the actual transmit rate is larger than the achievable secrecy rate

$$P(R_{sd}) = 1 - [\log_2(1 + \theta_{sd}) - \log_2(1 + \theta_{se})]^+ \quad 2$$

In cooperative jamming, cooperation is implemented by injecting additional noise to the wireless channel since the destination D has a better (less noisy) channel than the eavesdropper E, the legitimate parties S and D may have positive secrecy capacity. If eavesdropper node has a channel advantage over Destination node then it results in zero secrecy capacity between S and D. Therefore jammer J should sense and inject noise while S is delivering a message to D according to the eavesdropper's signal range. If the jammer J injects additional noise, the achievable secrecy rate  $R_{sd}$  becomes,

$$P(R_{sd}) = \left( \log_2 \left( 1 + \frac{\theta_{sd}}{1 + \theta_{sd}} \right) - \log_2 \left( 1 + \frac{\theta_{se}}{1 + \theta_{se}} \right) \right)^+ \quad 3$$

The cooperative jamming makes both (eavesdropper and jammer) channels noisier than they actually are, resulting in a lower signal to noise ratio by placing Reactive-Supportive jammers in the network. If the jammer-eavesdropper channel is strong enough then the achievable secrecy rate gets improved further (i.e., if jamming hurts the eavesdropper more than the legitimate receiver).

### Simulation Analysis

The performance of an existing system SBJ compared against the proposed RSJ system, which presented in this paper using simulation results. A scenario of 50 nodes randomly deployed in an area of 1000x1000m which is shown in the Table 1. In order to analyze the performances the simulation tool Network simulator (NS2) is used, performance of the proposed scheme is evaluated by the parameters packet delivery ratio, packet loss ratio, average delay and throughput. The traffic in the network is handled using Variable Bit Rate (VBR). The radio waves are propagated by using the propagation model two-ray ground. All the nodes receive the signal from all direction by using the Omni directional antenna

Table 1. Simulation Parameters of PIIA

Parameter	Value
Number of nodes	50
Routing scheme	RSJand SBJ
Traffic model	VBR
Simulation Area	1000x1500
Channel	Wireless Channel
Transmission range	250m
Communication Protocol	TCP
Antenna	Omni Antenna

### Packet Delivery Rate

The ratio of the total number of packets delivered successfully to the packets sent in total is said to be packet delivery ratio. It is obtained from the equation (4) below.

$$PDR = \frac{\text{Total Packets Received}}{\text{Total Packets Send}} \quad 5$$

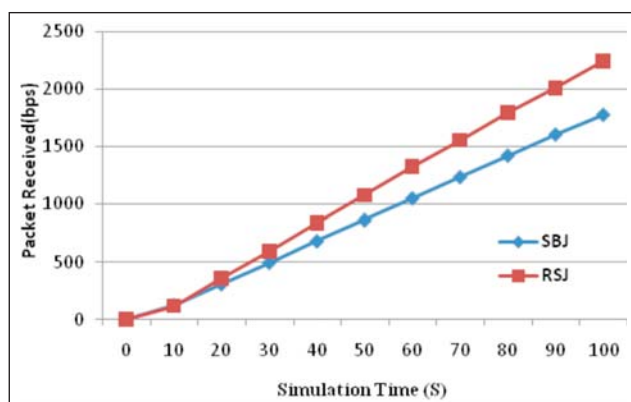


Fig. 2. Packet delivery rate

The Figure 2 shows the PDR of the proposed scheme RSJ is higher than the PDR of the existing method SBJ. The greater value of PDR means better performance of the protocol.

### Packet Loss Rate

Packet Loss Rate (PLR) is the ratio of the packets lost to the total packets sent, estimated by the equation (5) below,

$$PLR = \frac{\text{Total Packets Dropped}}{\text{Total Packets Send}} \quad 5$$

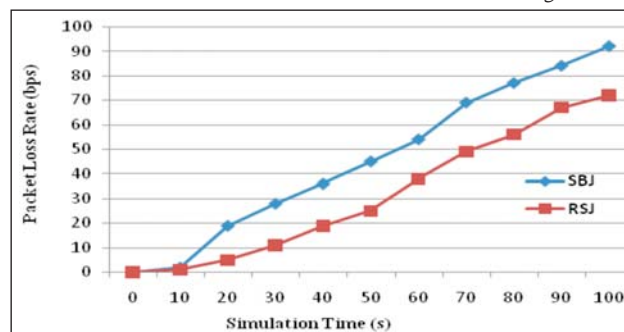


Fig. 3. Packet loss rate

The packet loss rate of the proposed scheme RSJ is lower than the existing scheme SBJ in Figure 3. Lower the PLR indicates the higher performance of the network.

### Average Delay

Delay is defined as the time difference between the current packets received and the previous packet received. The delay in the network degrades the performance of the network. The average delay is measured by equation 6.

$$\text{Delay} = \frac{\sum_{0}^n \text{Pkt Send Time} - \text{Pkt Recvd Time}}{\text{Time}} \quad 6$$

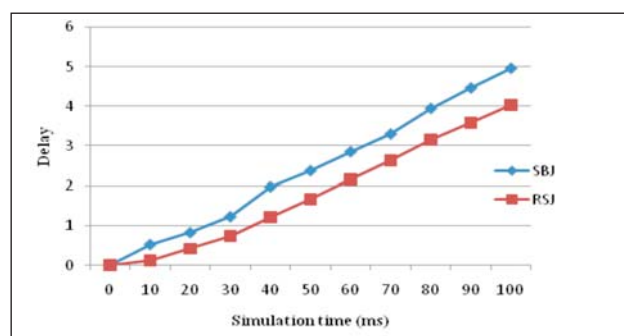


Figure 4. Average delay

Figure 4 shows that the delay value is low for the proposed scheme RSJ than the existing scheme SBJ. The minimum value of delay means that higher value of the achievable throughput of the network.

### Throughput

Throughput is defined as the rate of overall successful transmission of data in the network. The average throughput is estimated using equation 7.

$$\text{Throughput} = \frac{\sum_0^n \text{Pkts Received}(n) * \text{Pkt Size}}{1000} \quad 7$$

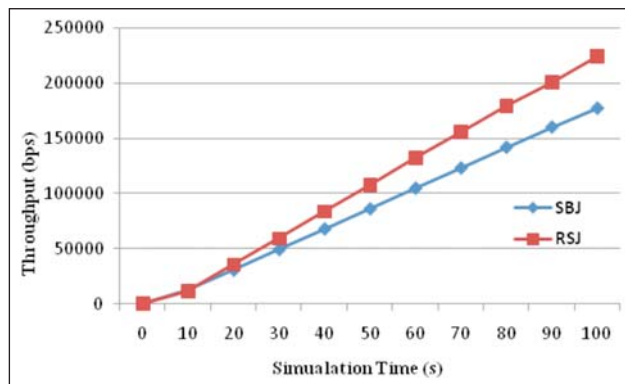


Fig. 5. Throughput

Figure 5 show that the proposed scheme RSJ has greater average throughput when compared to the existing scheme SBJ.

### CONCLUSION

The secured information is passed from the source to destination by placing cooperative jammer nodes in the network. The scheme RSJ with selective relays is proposed in this scheme for providing physical layer security. Here jammers are placed in the network in order to block the eavesdropper's signals to the users and to hinder the eavesdropper from intercepting the exact message generated by the source. The physical layer prevented from the deceptive and random attacks possessed by the adversary nodes. High computational complexity in the upper layer protocol stack security is provided in the physical layer and based on receiving signal strength the signal to noise ratio is determined. Message encryption is done in the physical layer stack so that anonymous users cannot inject their false data in the original message. The simulation result for the proposed scheme is evaluated

using packet delivery rate, packet loss rate, delay and throughput.

**Ethical Clearance:** Taken from St. Peters University Committee

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Sleep Scheduling for Energy Efficient Load Balance Routing in Heterogeneous Wireless Sensor Network

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## ABSTRACT

In energy constrained Wireless Sensor Networks (WSNs) is very important to preserve energy and prolong energetic network lifetime while ensuring the proper operation of the network. In this paper we propose Sleep Scheduling for Energy Efficient Load Balance Routing in Heterogeneous Wireless Sensor Network (EE\_LBR) to extend the lifetime of the network. The Sleep and awake scheduling utilized for reduce the energy consumption in the network. We also using Queue Priority Indicator (QPI) and Geographic Priority Indicator (GPI) are used to select the best relay node and find the efficient path. The QPI method is used the balance load and energy consumption. The Network simulation based performance evaluation shows that the EE\_LBR scheme to minimize the packet loss rate and energy consumption as well as increase the lifetime of the network and throughput.

**Keywords:** Energy, Load Balance, Routing, Sleep/Awake Scheduling, Queue Priority Indicator, Geographic Priority Indicator, Heterogeneous Wireless Sensor Network.

## INTRODUCTION

In Wireless sensor network (WSN) consists of number of sensor nodes that have inadequate resources among them energy is the most important one. It is complex, perhaps not possible to substitute or recharge those nodes batteries. Hence, energy is one of the crucial factors in wireless sensor network. To solve this problem, we use the heterogeneous node deployment for improving the network lifetime. Typical HWSNs consist of a large number of normal sensor nodes and a small number of heterogeneous nodes. The normal sensor node, whose main tasks are to sense and issue data report, is inexpensive and source-constrained. The heterogeneous node, which provides fusion, transport and data filtering is more costly and more proficient. It may possess one or more type of heterogeneous resource, e.g., enhanced energy capacity or communication capability. They may be line powered, or their batteries may be replaced easily. Compared with the normal nodes, they may be configured with more powerful microprocessor and more memory. They also may communicate with the sink node via high-bandwidth, long-distance network. The presence

of heterogeneous nodes in a wireless sensor network can increase network reliability and lifetime.

The goal of our proposed work is to increase the capable lifetime of a heterogeneous sensor network by scheduling a fraction of nodes to turn off their transceiver in each round while sensing unit and processor are turned on. The next hop will select based on the QPI and GPI which extend functional lifetime by maintaining balanced usage of energy.

<sup>1</sup>ProHet is a distributed routing protocol for WSNs that utilizes asymmetric links to reach assured delivery rate with low overhead. The ProHet protocol consists of two parts such as preparation part and routing part. In preparation part, identifying neighbor relationships and finding a reverse path for an asymmetric link. In routing part, select the forwarding nodes based on historical statistics using local information and send the message and acknowledgement. It addresses asymmetric links by finding reverse paths and improves reliability. <sup>2</sup>Optimal key management design for secure and survivable HWSN solved the multi-objective

optimization model and it develops a genetic algorithm obtains near-optimal solutions. This scheme results indicate that the balance the cost of the sensor network and maximize the flexibility of the sensor network with the necessary protection key connectivity constraint in different hostile environment, with a small percentage of the powerful sensor nodes.

<sup>3</sup>Energy Adaptive protocol for HWSN reduced to overall power consumption and maximize the network lifetime. Here, the cluster formation based on the nodes energy, number of cluster members and distance among cluster-heads and nodes. The cluster-head is selected by probability based on threshold per round. However, this scheme cannot provide the optimal threshold calculation in the network. <sup>4</sup>The perceived probability model is used to calculate the perceived probability in the heterogeneous wireless sensor nodes and transform virtual force algorithm. This model achieves the maximum coverage of the monitoring area. The result indicates that improving the network transmission range effect and minimizing the nodes movement distance thus prolong the lifetime of HWSN.

<sup>5</sup>Affinity Propagation Clustering based on Distances and Energy (APCDE) was proposed to solve the problem of uneven clustering in HWSN. The residual energy of the nodes and the distance between the nodes and base station were considered in the process of clustering to build the structure of uneven clustering. The dynamic multi-hop transmission mode was adopted in the process of data transferring. The APCDE algorithm can balance network energy utilization and extend the network life cycle powerfully. <sup>6</sup>A framework for key management scheme investigates the effect of heterogeneity. We show by simulations analysis that, with a small number of heterogeneous nodes, the wireless sensor network can achieve key connectivity, resilience and highest performance. <sup>7</sup>Energy-Efficient Range Assignment in HWSN to minimize the maximum transmission power consumed at each sensor nodes while maintaining a multi-hop communication path. This scheme proposed several algorithms for computing sensor range assignments such as: Integer Programming approach, a minimum spanning tree protocol and distributed

greedy protocol based on clustering. An Integer Programming solution offers optimal ranges but it is impractical in large-scale WSN deployment. The distributed greedy protocol provides a scalable solution for range assignment that indicates good scalability and linear improvement in network lifetime with super node population.

<sup>8</sup>Efficient and Hybrid Key Management for HWSN can improve network performance, such as connectivity, resilience and provide better security. In this scheme, cluster heads and base stations use public key encryption method depend on elliptic curve cryptography (ECC), while using symmetric encryption method between adjacent nodes in the cluster. In this method, communication between cluster heads and base station can establish a secure link through signature encryption algorithm. Diffie-Hellman (ECDH) key exchange algorithm based on ECC can be used to establish a shared symmetric key that is used for communicating between cluster head and nodes in its cluster, between energy-limited nodes in the cluster adopts one-way hash function to create a session key. This method can provide better security, connectivity, scalability and it can save storage space. However, this method needs relatively large energy in the network.

<sup>9</sup>Research on Coverage and Connectivity for HWSN analyzes the calculation of heterogeneous sensor and heterogeneous communication in WSN. Firstly, it classifies the heterogeneous WSN systematically, and put forward heterogeneous node model under communications heterogeneity and sensor heterogeneity. Secondly, it analyses the coverage calculation under two kinds of heterogeneous nodes. Thirdly, it analyses the simply connectivity and re-connectivity. Finally, it obtained the probability curve between the number of nodes and simply connectivity, re-connectivity. <sup>10</sup>Energy Aware Random Asynchronous Wakeup (RAW-E) used to reduce energy consumption without significantly affecting the latency and connectivity of the network. RAW-E is a distributed, randomized algorithm where nodes make local decisions on whether to sleep, or active state based on the energy level of its adjacent nodes. The RAW-E is the reduction



of energy disparity among sensor nodes. The results shows that the improvement on energy consumption and extension of connectivity life for heterogeneous sensor and actor networks. <sup>11</sup>An Enhanced Cluster-Head Selection Scheme for Distributed HWSN utilized heterogeneous node probability model based on energy threshold scheme. In this scheme, the cluster-head selection process ends up in less energy utilization that extends the network lifetime and stability. <sup>12</sup>Deployment Scheme for Lifetime Enhancement (LEDS) consider energy fairness problem in HWSN to conserve energy. This scheme prevents the problem of occurrence of energy holes and increase the network lifetime. The Game Theory model to provide packet transmission among sensor nodes and Nash equilibrium cannot be used by own performance metric and its designing own approach. However this scheme cannot perform in three dimensional networks.

**Proposed System**

In our work, we considered distributed heterogeneous Wireless Sensor Network, by deploying large number of limited power sensor nodes and small number of unlimited power nodes known as super nodes. These super consist of extra energy and coverage area. This scheme integrates awake/asleep schedules, routing, traffic load balancing.

In this scheme, the awake/ sleep scheduling is used based on the duty cycle approach. This schedule makes the sensor nodes are active or inactive state. The awake/sleep time is unfixed for each duty cycle. The sensor nodes are sleep or awake status depends on the sensor energy level. Hence, it extends the lifetime of the network. Initially every sensor nodes are having the sleep state. The sensor nodes are active state while sensing and data transmission. If any node transmit the data to Base station through the super node, this sensor node only awake another nodes are go to seep state. Hence highest amount of energy can be saved during data communication and reduce the overhead due to the next node will be set to sleep state in the network.

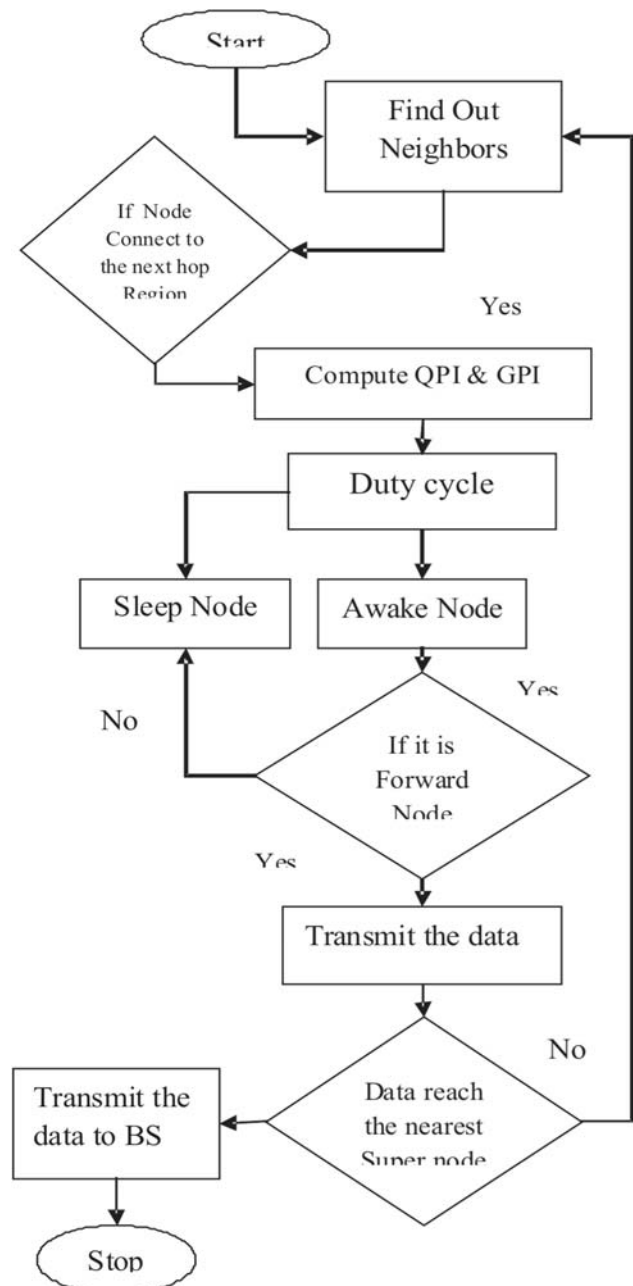


Fig. 1. Flowchart of the EE\_LBR Scheme

To make synchronization between source and destination and neighbor node use RTS/CTS. Data forwarding is enforced by having the source polling for availability its awake neighbors by broadcasting RTS packet for jointly performing channel access and communicating relevant routing information. Presented neighboring nodes respond with clear-to-send (CTS) packet carrying information through which the source can decide the best relay.

**In the proposed scheme, the best relay node selection is characterized by two parameters**

- Queue priority indicator (QPI),
- Geographic priority indicator (GPI).

The queue priority indicator is calculated based on the burst size of the packet communication and their moving average and the number of packets in suitable relay queue.

Where,  $QPI = \min\{[P+ B/ M]Q\}$  (1)

**P** → The number of packets queue of the nodes suitable for relay

**B** → Burst Packet size of the packet communication

**M** → Moving average of the packets

**P**→ Maximum permitted QPI

The QPI method is used to balance the load and energy consumption. The geographic priority indicator (GPI) is assigned by the range of the distance of each node from the Base Station. The every node location information is measured through the GPS. This relay choice is executed by neighbors offering superior performance in multi-hop data transmission. It increases energy efficiency, packet delivery rate, and decreases the latency.

The figure 1 shows that the flowchart of the proposed scheme. The source node discovered the neighbors within the transmission range. These nodes contain the nearest neighbor node that nodes compute the GPI and QPI. Check these nodes are sleep or awake state. The awake node is selected as the relay node. This node connects the nearest super node. It directly communicates the base station.

**Performance Evaluation**

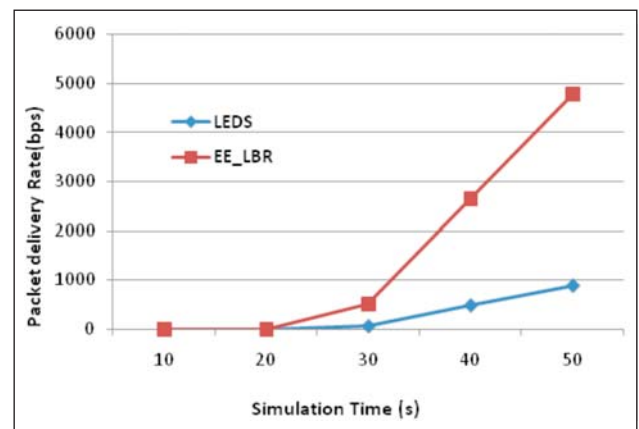
We have developed a simulator using NS-2. It is a discrete event simulation framework, to evaluate the performance of our protocol. All simulations were based on a network of dimension 1000x1000. The parameters used for the simulation of the EE\_LBR are tabulated in Table 1. The simulation of the proposed scheme has 52 nodes deployed in the simulation area.

The nodes are communicated with each other by using User Datagram Protocol (UDP). The traffic is handled using the traffic model CBR (Constant Bit Rate). The radio waves are propagated by using the propagation model two-ray ground. All the nodes receive the signal from all directions by using the Omni directional antenna. The performance of the proposed scheme is evaluated by the parameters packet delivery rate, packet loss rate, average delay, throughput and residual energy.

**Table 1. Simulation parameters of EE\_LBR**

Parameter	Value
Channel Type	Wireless Channel
Simulation Time	50 s
Number of nodes	52
MAC type	802.11
Traffic model	CBR
Antenna Model	Omni Antenna
Simulation Area	1000x1000
Transmission range	250m, 180m
Network Interface Type	WirelessPHY

**Packet Delivery Rate**



**Fig. 2. Packet delivery Rate**

Packet Delivery Rate is the ratio of number of packets delivered to all receivers to the number of data packets sent by the source node. The packet delivery rate is calculated by Equation 2.

$$PDR = \frac{Total\ Pkts\ Recvd}{Total\ Pkts\ Send} \quad (2)$$

Observations from figure 2 represent that the EE\_LBR scheme reaches a better packet delivery rate than the existing method Leds. The greater value of

packet delivery means the improved performance of the protocol.

**Packet Loss Rate**

The Packet Loss Rate (PLR) is the ratio of the number of packets dropped to the number of data packets sent. The packet loss rate is calculated by Equation.2.

$$PDR = \frac{\text{Total Pkts Dropped}}{\text{Total Pkts Send}} \quad (2)$$

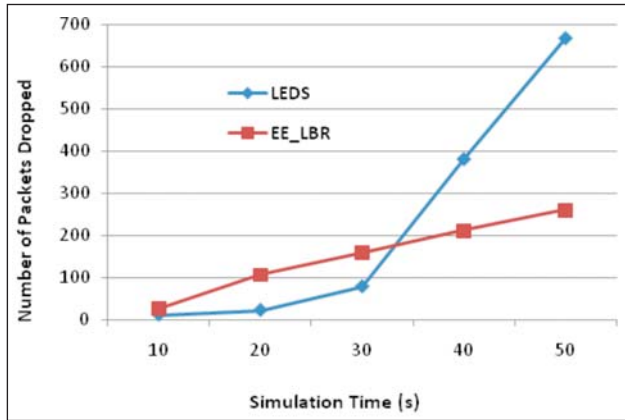


Fig. 3. Packet Loss Rate

The packet loss rate of the proposed scheme EE\_LBR is lower than the existing scheme LEDES in Figure 3. Lower packet loss rate obtains higher performance of the network.

**Average Delay**

The average delay is defined as the time difference between the current packets received and the previous packet received. It is measured by Equation.3.

$$\text{Avg Delay} = \frac{\text{Pkts Recvd Time} - \text{Pkts Sent Time}}{\text{Time}} \quad (3)$$

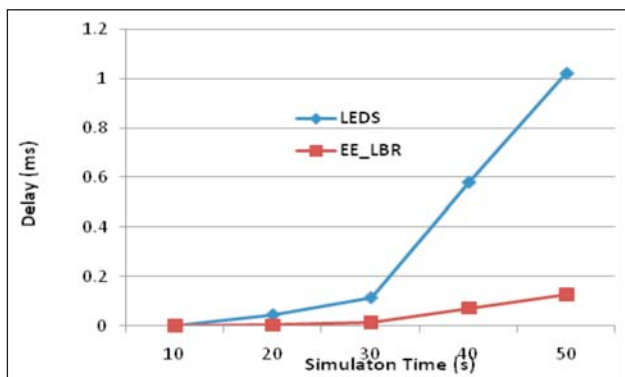


Fig. 4. Average delay

Figure 4 demonstrates the performance of delay with respect to the simulation time. The result shows that the EE\_LBR has minimum delay when compared to the existing scheme LEDES. The least value of delay means the higher value of the throughput of the network.

**Throughput**

Throughput is the average of successful messages delivered to the destination. The average throughput is calculated using Equation. 4.

$$\text{Throughput} = \frac{\sum_{n=0}^n \text{Pkts Received}(n) * \text{Pkt Size}}{1000} \quad (4)$$

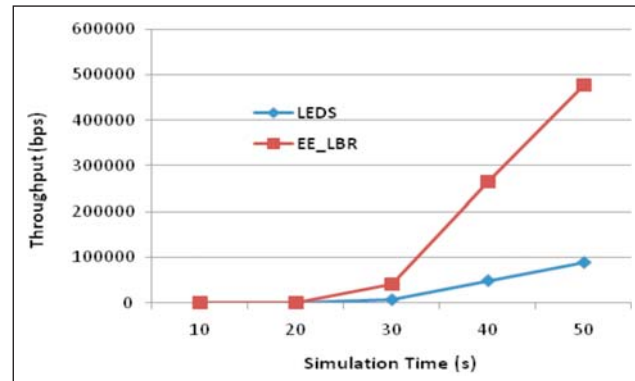


Fig. 5. Throughput

Figure 5 represents that the proposed scheme EE\_LBR has greater average throughput when compared to the existing scheme LEDES.

**RESIDUAL ENERGY**

The amount of energy remaining in a node at the current instance of time is called as residual energy. A measure of the residual energy gives the rate at which energy is consumed by the network operations.

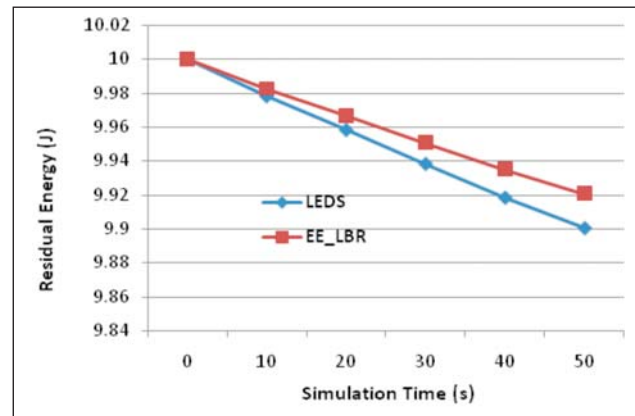


Fig. 6. Residual Energy

Figure 6 shows that the residual energy of the network is better for the proposed scheme EE\_LBR when compared with the existing scheme LEDS.

### CONCLUSION

In this paper we proposed Energy Efficient Load Balance Routing protocol mainly focused on reducing energy consumption and increasing network lifetime to optimize the network energy efficiently. The sleep or awake scheduling scheme employed based on our node model and analyze the stability property of a network system. The QPI and GPI method is used to find the best relay node in the network. The QPI is used to balance the load and energy consumption. The proposed routing algorithm using sleep and awake scheduling to extend the longer network lifetime can be achieved. The main objective is to reduce packet loss ratio and improve network throughput, and to minimal the energy consumption in wireless sensor networks.

**Ethical Clearance:** Taken from St. Peter's University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# A New Photovoltaic Power Generation of Switched Inductor Quasi ZSource Inverter for BLDC Motor Drive Control

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## ABSTRACT

The control of Brushless DC Motor is a challenging task while interfacing with renewable power generation. Especially in photovoltaic power generation having issues such as low power extraction, lagging of current with respect to voltage generation, low load of drives, multi stage of power conversion and control complexity. In this paper Switched Inductor Quasi Z Source Inverter (SL-QZSI) introduces for photovoltaic fed brushless DC Motor drive for reducing multistage power generation, additional power extraction of photovoltaic and reducing complexity of control circuit. Switched inductor circuit is replaces single inductor of quasi z source circuit and extracting high power, improving efficiency without using voltage lifting unit, coupled inductors and transformers. The speed sensing and reference current is used to estimate an actual reference current and Maximum Power Point Tracking (MPPT) is used to tune various modulation value of reference current to generate Maximum Boost Pulse Width Modulation (MB-PWM) scheme. MPPT is generated modulation index value with respect to photovoltaic power conditions. The proposed topology is implemented using MATLAB/ Simulink software to verifying about unique merits of power conversion stage and control performances of proposed switched inductor quasi z source inverter topology.

**Keywords:** Brushless DC (BLDC) Motor, Switched Inductor Quasi-Impedance Source Inverter (SL-QZSI), Photovoltaic (PV) Source, Simple Boost Pulse Width Modulation (SB-PWM).

## INTRODUCTION

With an increasing cost and maintenance of non-renewable energy sources, the renewable energy power generation has a great attention in present scenario. Among the various renewable energy sources, wind power generation require more maintenance. For large power transformation and for medium power generation the cost is economic with photovoltaic power generation. The medium power generation of photovoltaic is implemented using various converter schemes<sup>[1-3]</sup>. Those converter work for multiple generation and extract low power from photovoltaic while fed with brushless DC Motor drives even for the operations without transformer. So modified converter circuit scheme is introduced to extract high power from photo voltaic and also to improve the efficiency of maximum power

extraction<sup>[4-6]</sup>. Maximum power point tracking (MPPT) scheme is used to extract the maximum photovoltaic power from photovoltaic array using suitable converter topology <sup>[7, 8]</sup>. Perturb and Observer (P&O) Method is used commonly in photovoltaic generation because of simplicity and suitable for buck-boost converter scheme <sup>[9]</sup>. Maximum power point tracking using Incremental Conductance (IC) used later for improving photovoltaic power by continuous power point tracking and fast varying irradiance operation across photovoltaic fed Non-inverting four switch Buck-Boost converter system for brushless DC Motor control<sup>[10]</sup>. Photovoltaic fed Four-switch DC-DC converter is interfaced with inverter scheme for providing continuous and controlled voltage to inverter DC link. Classical approach of four switch buck-boost converter and current fed solar converter

scheme is suitable a choice for photovoltaic fed motor drives system and also to overcome the drawbacks of converter system is in literatures [11-15]. But those are still having some limitation in low current generation, low voltage generation, photovoltaic shading problem and multi-stage power conversion system. To overcome the limitation presented in the classical approach, the Impedance Source Inverter (ZSI) scheme is introduced to the photovoltaic fed brushless DC Drive control [16-19]. In this paper the quasi z source inverter scheme is introduced to reduce the passive components and the size while compared with classical Z-Source inverter circuit [20].

The conventional z source inverter topology have high frequency problems on pulse width modulation and generation that result in high switching losses, require additional sensing unit that leads to a complex control scheme. Under the extended boost inverter topology, Switched Inductor Quasi Z Source Inverter (SL-QZSI) circuit is proposed in this paper for single power generation fed inverter drive system. Proposed z source scheme offer reduced capacitor, inductor elements with low switching and high power boosting capability. Incremental conductance based vector control circuit is implemented using simple boost pulse width modulation for desired phase power across Brushless DC (BLDC) Motor. A fuzzy logic based vector control approach is implemented to improve the accuracy of torque and speed control performances. The proposed circuit and control configuration is implemented using MATLAB/Simulink software to verify about photovoltaic fed switched inductor quasi z source inverter for Brushless DC Motor Control.

**Maximum Power Point Tracking Scheme On Photovoltaic Model**

A single diode equivalent circuit basis photovoltaic model is sophisticated in this paper because it is having simple structure, reliable in operation and easily adjusting a parameters when this interfacing with power converters over classical multi diodes structures. Proposed photovoltaic model is designed by following equation and it's interfaced with dynamic single diode equivalent circuit as

$$I_{PV} = N_p \left\{ I_{ph} - I_0 \left\{ \exp \left( \frac{qV_{PV}}{nN_sKT} \right) \right\} \right\} \quad (1)$$

Where in above equation (1) current and Voltage of photovoltaic array is denoted by  $I_{PV}$  and  $V_{PV}$  respectively, short circuit current of photovoltaic array and saturation current are denoted by  $I_{ph}$  and  $I_0$  Respectively. Coulomb constant ( $q$ ) ( $1.602 \times 10^{-19}$ ) and Boltzmann constant ( $k$ ) ( $1.38 \times 10^{-23} J/K$ ) are applied for derivation of photovoltaic current ( $I_{pv}$ )

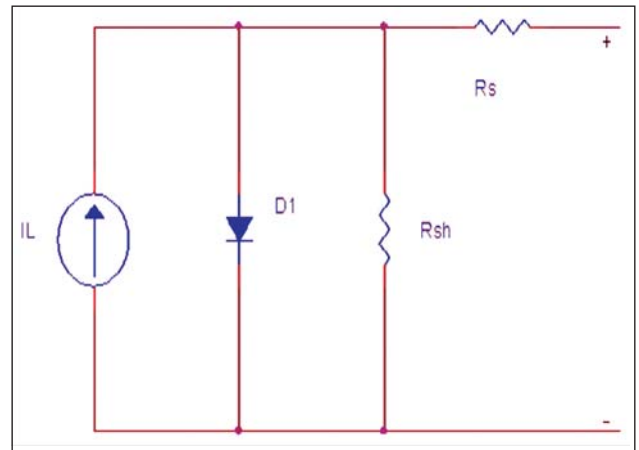


Fig. 1. Equivalent circuit for photovoltaic system

In exchange of solar power to extract maximum power from solar array, a MPPT (Maximum Power Point Tracking) is applied widely in modeling and application solar array as [25]. Nominal voltage and current in equation (1) is replaced by  $V_{MPP}$  and  $I_{MPP}$  is performed by using proposed incremental method as

$$I_{MPP} = N_p \left\{ I_{ph} - I_0 \left\{ \exp \left( \frac{qV_{MPP}}{nN_sKT} \right) \right\} \right\} \quad (2)$$

The power and current characteristic of photovoltaic array is explaining on every  $P_{PV} - V_{PV}$  characteristic every power can be extracted every operating point for photovoltaic array is called maximum power point tracking by MPPT Controller.  $V_k, I_k$  are the momentary voltage and current of photovoltaic array. Existing voltage and current of photovoltaic array is represented as  $V_{k-1}$  and  $I_{k-1}$ ,  $I + (\Delta I / \Delta V)V$  is expressed as  $dP/dV$ . The duty cycles are calculated using output voltage configuration  $V_{ref}$  and also calculated by comparing various conditions using incremental conductance method is shown in Figure 2.

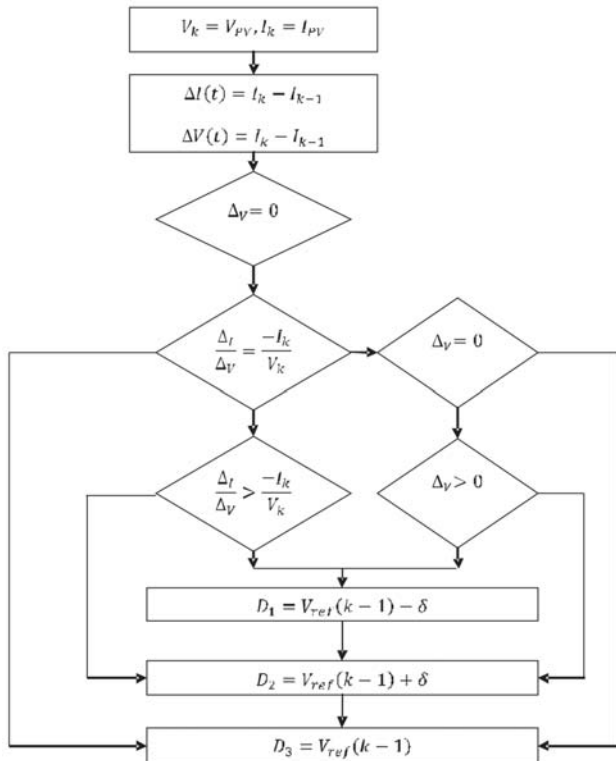


Fig. 2. Flow chart for MPPT using Incremental Conducance Algorithm

**Brushless DC Motor Drive**

The mathematical model of brushless DC motor is presented in this section. The introduced configuration of brushless DC Motor in this paper is derived by following equation as

$$\begin{bmatrix} V_a \\ V_b \\ V_c \end{bmatrix} = \begin{bmatrix} R & 0 & 0 \\ 0 & R & 0 \\ 0 & 0 & R \end{bmatrix} \begin{bmatrix} i_a \\ i_b \\ i_c \end{bmatrix} + \begin{bmatrix} L-M & 0 & 0 \\ 0 & L-M & 0 \\ 0 & 0 & L-M \end{bmatrix} \frac{d}{dt} \begin{bmatrix} i_a \\ i_b \\ i_c \end{bmatrix} + \begin{bmatrix} e_a \\ e_b \\ e_c \end{bmatrix}$$

Where

$V_a, V_b, V_c$ , are the phase voltage and  $i_a, i_b, i_c$ , are the phase current,  $e_a, e_b, e_c$  are back EMF waveform of motor,  $L$ , inductance of each phases and  $M$  is mutual inductance between two phases. The performance of electro-magnetic torque is obtained by adequate control scheme which explained in chapter V is resulting as

$$T_e = (e_a \cdot i_a + e_b \cdot i_b + e_c \cdot i_c) \omega_r \tag{4}$$

Where,  $\omega_r$  is the mechanical speed of motor and motion equation is expressed by

$$\frac{d}{dt} \omega_r = (T_e - T_L - B \omega_r) / J \tag{5}$$

Where  $B$  is the damping constant,  $J$  is moment of inertia of drive,  $T_L$  is hydrodynamic load torque of drives shaft which is respect speed as follows

$$T_L = k \omega_r^2 \tag{6}$$

Where  $k$  is the constant torque of load motor, here electrical frequency is related to mechanical speed and with number of poles is

$$\omega_e = \frac{P}{2} \omega_r \tag{7}$$

**Operation principles of Switched Inductor Quasi Z Source Inverter**

The switched inductor quasi z source inverter is proposed in this paper for extracting maximum power with high efficiency using incremental conducance algorithm. This scheme of circuit is differed from classical Quasi Z Source Inverter in passive elements count and size wise. The use of passive elements which are inductor ( $L_1, L_2, L_3$ ) capacitor ( $C_1, C_2$ ) and diode ( $D_1, D_2, D_3, D_n$ ) in the inverter circuit is shown in Fig. 3

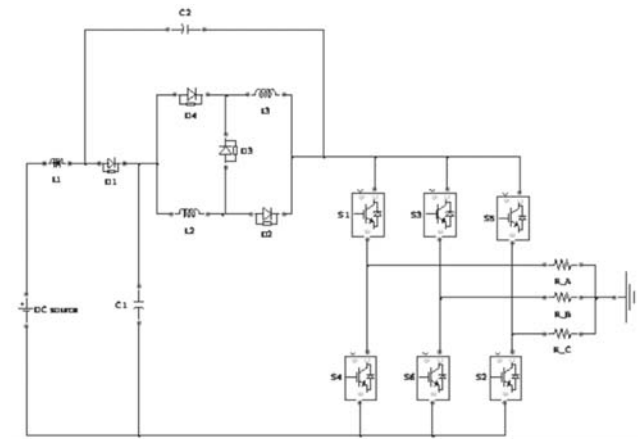


Fig. 3. Circuit Diagram for Switched Inductor Z-Source Inverter

In shoot through state, two-switches are ON in same leg of inverter circuit for short time duration. If diode  $D_{in}$  and  $D_2$  remain off state then  $D_1$  and  $D_3$  are ON. The inductors ( $L_1, L_2$ ) are connected in parallel with capacitor circuit, capacitors are discharged in this mode and inductors are charged or stored energy during this mode. The relationship between inductor voltage, capacitor voltage and input voltage of proposed switched quasi z source inverter configuration is obtained by

$$V_{L3} = V_{in} + V_{C1} \tag{8}$$

$$V_{L1} = V_{L2} = V_{in} + V_{C2} \tag{9}$$

In the non-shoot through state, diodes and are ON when diodes and are OFF, The inductors are connected in parallel with capacitor circuit, capacitors are charged in this mode and inductors are discharged in this mode. The relationship between input DC Link voltage, capacitor voltage and inductor voltage is obtained by

$$V_{in} = V_{dc} - V_{c1} + V_{L3}(10)$$

$$V_{L3} = -V_{c2}(11)$$

$$V_{L1} = V_{L2} = -\frac{1}{2} V_{c1}(12) V_{dc} = V_{in} + V_{c1} + V_{c2}(13)$$

The inductor voltage is calculated by applying voltage-second balance principles on (8) and (9) equationis resulting as (14), similarly voltage-second balance principles is applied on equation (9) and (12) is resulting as (15)

$$V_{c1} = (1 - D)V_{dc} - V_{in}(14)$$

$$V_{c2} = \frac{(1-D)V_{dc} - (1+D)V_{in}}{1+D}(15)$$

The equation (14) and (15) is used to calculate  $V_{dc}$  is expressed by

$$V_{dc} = \frac{1 + D}{1 - 2D - D^2} V_{in} \quad (16)$$

The boost factors of proposed switched inductor z source inverter is calculated by following expression as (17) and peak DC-Link voltage across present inverter circuit is calculated as equation (18)

$$\frac{1 + D}{1 - 2D - D^2} \quad (17)$$

Peak DC-Link voltage across inverter circuit is explained by

$$V_{PN} = BV_{DC} \quad (18)$$

**Control System Description using Maximum Boost Control**

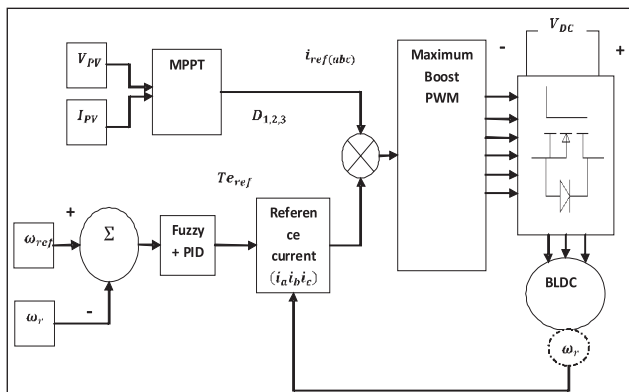


Fig. 4. Control circuit for proposed inverter scheme

The control circuit of current sensing based fuzzy logic sensor-less vector control of brushless DC Motor using incremental conductance algorithm is shown in Figure4. The pulse generation of proposed switched inductor quasi z source inverter is implemented using maximum boost control technique. Incremental conductance algorithm is generator a reference voltage using flow chart given in Figure2. Then reference voltage is used to calculate duty cycle with respect photovoltaic conditions and it's compared with calculated reference current ( $I_{ref(abc)}$ ) for different modulation value. Reference current  $i_a, i_b, i_c$  generation using Current Sensing scheme and followed by Fuzzy-PID based torque and speed control circuits are implemented.  $i_d, i_q$  are generated by current sensing circuit and Fuzzy-PID controller respectively. Theta ( $\theta$ ) is calculated using reference torque and reference current ( $i_d, i_q$ ). Theta is used for calculating final reference current generation using current which direct and quadrature-axis ( $i_d, i_q$ ). The estimated reference signals are compared with reference voltage ( $V_{ref}$ ) is calculated by incremental conductance and carrier signals ( $V_{carrier}$ ).

The both carrier and Reference signals is should be greater than references to generate pulse width modulation for maximum boost control which is shown in Fig. 4.

**Fuzzy logic control system for torque reference generation**

The fuzzy control system with PID controller is applied for extract and control of torque signals through speed control logic is show in Fig4. The Fuzzy logic control circuit is consists of fuzzification, defuzzification and decision making stage which is shown in Fig.6. The proposed fuzzy logic controller applied in speed control and indirectly controls a torque using d-q reference current generation. The fuzzy based PID controller is reduces a peak overshoot and constant speed and Torque performance over classical multi-stage converter scheme [10]. The proposal of fuzzy logic scheme has the capability to extract torque signals from compared speed signals of actual and reference speed and it is provided the suitable reference signal generation by generating direct- axis and quadrature- axis current for single stage of switched inductor quasi z source inverter fed with photovoltaic generation for brushless DC Motor.



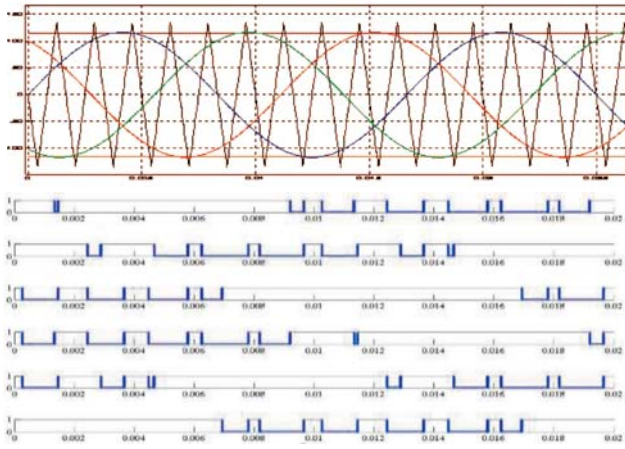


Fig. 5. Maximum Boost Control using carrier voltage, reference voltage and reference current ( $V_{carrier}, V_{ref}, i_{abc}$ )

Fuzzy decision table

$E/\Delta e$	LP	MP	SP	S	SN	MN	LN
LP	PB	PB	PB	PM	PM	PS	Z
MP	PB	PB	PM	PM	PS	Z	NS
SP	PB	PM	PM	PS	Z	NS	NM
S	PM	PM	PS	Z	NS	NM	NM
SN	PM	PS	Z	NS	NM	NM	NB
MN	PS	Z	NS	NM	NM	NB	NB
LN	Z	NS	NM	NM	NB	NB	NB

Fig. 6. Fuzzy control rules assignment

SIMULATION RESULTS AND DISCUSSION

The proposed configuration of switched inductor quasi z source inverter fed photovoltaic for brushless DC Motor using Fuzzy-PID based sensor-less control was implemented using MATLAB/Simulink software. The parameters used for circuit and BLDC motor which given in Table I. The photovoltaic generation is applied through on proposed quasi switched inductor Z source inverter configuration which reduces multiple power generation stages and boosting power is shown in Figure7. The combined operation of proposed inverter circuit and control circuit is reaches a controlled torque, reduced peak overshoot in speed, desired phase voltage performance for wide load variation on Brushless DC Motor (BLDC) over classical control and converter scheme of approach. The photovoltaic generation and motor performance are shown in Figure 8 to Figure 12.

Table 1: Simulation parameters

Name	Range
Impedance source inductors ( $L_1, L_2, L_3$ )	330 $\mu$ BF, 2155 $\emptyset$ BF, 2155 $\emptyset$ BF
Impedance source capacitors ( $C_1, C_2$ )	2005 $\emptyset$ BF, 205 $\emptyset$ BF
Switching frequency ( $f$ )	1kHz
Photovoltaic voltage ( $PV_v$ )	50V
DC-Link Voltage ( $V_{DC}$ )	100V
Motor parameters	
Stator resistance ( $\Omega$ )	7.6187
Stator inductance ( $mH$ )	8.5
Rotor moment of inertia J	0.8
Number of poles	4
Load Torque constant	0.1
Rotor speed	2000
Rotor moment of inertia(mH) J(?kg.m? <sup>2</sup> )	0.8
Number of poles (N_P)	4
Load Torque constant (k)	0.1
Rotor speed ( $\omega_r$ )	2000

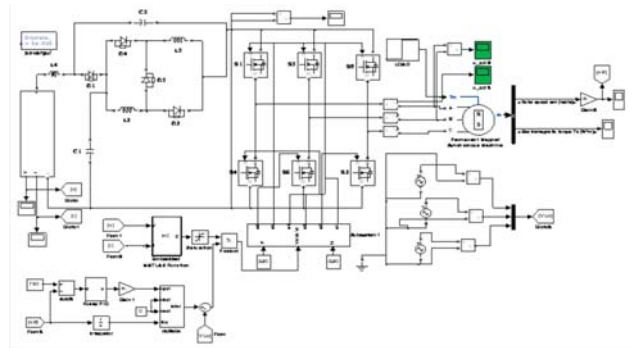


Fig. 7. Proposed simulation implementation circuit

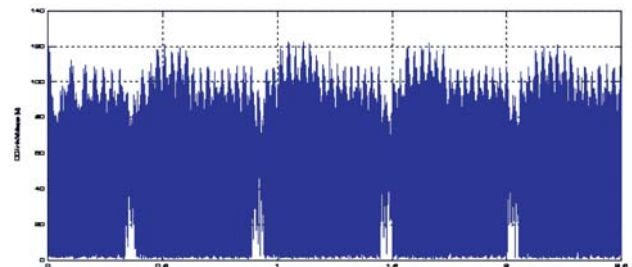


Fig. 8. Switched inductor quasi z source inverter DC-link voltage

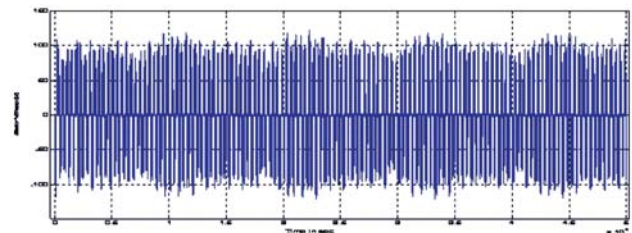


Fig. 9. Performance of Stator Voltage (V)

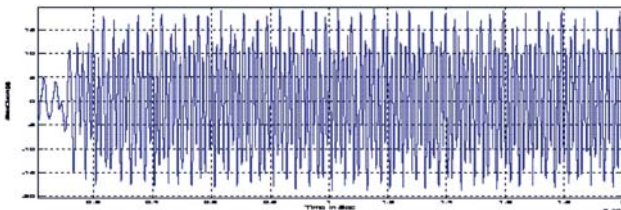


Fig. 10. Performance of Stator Current (A)

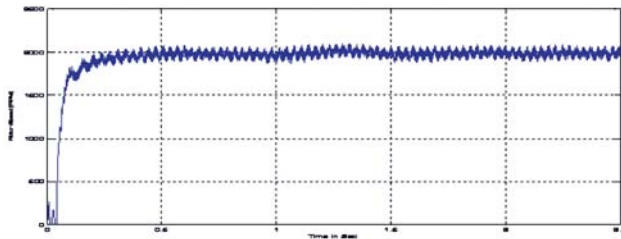


Fig. 11. Performance of brushless DC Motor Rotor speed (RPM)

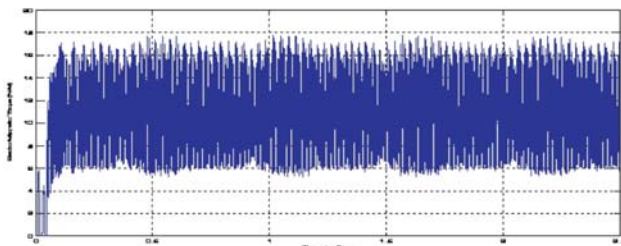


Fig. 12. Performance of Electromagnetic Torque (N-M)

## CONCLUSION

The proposed switched inductor quasi Z source inverter scheme is implemented as single stage of photovoltaic power conversion with continuous power extraction over classical scheme of buck-boost fed inverter. The proposed Z source topology offers a less passive component, extracting maximum power, continuous input current tracking scheme without using of coupled inductor and transformer circuit. Reference current generation is calculated using sensor less speed and flux estimation circuit using Fuzzy-PID controller. The maximum boost pulse width modulation technique is implemented by varying different modulation values to calculate the reference current. Modulation value is obtained by the proposed maximum power point tracking scheme using incremental conductance algorithm for photovoltaic power conditions. The proposed topology concludes the high power extraction in single stage of power conversion and also adequate power flow control is obtained for Brushless DC Motor drive for wide load variations. Simulation results prove the lossless

maximum power extraction, are simple and provide effective control of brushless DC Motor drive over multi-stage power conversion system.

**Ethical Clearance:** Taken from St. Peter's University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# A Switched Inductor Quasi Z source-H-bridge Multilevel Inverter for Soft starting Control of Induction Motor using Direct Torque and Flux Control

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## ABSTRACT

An impedance source multilevel inverter schemes applied for traction and industrial drives application. Because it has unique merits of harmonics less, transformer less drives control application and also soft start capability of induction drives. This paper proposed a reduced source z source H-bridge multilevel inverter and it is applied for induction motor drive control. In order to improving performance of induction motor performance, the torque and speed control is achieved using Direct Torque and Flux Control (DTFC) via phase voltage and current magnitude control. The proposed control scheme of Direct Torque and Flux Control (DTFC) is calculated through phase voltage and phase current sensing and then stator torque and flux is to be calculated by separate estimation scheme. In reduced source Z source H-bridge multilevel inverter schemes, z source circuit gives a soft start capability across induction motor drive by controlling power magnitude across DC-Link. Reduced source is achieved using capacitor balancing circuit using a common DC-source. A single carrier and multi-reference of Phase Opposition and Disposition (POD) pulse width modulation topology is used for proposed reduced source z source Multilevel Inverter for soft start control of induction motor.

**Keywords:** Induction Motor (IM), Soft Start Capability (SSC), Direct Torque and Flux Control (DTFC), Impedance Source Multilevel Inverter (Z-source MLI), Phase Opposition Disposition (POD), Pulse Width Modulation (PWM).

## INTRODUCTION

Due to short acceleration of induction motor, a high starting current is generated across phase or stator terminals. An integrity of motor and control parameters are varied is depends on stator starting current variation. The high starting current results a voltage magnitude variation, stator insulation failure by generation of magnetic failure across Induction Motor drive<sup>[1-2]</sup>. The frequent operation of induction motor causes high starting current and high starting torque creates a stator insulation failure via stator current<sup>[3]</sup>. In literatures explain about soft starting of induction motor and it is given below as (i) Electromechanical (ii) solid state (iii) Variable Frequency Drive. Electro-mechanical starting method was implemented using reactor or resistor start, auto-

transformer based start. Method is enabled while motor reaches near steady states speed. In this method results a high starting current and torque of induction while changes in that circuit. In solid states method, anti-parallel thyristor are used to reduce voltage and current for controlling torque of motor drives.

Development of solid states method is high over electromechanical method. Since life time cost is less while applied on induction motor drive. This system results a low order harmonics across thyristor circuit so power quality of system was poor and poor performance was drawn on high load motor drives<sup>[4-5]</sup>. A variable frequency Drive (VFD) system is changes a frequency from fixed level to variable level and also it control A Fixed voltage magnitude to variable voltage magnitude across Induction Motor

drives. Even it having high performance in control, it generates a low order harmonics because of uncontrolled bridge rectifier to create across utility grid system. In order overcome the drawbacks of harmonics generation, filters are uses to compensate on variable frequency drive control system<sup>[6-8]</sup>.

Later a z source inverter was used to improving performance of induction motor and also generates a high voltage in single stage of power generation. It utilizes a shoot through state for voltage boosting across impedance circuits. In this z source schemes switched Inductor Quazi quasi z source inverter is uses for high performance and high efficiency over classical Z source Inverter Circuit<sup>[9-10]</sup>. The unique merits while Z source inverter involves that reduce an electromagnetic Torque, limiting inrush current throughout the process. Even Impedance Z source Inverter requires additional filters across load terminals to reduce a low order harmonics. To reduce a low order harmonics and neglecting filters, transformers to interfacing with grid-system, A Multi-level Inverter system is introduces to overcome the above drawbacks and creates soft start operation of induction motor. This paper is introduces a quasi-z source based simplified H-Bridge 9-level Multi-level inverter is introduces in induction motor drive for soft-start control operation through reduces inrush current and improving voltage boosting capability and controlling low order harmonics. The proposed simplified Z source inverter creates a maximum level using Two-DC source and soft start operation of induction Motor and having harmonics minimization capability. Induction motor control is greatly improves by proposed Direct Torque Flux Control (DTFC) to maintain desired speed and Torque performance over operation region.

**Topology analyses of Switched Inductor Quazi Based Simplified H-bridge Multilevel Inverter**

The proposed switched Inductor Quasi Impedance Source (SLQ-ZS) based Simplified H-Bridge 9 Multilevel inverter circuit is implemented for achieving soft start operation induction motor shown in Figure 1. The circuit is capable of reducing number of DC-Power source, high step up voltage capability, controlling inrush current, minimization of low order harmonics without need of additional Filters. The amount of voltage step up, minimization of inrush current, creating soft start capability is achieved by proposed Switched Inductor Quazi Z source Circuit involved which is in Fig.1.

The switched Inductor Quazi quasi z source inverter is proposed in this paper for extracting maximum power with high efficiency using incremental conductance algorithm. This scheme of circuit is differed from classical Quasi Z Source Inverter in passive elements count and size wise. The using passive elements which are inductor ( $L_1, L_2, L_3$ ) capacitor ( $C_1, C_2$ ) and diode ( $D_1, D_2, D_3, D_n$ ) presented in inverter circuit on Figure 2.

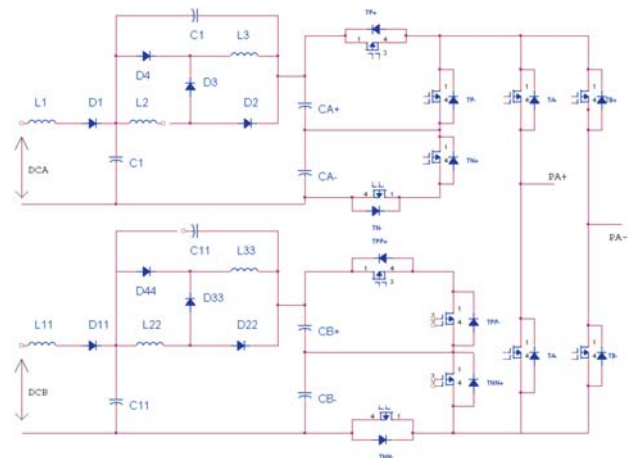


Fig. 1. Proposed circuit configuration for induction Motor

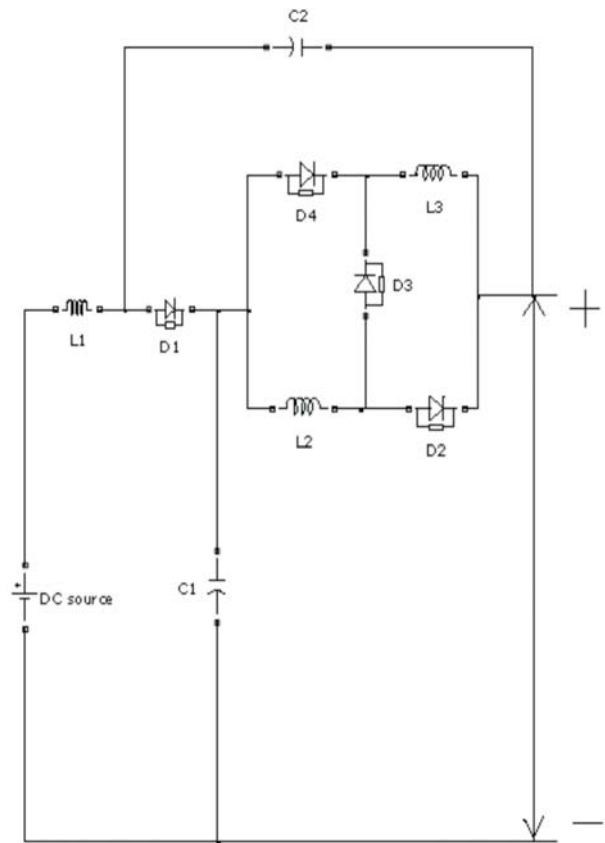


Fig. 2. Circuit Diagram for Switched Inductor Quazi Z -Source Inverter

The shoot through and non-shoot through state are explained about operation of proposed switched quasi z source inverter state. In shoot through state, two-switches is ON in same leg of inverter circuit for short time duration. The same time diode  $D_{in}$  and  $D_2$  are off state remains  $D_1$  and  $D_3$  are ON. The inductors  $(L_1, L_2)$  are connected in parallel with capacitor circuit, capacitors are discharged in this mode and inductors are charged or stored energy during this mode. The relationship between inductor voltage, capacitor voltage and input voltage of proposed switched quasi z source inverter configuration is obtained by

$$V_{L3} = V_{in} + V_{c1} \quad (1)$$

$$V_{L1} = V_{L2} = V_{in} + V_{c2} \quad (2)$$

Where as in non-shoot through state, diodes are ON when and are OFF, The inductors are connected in parallel with capacitor circuit, capacitors are charged in this mode and inductors are discharged in this mode. The relationship between input DC Link voltage, capacitor voltage and inductor voltage is obtained by

$$V_{in} = V_{dc} - V_{c1} + V_{L3} \quad (3)$$

$$V_{L3} = -V_{c2} \quad (4)$$

$$V_{L1} = V_{L2} = -1/2 V_{c1} \quad (5)$$

$$V_{dc} = V_{in} + V_{c1} + V_{c2} \quad (6)$$

The inductor voltage is calculated by applying voltage-second balance principles on (8) and (2) equation is resulting as (7), similarly voltage-second balance principles is applied on equation (2) and (6) is resulting as (8)

$$V_{c1} = (1 - D)V_{dc} - V_{in} \quad (7)$$

$$V_{c2} = \frac{(1-D)V_{dc} - (1+D)V_{in}}{1+D} \quad (8)$$

The equation (7) and (8) is used to calculate  $V_{dc}$  is expressed by

$$V_{dc} = \frac{1+D}{1-2D-D^2} V_{in} \quad (9)$$

The boost factors of proposed switched Inductor Quazi z source inverter is calculated by following expression as (10) and peak DC-Link voltage across present inverter circuit is calculated as equation (11)

$$\frac{1+D}{1-2D-D^2} \quad (10)$$

Peak DC-Link voltage across inverter circuit is explained by

$$V_{PN} = BV_{DC} \quad (11)$$

The topology of proposed simplified Z source multilevel Inverter is having Two-DC power source. A clamping circuit is involved and for DC-source A and DC Source B respectively. The capacitor elements and are controlled by clamping circuits. The involved switches and is used for positive and negative cycle control of capacitor respectively. Similarly another Dc-source B clamping circuit is involved and for control of capacitors. A Common H-bridge structure is used to create a multilevel to combine with clamping circuits. In order to achieve 9-level two clamping circuit is used in this paper.

**Proposed Control Topology**

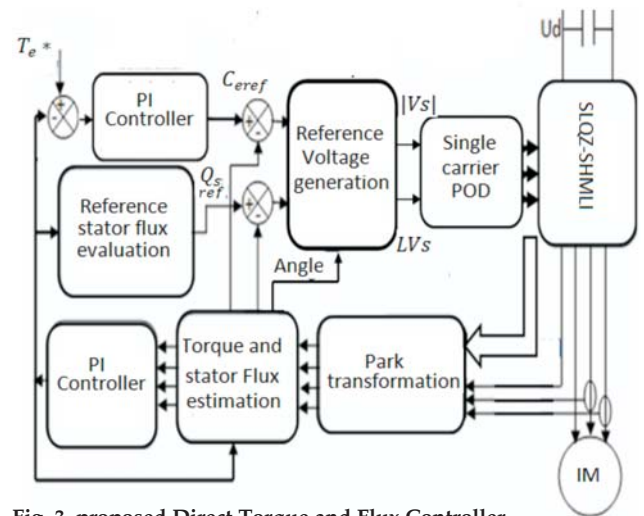


Fig. 3. proposed Direct Torque and Flux Controller

The proposed Direct Torque and Flux Control (DTFC) are implemented in this paper for achieving high performance of induction which is shown in Fig. 3. This control scheme has unique merits and comparatively novel and economical. The hysteresis block is used to modify the state of switching functions also used to modify about magnitude of stator flux and Electromagnetic Torque. In proposed control scheme stator flux equation is derived by basic flux equation (12) and gives (13)

$$\bar{\phi}_s = \bar{\phi}_{s0} + \int_0^t (\bar{V}_s - R_s \bar{I}_s) dt \quad (12)$$

$$\bar{\phi}_s = \bar{\phi}_{s0} + \int_0^t \bar{V}_s dt \quad (13)$$

During a process time, Torque  $T_e$  is applied

$$\bar{\phi}_{s(k+1)} \approx \bar{\phi}_{s(k)} + \bar{V}_s T_e \quad (14)$$

$$\Delta \bar{\phi}_s \approx \bar{V}_s T_e \quad (15)$$

There is to increasing stator flux is shown in Fig5, we can apply carrier modulation using single carrier signals is shown in Fig.4

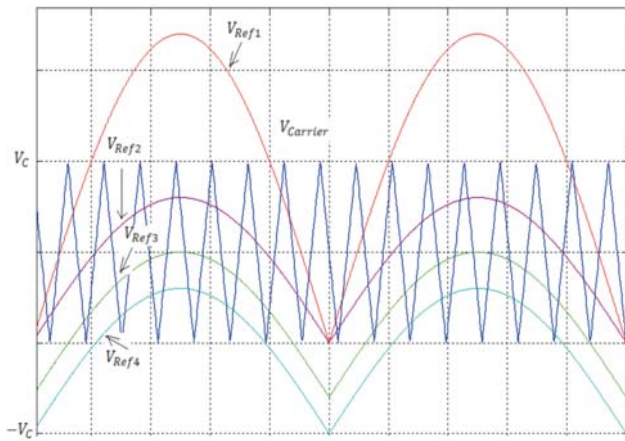


Fig. 4.

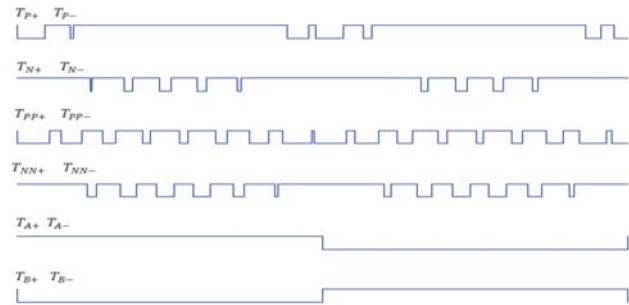


Fig. 4. Single Carrier Multi-reference based Phase Opposition disposition Pulse Width Modulation

The stator flux component is giving Torque components whilst flux magnitude changes during the process of time. The proposed induction motor by applying control scheme is obtaining a torque is given by following equation

$$C_e = \frac{3}{2} P \frac{M}{\sigma L_s L_r} \phi_s \phi_r \sin \gamma \quad (16)$$

The proposed control of torque is achieved by tuning or controlling the magnitude of Stator Flux and rotor flux and its relative position. The proposed switched inductor quasi z source based simplified H-Bridge Inverter scheme is operation is performed as it is given Table 1. Parameter of proposed circuit scheme is given in Table 3.

Table 1: output voltage and corresponding switching table

Output Voltage (V0)	Switching Conditions									
	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF
1.5VDC	ON	OFF	OFF	ON	OFF	ON	OFF	ON	ON	OFF
VDC	ON	OFF	OFF	ON	OFF	ON	ON	OFF	ON	OFF
0.5VDC	ON	OFF	ON	OFF	OFF	ON	ON	OFF	ON	OFF
0	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON
-0.5VDC	ON	OFF	ON	OFF	OFF	ON	ON	OFF	OFF	ON
-VDC	ON	OFF	OFF	ON	OFF	ON	ON	OFF	OFF	ON
-1.5VDC	ON	OFF	OFF	ON	OFF	ON	OFF	ON	OFF	ON
-2VDC	ON	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	ON

**Proposed A Single Carrier Multi-reference Pod Pulse Width Modulation**

The given phase opposition disposition is obtained by a single carrier multi-reference signals. Three phase signals are applied to generate positive sine signals and negative sine signals with respect to 0VDC references. The operating stage of proposed topology is explained bellow using Table 1.

In stage 1, reference signals 2Vc is directly compared with carrier signals is generate 2VDC output voltage

whilst switch TP+, TN- , TPP+, TNN—are ON state remains TP-, TN+, TPP-, TNN+ are OFF state also H-bridge switches TA+, TB- is in ON state whereas TA-, TB+ is in OFF state .

In state 2, reference signals 2Vc is subtracted from 4Vc and it's compared with carrier signals, the resultants value is 1.5 VDC output voltage is generated whilst TP+, TN- , TPP+, TNN- are ON state remains TP-, TN+, TPP+, TNN+ are in OFF state. Also H-bridge switches of TA+, TB- is in ON state whereas TA-, TB+ is in OFF state.

In state 3, reference signals  $V_c$  is directly comparing with carrier signals and it is generated output voltage  $V_{DC}$  whilst  $TP+$ ,  $TN-$ ,  $TPP-$ ,  $TNN+$  are ON state remains  $TP-$ ,  $TN+$ ,  $TPP+$ ,  $TNN-$  are OFF state. H-bridge switches  $TA+$ ,  $TB-$  is in ON state whereas  $TA-$ ,  $TB+$  is in OFF state.

In state 4, reference signals  $V_c$  is comparing with  $2V_c$ , and its comparing with carrier signals and generate output voltage  $0.5V_{DC}$  whilst  $TP+$ ,  $TN+$ ,  $TP-$ ,  $TN-$ ,  $TPP-$ ,  $TNN+$  are ON state remains  $TP-$ ,  $TN-$ ,  $TP+$ ,  $TN+$ ,  $TPP+$ ,  $TNN+$  are OFF state. H-bridge switches  $TA+$ ,  $TB-$  is in ON state whereas  $TA-$ ,  $TB+$  is in OFF state. Similarly  $0V_{DC}$  is obtained in this state itself.

In state 5, reference signals  $-V_c$  is comparing with  $-2V_c$ , and its comparing with carrier signals and generate output voltage  $-0.5V_{DC}$  whilst  $TP-$ ,  $TN-$ ,  $TP+$ ,  $TN+$ ,  $TPP+$ ,  $TNN-$  are ON state remains  $TP+$ ,  $TN+$ ,  $TP-$ ,  $TN-$ ,  $TPP-$ ,  $TNN-$  are OFF state. H-bridge switches  $TA+$ ,  $TB-$  is in OFF state whereas  $TA-$ ,  $TB+$  is in ON state

In state 6, reference signals  $-V_c$  is directly comparing with carrier signals and it is generated output voltage  $-V_{DC}$  whilst  $TP-$ ,  $TN+$ ,  $TPP+$ ,  $TNN-$  are ON state remains  $TP+$ ,  $TN-$ ,  $TPP-$ ,  $TNN+$  are OFF state. H-bridge switches  $TA+$ ,  $TB-$  is in OFF state whereas  $TA-$ ,  $TB+$  is in ON state.

In state 7, reference signals  $-2V_c$  is subtracted from  $-4V_c$  and it is compared with carrier signals, the resultants value is  $-1.5 V_{DC}$  output voltage is generated whilst  $TP-$ ,  $TN+$ ,  $TPP-$ ,  $TNN+$  are ON state remains  $TP+$ ,  $TN-$ ,  $TPP+$ ,  $TNN-$  are in OFF state. Also H-bridge switches of  $TA+$ ,  $TB-$  is in OFF state whereas  $TA-$ ,  $TB+$  is in ON state.

In state 8, reference signals  $-2V_c$  is directly compared with carrier signals is generate  $-2V_{DC}$  output voltage whilst switch  $TP-$ ,  $TN+$ ,  $TPP-$ ,  $TNN+$  are ON state remains  $TP+$ ,  $TN-$ ,  $TPP+$ ,  $TNN-$  are OFF state also H-bridge switches  $TA+$ ,  $TB-$  is in OFF state whereas  $TA-$ ,  $TB+$  is in ON state .

Two- DC power supply uses in proposed circuit system,  $0.5 V_{DC}$  is generated via control of capacitor link circuits and by  $TP+$ ,  $TP-$  of positive cycle of DCA whereas  $TN-$ ,  $TN+$  of negative half cycle of DCB and also  $TPP+$ ,  $TPP-$  of positive cycle of DCA whereas  $TNN-$ ,  $TNN+$  of negative half cycle of DCB. Equal voltage balancing for both DC-power supplies are achieves in controlled and equal magnitude form by

proposed control topology. So proposed circuit is requires less number of DC power supply over classical cascaded H-Bridge Multi-level inverter [11].

### SIMULATION RESULTS

The proposed switched inductor quasi z source based a simplified H-bridge multilevel inverter was implemented using MATLAB/Simulink software. The given direct torque and flux control scheme is applied to control of flux and torque across induction motor and also generates reference signals for proposed single carrier multi-reference signalsof phase opposition disposition pulse width modulation. Proposed pulse width modulation is applied to a simplified H-bridge multi-level inverter generates 9-level output voltage using two DC power sources. The proposed circuit and control scheme is drawn an improved soft start and control of induction over classical inverter fed motor, z source fed motor schemes. Topology implementation is shown in Figure 5. High step up ratio (1:4) and soft start capability was achieved by introduced switched inductor quasi z source circuit is shown in across DC-Link voltage in Figure 6. Nine-level phase voltage performance is shown in Figure 7. Soft start and controlled induction motor performance is shown in Figure 8.

Table 2: Induction Motor Parameters

Parameters	Range	
Induction Motor	Power	0.5Hp
	Voltage/Frequency	800V
	$R_s$	0.085
	$R_r$	0.528
	$L_s=L_r$	0.8mH
	J	1.662 kg.
	RPM	1800
SLQZS	L1,L11	0.1mH
	L2,L3,L22,L33	1mH
	C1,C2	1000
MLI	CA+, CA-, CB+,CB-	2200

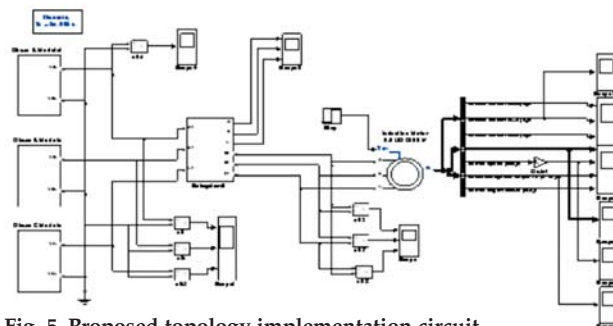


Fig. 5. Proposed topology implementation circuit



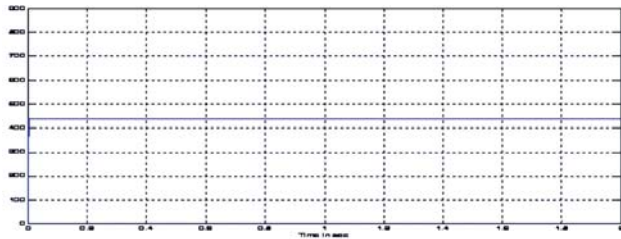


Fig. 6. Inverter DC-link Voltage

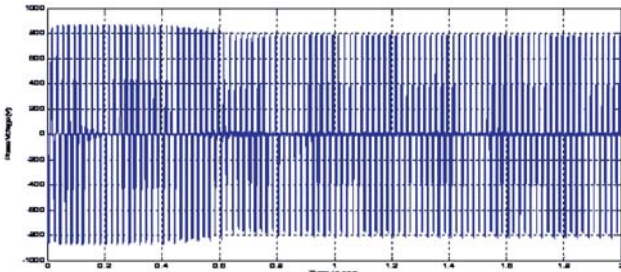
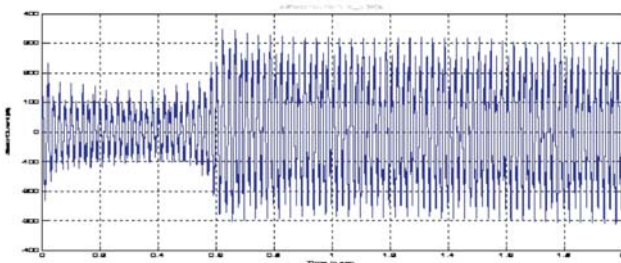
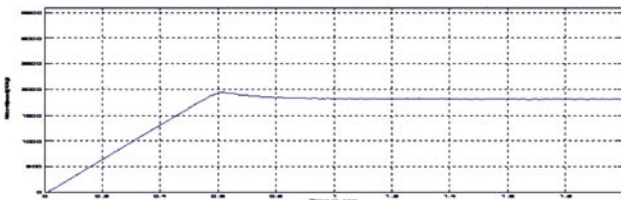


Fig. 7. Stator Voltage of Induction Motor(a)



(b)



(c)

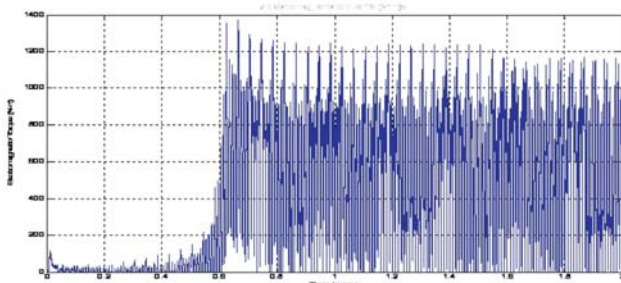


Fig. 8. Induction Motor (0.5Hp) Performance

### CONCLUSION

The present circuit configuration and control scheme is used to create soft start and improved performances of induction motor. Switched inductor quasi z source circuit is capable of high step up of DC-voltage across DC-link and gives simplified H-bridge

multilevel inverter is used to obtain less harmonics and combined high step-up voltage from two DC source across induction motor. Induction motor performance is improved by proposed Direct Torque and Flux Control topology over classical z source and multilevel scheme. Proposed DTFC creates reference signals for implementing proposed POD pulse width modulation. Proposed POD requires a single carrier signal and multi-reference wave to reduce the computation burden of general POD Topology. 0.5 HP induction motor is utilized for high load region to verify about proposed soft start and control of circuit and control configuration. Implemented simulation results were proved about Motor performance and proposed topology.

**Ethical Clearance:** Taken from St Peter’s University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Analysis and improvement of Self Tuning Based on Sensor less Control of BLDC Motor

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## ABSTRACT

This paper introduce the sensorless control of brushless dc motor based on self tuning PID adaptive neuro fuzzy controller is analyzed. The proposed control is to be introduces for reducing sensor cost, computation burden and improving speed torque performance for variable load conditions. Phase current and Speed rating is required for controlling motor speed torque performance. So speed estimation algorithm is introduces to finding rotating speed of machine without sensor methods after that speed control and estimation of speed is implemented using back emf method and the torque estimation is based on PI controller. The estimated speed and torque is used for self PID tuning based adaptive fuzzy in space vector pulse width modulation. The speed and stator current of brushless DC motor is controlled and computed by using MATLAB/Simulink platform.

**Keywords:** Brushless DC motor (BLDC), Sensorless control, adaptive Neuro fuzzy PID, Per Minutes (RPM), Fuzzy Logic Control, PID Control (Proportional Integral Derivative), Proportional gain( $k_p$ ), Integral gain( $k_i$ ), Derivative gain( $k_d$ ) Space Vector Modulation (SVM).

## INTRODUCTION

Recently in industrial application the use of brushless DC motor is increasing instead of permanent magnet synchronous motor because it has more advantage such as long life, high efficiency, high power production and high dynamic performance and easy adaptable in industrial environment. The BLDC motor has increasing the greater number in power electric devices. The BLDC motor has needed to sense the position of rotor for commutation operation. The sensor less is used in BLDC motor because it can reduce the sensor cost, high reliability and decrease the feedback units<sup>[1-4]</sup>. The speed of the motor is sensed by using the back emf estimation method. The estimated speed is used in the self tuning adaptive neuro fuzzy based PID controller. The sensor based control has poor performance as well as increase the cost of the sensor is compared to sensorless based BLDC motor<sup>[5-7]</sup>. The self tuning adaptive method is used to regulate the speed and stator current. The adaptive Neuro fuzzy system combines the property of fuzzy and neural network is to give better motor performance. The proposed self tuning is to compute the membership function and also track the input /output of the system<sup>[8]</sup>.

The advantage of proposed self tuning controller is the need of fine changes in the system parameters and by adjusting the bounds of the membership functions is removed<sup>[9]</sup>. An open loop control system which can predict the dynamic behavior of systems involving mechanic and electronic modules has been successfully designed and implemented to control the speed of a DC motor. The superior performance of artificial intelligence based controllers in power system and power electronic engineers to replace conventional speed control circuit with intelligent speed controllers<sup>[10-12]</sup>.

The self tuning neuro fuzzy PID controller is used to regulate the speed and stator current of BLDC motor. The conventional dc motor is replaced with BLDC motor because of high efficiency and high torque to power ratio and low maintenance<sup>[13-15]</sup>. The proposed motor can be used in many applications such as home appliance, robotics and industrial application. In back emf method is used to generate the calculated speed by using the voltage and current of stator. The proposed neuro fuzzy based PID control is used to improve the speed performance for variable load. The proposed control has to sensorless and speed is estimated by voltage and current of the stator current

for improving the motor performance. The space vector pulse width modulation is used to generate the pulse and fed to inverter by using the dq current axis by using the self tuning adaptive neuro fuzzy system.

**Brushless DC Motor**

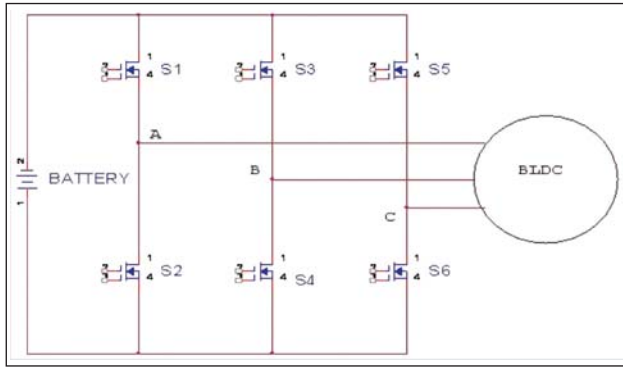


Fig. 1. Three Phase Inverter fed Brushless DC Motor

Fig 1 shows the three phase inverter fed BLDC motor. The Brushless dc (BLDC) motor is used in medium and low power application because high efficiency, high flux density, low maintenance, high ruggedness, low EMI problems and speed control. The absence of brushes and commutators in BLDC motor so it does not produce the sparking problem in BLDC motor. The proposed dynamic model of brushless DC Motor is explained by following equations as stator winding equations which is given in Fig.1

$$U_{xn} = R_x i_x + \frac{d}{dt} (L_{xx} i_x + L_{yx} i_y + L_{zx} i_z) + e_x \quad (1)$$

$$U_{yn} = R_y i_y + \frac{d}{dt} (L_{xy} i_x + L_{yy} i_y + L_{zy} i_z) + e_y \quad (2)$$

$$U_{zn} = R_z i_z + \frac{d}{dt} (L_{xz} i_x + L_{yz} i_y + L_{zz} i_z) + e_z \quad (3)$$

Here we assume as  $R_x = R_y = R_z \quad (4)$

$$L_{xx} = L_{yy} = L_{zz} = L_s \quad (5)$$

$$L_{yx} = L_{xy} = L_{zx} = L_{xz} = L_{yz} = L_{zy} = M \quad (6)$$

$$\begin{bmatrix} V_{xn} \\ V_{yn} \\ V_{zn} \end{bmatrix} \begin{bmatrix} R & 0 & 0 \\ 0 & R & 0 \\ 0 & 0 & R \end{bmatrix} \begin{bmatrix} i_x \\ i_y \\ i_z \end{bmatrix} \begin{bmatrix} L_s & M & M \\ M & L_s & M \\ M & M & L_s \end{bmatrix} \frac{d}{dt} \begin{bmatrix} i_x \\ i_y \\ i_z \end{bmatrix} + \begin{bmatrix} e_x \\ e_y \\ e_z \end{bmatrix} \quad (7)$$

Since  $i_x + i_y + i_z = 0$  and with  $L_s - M = L$ , we obtained as

$$\begin{bmatrix} V_{xn} \\ V_{yn} \\ V_{zn} \end{bmatrix} \begin{bmatrix} R & 0 & 0 \\ 0 & R & 0 \\ 0 & 0 & R \end{bmatrix} \begin{bmatrix} i_x \\ i_y \\ i_z \end{bmatrix} \begin{bmatrix} L & 0 & 0 \\ 0 & L & 0 \\ 0 & 0 & L \end{bmatrix} \frac{d}{dt} \begin{bmatrix} i_x \\ i_y \\ i_z \end{bmatrix} + \begin{bmatrix} e_x \\ e_y \\ e_z \end{bmatrix} \quad (8)$$

Where,

$R$  = stator resistance per phase for phase a to c

$L$  = Stator inductance per phase and presume to be phase a to b

$i_x, i_y$  &  $i_z$  stator current

Immediate induced electro motive force (EMF) of proposed BLDC is written as

$$e_x = f_x(\theta_r) \lambda_p \omega_m \quad (9)$$

$$e_y = f_y(\theta_r) \lambda_p \omega_m \quad (10)$$

$$e_z = f_z(\theta_r) \lambda_p \omega_m \quad (11)$$

Where

$\omega_m$ , The rotor mechanical speed

$\theta_r$ , Rotor electrical position

**Self Tuning Control Using Adaptive Neuro Fuzzy-Pid**

The proposed control method is adaptive neuro fuzzy based PID for control the inverter output current and voltage and also regulates the performance of BLDC motor. The adaptive neuro fuzzy has indicated the status of motor performance and help to synthesis of fuzzy system. This controller is computing the target value by giving input/output of measured data. Fuzzy rules are used to fine tuning of input and output of system. The general representation of fuzzy and self tuning PID based on neuro fuzzy is shown in fig 2 (a) and 2 (b).

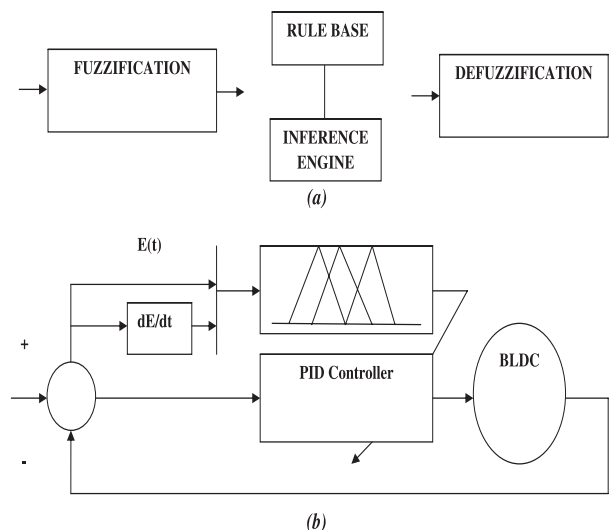


Fig. 2. Tuning control structure (a) structure of Fuzzy Logic Control (b) self tuning of PID using Neuro Fuzzy logic control

In Fig. 2 (b), E(t) is calculated by evaluating the estimated speed and reference speed signals. dE(t) is a derivative form of obtained error e(t). PID tuning by fuzzy logic control is delivered a non-linear mapping from error (E(t)) and derivation of error (dE(t)). The value of  $K_p, K_d, \alpha$ , error and derivative error signal is used to calculating the value of  $K_i$ . The  $K_p$  and  $K_d$  value between 0 and 1. The  $K_p, K_d, K_i$  values are evaluated in equation 12, 13 and 14.

$$k_p = \frac{k_p - k_{p,min}}{k_{p,max} - k_{p,min}} \quad (12)$$

$$k_d = \frac{k_d - k_{d,min}}{k_{d,max} - k_{d,min}} \quad (13)$$

$$k_i = \frac{k_p}{k_d + \alpha} \quad (14)$$

The Proposed SVPWM based vector control scheme using adaptive Neuro fuzzy self tuning of PID is shown in fig 3.

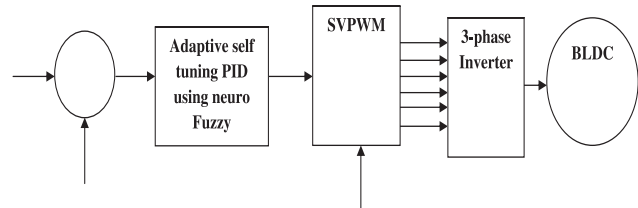


Fig. 3. Proposed SVPWM based vector control scheme using adaptive Neuro fuzzy self tuning of PID

The adaptive neuro fuzzy system is implemented by fuzzy rules and produced due to the load and parameter variation in BLDC motor is given in Table 1. The switching state of SVPWM is given in Table 2.

Table 1. Proposed fuzzy rules for self tuning PID control

De/e	NB	NM	NS	PB	PM	PS	ZO
NB	$K_p$ -BK <sub>d</sub> -B $\alpha$ -2	$K_p$ -BK <sub>d</sub> -S-2	$K_p$ -BK <sub>d</sub> -S-2	$K_p$ -BK <sub>d</sub> -S-2	$K_p$ -B K <sub>d</sub> -S-2	$K_p$ -BK <sub>d</sub> -S-2	$K_p$ -BK <sub>d</sub> -S-2
NM	$K_p$ -SK <sub>d</sub> -B-3	$K_p$ -BK <sub>d</sub> -B-3	$K_p$ -BK <sub>d</sub> -S-2	$K_p$ -B K <sub>d</sub> -B-3	$K_p$ -B K <sub>d</sub> -B-3	$K_p$ -BK <sub>d</sub> -S-2	$K_p$ -BK <sub>d</sub> -S-2
NS	$K_p$ -SK <sub>d</sub> -B-4	$K_p$ -SK <sub>d</sub> -B-3	$K_p$ -BK <sub>d</sub> -B-3	$K_p$ -S K <sub>d</sub> -B-4	$K_p$ -S K <sub>d</sub> -B-3	$K_p$ -BK <sub>d</sub> -B-3	$K_p$ -BK <sub>d</sub> -S-2
PB	$K_p$ -BK <sub>d</sub> -S-2	$K_p$ -BK <sub>d</sub> -S-2	$K_p$ -BK <sub>d</sub> -S-2	$K_p$ -B K <sub>d</sub> -S-2	$K_p$ -B K <sub>d</sub> -S-2	$K_p$ -BK <sub>d</sub> -S-2	$K_p$ -BK <sub>d</sub> -S-2
PM	$K_p$ -SK <sub>d</sub> -B-3	$K_p$ -BK <sub>d</sub> -B-3	$K_p$ -BK <sub>d</sub> -S-2	$K_p$ -S K <sub>d</sub> -B-3	$K_p$ -B K <sub>d</sub> -B-3	$K_p$ -BK <sub>d</sub> -S-2	$K_p$ -BK <sub>d</sub> -S-2
PS	$K_p$ -SK <sub>d</sub> -B-4	$K_p$ -SK <sub>d</sub> -B-3	$K_p$ -BK <sub>d</sub> -B-3	$K_p$ -S K <sub>d</sub> -B-4	$K_p$ -SK <sub>d</sub> -B-3	$K_p$ -BK <sub>d</sub> -B-3	$K_p$ -BK <sub>d</sub> -S-2
ZO	$K_p$ -SK <sub>d</sub> -B-5	$K_p$ -SK <sub>d</sub> -B-4	$K_p$ -SK <sub>d</sub> -B-3	$K_p$ -S K <sub>d</sub> -B-5	$K_p$ -SK <sub>d</sub> -B-4	$K_p$ -SK <sub>d</sub> -B-3	$K_p$ -BK <sub>d</sub> -B-3

$$\vec{V}_{ref} = V_\alpha + jV_\beta = \frac{2}{3}(V_a + aV_b + a^2V_c) \quad (15)$$

Similarly,

$$|\vec{V}_{ref}| = \sqrt{V_\alpha^2 + V_\beta^2}, \quad \alpha = \tan^{-1}\left(\frac{V_\beta}{V_\alpha}\right)$$

$$V_\alpha + jV_\beta = \frac{2}{3}(V_a + e^{j\frac{2\pi}{3}}V_b + e^{-j\frac{2\pi}{3}}V_c) \quad (16)$$

$$V_\alpha + jV_\beta = \frac{2}{3}(V_a + \cos\frac{2\pi}{3}V_b + V_a + \cos\frac{2\pi}{3}V_c)$$

$$j\frac{2}{3}(\sin\frac{2\pi}{3}V_b - \sin\frac{2\pi}{3}V_c) \quad (17)$$

By equating the real and imaginary parts derived by,

$$V_\alpha = \frac{2}{3}(V_a + \cos\frac{2\pi}{3}V_b + \cos\frac{2\pi}{3}V_c)$$

$$V_\beta = \frac{2}{3}(0V_a + \sin\frac{2\pi}{3}V_b - \sin\frac{2\pi}{3}V_c)$$

$$\begin{bmatrix} V_d \\ V_q \end{bmatrix} = \frac{2}{3} \begin{bmatrix} 1 & \cos\frac{2\pi}{3} & \cos\frac{2\pi}{3} \\ 0 & \sin\frac{2\pi}{3} & \sin\frac{2\pi}{3} \end{bmatrix} \cdot \begin{bmatrix} V_a \\ V_b \\ V_c \end{bmatrix} \quad (18)$$

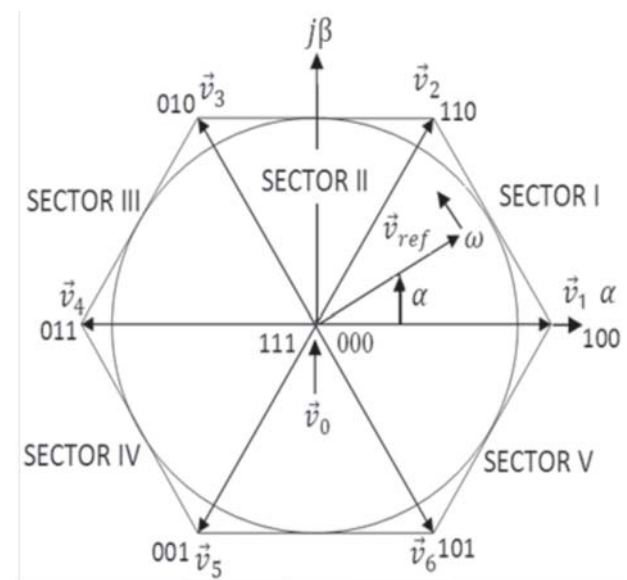


Fig. 4. Space vector diagram for two-level inverter

### SIMULATION RESULTS AND DISCUSSION

The proposed adaptive self tuning PID using neuro fuzzy control based inverter fed brushless Dc Motor control was implemented. The speed control is achieved by proposed sensor less based self tuning

control for increasing the motor performance under variable load and parameters conditions. The proposed adaptive self tuning control is used to obtain the steady state performance and less peak overshoot. The simulation of proposed circuit and control configuration is shown in fig 5. The proposed self tuning PID based on neuro fuzzy control is shown in fig 6. The stator current of proposed BLDC motor is shown in fig 7. The stator voltage of BLDC motor is shown in fig 8. The speed characteristics of BLDC motor is shown in fig 9. The torque characteristics of BLDC motor is shown in fig 10.

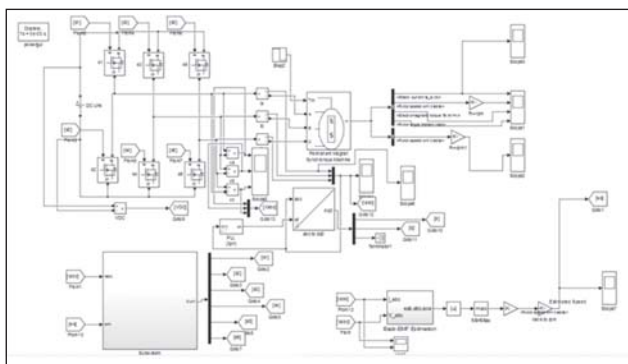


Fig. 5. Simulation of proposed circuit and control configuration

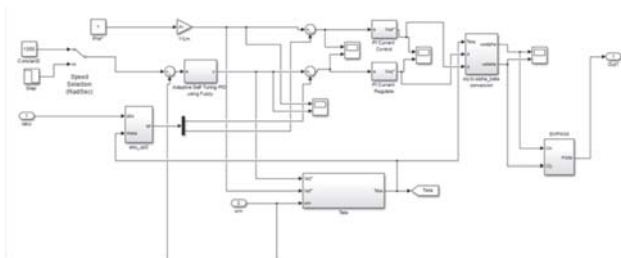


Fig. 6. Proposed self tuning PID based on neuro fuzzy control

Table 4. Motor parameters

Parameters	Value
Nominal Power (HP)	$P_n = 10$
Nominal speed (RPM)	$\omega_n = 1800$
Nominal torque (N.m)	$T_n = 39.5$
Inductance in d-axis (H)	$L_d = 22.1 \cdot 10^{-3}$
Inductance in q-axis (H)	$L_q = 91.1 \cdot 10^{-3}$
Armature winding resistance ( $\Omega$ )	$R = 6.51 \cdot 10^{-1}$
Flux linkage (Wb)	$\lambda = 67.09 \cdot 10^{-1}$
Coulomb friction coefficient (N.m)	$F_c = 10^{-1}$
Viscous friction coefficient (N.m.s/rad)	$F_v = 1 \cdot 10^{-1}$
Static friction coefficient (N.m)	$F_s = 6.4 \cdot 10^{-1}$
Static friction decreasing rate (rad/s)	$\eta_s = 2$
Rotor and load inertia (kg.m <sup>2</sup> )	$j = 1 \cdot 10^{-1}$
Number of pole pairs	$p = 2$

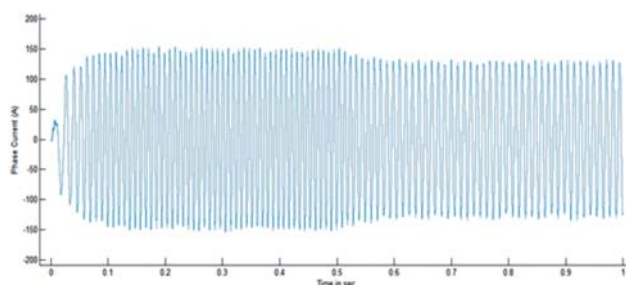


Fig. 7. Performance of phase current waveform (A)

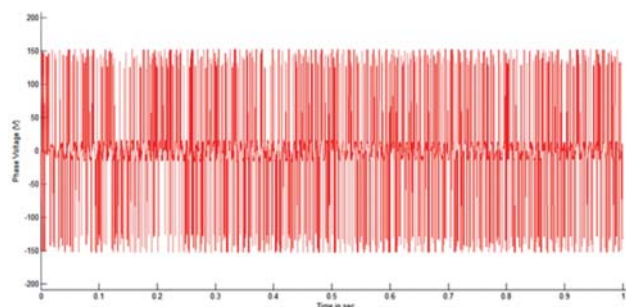


Fig. 8. Performance of phase Voltage waveform (A)

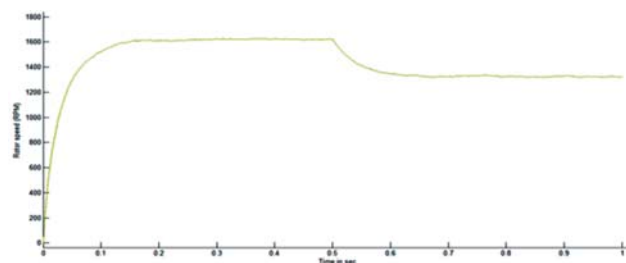


Fig. 9. Rotor speed in RPM

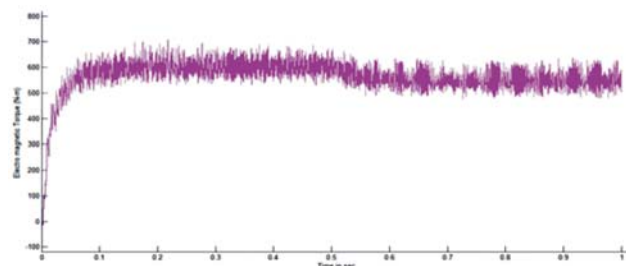


Fig 10: Electromagnetic Torque in N-m

### CONCLUSION

This paper is proposed sensor-less control of Brushless DC Motor using neuro-fuzzy-PID self tuning of control topology. Sensor-less method using phase current sensing is introduced for reducing cost of sensor scheme and self-tuning based neuro-fuzzy applied for control speed for variable load conditions. Phase current sensing is applied via back emf calculation to estimate speed performance of system. An adequate Space Vector Pulse Width Modulation

(SVPWM) is applied for proposed inverter fed brushless DC Motor drive system. An obtained estimation of speed and control speed using neuro fuzzy PID based self tuning is to performing desired speed and controlled torque of Brushless DC Motor. The MATLAB/Simulink results were implemented to verifying about performance of proposed circuit and control configuration. The drawn results are proved about their performance and capable of variable load conditions.

**Ethical Clearance:** Taken from St. Peter's University / or not required as it is a review article.

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Design of Reconfiguration Based Manchester Coding Techniques for Li-Fi System

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## ABSTRACT

Light fidelity Li-Fi is one of the best solutions to increase the transmission range in the indoor. It is purely based on Light Emitting diodes (LEDs) to achieve a high speed communication. Li-Fi communication is based on transmitter and the receiver. Both the transmitter and receiver contain Encoder and Decoder, the functions of the components is to encode and decode the data without any errors. The existing encoding and decoding techniques occurs more complexity; the complexity of the data reduced the speed of the transmission. To overcome the drawback, these papers propose the novel encoding and decoding to reduce the complexity of the data during the transmission. Avoids complexity in the encoding, its speed up the data transmission. Here also consider the area occupied by the encoder and decoder. To optimize the area using reconfiguration approach, its uses more than one encoding and decoding technique in the same component. Its provide hardware reuse and area optimization. The proposed approach provides the data speed and low area. The encoding and decoding design is implemented by Hardware Description Language (HDL). The performance of the novel encoding and decoding technique is evaluated and analyzed using VLSI simulation environment.

**Keywords:** Encoding, Decoding, Complexity, Hardware Description Language (HDL), Reconfiguration

## INTRODUCTION

The Encoding and Decoding module is one of the important tasks in any communication system. The meaning of encoding is to protect the message from others during transmission. Encoding is the process of converting the information form one system to another system. The conversion process done in the form of codes. In general, code in the system is denoted as verbal and non-verbal symbols. In the sender side the process of encoding scheme uses both the verbal and non-verbal symbols. Verbal symbols are words, signs, video, images etc. likewise face expression and bodylanguage is the non-verbal symbols for communication. One of the important things is how the message is encoded by the sender is known by receiver side, than only the receiver decode the message. In the digital encoder, a decoder output bit is more than input code. Error detection scheme is build into the encoding technique. Decoding is done by the receiver side; here the original message is taken from the encoded message. So the receiver gets the original message signal. Varieties of encoding and decoding techniques are available in the communication

systems. Encoding and decoding schemes are changed over the communication systems. In VLSI approach, parity checking, non return to zero, high efficiency video coding is the important coding scheme. The non-return to zero (NRZ) encoding is the simplest form of encoding; it is easy to represents the digit data. In signal higher voltage is represented as logic '1' and the lower voltage is represented as logic '0'. Another encoding technique is Manchester encoding, this method give the speed up to 10Mbps. Manchester technique solve the problems occurred in the NRZ coding technique. It is works on high frequency without any changes in the original signal. 4B/5B encoding and MLT-3 (multi level threshold) encoding techniques are the block coding technique; both the techniques are designed to process the data without increasing the frequency bandwidth. The speed of the block codes are up to 100 Mbps. This coding scheme is used for fast Ethernet communication. But these block codes are not suitable for long distance fast Ethernet communication, using this technique in the long range communication, surely it losses the data during the transmission. To overcome this drawback a new block codes were designed named as 8B/10B and MLT-5. The new method is



suitable for long distance fast Ethernet communication system; it does not losses any kind of data during the transmission and reception from sender to receiver side.

### Related Works

Petr Pfeifer et al. <sup>[1]</sup> introduce the new concept named as PENCA architecture for encoding and decoding. This architecture presents a reconfigurable encoder for flexible error correction and detection mechanism in communication system. Reconfiguration in the system reduces the hardware complexity, and it also introduces the hardware reuse concept in the system. PENCA architecture introduces the honey comb architecture for logic utilization. It provides area efficiency and flexibility. Fabio Luis Livi Ramos et al. <sup>[2]</sup> have been proposed the novel concept named as high efficiency video encoding technique. It increases the state of art for coding standard process the high quality videos. Parallelization process in the video was done by using context adaptive binary arithmetic coding algorithm. It increases the quality of the video and images in the reception.

Low density parity check code (LDPC) technique for space application have been proposed by Dimitris theodoropoulos et al. <sup>[3]</sup> Here implemented the novel encoder architecture, it suitable for space communication. Parallel implementation is done in the architecture; it increases the throughput performance, flexibility and speed, and also reduces the latency during the transmission. The proposed architecture operated on an uninterrupted stream of input data. Sayed el gendy et al. <sup>[4]</sup> described a low cost sample adaptive offset (SAO) encoder for VLSI architecture. It increases the compression efficiency for huge amount of data. Three modules are present in the SAO encoder, named as statistics collection module, parameters determination module and controller module. Based on the three the encoding and decoding process is done.

To increases the speed of the encoder HE Zhiyong et al. <sup>[5]</sup> presented the Rate compatible RC LDPC codes for wide range of data rates. Here push the upper bound of code data rates to 0.96. The proposed technique is based on linear time for encoding. It is perfectly suited for high speed implementation of parallel encoders. Implementation was done with many left circular shifter and xor gates. To maximize the speed of the encoding, also proposed q-parallel

encoder architecture, q is the size of the matrix. The speed of the encoder up to 40 Gbps using a 300MHz clock frequency.

Hamid Reza et al. <sup>[6]</sup> introduced the novel concept of encoder complexity reduction for improving the quality and fidelity of the data. High efficiency video coding (HEVC) are the universal access of digital multimedia application. But complexity is one of the main issues in HEVC. To overcome the drawback by scalable extension of HEVC to SHEVC. The main aim of the extended technique is to reduce the complexity and increases the quality, fidelity and scalability of the encoder. The proposed method also transmits the same video content in single bit stream with complexity reduction. Jui-Hung Hsieh et al. <sup>[7]</sup> proposed a hardware efficient encoder named as Bose chaudhuri Hocquenghen (BCH). It is mainly developed for error correcting and hardware complexity reduction. This method is directly codes the input without any extra operations needed. The proposed BCH coding minimizes the critical delay and saves the logic gates usage. Steffy Johnson and Nidhi Gaur <sup>[8]</sup> were presented the FPGA implementation of LDPC encoder. LDPC encoder is mostly used for error detection and correction in the communication system, <sup>[9]</sup> and also implemented in Spartan 3E board for analyze the device utilization and critical delay.

### Reconfiguration Technique

The main aim of the reconfiguration is to perform the operation at low power. The applications are wide range, for example mobile phones, embedded systems etc. Device reconfiguration provides hardware reuse, low power consumption and flexibility. Coarse grained reconfigurable architecture and fine grained reconfigurable architecture are the two types used in the device reconfiguration. The figure shows the reconfiguration architecture of both the fine grained and coarse grained architecture. Depend on the Logic elements used, it vary the characteristics. Fine grained architecture contains array of homogeneous logic elements and it operated at bit level, likewise coarse grained architecture contains array of heterogeneous logic elements operated at word level. Design and reconfigure of coarse grained architecture are easy, more efficient and faster, but it is less flexible than fine grained reconfigurable architecture. The operations of the reconfigurable architecture are decided by logic elements.

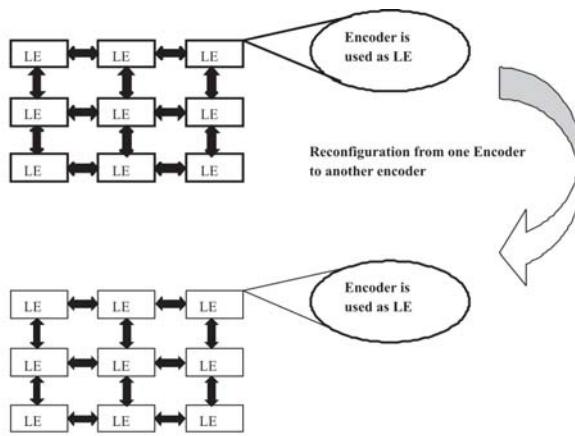


Fig. 1. Reconfigurable Architecture Design

Logic elements are optimized during the large computation operation. So the process utilizes less area and increases the speed of the operation. Different types of reconfiguration are present in the reconfigurable system. The reconfiguration schemes are static reconfiguration, dynamic reconfiguration and logic reconfiguration.

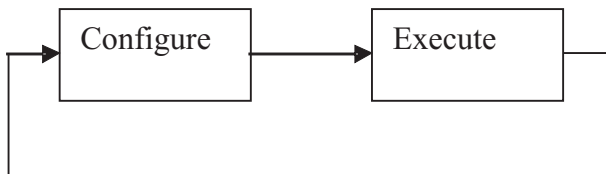


Fig. 2. Static Reconfiguration

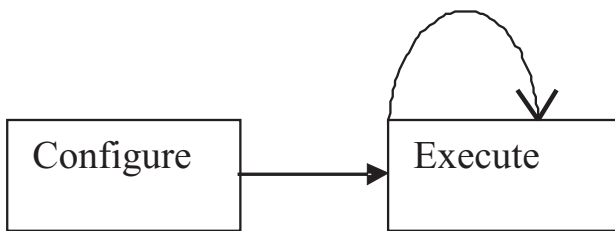


Fig. 3. Dynamic Reconfiguration

In fig. 2 and 3 shows the operation of static and dynamic reconfiguration. In the static reconfiguration, the systems are not allowed to configure the hardware, when the system is running. The systems are allowed to configure the hardware, while the system is in running condition is called as dynamic reconfiguration.

### Line Coding Technique

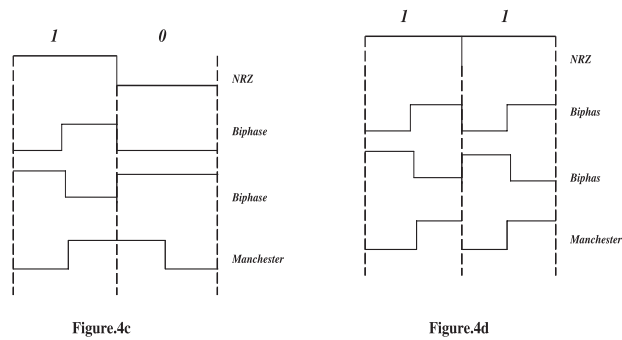
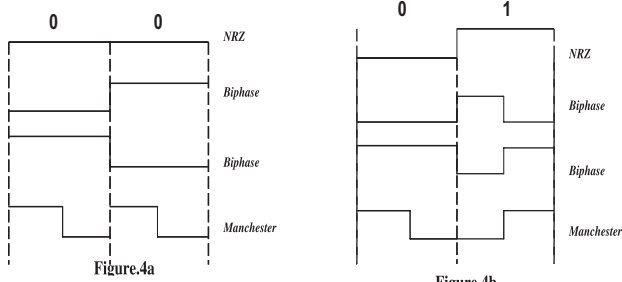
Coding techniques both the encoding and decoding is differ from modulation and demodulation techniques. It shows how the message signal is changed over the channel. It does not take any

responsibility about the accuracy and efficiency. But the encoding and decoding take care off the message accuracy, efficiency and robustness during the transmission and reception. Digital coding techniques are used to transmit the data in the form of '0' and '1'. Logic '0' is represented as low level and the logic '1' is represented as high level of the signal. In a modern digital transmitter and receiver uses varies new encoding and decoding techniques. This coding are transmit the data without any error. In case any errors occur in the data, it automatically detects and corrects the error in the data. NRZ (Non return to zero) is one of the basic digital line coding techniques. It is easy to implement, but one main drawback is error detection. NRZ is not able to detect the error without using the data integrity. So it produces some error bit in the decoding side. Another line coding technique is Biphas, it reduces the complexity to the coding process and also increase the accuracy level in the decoding side. Here logic '1' has an extratransition at the mid-bit.

### Manchester Coding Techniques

Manchester coding is one of the most important data coding techniques commonly used today. It is similar to biphas coding method. Here the transition of signal done in the middle of the clock cycle. Midpoint transition of logic '1' is from low to high and the midpoint transition of logic '0' is from high to low. It is commonly used error detection technique in serial and parallel communication. The mid-bit transition of code allows error detection by using data integrity. Manchester Encoding is the process of adding the transition bit to the original message signal. The added data bit is send over the channel in the communication system. Initial process of the encoding is fixing the data rate of the bits. Once the data rate is fixed for the bit, the mid bit time can be easily determined. It can be determined as  $\frac{1}{2}$  of the period of data rate. For example, fixing the data rate of the signal is 5 KHz, now the bit period of the data is  $\frac{1}{5000} = 0.0005s$  or 500us. The time period is divided into two half, based on the time period the mid bit transition is done in a clock cycle. Manchester decoding is a process of recover the original data bits from the encoded data's. Manchester decoder based on two types, one is time based and another one is sampling based. Timing based Manchester decoding approach is capture the time transition of each data from the demodulator block. This method is able to recover the data correctly. Sampling based decoding does not require the edge transitions, instead of capturing the time; it simply

samples the data and buffers the message. Time synchronization is not an issue in the sampling based decoding. Manchester coding method uses 10 Mbps for Ethernet networks. It also has a broader frequency spectrum than the other coding methods. So it is used for long distance communication systems.



In the above figures show the different line coding response based on the bit frame. Figure 4a shows the response of NRZ, biphas, and Manchester coding technique with the bit frame (0 0). Likewise figure 4b, 4c and 4d shows the output response of different line coding with the bit frame (0 1), (1 0), and (1 1).

**Manchester Coding with Clock and Data Recovery Circuit**

High speed digital data stream serial communications needs clock frequency to transmit the data streams in high speed, for example Ethernet, magnetic disk etc. Clock frequency decides the range and speed of the data. Here use two methods to recover the clock and data. First method is Phase locked loop (PLL), this is the most commonly used technique to recover the clock and data. In this method the receiver generating the clock frequency with an approximate reference frequency. Another method is depends on delay, it is named as delay locked loop (DLL). It will be performed by using sampling, creates multiple input samples and choose the best sample to drive the input with free running clock.

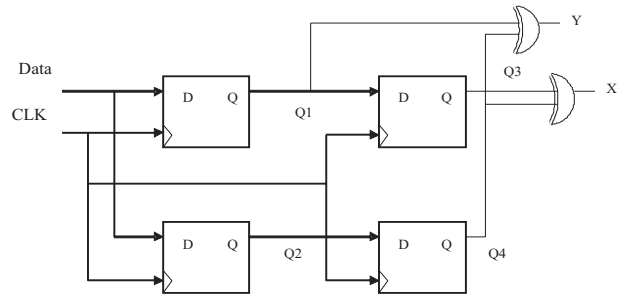


Fig. 5. PLL based Clock and Data Recovery

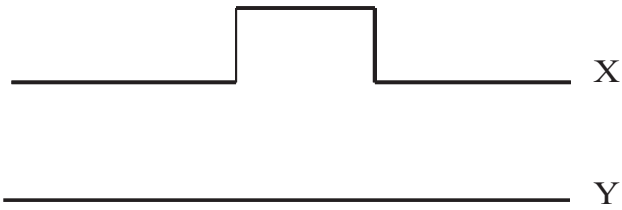


Fig. 6a. Data Edge Leads

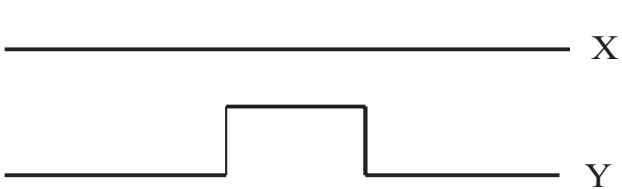


Fig. 6b. Clock Edge Leads

Oversampled clock and data recovery decouples the clock generator from the tracking data. Drawback of the oversampling method is it need special clock for sampling, and three to four sampling is needed for each data bits, and clock frequency is directly proportional to the input frequency. To overcome the drawback, a new clock and data recovery method is proposed. The proposed CDR method takes less number of sampling for input. It is not depend on PLL, depends on multiphase clock jitter and Time to Digital converter (TDC), and also has an infinite frequency acquisition.

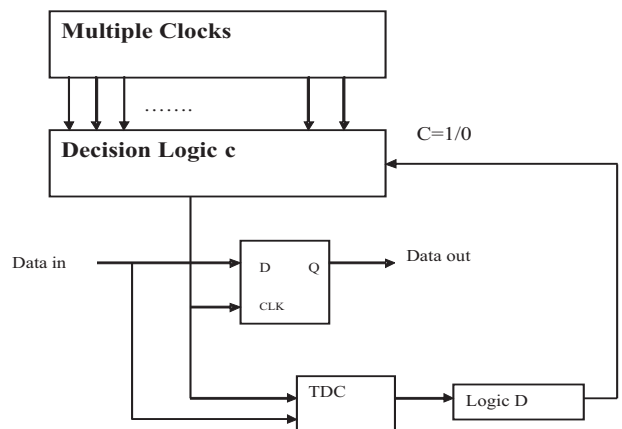


Fig. 7. Clocks and Data Recovery Circuit

### SIMULATION RESULTS

The coding was designed by using verilogHDL, and the simulation results can be done using Modelsim simulator. It is useful to see the clear view of the output response of the technique used.

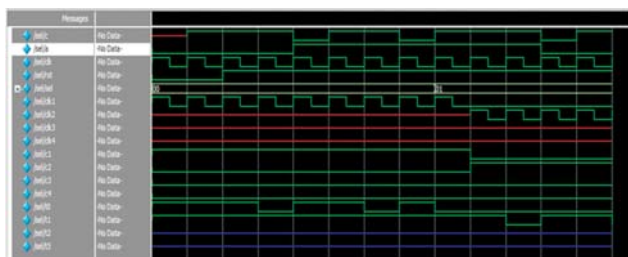


Fig. 8. Simulation Results of Reconfigurable Manchester coding without Clock Recovery Circuit

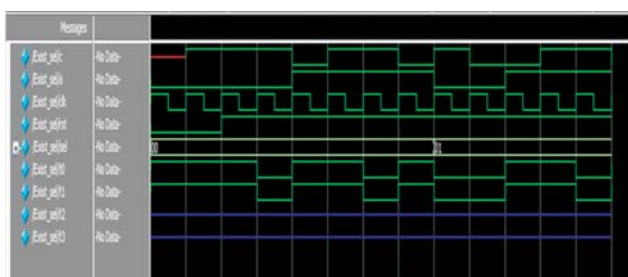


Fig. 9. Simulation Results of Reconfigurable Manchester coding with Clock Recovery Circuit

In fig. 8 and fig. 9 shows the simulation output of Manchester code with clock recovery and without clock recovery. It is very useful to understand the output nature of the design and also differentiate the design in the waveform manner.

#### Performance Evaluation

Table 1: Comparison of with and without clock recovery circuits

Parameter	Manchester coding with Clock recovery	Manchester coding without Clock recovery
Delay (ns)	2.34ns	2.44ns
Power (w)	0.257w	0.742w

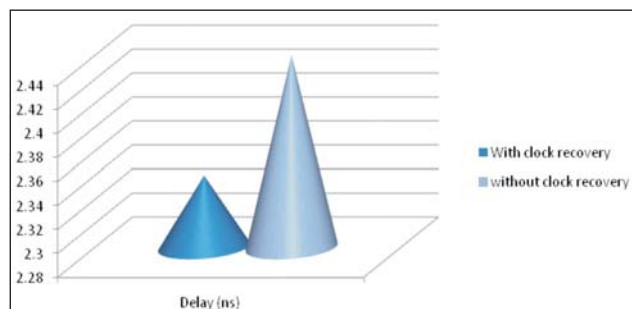


Fig. 12. Graphical representations Delay Comparison

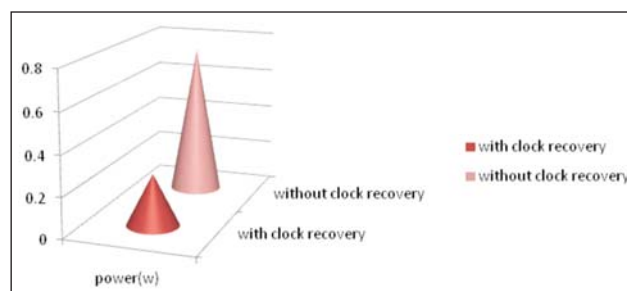


Fig. 13. Graphical representations of Power comparison

### CONCLUSION

This paper presented the concept of clock and data recovery coding technique. It is useful to avoid the information losses during the operation and also reduce the unwanted power usage of the circuit. This circuit uses the decision logic to take care of clock. It avoids the unwanted usage of clock to the circuits for decreases the power dissipation over the operation. Reconfiguration is also done with single clock using the decision logic. Reconfiguration technique is helpful for using more than one coding technique within a single hardware. Coding concept play a vital role in the Li-Fi system, it decides the speed and error free transmission of the system. The proposed concept is applied into the Li-Fi communication system; it will improve the overall performance of the Li-Fi system.

**Ethical Clearance:** Taken from St. Peters University Committee

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Fuzzy Logic Technique Based Image Contrast Enhancement

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## ABSTRACT

Image enhancement plays a vital role in image processing technique. This paper presents a Novel method for image enhancement by using Fuzzy. In this proposed algorithm, the RGB image converted into HSI (Hue, Saturation and Intensity) model, where as Intensity and Hue color considered for Image enhancement after conversion. The Hue component decomposed into directional co-efficient by Fuzzy. The higher directional coefficients are eliminated as it causes artifact and unnatural efforts in a image and the intensity components of image is contrast enhanced by using Fuzzy. The performance of the proposed image enhancement method is compared with existing histogram equalization and contrast limited adaptive histogram equalization based image enhancement. The result of the proposed method achieves satisfactory performance in visualization.

**Keywords:** Fuzzy, Image, Contrast enhancement

## INTRODUCTION

Image enhancement techniques make an image easier to analyze and interpret. The range of brightness values present on an image is referred to as contrast. Contrast enhancement is a process that makes the image features stand out more clearly by making optimal use of the colors available on the display or output device. Contrast enhancement, a process applied on image to increase their dynamic range.

Contrast enhancement is an important area in image processing for both human and computer vision<sup>[1]</sup>. It is widely used for medical image processing and as a preprocessing step in speech recognition, texture synthesis, and many other image/video processing applications. Contrast enhancement automatically brightens the images that appear very dark or hazy and apply appropriate tone correction to deliver improved quality and clearly. It will be used to perform adjustment on darkness or lightness of the image and mainly used to bring out the feature hidden in an image or increase the contrast of low contrast image. This can be done using several contrast enhancement techniques. These techniques applied for various applications such as remote sensing and general images.

Histogram equalization (HE) is most popular technique in contrast enhancement<sup>[2]</sup>. There are variants of HE techniques are available. Dualistic sub-image histogram equalization produces good image contrast enhancement and the enhanced image mean brightness is similar to input image but equalization effect is reduced<sup>[3]</sup>. Automatic weighting mean separated histogram equalization is more suitable for gray scale images. Recursive sub-image histogram equalization has a good contrast enhancement effect. Recursively separated weighting histogram equalization<sup>[4]</sup>, the enhanced image has no severe effect also maintain mean brightness of the input image. Automatic weighting mean-separated histogram equalization is suitable for gray scale images.

A new method for un-sharp masking for contrast enhancement of images is explained in<sup>[5]</sup>. The approach employs an adaptive filter that control the contribution of the sharpening path in such a way that contrast enhancement occurs in high detail areas and little or no image sharpening occurs in smooth areas. The enhancement is reduced in uniform areas of an image which prevents over enhancement of noise and reduces edge shadowing effect of unlimited adaptive histogram equalization.

The size of pixel's contextual region and clip level of histogram are basic parameters of contrast limited adaptive histogram equalization<sup>[6]</sup>. A novel method for contrast image enhancement method using Fuzzy Logic is proposed in this research work. This paper is organized as follows, section II explains the image processing in fuzzy domain. Section III gives details of proposed approach is presented. Section IV presents results that illustrate the effectiveness of the method and compared with previous methods. Finally we conclude this paper in section V.

## FUZZY DOMAIN

Over the last few decades, fuzzy logic systems have superseded conventional technologies in many scientific and engineering applications because of their capability of emulating humans' approximate reasoning ability. The importance of fuzzy logic for control applications arise from the fact that control problems can be easily formulated using fuzzy linguistic variables and fuzzy rules with the inherent advantage of nonlinear mapping, thus leading to a superior controller performance<sup>[7]</sup>. A fuzzy logic system can be considered as a nonlinear mapping of an input data vector into an output vector where this nonlinear relation is defined by linguistic expressions which are computed with numbers. Thus, a fuzzy logic system is unique in its ability to handle numerical data and linguistic information. The richness of this logic is that there are many possibilities which lead to many different mappings.

A FLS is a kind of fuzzy rule based system which is composed of a knowledge base that comprises of two components: the data base and the rule base. The data base contains the definitions of the linguistic labels, that is, the membership functions for the fuzzy sets and the rule base is a collection of fuzzy control rules representing the expert knowledge about the system to be controlled. An interface between the crisp level and the linguistic level - fuzzification interface, transforms the crisp values of the input or measured variables into fuzzy sets using a set of relations defined by membership functions that is further used in the fuzzy inference process. An inference system then uses the fuzzy values from the fuzzification interface and the information from the knowledge base and performs the reasoning process to estimate the controller output. At the end there is a defuzzification interface, which takes the fuzzy action from the

inference process and translates it into crisp values for the control variables.

Each fuzzy rule is a statement where the antecedent and the consequent consist of fuzzy propositions that in turn are statements which join the linguistic variables. In general, the antecedent part of any rule is defined in one form; however the consequent of a fuzzy rule can take different forms giving rise to different fuzzy inference system, thereby different fuzzy schemes. Fuzzy set theory is thus useful in handling various uncertainties in computer vision and image processing applications. Fuzzy image processing is a collection of different fuzzy approaches to image processing that can understand, represent, and process the image. It has three main stages, namely, image fuzzification, modification of membership function values, and defuzzification. Fuzzy image enhancement is based on gray level mapping into membership function. The aim is to generate an image of higher contrast than the original image by giving a larger weight to the gray levels that are closer to the mean gray level of the image that are farther from the mean.

## FUZZY IMAGE PROCESSING

Fuzzy image processing is collection of all approaches that understand, represent and process the images, their segments and features as fuzzy sets. The schematic diagram of fuzzy image processing is shown in Figure 1.

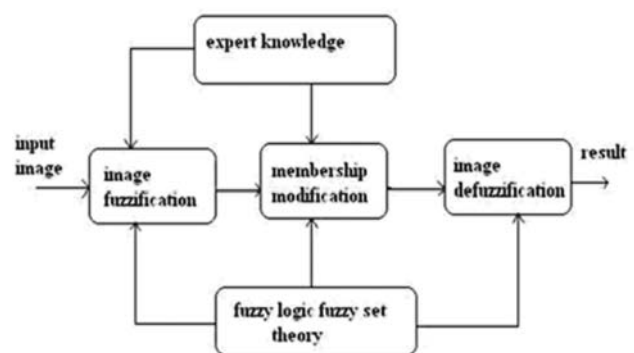


Fig. 1. Fuzzy Image Processing

The fuzzification and defuzzification steps are due to the fact that we do not possess fuzzy hardware. Therefore, the coding of image data (fuzzification) and decoding of the results (defuzzification) are steps that make possible to process images with fuzzy

techniques. The main power of fuzzy image processing is in the middle step (membership modification).

### EXPERIMENTAL RESULTS

In this section, to demonstrate the performance of the proposed algorithm, the proposed method is compared with other image enhancement techniques in terms of ability in contrast and detail enhancement, the proposed method to produce nature and fundal images. Histogram Equalization, CLAHE methods which are used for comparison. In this study, the proposed method was simulated on 512 \* 512 images.

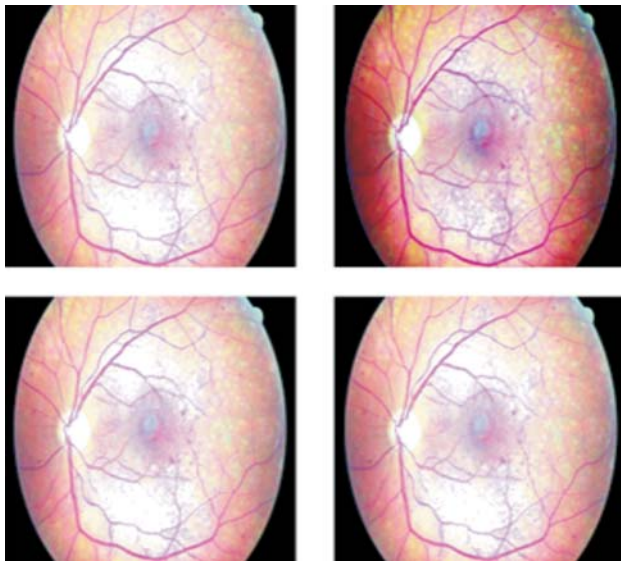


Fig. 2. Comparison of proposed technique with Histogram equalization method and CLAHE (a) Input Image (b) Histogram equalization image (c)CLAHE (d) Proposed Technique



Fig. 3. Comparison of proposed technique with Histogram equalization method and CLAHE (a) Input Image (b) Histogram equalization image (c) CLAHE (d) Proposed Technique

### CONCLUSION

A novel approach for image enhancement has been proposed in this paper based on fuzzy logic. Initially, the color image converted into HSI model. In order to improve the contrast of the image, the hue colour and intensity channels only considered. The fuzzy decomposition produces low and high directional sub bands on the hue channel. Intensity value is transformed by fuzzy and saturation is preserved. Then, the enhanced image is obtained by converting HSI to RGB model. The satisfactory result is achieved from the proposed fuzzy image enhancement approach.

**Ethical Clearance:** Taken from St. Peters University Committee

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Vlsi Architecture for 2D-Discrete Wavelet Transform (DWT) Based Lifting Method

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## ABSTRACT

In this research work, the VLSI based 2D-DWT (Discrete Wavelet Transformation) with lifting method is proposed to improve the performance. Discrete Wavelet based simulation generates efficient image compression with higher compression ratios. Lifting method based 2D-DWT is implemented by using the 1D-DWT architecture with improvement in the picture resolutions. In general, the two dimensional discrete wavelet transform is performed by using the two levels, the predict method is performed in the initial stage and the next stage is performed in addition. By implementing the DWT, the input samples are decomposed into the various sub bands of the signals with both time and frequency data. VLSI architecture is used to further improve the performance of the transformations. The proposed architecture has been implemented by using the VHDL Modules. The flexible efficient architecture is easily designed by using VHDL modules. The simulations are performed by using Modelsim XE to check the validations of the wavelet transformations. Image compression is achieved by using MATLAB R2013 to generate the efficient image pixels for the input image by using 2D-DWT.

**Keywords:** Discrete Wavelet Transform, VLSI, DWT, Lifting method, VHDL, 1D-DWT, 2D-DWT, Image Compression, Resolution.

## INTRODUCTION

For Digital Signal Processing (DSP) and Image Processing applications, there are three various category of the discrete wavelet transform (DWT) is used for image compression. Multilevel one dimensional, Two dimensional and three dimensional wavelet transform is used for the image compression. The wavelet transformation is highly used for the image processing applications as well as the digital signal processing applications. Based on the multi resolution technique, the various transformation techniques are control the time and frequency information. For analysis of the signals, the wavelet transformation generates the time-frequency domain notation. There are two method is used to implement the wavelet transforms. That is, Filter bank (Frequency based) and another one is Lifting Schemes (Time based).

Image transformation using wavelets, encoding of the wavelet coefficients were considered as separate entities initially. Wavelet transform of the input image identifies the spatial spectrum components of the x, y

direction. The x-spectral component is indicative of the horizontal frequency components present in the image. The y-spectral component indicates the vertical frequency components present in the image. The horizontal edge is obtained using high pass filtering along the y direction and low pass filtering along the x direction. The vertical edge is obtained using high pass filtering along the x direction and low pass filtering along the y direction. Data compression can be performed in signals right from the image sensor.

Even though the image is digitized in space in the digital equipment, the color information like chroma, luminescence of each pixel under consideration is still analog. The discretization in space should be followed by discretization of color information and quantizing the same for digital processing. Digital video is a sequence of non interlaced pictures compressed using a suitable codec. Hence image compression using wavelets followed by encoding results in video compression too, with the video constituted by same set of pictures. JPEG the famous multimedia compression format relies on visual perception of the human eye. The information that is not sensitive to

human eye like certain color and optical perceptions are removed to achieve greater compression. However JPEG is a lossy compression and cannot be applied to medical images. Most of multimedia data cater to the need of entertaining the users and therefore lossy compression of images can be applied with caution.

Different techniques exist to compress Analog and Digital signals. Analog compression can be done at the electrical level by differential recording, companding and other non-linear operations. Digital compression is done using mathematical libraries of high level languages like C used to program the Digital Signal Processors, high-end microcontrollers and microprocessors. Optimized compression algorithms can be implemented by programming at the Assembly Language level and Machine Language level. Companding is widely used because it enhances minute information when viewing the signal plotted in a graph and suppresses information that is more vivid to extent that is sufficient.

### Related Works

Data compression is one of the important processes to eliminate the redundancy of data and save the storage medium. Kumar B, M., et al. (2014) [1] designed a new image compression for JPEG format. The design was done by using verilog HDL language. Image and data compression can be classified into two types. First one lossy and another one is lossless. In lossy method there is some loss of information during the image compression. In lossless scheme there are no losses of information during the compression process. Normally digital images occupy large space to save.

In the proposed technique reduce the storage space without any damage of images. Joint pixel expert group (JPEG) is the advanced standard to describe the images. The compression of JPEG standard images are not that much easy without any loss of data. But here using the discrete cosine transform (DCT) and entropy coding for avoid the information loss during the image compression. Nagabushanam, M., et al. (2011) [2] have been proposed the image compression and decompression method using Discrete wavelet Transform (DWT) and Inverse discrete wavelet transform (IDWT) process.

The DWT and IDWT algorithm was designed by using VerilogHDL. Filter is one of the main components to compress the image by DWT. It consists of low pass filter, high pass filter and down sampler. The efficient filter output is depends on order of the

filter. Increase the number of order in the filter automatically the quality of the image gets improved. Filter consists of two coefficients, named as wavelet coefficient and scaling coefficient. A wavelet coefficient is the output of high pass filter and the scaling coefficient is the output of low pass filter.

In the same way IDWT consists of reconstruction low pass filter, high pass filter and up sampler. It performs the inverse operation and get the original compressed image. Gupta, M. and Garg, A.K., (2012) [3] presented the new DCT algorithm for image compression. Discrete Cosine Transform (DCT) is the technique converting any kind of signal into a frequency component. In this method the original image is processed or transformed in 8x8 blocks. The difference between the original image and the reconstructed image is called as error image. Error value of each and every image is calculated and the calculated value is used for reconstruct the original image at the future. JPEG and MPEG image compression is used by DCT technique. DCT based image compression technique has two method to reduce the data loss. First method is quantization of image; in the method image pixel values are quantized. The quantized data is applied into the entropy coding. After getting the resulting image, entropy coding is used to avoid the information loss.

Shannon coding is used to get the original image after the reconstruction. Patel, T.S., et al., (2013) [4] described the image compression using vector quantization and Discrete Wavelet Transform (DWT). Compression is one of the techniques for efficient transmission and storage space. Vector quantization is a type of image compression with lossy. Because some information get loosed during the quantization process. Image is split up by different blocks with same size. Also create a codebook for representing the image block types. This type of compression reduces the losses of information during the computation by the help of codebook vector. Hybrids DWT- vector quantization technique provide the better compression image with higher ratio. Also provide high quality images with small storage space. Hybrid technique is extended and processes the image compression; it provides the better quality of image and very low information loss.

### PROPOSED METHODOLOGY

For implementation of the bi-orthogonal wavelets, the lifting method is used. Spatial domain is used to

construct the lifting scheme and the method is used to provide the efficient wavelet transform with a lifting procedure. There are three steps is used to construct the lifting method. First step is split step, for breaking the input samples  $x(n)$  into odd and even samples. Lifting step is simulated depends on the type of filter is used to filter the odd and even samples.  $P(z)$  and  $u(z)$ . The low pass sub bands of the odd and even samples are determined by the scaling step. The lifting methods is achieve the splitting of the high pass and low pass filters into the samples of the upper and lower samples and also the implementation of the filter is transformed into the multiplication matrixes. The upper and lower triangular matrix are shown above for wavelet transformation. The  $L$  is denoting the lower triangular matrix and the  $U$  is denoting upper triangular matrix. Lifting method is used to reduce the computational complexity of the implementation of the wavelet transformations and also it used to remove the memory elements for store the results. The requirement of the memory used for store the results is minimized by using the lifting scheme compare than the traditional implementations. In general wavelet implementations, the memory requirement of the storage purpose are highly used but in the type of lifting scheme it perform efficiently for memory utilizations. There are two main blocks are used to build the 2D-DWT block that is, Predict block and Update block. To compute the high coefficients, the input pixels are connected to the predict block.

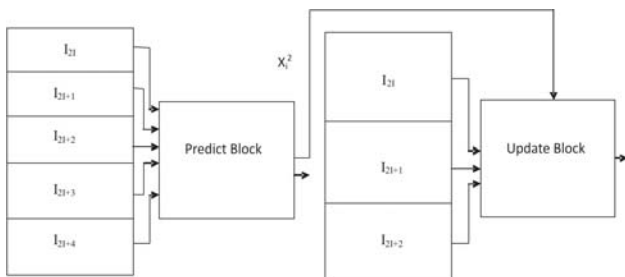


Fig. 1. Block Diagram of the proposed architecture

At the same time, the output of the predict block is connected to the update block to generate the lower coefficients for pixels. The predict block need the some input pixels that is,  $IP_{i-1}$ ,  $IP_{i+1}$ ,  $IP_{i+2}$ ,  $IP_{i+3}$  and  $IP_{i+4}$ . And  $IP_i$ ,  $IP_{i+1}$ ,  $IP_{i+2}$  input pixels are required for the update block. For calculation of the  $X_i$  and  $Y_i$ , there are some amount of pixels are required. In proposed method, there are five pixels are required for determine the  $X_i$  and there are three pixels are required for the  $Y_i$  calculations. Split, Predict, Update and Scaling steps

are basically used to generate the lifting method schemes.

**Lifting Scheme**

The proposed lifting scheme is used to compress the image by using multilevel two dimensional and also the filters are used to reduce the hardware utilizations and the system is more effective for FPGA architectures. There are two main blocks is used to perform the lifting method that is, Predict block and update block. To compute the higher level of coefficients, the input image samples are given to the predict block and the output of the predict block is given to the input of the update block. The update block is used to compute the lower level of coefficients of the image samples.

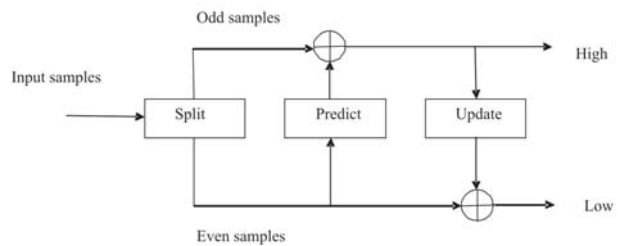


Fig. 2. Lifting Method

$$L = \begin{pmatrix} L_{1,1} & \dots & 0 \\ \vdots & \ddots & \vdots \\ L_{n,1} & \dots & L_{n,n} \end{pmatrix} \dots (a)$$

$$U = \begin{pmatrix} U_{1,1} & \dots & U_{1,n} \\ \vdots & \ddots & \vdots \\ 0 & \dots & U_{n,n} \end{pmatrix} \dots (b)$$

**Predict Block**

In the Predict block, the each clock pulse samples are overlapped and the input given image samples are overlapped at the given input five pixels. There are four pre computed values are stored in the register name is, A, B, C and D. There are four multipliers and two adders are used in the predict block. The multiplier is producing the output bit to the delay register and the output of the delay register is connected to the adder block. The adder block is initialized by the zero in the samples and the values are stored in the delay register. Then the output of the adder block is again forward to the adder block. These operations are performed at the each stage of the input samples.

### Update Block

By using the strip based method, the input pixels are read and the last pixel is overlapped by the each clock pulses. In this block, there are three constant values are pre computed namely,  $\alpha$ ,  $\beta$ ,  $\gamma$  and these values are stored in the register. There are four multipliers and one adders are required for the update operations. The addition operations are performed as same in the predict block. The lower levels of coefficients are determined by the update block. At the final stage, the both higher and lower co-efficient are scaled by using the scaling factor.

In 2D-DWT, the information are selected from the image is performed by the multiplexer. The input data is divided into the four sub bands. That is, LL, LH, HL and HH. The LL band is given the information to the transform block to perform the next level decompositions. Then, the LL band of the data is further decomposed into the LLLL, LLLH, LLHL and LLHH. At the final stage, the LLLL band is perform the final decompositions. 1-Dimensional wavelet transformation performance of row and column can be reduced by the 2-Dimensional wavelet transformation. The sub band of the given data is generated by applying the straight forward approach for both row wise and column wise. There are two architecture is generally used in the 2D-wavelet implementations. That is, level by level and line based architecture. In case of system on chip (SOC), the power consumption is high as well as the hardware utilization is high by using the external memory access. The line based architecture is performing with the input buffer and data buffer. The data buffer is proportional to the number of the register nodes. The lifting scheme for DWT transformation is reconstitute the low and high filter of the traditional method by samples of the modified filter.

### EXPERIMENTAL RESULTS

The design of 2D-Discrete Wavelet Transform (DWT) based Lifting method has been implemented by using Very High Level Design Language (VHDL). 2D-DWT simulation has been estimated by using MATLAB R2013 and these results are shown in Fig.3. By using Modelsim XE simulation tool, the simulation results for three level discrete wavelet transform with predict and update method has been evaluated and these results are shown in Fig.4, Fig.5 and Fig.6.

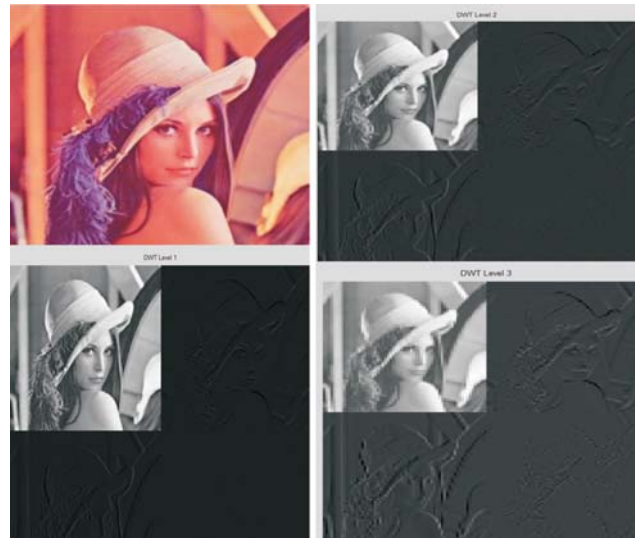


Fig. 3. MATLAB Simulation result for 2D-DWT

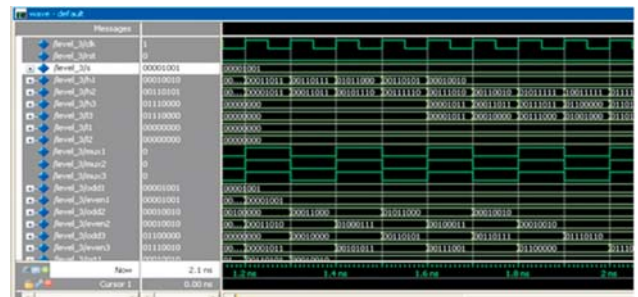


Fig. 4. Simulation output for three levels Discrete Wavelet Transformation (DWT)

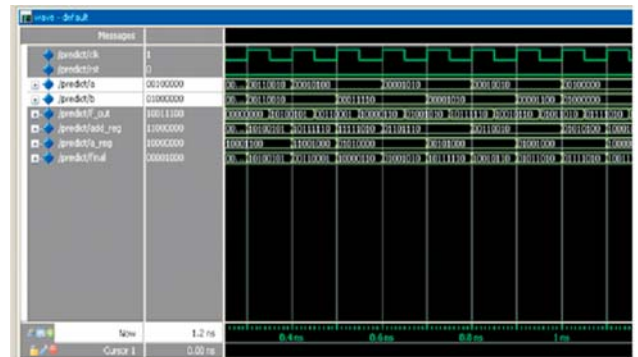


Fig. 5. Simulation output for the Predict method

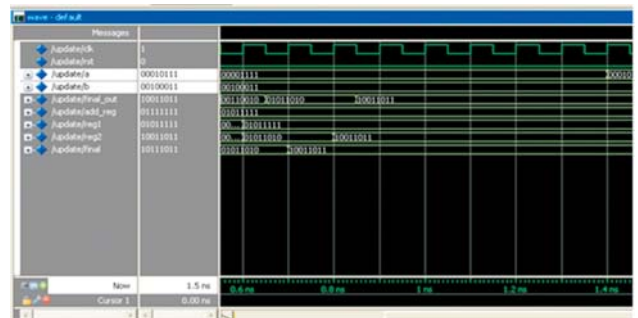


Fig. 6. Simulation Output for the Update method

**Synthesis Results Aand Analysis**

By using proposed lifting method, the image compression is implemented efficiently by using Xilinx ISE in terms of the VLSI Design environment. The proposed design is perform with the minimum number of logical elements utilizations. The number of logical elements counts are denoted as Look-up-table (LUT) and slices and also the computational delay is efficiently reduced by using the proposed lifting based DWT. The Synthesis result for conventional and proposed method is illustrated in below Fig. 7 and Fig.8. The comparison tabulation of conventional and proposed synthesis result are tabulated in below Table.1.



Fig. 7. LUT Report for proposed method

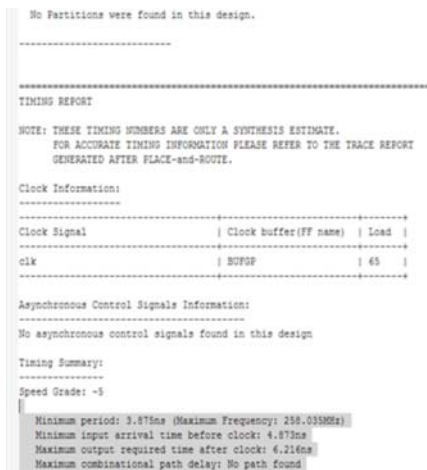


Fig. 8. Delay report for proposed method

**Table 1: Synthesis Result for Conventional and Proposed Design**

Design Description	Look-up-table (LUT)	Delay (ns)
Conventional Three Level DWT	93	5.496
Proposed Lifting based Three Level DWT	34	4.873

**CONCLUSION**

In this research work, the VLSI design of the 2D-Discrete Wavelet Transform (DWT) with lifting method is presented. The proposed lifting method is reducing the memory elements requirements as well as the efficient image compression without the data loss. The original data of the image is transformed by using the lifting method. For the design of 2-D DWT architecture, the data buffer is the only requirement with 4N size for column filter. 2-D-DWT coding was simulated and image compression is performed by using MATLAB R2013a and the VLSI implementations of the lifting scheme are designed by using the VHDL modules. VLSI simulations are performed by using Modelsim XE and the synthesis is evaluated by using Xilinx ISE. According to the simulation of the lifting method, the proposed architecture is highly efficient for the image processing applications.

**Ethical Clearance:** Taken from St.Peter’s University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# An Improved Query Ranking and Hardness prediction Algorithm for Query Interfaces on Databases

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## ABSTRACT

The ability to make accurate predictions of the outcome of an event or a process is highly desirable in several contexts of human activity. Keyword queries on databases give simple access to information, yet frequently experience the ill effects of low positioning quality, i.e., low accuracy and additionally review, as appeared in late benchmarks. It is valuable to recognize queries that are probably going to have low positioning quality to enhance the client fulfillment. The existing work has not focused about the semantic significance among the queries that are presented by the clients, which will prompt erroneous outcome recovery. To overcome this issue in the proposed work, we devise efficient algorithms to compute the degree of difficulty using query-time, and show that the overhead is very small compared to the query execution time by utilizing the Word Net tool. This will prompt an exact to k recovery of record because of utilization of semantic significance of the archives in web index. Our approach has shown a great improvement in accuracy of predicting hard keyword queries.

**Keywords:** Query Ranking, Databases, Hardness prediction Algorithm, Query Retrieval Prediction Algorithms.

## INTRODUCTION

With a specific end goal to decide the connection between the evaluation and the application of query effectiveness prediction strategies, it is required to apply them in real situations. This progression is frequently not executed as obvious in the solid complexity between the quantity of prediction algorithms that have been proposed throughout the years, and the quantity of distributions committed to applying those prediction strategies in an operational setting. It accordingly remains generally obscure when a prediction technique can be considered to perform all around to be employable in a versatile retrieval framework.

In this paper we investigate the relationship between the rank correlation coefficient  $\hat{\rho}$  a prediction method achieves and the prediction method's effect on retrieval effectiveness in two operational settings: Meta-Search (MS)<sup>[1,2]</sup> and Selective Query Expansion (SQE)<sup>[3,4]</sup>. In SQE, pseudo-relevance feedback is not applied uniformly to all queries, instead the decision whether to apply automatic query expansion (AQE) is made for each query individually.

Our goal is to determine at what levels of correlation a prediction technique can be thought to

be of sufficiently high quality to create unmistakable positive changes in recovery effectiveness in a versatile recovery segment. In the event that we could decide such edges, we could interpret from a correlation-based evaluation, regardless of whether the nature of a prediction technique is adequate for a specific application. In the event that the effectiveness of the versatile framework is higher than the effectiveness of the benchmark framework, we may presume that the correlation of the prediction technique accomplished, is adequate for the predictor to be reasonable practically speaking. In view of the result of a solitary prediction strategy and one informational index, we cannot make inferences about the level of correlation that shows a sufficiently high predictor accuracy to enhance the recovery effectiveness of a versatile framework in general.

## Related works

The two SQE scenarios that were assessed by Yom-Tov et al<sup>[4]</sup> depend on the thought that simple inquiries, that is questions bringing about high recovery effectiveness, additionally enhance with the application of pseudo-pertinence criticism. On the other hand, inquiries that are considered troublesome and which in this way accomplish just low recovery

effectiveness debase with the application of AQE. The reason is the accompanying: simple questions will have important archives among the top positioned comes about, and accordingly an AQE algorithm [5,6] which gets extra query terms from the top positioned records returned for the underlying query, is probably going to determine terms identified with the data required. Selective query expansion builds on these assumptions: if we can predict the performance of a query, we selectively expand the queries that perform well according to the predictor method, while not expanding the poorly performing ones.

A comparable situation with an alternate predictor is assessed by Amati et al [7]. Here, an anticipated score edge is settled in a heuristic design and inquiries with anticipated scores over the edge are extended, while questions with anticipated scores beneath the edge are most certainly not. Better outcomes are accounted for by Cronen-Townsend et al [8] where the edge of when (not) to extend a query is found out.

### Query Retrieval Prediction Algorithms

Retrieval prediction algorithms predict the effectiveness of a query before the retrieval stage is reached and are, thus, independent of the ranked list of results; essentially, they are search-independent. Such methods base their predictions solely on query terms, the collection statistics and possibly an external source such as WordNet [9], which provides information on the query terms' semantic relationships.

In general, retrieval indicators can be separated into four distinct gatherings as indicated by the heuristics they affect as shown in figure 1. In the first place, specificity based indicators foresee an inquiry to perform better with expanded specificity. How the specificity is resolved further partitions these indicators into gathering insights based and inquiry based indicators.

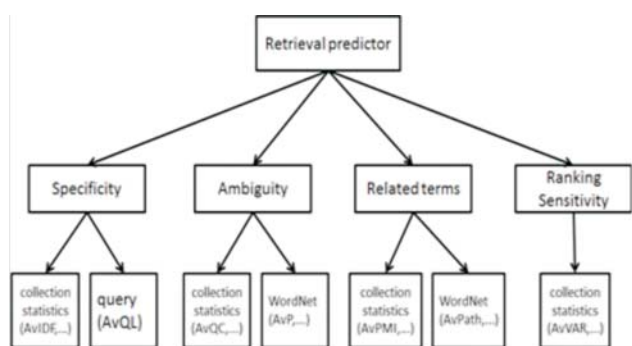


Fig. 1. Categories of Retrieval Predictors

### Query Difficulty

The query difficulty criterion can be defined as follows: given a query  $q$ , a corpus of documents  $C$ , external knowledge sources  $E$  and a ranking function  $R$  (which returns a ranked list of documents), we can estimate whether  $q$  is difficult as follows:

$$f_{diff}(q, C, E, R) \rightarrow \{0, 1\} \theta \quad (1)$$

Here,  $f_{diff} = 0$  is an indicator of the class of difficult queries which exhibit unsatisfactory retrieval effectiveness and  $f_{diff} = 1$  represents the class of well performing queries. When  $R = \theta$ , we are dealing with pre-retrieval prediction methods. A number of algorithms involve external sources  $E$  such as Wikipedia or WordNet. The majority of methods however, rely on  $C$  and  $R$  only.

### Query Performance

Deciding if a query will perform well or poor is not generally adequate. Consider for instance various option query details for a data is required. Keeping in mind the end goal to choose the best performing query, a more broad approach is required; such an approach is *query performance prediction*. Utilizing the documentation above, we express this as takes after:

$$f_{perf}(q, C, E, R) \rightarrow R \quad (2)$$

The query with the top score as per  $f_{perf}$  is esteemed to be the best formulation of the data required. In this situation, we are not intrigued by the specific scores, yet in accurately positioning the inquiries as indicated by their anticipated adequacy. In such a setup, assessing the agreement between the anticipated query positioning and the real query adequacy positioning is a sound assessment procedure. The arrangement of these two rankings is typically announced regarding rank relationship coefficients, for example, Kendall's  $\tau$  and Spearman's  $\rho$ .

### Improved Query Ranking and Hardness Prediction Algorithm (IQRHP)

At first the original dataset, which contains result set for client queries, must be put away in the relating database. In this way, each time when client set forth a query search, the query is taken into database to recover the comparing answer for query. In our proposed strategy, we also utilized WordNet instrument for acquiring the helpful depiction about specific Query. The top  $k$  result is acquired through probabilistic retrieval model for semi-structured data



(PRMS) ranking technique for semi-organized information. Each time the new keyword occurrences are underlined, the progressions will be finished by PRMS ranking strategy. PRMS uses a dialect display way to deal with search over organized information. It registers the language model of each attribute smoothed by the language model of its attribute. It appoints each quality a query keyword-particular weight, which indicates its commitment in the ranking score. The ranking of the search results is being enhanced by utilizing ranking algorithm in light of the power to expand the semantic search answers.

An opportunity to recover the search information on unique and tainted database is being computed. Presently re-rank the top k results for particular client query. We Utilize the Query Ranking and Hardness Prediction Algorithm (IQRHP) to diminish the overhead time to handle the query. This algorithm additionally concentrates on the estimation of trouble of a query and rankings. It depends on the contrasts between the rankings of a similar query over the first and boisterous (debased) forms of a similar database. IQRHP algorithm handles proficiently the undermined element, qualities and characteristic esteem utilizing vigorous score esteem. So we need to ascertain the IQRHP score for every client query and result from the database. At long last, we get the outcome after the performance of spearman relationship.

**Ranking in Original Database**

With the mapping probabilities assessed, probabilistic retrieval model for semi-structured data (PRMS) can utilize them as weights for consolidating the score from every component into a record score, as takes after:

$$P_M(E_j | w) = \frac{P_M(w | E_j)P_M(E_j)}{\sum_{E_k \in E} P_M(w | E_k)P_M(E_k)} \quad (3)$$

Here, the mapping probability  $PM(E_j | w)$  is calculated and the element-level query-likelihood score  $PQL(w | e_j)$  is estimated in the same way as in the HLM approach.

$$P_M(E_j | w) = \frac{P_M(w | E_j)P_M(E_j)}{\sum_{E_k \in E} P_M(w | E_k)P_M(E_k)} \quad (4)$$

The method of reasoning behind this weighting is that the mapping likelihood is the consequence of the surmising technique to choose which component the client may have implied for a given query term. For example, for the query term ‘romance’, this model appoints higher weight when it is found in type

component as we accept that the client will probably have implied a kind of motion picture as opposed to a word found in plot. One may envision a situation where the client implied ‘megryan’ to be words in the title and ‘romance’ to be in the plot. Given that we will likely make the best figure with the insignificant data provided by client, notwithstanding, the PRMS won’t rank films that match this elucidation as profoundly as the more typical significance. Motion pictures that do coordinate this translation will, in any case, show up in the ranking as opposed to being rejected through and through, which would be the situation on the off chance that we were creating organized queries. The exploratory results in view of accumulations and queries taken from the real web administrations bolster the claim that the regular translation is typically right.

We compute the similarity of the answer lists using Spearman rank correlation. It ranges between 1 and “-1, where 1, “-1, and 0 indicate perfect positive correlation, perfect negative correlation, and almost nocorrelation, respectively. To computes the Structured Robustness score (SR score), for query Q over database DB given retrieval function:

$$SR(Q,g,DB,XDB)=E\{Sim(L(Q,g,DB),L(Q,g,XDB))\}$$

Where *Sim* denotes the Spearman rank correlation between the ranked answer lists.

**Pseudo code for IQRHP**

- 1 Consider the input query Q, Inverted Index I, Number of relations exist in the ontology R, Finite Set O (Ontology), Similarity word, Top k result List L of Q by ranking function g, Number of corruption iteration N.
- 2 IQRHP 0 ; C{};
- 3 For i=1 N do
- 4 For (inti=0; i<word length;i++);
- 5 WordInformation[i]=Find WordInformation for Words(i) byWordnet
- 6 For (j=1;j<R;j++)
- 7  $R = R_{ij}$  // no.of relations exist in ontology concept.
- 8 For each concept ofontology
- 9 If Type (word Type.word) is a nounthen
- 10 Word Distance = word Type . word GetSimilarity

- 11 (concept of ontology),return
- 12 Build similaritymatrix
- 13 Improve the relevance score value based on the web page counts.
- 14 Then do the same process for corrupteddatabase.
- 15 For each result R in L do
- 16 For each attribute value A in Rdo
- 17 Obtain corrupted version ofA.
- 18 For each keyword w in Qdo
- 19 Calculate number of w in corruptedA.
- 20 Perform for all words in a givenquery.
- 21 Read the character after “+”, “-” and hyphen using IQRHP algorithm.
- 22 Update all the metadatavalues.
- 23 Compute the ranking using function g and correlation method.
- 24 Obtain IQRHP result with semantic result using ontology concept.
- 25 Return ISR+=Semantic and Similarity top k result (L,L')

**Performance Evaluation**

**Approximation Algorithms**

In this section, the proposed IQRHP algorithm with the existing approximation algorithms like Query-specific Attribute values only Approximation (QAO-Approx), Static global stats approximation (SGS-Approx) algorithm, Combination of QAO-Approx and SGS-Approx (Combined -Approx).

**Datasets**

Table 1 shows the characteristics of two datasets used in our experiments. The INEX data set is from the INEX 2010 Data Centric Track [10]. It is a subset of the IMDB dataset. The INEX data set contains two entity sets: movie and person. Each entity in the movie entity set represents one movie with attributes like title, keywords, year, actor, director etc. The person entity set contains attributes like name, nickname, movie. The SemSearch data set is a subset of the data set used in Semantic Search 2010 challenge[11]. The original data

set contains 116 files with about one billion RDF triplets.

**Table 1. INEX and SemSearch Dataset characteristics**

	INEX	SemSearch
Size	9.85 GB	9.64 GB
Number of Entities	4,418,081	7,170,445
Number of Entity Sets	2	419,610
Number of Attributes	77	7,869,986
Number of Attribute values	113,603,013	114,056,158

**Effectiveness Metrics:** We have used the widely used effectiveness metrics Average Precision and Mean Average Precision (MAP) to measure the quality of rankings delivered by ranking algorithms for a query and a set of queries over a database, respectively[12].

**Recall:** Recall value is calculated based on the retrieval of information at true positive prediction, false negative. Data precision is calculated based on the percentage of positive results returned and is also referred to as the True PositiveRate.

$$\text{Recall} = \frac{\text{Truepositive}}{\text{Truepositive} + \text{Falsenegative}} \quad (5)$$

We use Improved Query Ranking and Hardness Prediction (IQRHP)algorithm in proposed scenario to build high accurate results. For number of queries it generates the higher recall values in current scenario. Finally we can say that our proposed system is higher performance than existing algorithms.

**Precision:** Precision value is calculated based on the retrieval of information at true positive prediction, false positive.

$$\text{Precision} = \frac{\text{Truepositive}}{\text{Truepositive} + \text{Falsepositive}} \quad (6)$$

**Time Parameter:** From the graph generated, it is being found that the time taken is long in existing scenario and low in proposed scenario. We use ontology with wordnet tool hence it extracts the necessity answer set fast and efficient with relevant top k results. With the proposed IQRHP algorithm with ontology concept, it takes minimumamountof timefor computation in proposed system. Finally we can prove that our proposed algorithm outperforms the existing algorithms in terms of efficiency.

**EXPERIMENTAL RESULTS**

According to our performance study of QAO-Approx, SGS-Approx, the combined algorithm and our IQRHP algorithm over both datasets, we observe that

IQRHP algorithm delivers the best balance of improvement in efficiency and in effectiveness for both datasets. On both datasets, the IQRHP algorithm can achieve high prediction accuracy (correlation score about 0.5).

We measure the prediction effectiveness for smaller values of N using average correlation score. The QAO-Approx algorithm delivers acceptable correlation scores and the corruption times of about 2 seconds for N=10 on INEX and N=20 on SemSearch. Comparing to the results of IQRHP Algorithm for N=250 on SemSearch and N=300 on INEX, the correlation score drops, because less noise is added by second and third level corruption. These results show the importance of these two levels of corruption.

SGS-Approx outperforms QAO-Approx in terms of both efficiency and effectiveness on the SemSearch dataset.

Combining QAO-Approx and SGS-Approx algorithms achieve better performance compared to QAO-Approx and SGS-Approx. But it is evident that that the proposed IQRHP algorithm outperforms the combined algorithm in terms of accuracy and query effectiveness.

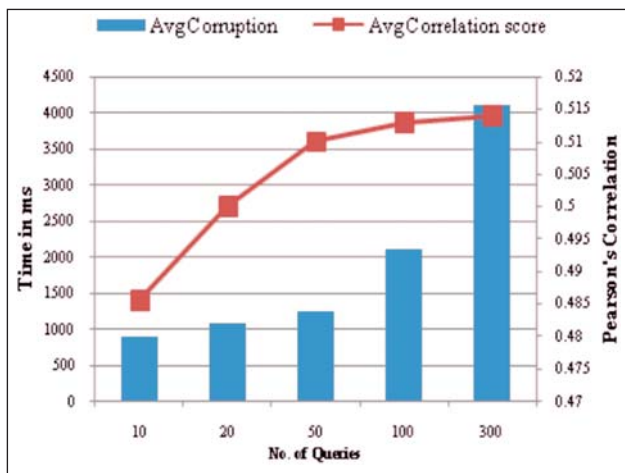


Fig. 2 (a). Combined -Approx

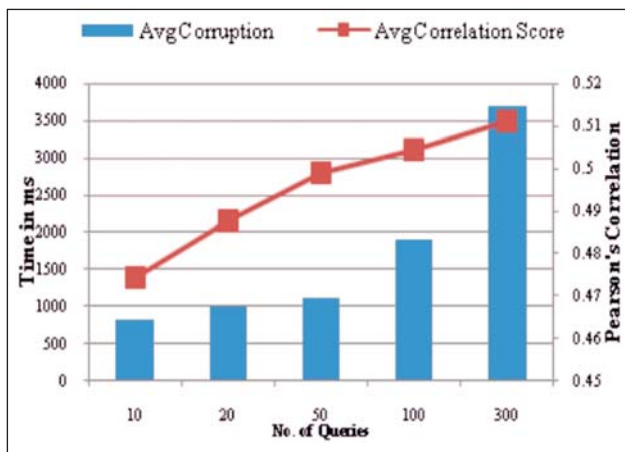


Fig. 2 (b). IQRHP Algorithm

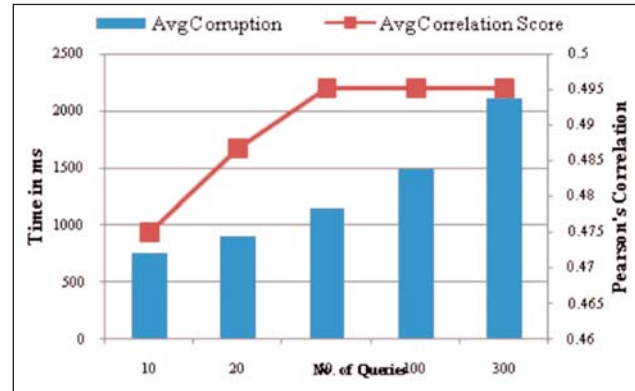


Fig. 3(b). Combined - Approx

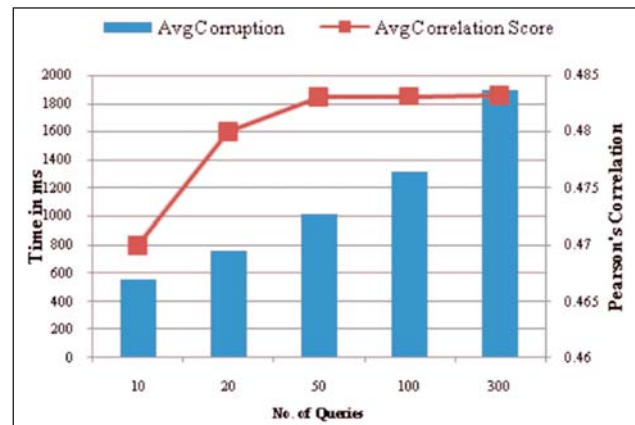


Fig. 3 (b). IQRHP Algorithm

Figures.2 (a) and Figure.3(a) present the results of the combined algorithm for INEX and SemSearch databases, respectively. Figure 2.(b) and figure 3.(b) shows the results of the IQRHP algorithm for INEX and SemSearch datasets respectively. From the graphs it is evident that our proposed algorithm outperforms the existing algorithms.

### CONCLUSION

In this paper, we presented the novel issue of anticipating the effectiveness of keyword queries over databases. We demonstrated that the present prediction strategies for queries over unstructured information sources can't be adequately used to take

care of this issue. We put forward a improved principle system to measure the level of hardness of a keyword query over a database, utilizing the Improved Query Ranking and Hardness Prediction (IQRHP) Algorithm. From the results obtained it is evident that the proposed algorithm predicts the hardness of the keyword query more efficiently with relatively low errors and negligible retrieval time overheads.

**Ethical Clearance:** Taken from MGR University

**Source of Funding:** Self

**Conflict of Interest:** NA

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# Design of MML Reduction in Super High Frequency Antenna Using HFSS for Wireless Communication System

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## ABSTRACT

In the world of modern wireless communication, engineer who needs to work in the communication field needs an essential comprehension of the parts of electromagnetic radiation, antennas, and related propagation phenomena. Antenna is an essential part of any wireless communication system as it changes over the electronic signals (propagating in the RF Transreceiver) into Electromagnetic Waves (Propagating in the free space) proficiently with minimum loss. In this paper, cylindrical half wavelength dipole antenna for super high frequency satellite communication system has been designed. Perfect Electric Conductor (PEC) and air material are used in this design. The main goal of this paper is to minimizing the mismatch loss. An antenna's impedance is essential for reducing the impedance mismatch-loss. A badly matched antenna will not radiate power. If the VSWR value is equal to 1, there is no mismatch loss in the antenna. If the VSWR value is greater than 1, there is more mismatch loss. Dipole antenna will be designed and analyzed using the HFSS simulation software by Ansoft. The frequency band of 29.182GHZ has been used in this dipole antenna design. The frequency band of 3-30GHZ is known as super high frequency antennas.

**Keywords:** Voltage Standing Wave Ratio (VSWR), Impedance Matching, High Frequency Structure Simulator (HFSS).

## INTRODUCTION

Antennas are fundamental components of any electric framework and are connecting links between the transmitter and free space or free space and the receiver. In this manner, antenna plays an essential part in finding the qualities of the system in which antennas are utilized. Antennas are utilized in various systems in various structures. That is, a few systems the operational characteristic of the system are designed around the directional properties of the antennas or in some others systems, the antennas are utilized essentially to transmit electromagnetic energy in an omni directional or at last in a few systems for point-to-point communication purpose in which increased gain and reduced wave interference are required.

Dipole antennas are generally used in assortments of uses such as being the basic units of phased-array antennas and the feeding sources of aperture antennas. A standard dipole antenna has an Omni-directional radiation design. However, in present day wireless communication systems, directive gains are frequently required, for instance, for cell phones, mobile base stations and long range RFID readers.

HFSS (High Frequency Structure Simulator) tool is a high performance full-wave electromagnetic (EM) field test system for arbitrary 3D volumetric passive device modeling that takes advantage of the familiar Microsoft windows graphical user interface. HFSS integrates simulation, visualization, solid modeling and automation in an easy to learn environment where solutions to your 3D EM issues are rapidly and precisely obtained. Ansoft HFSS has advanced over a time of years with input from many users and industries. In industry, Ansoft HFSS is the tool of choice for high-productivity research, development, and virtual prototyping. In this paper, cylindrical dipole antenna has been designed to minimizing the mismatch loss for improving the impedance matching.

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## Literature Survey

Eldek, A. A., (2006) have been proposed <sup>[1]</sup> a double dipole antenna with enhanced usable bandwidth. It is applicable for wideband phase array antenna. Here the regular microstrip-fed antenna is used to improve the usable bandwidth. It can be achieved by increasing the radiation pattern stability. The author presented the two dipole antenna both are parallel in nature. The length of the two antennas is different from each other. To decrease the return loss between the two resonances can be achieved by adjusting the two dipole antenna. The placed antenna is small in size and simple in nature. Top substrates having left halves of the dipole, likewise the bottom substrate contain right halves of the dipole. Both the halves are connected to the microstrip feed line. Here the reflector acts as a ground plane to get a higher radiation pattern. Also it provides the good stability and bandwidth.

Singh, J. M., et al. (2013) presented the design and optimization of patch antenna <sup>[3]</sup>. Designer concentrates the following parameters to optimize the antenna. The parameters are Voltage standing wave ratio (VSWR), axial ratio, bandwidth and operating frequency. Here the author proposed the optimization technique named as Particle Swarm Optimization (PSO). This technique is easy to calculate the microstrip patch antenna design. The design parameter like length, width and substrate of the antenna is calculated by PSO technique. The optimization of the antenna design provides better radiation pattern and higher bandwidth. It is not only for microstrip patch antenna, this technique is applied to all antennas used for radiation.

Muhlschlegel, P., et al. (2005) designed a modern dipole antenna <sup>[4]</sup> and the results can be taken from using computer simulation. The computer simulation was developed by using c programming language. The list of the following parameters is calculated using this simulation software. The antenna parameters are radiation pattern, bandwidth, VSWR, gain, beam width, input impedance and output admittance. Radiation pattern play an important role in antenna design, because it determines in which direction the signal strength is high and in which direction the signal strength is low. Based on the parameter results only the fabrication is to be started. Second important parameter of the antenna is gain and bandwidth, gain determines how much of electromagnetic signal can be achieved by our designed antenna. Bandwidth

refers how much of signal delivered to free space for communication.

Tareq, M., et al. (2014) described the simple half wave dipole antenna for wireless communication application using the CST microwave studio. Frequency of the antenna is depends on length and thickness, also consider the metal to be used for fabrication. Microwave studio observed the following parameters, these are return loss, bandwidth, reflection coefficient, etc.

## Dipole Antenna

In any radio and telecommunication system antenna is one of the most important elements. In most cases dipole antenna is used to transmit and receive the radio frequency signal. Because dipole antenna or doublet is simple in structure and it is easy to handle. Dipole antenna consists of two conductive elements; both the elements are identical in nature. One is act as a transmitter, it driving the current from the input side. Another one is act as receiver, it take the output signal to the receiver side. The most common structure of dipole antenna is two straight wires are arranged with same axis. The fed line is connected to the end of the metal rod. Dipole antenna is also called as resonant antennas because the element acts as a resonator with standing waves. Length of the antenna should be determined by wavelength of the radio waves. Most common dipole antenna is half wave dipole in which the element wavelength is  $\frac{1}{2}$  long. Vertical dipole radiation pattern is omnidirectional in nature. It radiates same power in all azimuthal direction. The radiation direction is perpendicular to the antenna axis.

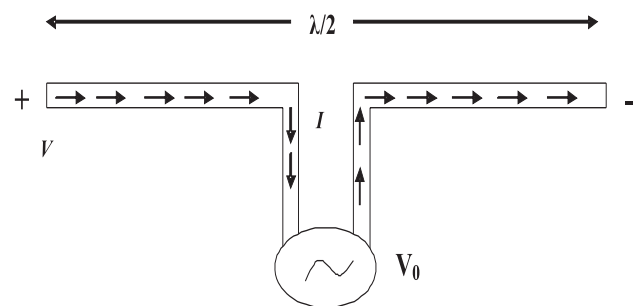


Fig. 1. Standing Waves of Voltage and Current on the half wave dipole by AC voltage

Some of the antenna characteristic predicts which antenna is suitable for all type of process. The important antenna characteristics are impedance, radiation pattern, bandwidth and gain.

**DESIGN AND PARAMETERS**

The resonant frequency of the antenna must be selected appropriately. The wireless communication system uses the frequency range from 3-30 GHz. Hence the antenna designed must be able to operate in this frequency range. The resonant frequency selected for this design is 29.9792 GHz. The dipole antenna design using HFSS tool has been shown in Fig.2. The radiation boundary of the dipole antenna is shown in Fig.3. The Lumped port design is shown in Fig.4.

Resonant frequency,  $f_r = 29.9792$  GHz

Wavelength,  $\lambda = c/f$

$$= (3 \times 10^{11}) / (29.9792 \times 10^9)$$

$$\lambda = 10 \text{ mm}$$

The parameter specifications of the dipole antenna are given below.

Dipole\_Length = 2.3125 mm

Dipole\_radius = 0.05 mm

$\lambda = 10$  mm

gap\_src = 0.125 mm

Radiation\_height = 3.375 mm

Radiation\_radius = 2.5 mm,

Res\_length = 4.75 mm.

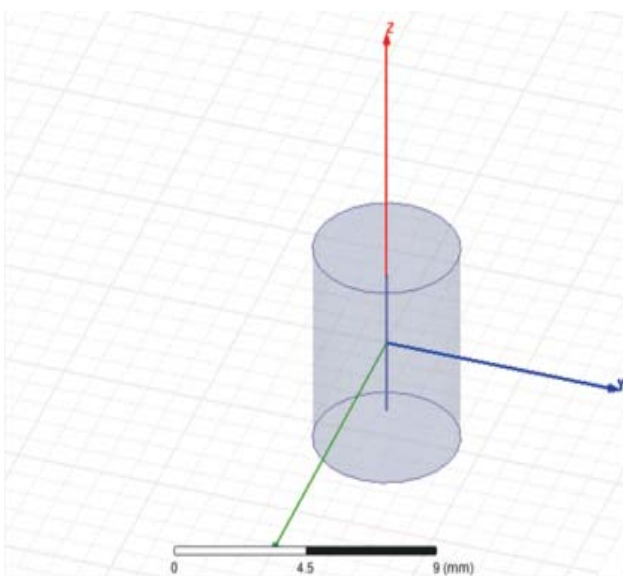


Fig. 2. Dipole Antenna Design using HFSS Tool

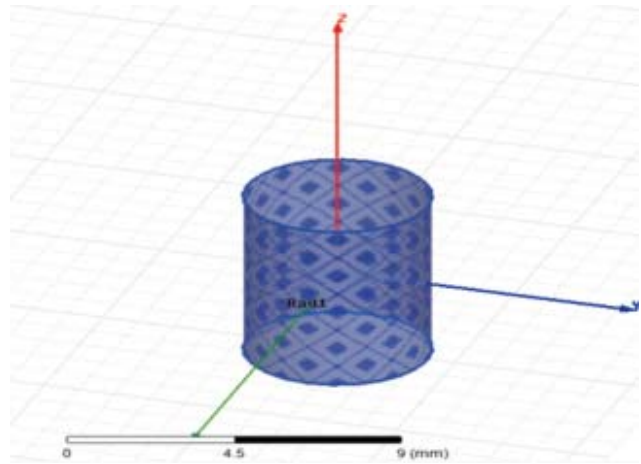


Fig. 3. Radiation Boundary of Dipole Antenna

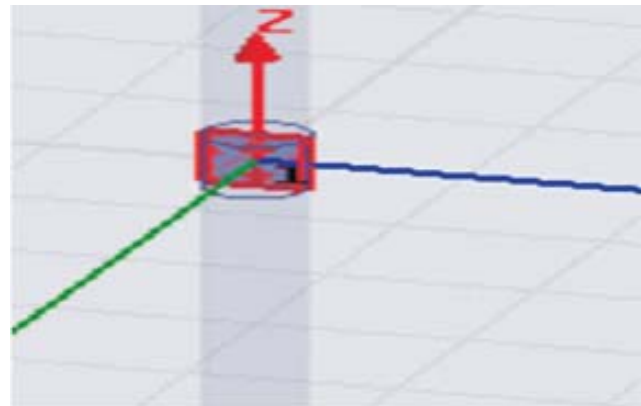


Fig. 4. LumpedPort

**Dipole Impedance at Various Length**

Dipole with small wavelength is referred as short dipole. It has low radiation resistance and high capacitive reactance. Length of the dipole is equal to half of the wavelength of the signal is called as half wave dipole. A half wave dipole is one half of the wavelength  $\lambda$  in length. Impedance of the dipole feed point consists of 72  $\Omega$  resistance and 44  $\Omega$  reactance. In order to remove the reactance and include pure resistance to the feed line.

$$l = \frac{1}{2} * k \square = \frac{1}{2} * k * \frac{c}{f} = \frac{1}{2} * \frac{c}{f} * \frac{v}{c}$$

where  $\square = \frac{c}{f}$   
 $k = v/c$

Where  $\square$  is referred as length of free space, c referred as light speed in free space, v is speed of electric wave in wire, k is adjustment factor. Most of the cases the adjustment factor k should be ignored, because it depends on diameter of the conductor. Thin

wire  $k$  is approximately equal to 0.99, for thick wire it around at 0.94.

### Radiation Pattern and Gain

A dipole antenna is omni directional in nature and its axis is perpendicular to the conductor. It radiates same power in all direction the radiation is falling zero at the end of the axis. In most cases the dipole antenna is mounted on vertical position, so the radiation is higher in horizontal direction. Some of the radiated signals are transmitted towards the earth. It is referred as minor or side lobe of the radiation pattern. The higher radiation direction is referred as major lobe. Three dimensional view of the radiation pattern clearly shows the radiation direction.

Gain is another important parameter to decide the character and function of the antenna. It is defined as how much of radio frequency signal can be gained by the antenna. Some of the antenna achieves high gain some one achieve low gain, the process of achieving the gain is depends on metal to be used to fabricate the antenna and position to be placed. Now a day's reflector is used to avoid the signal loss. It is placed back to the antenna the backward radiated signals are again forwarded to the correct direction. It can be achieved a higher gain. Mirror is used as reflector for speed transmission.

### RESULTS AND DISCUSSION

The cylindrical half wavelength dipole antenna has been designed by using HFSS tool. The result of return loss of the dipole antenna with the resistance value is  $50\Omega$  is shown in Fig .5. The result of return loss of the dipole antenna with the resistance value is  $79\Omega$  is shown in Fig .6.

### Return Loss Vs Frequency

Return loss is the part of a signal that is lost due to a power reflection at a line discontinuity. The return loss measurement explains the ratio of the reflected wave power to the incident wave power in units of dB.

Resistance = $50\Omega$ , Return Loss = -14.8366

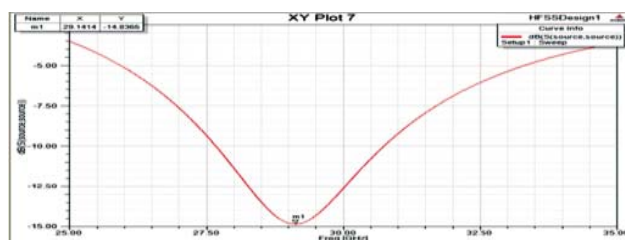


Fig. 5. Result of return loss of the dipole antenna with the resistance value is  $50\Omega$

Resistance =  $79\Omega$ , Return loss = -29.2680

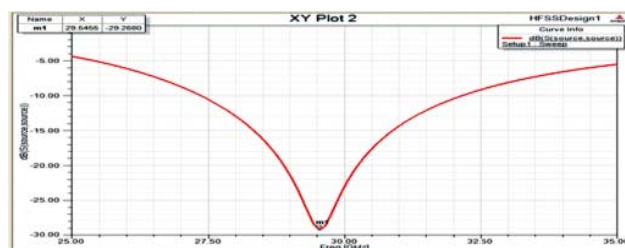


Fig. 6. Result of return loss of the dipole antenna with the resistance value is  $79\Omega$

### VSWR Vs Frequency

VSWR (Voltage Standing Wave Ratio) is a function of the reflection coefficient, which describes the power reflected from the antenna.

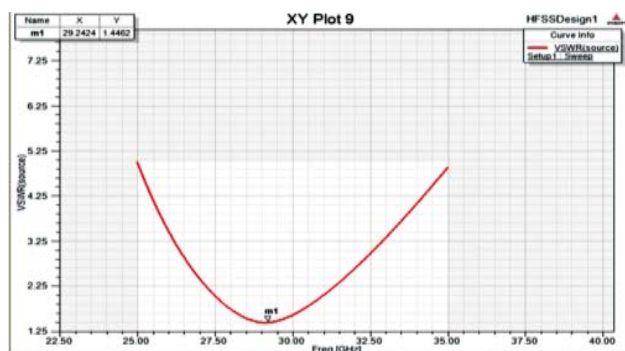


Fig. 7. Result of VSWR with the resistance  $50\Omega$

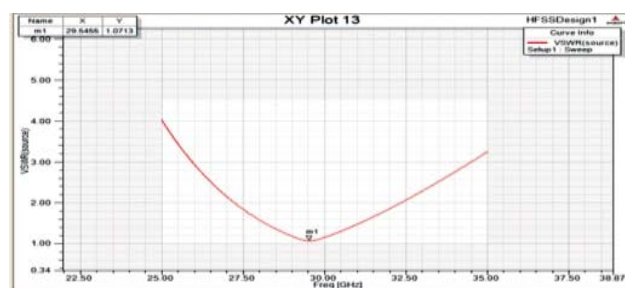


Fig. 7. Result of VSWR with the resistance  $79\Omega$



**Reflection Coefficient,  $|\tau|$**  =  $VSWR - 1 / VSWR + 1$

$$= 1.07-1/1.07 +1$$

$$|\tau| = 0.03$$

**VSWR** =  $1+ |\tau| / 1- |\tau|$

$$= 1+ 0.03 / 1-0.03$$

VSWR = 1.0

**Reflected Power (%)** =  $100 * |\tau|^2$

$$= 100 *(0.03)^2$$

$$= 0.09$$

$$= 0.1$$

**Reflected power (dB)** = -29.42

**Mismatch Loss (dB)** =  $10 * \log_{10} (|\tau|^2)$

$$= 20 * \log_{10} (|\tau|)$$

$$= 10 * \log_{10} (1- |\tau|^2) = 0$$

In this dipole design, the VSWR value is under 2, so the antenna design is considered very good and little would be gained by impedance matching. The VSWR value is 1 in this design, there is no mismatch loss. The antenna is perfectly matched to the transmitter line.

**Radiation Pattern**

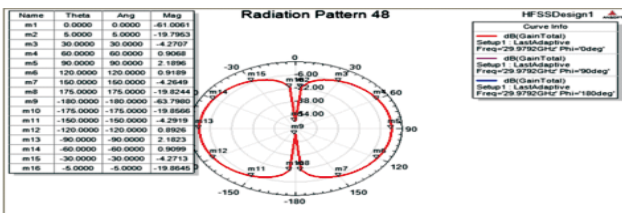


Fig.8 Radiation pattern of dipole antenna

**Gain**

The gain of the dipole antenna is 2.20 dB.

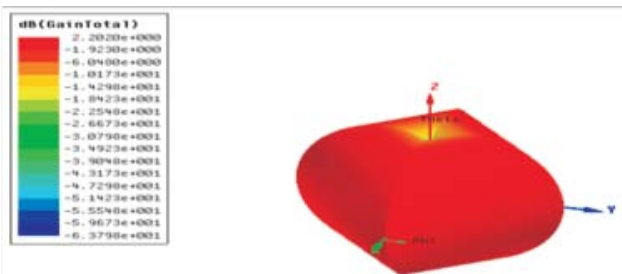


Fig. 9. Gain of the dipole antenna

**CONCLUSION**

In this paper, the cylindrical dipole antenna has been designed by using HFSS tool for reducing the mismatch loss and also for improving the gain of the antenna. In this proposed antenna design, the resonant frequency is 29.182 GHz. The gain of the dipole antenna is 2.2 dB. The VSWR value is 1.07dB, Reflected coefficient  $|\tau|$  is 0.03, Reflected power is -29.42dB. Hence, the mismatch loss is reduced in this proposed design. If no power is reflected from the antenna, which is ideal. This dipole antenna design gives better performances of gain and VSWR than the existing design. This antenna design is super high frequency antenna, which is used for satellite communication application.

**Ethical Clearance:** Taken from St. Peter’s University committee/ or not required as it is a review article.

**Source of Funding:** Self

**Conflict of Interest:** NA

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Mob: 09971888542, Fax No. +91 11 3044 6500

E-mail: editor.ijphrd@gmail.com, Website: www.ijphrd.com

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Published, Printed and Owned : Dr. R.K. Sharma

Printed : Printpack Electrostat G-2, Eros Apartment, 56, Nehru Place, New Delhi-110019

Published at: Institute of Medico Legal Publications Pvt. Ltd. 501, Manisha Building, 75-76, Nehru Place, New Delhi-110019

Editor : Dr. R.K. Sharma, Mobile: + 91 9971888542, Fax No: +91 11 3044 6500