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Case Report

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The Intersection of Autoimmunity and Ocular Disease: Ocular Manifestations of Granulomatosis with Polyangiitis in Focus: A Case Report

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Abstract

Introduction: Granulomatosis with Polyangiitis is a rare type of systemic vasculitis which affects multiple organs. The ocular manifestations are diverse and are reported in 13- 60% of patients with a risk of permanent visual loss. Promptdiagnosis and management is required, which are critical for favourable visual and systemic outcomes.

Case report: A 40-year-old female with Granulomatosis with Polyangiitis presented with painful diminished vision in left eye. On examination, the patient had a saddle nose deformity, conjunctival chemosis with congestion, bilateral axial proptosis, and total ophthalmoplegia with painful eye movements. Visual acuity was 6/60 in the right eye and perception of light in the left. Grade 3 RAPD was noted in the left eye and both eyes had posterior subcapsular cataracts. Blood tests indicated a systemic inflammatory response with elevated anti-PR3 antibodies (181 Ru/ml). MRI of the brain and orbits revealed bilateral orbital involvement with heterogenous enhancement in the medial extraconal and intraconal spaces (L>R), perioptic neuritis on the left, and thickening of all recti muscles. Paranasal sinus hyperostosis and lamina papyracea erosion were also noted. She was treated with IV methylprednisolone followed by oral steroids; pain resolved, but vision did not improve. She was subsequently lost to follow-up.

A year later, the patient presented with a one-week history of pain, redness, and photophobia in the left eye. The right eye's anterior and posterior segments were normal. The left eye showed a peripheral corneal ulcer with adjacent scleritis. The patient was referred to a rheumatologist and started on systemic immunosuppressives, including IV methylprednisolone followed by a tapering course of oral steroids and continued oral cyclophosphamide. Ocular inflammation stabilized with resolution of scleritis. ENT evaluation and septal biopsy confirmed GPA. Pulmonology assessment and CT thorax revealed nodular lesions and fibrosis, indicating lung involvement. The patient is now stable and under regular multidisciplinary follow-up.

Conclusion: This case highlights the vision-threatening ocular manifestations of Granulomatosis with Polyangiitis, including orbital inflammation, peripheral ulcerative keratitis, and scleritis. It emphasises on the importance of early diagnosis and timely intervention in controlling disease progression. Regular follow-up remains crucial for

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monitoring systemic involvement and maintaining visual function.

Keywords: Peripheral ulcerative keratitis; Granulomatosis with Polyangiitis; orbital inflammatory disease, case report

Introduction

Granulomatosis with Polyangiitis (GPA), formerly known as Wegener's granulomatosis, is a rare, potentially life-threatening autoimmune, small-to-medium vessel vasculitis characterized by necrotizing granulomatous inflammation. It most commonly affects the respiratory tract and kidneys but can involve nearly any organ, including the eyes. Estimated global prevalence of GPA is about 3 to 15 cases per 100,000 population. Data on prevalence in India is limited. Ocular involvement occurs in approximately 13–60% of GPA cases and may be the initial or sole manifestation of disease[1,2]. The most frequently reported ocular features include conjunctivitis, episcleritis, scleritis, uveitis, keratitis, orbital inflammation, and optic nerve involvement[1,3].

This case is unique in that the patient presented with two distinct and severe ocular manifestations of GPA—bilateral orbital inflammatory disease with optic nerve involvement, followed by peripheral ulcerative keratitis (PUK)—at separate points in time. While each of these conditions is individually recognized in GPA, their sequential presentation in a single patient is rare and highlights the potential for progressive ocular complications in the absence of continuous follow-up and immunosuppressive therapy[3,5].

What further distinguishes this case is the progression from orbital involvement causing vision loss to the development of PUK with adjacent scleritis one year later, despite prior immunosuppressive treatment. It underscores the importance of sustained multidisciplinary management and close monitoring to prevent vision-threatening sequelae in GPA patients[5,6].

Early identification and aggressive treatment are essential in preventing irreversible ocular damage. This report contributes to the limited literature emphasizing the relapsing-remitting nature of GPA ocular involvement and serves as a reminder of the need for long-term ophthalmic surveillance, even in the absence of systemic flare[2,4].

Case Report

A 40-year-old female presented to ophthalmology OPD with complaints of sudden onset of pain and diminished vision in left eye. She is a known case of Granulomatosis with Polyangiitis and has been on Tab Cyclophosphamide for 3 years.

On examination, her vitals were stable. General examination revealed a saddle nose deformity. Visual acuity in the right eye was 6/60 and only perception of light in left eye. Both eyes appeared prominently protruded forward along the normal line of sight suggestive of bilateral axial proptosis with painful limitation of extraocular movements in all directions indicating total ophthalmoplegia (Figure 1). Conjunctival chemosis with congestion was noted. Grade 3 RAPD was present in left eye. She had posterior subcapsular cataract in both eyes. Fundus examination showed a hazy media making it difficult to examine the posterior segment.

Routine diagnostic blood investigations revealed a systemic inflammatory state with low haemoglobin (Hb 8.7 gm/Dl), leucocytosis (WBC count 12,200/mm^3), thrombocytosis (platelet count 6.8 lakhs/mm^3) and elevated ESR (140 mm/hr) . Targeted blood analysis was done and was found positive for anti PR3(181 Ru/ml) antibody. Emergency MRI Brain and Orbit (Plain and Contrast) was taken (Figure 2) which showed diffuse ill-defined altered signal with heterogenous enhancement in bilateral orbital medial extraconal and intraconal space (L>R). Mild enhancement of the left intraorbital nerve sheath and mild thickening of the muscle belly of all the four recti muscles bilaterally also noted. All the features were suggestive of bilateral orbital disease with left perioptic neuritis. There was also diffuse hyperostosis of the wall of paranasal sinuses with focal destruction of bilateral lamina papyracea (L>R).

The patient was treated with IV Methylprednisolone 1 g intravenously for three days which was later converted to oral steroids following which pain subsided. But vision did not improve. Later, she was lost to follow up.



Figure 1. Image depicting the restricted extraocular movements in both eyes of the patient

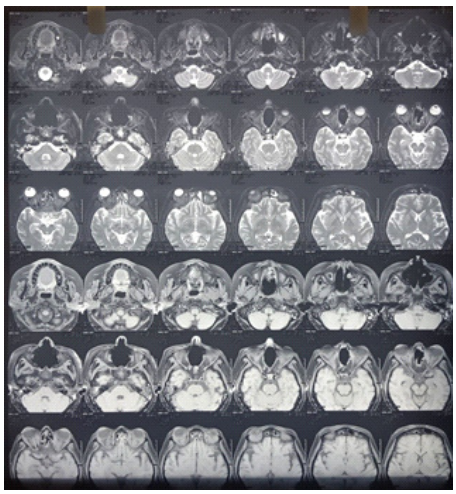


Figure 2. MRI BRAIN AND ORBITS- showing heterogenous enhancement in extraconal and intraconal space of left orbit with mild enhancement of the intraorbital optic nerve sheath

A year later, she presented with pain, redness and photophobia in left eye for a duration of 1 week. She reported having undergone cataract surgery with intraocular lens implantation in both eyes elsewhere, 6 months back. Anterior segment and Fundus examination in right eye was normal. The left eye had a diffuse circumcorneal congestion. A crescent shaped peripheral corneal ulcer with greyish white stromal infiltrates extending from 2 o'clock to 7 o'clock position was noted concentric to the limbus (Figure 3). Associated 50% stromal thinning was noted. Scleritis was noted adjacent to it. Anterior chamber was quiet. Fundus examination showed pale disc with visible part of retina appearing normal.

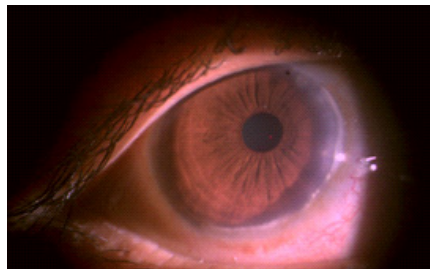


Figure 3. The image shows peripheral corneal ulcer with adjacent scleritis in patient's left eye

Patient was referred to a Rheumatologist and in accordance with their advice was started on systemic immunosuppressives. IV Methyl Prednisolone 1 g was administered for 3 days subsequently switching to oral steroids which was gradually tapered over weeks. Oral Cyclophosphamide 2mg/kg/day was recommended to be continued. Corneal condition stabilized and scleritis resolved following the course of steroids.

ENT consultation was done and septal biopsy taken. Biopsy findings of the lesions of the nasal septum correlated with diagnosis of GPA.

Pulmonology consultation was done for the patient. CT scan of Thorax (plain and contrast) (Figure 4) was taken which showed multifocal areas of nodular lesions and parenchymal fibrosis of granulomatous etiology suggestive of lung involvement and further management was done. Physician consultation was also done where they ruled out other systemic involvement including renal. Patient is now on regular follow-up.



Figure 4. CT scan images of Thorax (plain and contrast) showing multifocal areas of nodular lesions and parenchymal fibrosis of granulomatous etiology

Table 1. TIMELINE:

Year	Event
2017	Diagnosed with GPA. Started systemic immunosuppressive therapy.
2018–2021	Disease in remission. No ocular involvement reported.
Mid-2022	Developed sudden pain, vision loss in left eye. Diagnosed with orbital inflammatory disease with perineuritis left eye. Treated with steroids. Lost to follow-up.
Mid-2023	Presented with peripheral ulcerative keratitis left eye. Treated with immunosuppressives.
Present	Patient on regular follow-up. Left eye -no pain, but irreversible vision loss. Right eye remains unaffected. General condition stable.

Discussion

Granulomatosis with Polyangiitis (GPA), formerly known as Wegener's granulomatosis, is an autoimmune, small-to-medium vessel vasculitis. The pathogenesis involves a complex interaction of genetic susceptibility, environmental triggers, and immune dysregulation. The primary immune mechanism driving GPA is the production of antineutrophil cytoplasmic antibodies (ANCA). The most common form of ANCA associated with GPA is anti-proteinase 3 (PR3-ANCA), though anti-myeloperoxidase (MPO-ANCA) can also be seen in some cases. ANCA targets neutrophils, which are key immune cells involved in inflammation, leading to their activation, degranulation, and the release of reactive oxygen species (ROS), proteases, and pro-inflammatory cytokines, causing tissue damage. This can lead to both endothelial injury and formation of vasculitis. The chronic inflammation seen in GPA leads to the formation of granulomas—clusters of activated macrophages and other inflammatory cells, such as T lymphocytes. These granulomas can form in affected tissues like the lungs, sinuses, and kidneys, contributing to the disease's characteristic tissue damage.

GPA can cause a range of ocular manifestations, from mild conjunctivitis to severe orbital granulomas and optic nerve involvement. Peripheral ulcerative keratitis (PUK) is a potentially sight-threatening complication of GPA[1,2].

Orbital involvement is common in GPA, affecting the lacrimal gland, extraocular muscles, and soft tissues. It usually presents with proptosis, pain, lacrimation, diplopia, and reduced vision. Orbital inflammation can also affect the oculomotor, trochlear, and abducent nerves, resulting in ophthalmoplegia[3,4].

Optic nerve involvement may be due to compressive, ischemic, or inflammatory optic neuropathy, which may ultimately result in atrophy. In our case, the optic nerve involvement may probably be due to an inflammatory pathology[3].

Corneal involvement is another common entity of GPA. The pathophysiology involves immune-mediated necrotizing vasculitis of the anterior ciliary arteries that supply the peripheral cornea[5]. This causes inflammatory damage to corneal blood vessels, resulting in ischemia, weakening of the corneal tissue, and increasing vulnerability to infection, ulceration, and degeneration. Immune complex deposition in the cornea exacerbates inflammation, leading to corneal thinning and ulceration, and potentially causing perforation[5].

Diagnostic modalities like CT and MRI help in demonstrating orbital pathology, its extent, and involvement of adjacent structures. Involvement of paranasal sinuses needs to be ruled out[4]. A multidisciplinary approach to rule out other systemic involvement is imperative for the patient's well-being.

The treatment of ocular features of GPA relies on systemic immunosuppression to control vasculitis and inflammation. Corticosteroids (oral/IV) like prednisone reduce systemic inflammation. In severe or refractory cases of GPA, Cyclophosphamide and Rituximab are used to suppress the immune response and prevent further tissue damage[1,2]. Methotrexate and Azathioprine serve as alternative options for maintaining remission or managing less severe cases.

Local treatments for PUK include topical corticosteroids to reduce ocular inflammation and topical antibiotics to prevent or treat secondary infections[5].

In severe cases of corneal thinning or ulceration, measures to protect the cornea and prevent perforation may be needed. This can include the use of bandage contact lenses or, in extreme cases, surgical interventions like corneal grafting or amniotic membrane transplantation to promote healing[5].

To conclude, Granulomatosis with Polyangiitis has a varied spectrum of ocular manifestations. Early diagnosis, management, and regular follow-up are key to preventing blindness. Multimodal management is also necessary to ensure systemic disease control and longevity of life.

Patient perspective*:* The patient described her experience with Granulomatosis with Polyangiitis as overwhelming, particularly when the disease began to affect her eyes. She recalled the sudden onset of pain and vision loss in her left eye as frightening. Although the initial treatment alleviated the pain, the vision loss was unfortunately permanent, and she was unable to attend follow-up care during that time.

A year later, when symptoms recurred, she promptly sought medical attention. She acknowledged that coordinated care involving multiple specialists significantly improved her understanding of the disease and highlighted the critical importance of regular monitoring.

Despite the challenges of living with GPA, the patient expressed a sense of regained control and hopefulness. With ongoing treatment and consistent follow-up, she feels optimistic about preserving her remaining vision and maintaining overall health.

Informed consent: Informed consent was taken from the patient for publication of information in a journal

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Case Report

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Bite Count Reduction for Sustainable Weight Loss: A Case Report

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Abstract

Background: Bite count reduction is a behavior-based method to manage weight without tracking calories. While it has shown results in lab settings, its use in daily life, especially for busy professionals, is less understood. This case study assessed how practical and effective this approach is for an Indian executive over eight weeks

Methods: A 45-year-old male executive reduced his bite count by 30% per meal while keeping his usual meal timing and food choices. Baseline bite count, weight, and body composition were recorded for one week before the change. Weekly tracking included adherence, weight, fat percentage, muscle mass, and hunger levels. Correlation analysis was done to assess the link between bite count and fat loss.

Conclusion: Over eight weeks, the participant lost 5.3 kg (5.82%), with fat percentage dropping from 19.86% to 17.8%. Muscle mass was maintained. A strong correlation ($r = 0.818$, $p = 0.013$) was found between bite count and weight loss. Satiety improved from 3.0 to 4.8 hours, and adherence reached 95%. This shows that bite count reduction is a simple, low-effort method that fits Indian eating habits and professional routines. More studies are needed to confirm long-term results and wider use.

Keywords: Bite count reduction, portion control, sustainable weight loss, case report.

Introduction

Staying fit is challenging for working professionals due to long hours, travel, and job-related stress. Traditional methods like calorie counting and portion control often require ongoing effort, making them impractical for busy individuals[1]. Bite count reduction offers a simpler, behavior-based alternative. Rather than measuring food or tracking calories, it focuses on reducing the number of hand-to-mouth actions during meals[2]. Research shows that higher bite counts are linked to greater energy intake[3]. Tools like the Bite Counter support this method and promote self-awareness[4,5]. Even without changing portion size, bite count feedback alone can lower intake[6]. Studies show that reducing bites by 20–30% can lead to 1.2–1.6 kg weight loss over four weeks[7,8].

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However, most evidence comes from lab settings or Western populations. Its relevance in Indian contexts—where meals are eaten by hand and satiety guides portioning—is largely unexplored. Early work suggests that neuromarketing techniques may reinforce such habits[9], and newer technologies are making tracking more accessible[10].

This case study explores whether bite count reduction is feasible, effective, and culturally aligned for an Indian professional. Over eight weeks, a 45-year-old executive followed a 30% bite reduction without changing diet. The study, aligned with CARE case report guidelines[11], tracks weight loss, adherence, and satiety outcomes.

Methodology

This single-participant case study was conducted in Mumbai, India, from July to September 2023. It aimed to evaluate whether reducing bite count could help manage weight in a real-life professional context. The approach reduced energy intake through behavioral change, without altering food type or meal timing.

Participant Information

The participant was a 45-year-old male pharmaceutical executive from Mumbai with a stressful, travel-heavy routine. Though he ate balanced meals and exercised five times a week, prior weight loss efforts were short-lived. Under dietitian Sheryl S. Salis's guidance, he began a 30% reduction in bite count per meal. The goal was to reduce weight from 91 kg to 86 kg while preserving muscle mass. Written consent was obtained, and ethical norms for case reports were followed.

Baseline Data Collection

A one-week baseline phase was conducted to document the participant's regular eating habits. Each hand-to-mouth motion was logged as one bite[4] using a mobile app, with daily counts noted in a diary and later entered into Google Sheets. The average baseline bite count was 159 per day, with an estimated calorie intake of ~2640 kcal/day based on typical meals (see Table 1). Basal metabolic rate (BMR), measured via bioelectrical impedance, was 1900 kcal/day. A 30% reduction in bite count was introduced to create a ~800 kcal daily deficit, without changing food composition or meal timing.

Table 1. Baseline vs Reduced Bite Count and Estimated Calorie Intake

Meal	Food Items	Baseline Bite Count	Reduced Bite Count (30%)	Baseline Calories (kcal)	Estimated Caloric Intake After Reduction (kcal)
Breakfast	1 dosa, 1 egg white omelette, 1 full egg fry, 1 cheese cube	31	22	420	294
Snacks	Half seasonal fruit	6	4	60	42
Lunch	2 roti, 200g chicken, 1 bowl curd	45	32	640	448
Pre & Post Workout	1 banana (pre), whey protein shake (pre & post), 1 banana (post)	26	18	480	336
Dinner	Same as lunch + 1 portion sweet	51	36	840	588
Total per day		159	112	2640	1848

The participant's initial body composition was recorded at the end of the one-week baseline phase using a bioelectrical impedance scale. Key parameters, including fat percentage, muscle mass, and metabolic rate, are detailed in Table 2.

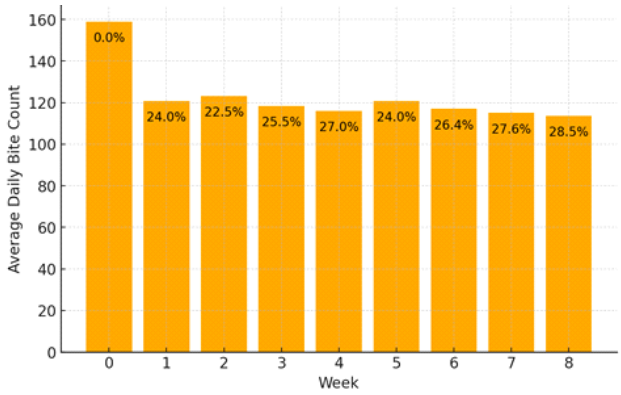
Table 2. Baseline Body Composition (Week 0)

Week	Weight (kg)	BMI (kg/m²)	Body Fat (%)	Fat-Free Body Weight (kg)	Skeletal Muscle (%)	Muscle Mass (kg)	Body Water (%)	Bone Mass (kg)	BMR (kcal)	Metabolic Age
Week 0 (Baseline)	91	25.23	19.86	73.16	52.59	69.52	58.78	3.66	1955	44.6

Disclaimer: Measurements were taken using the ActiveX Savvy Plus scale. Values may vary due to hydration, time of day, and other conditions.

Intervention Strategy

Daily bite count was reduced from 159 to 112 without changing food composition. Traditional Indian meals and meal timing were maintained throughout. This approach created an estimated ~800 kcal daily deficit, chosen for its ease and sustainability[8]. Bite count reduction was implemented gradually over eight weeks, with weekly tracking to monitor adherence and progress. The week-wise bite count trend is illustrated in Figure 1.



Percentage values indicate reduction from baseline (159 bites/day)

Figure 1. Progressive Reduction in Daily Bite Count Over 8 Weeks

Intervention Timeline and Monitoring

The 8-week plan started with gradual reduction in Weeks 1–2, reaching full 30% by Week 3. Bite counts were logged daily and reviewed weekly. Weight and body metrics were measured each Sunday with the ActiveX Savvy Plus scale. Hunger and satiety were rated daily using a self-assessment scale.

Writing and Analysis

The manuscript was written using academic methods. AI tools were limited to grammar checks; no AI was used in analysis, study design, or conclusions.

Results

Body Composition Trends

The participant's weight reduced from 91.0 kg to 85.7 kg over eight weeks (–5.3 kg, 5.82%). Most weight loss occurred by Week 4 (–3.15 kg), followed by gradual tapering. Body fat percentage dropped from 19.86% to 17.8%, with fat-free weight decreasing from 73.16 kg to 70.4 kg. Skeletal muscle percentage slightly increased (52.59% to 53.1%), indicating preservation of lean mass. BMR declined from 1955 to 1891 kcal, consistent with weight reduction. Water content rose marginally (58.78% to 59.3%), while bone mass stayed stable. These trends, detailed in Table 3, suggest that bite count reduction effectively reduced fat without affecting muscle or metabolic function.

Table 3. Weight and Body Composition Trends Over 8 Weeks

Week	Weight (kg)	BMI (kg/m^2)	Body Fat (%)	Fat-Free Body Weight (kg)	Skeletal Muscle (%)	Muscle Mass (kg)	Body Water (%)	Bone Mass (kg)	BMR (kcal)	Metabolic Age
Week 0 (Baseline)	91	25.23	19.86	73.16	52.59	69.52	58.78	3.66	1955	44.6
Week 1	90.6	25.1	19.7	72.8	52.5	69.3	58.7	3.65	1950	44.5
Week 2	90	24.95	19.5	72.4	52.4	69	58.6	3.64	1940	44.3
Week 3	89.2	24.7	19.2	71.9	52.3	68.7	58.5	3.6	1930	44.2
Week 4 (Midline)	87.85	24.3	18.8	71.3	52.4	67.8	58.6	3.57	1910	44
Week 5	87.5	24.1	18.6	71	52.6	67.5	58.8	3.55	1905	43.5
Week 6	86.9	24	18.3	70.7	52.8	67.3	58.9	3.54	1900	43.2
Week 7	86.3	23.85	18	70.5	53	67.1	59.1	3.53	1895	42.8
Week 8 (Final)	85.7	23.7	17.8	70.4	53.1	66.9	59.3	3.52	1891	42

Note: Measurements were taken using the ActiveX Savvy Plus Bluetooth Body Fat Scale (Sept–Oct 2024). Minor variations may occur due to hydration, timing, or other factors.

Physiological Progression

Weekly tracking (Figure 2) showed steady reductions in weight, BMI, and fat percentage. Muscle mass remained stable, confirming preservation of lean tissue. Metabolic age also dropped. Water percentage rose slightly, suggesting improved hydration. The data reflect healthy, gradual changes over time.

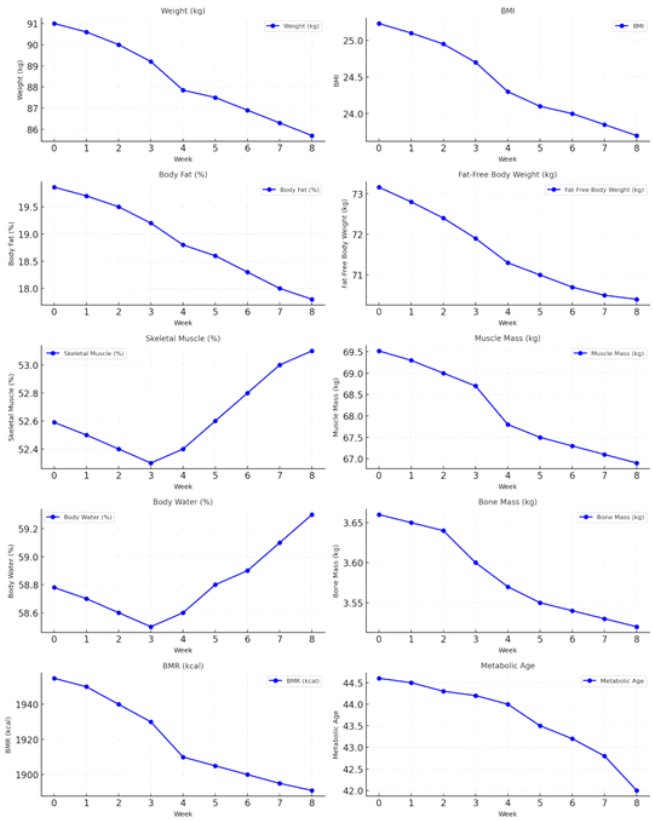


Figure 2. Weekly Trends in Key Body Composition Metrics Over 8 Weeks

Satiety and Appetite Trends

Hunger and fullness were tracked using the Visual Analogue Scale (VAS)[12,13]. Pre-meal hunger decreased from 85 mm to 62 mm, while post-meal fullness increased from 50 mm to 72 mm. Satiety duration improved from 3.0 to 4.8 hours. Week-wise changes are detailed in Table 4. Though not statistically significant ($p > 0.1$), the trends showed meaningful improvement. By Week 5, hunger was better controlled, with greater meal satisfaction and stable energy levels. These findings align with prior studies suggesting that mindful eating enhances appetite regulation[13,14].

Table 4. Hunger and Satiety Trends Over the Intervention Period (VAS-based)

Phase	Pre-Meal Hunger (VAS mm)	Post-Meal Fullness (VAS mm)	Satiety Duration (Hours)	Observations
Week 1 (Baseline)	85	50	3	Initial adaptation, high hunger levels
Week 2	82	55	3.2	Struggled with satiety, mild cravings
Week 3	78	60	3.5	Gradual stabilization, slight hunger control
Week 4 (Midline)	75	62	3.8	Body adjusting, satiety improving
Week 5	70	65	4	More control over hunger, fewer cravings
Week 6	68	68	4.2	Satiety duration increasing, consistent adherence
Week 7	65	70	4.5	Hunger well managed, comfortable with meal sizes
Week 8 (Final)	62	72	4.8	Fully adapted, no major hunger spikes

Effect of Bite Count Reduction on Body Weight and Composition

A strong correlation was found between weekly bite reduction and weight change (Pearson $r = 0.818$, $p = 0.013$; Spearman $r = 0.814$, $p = 0.014$), as shown in Table 5. This supports the hypothesis that reducing bites can effectively aid weight management—especially in structured, tech-free settings.

Table 5. Correlation Between Weekly Bite Count Reduction and Weight Change

Metric	Pearson Correlation (r)	p-value	Spearman Correlation (r)	p-value	Statistical Significance
Weekly Bite Count Reduction vs. Weight Change	0.818	0.013	0.814	0.014	Significant ($p < 0.05$)

Adherence and Behavioral Adjustments

Adherence improved from 75–80% in early weeks to 95% by Week 8. Initial dips were due to travel and distractions. Simple changes—like avoiding TV during meals and later using a bite counter app—helped improve tracking and focus. Week-wise adherence, deviations, and self-reported energy levels are detailed in Table 6. The participant reported improved satisfaction, stable mood, and better energy—indicating strong behavioral adaptation.

Table 6. Adherence and Behavioral Adjustments

Week	Adherence (%)	Deviations	Energy & Mood
1	80%	Struggled with portion control; minor errors in bite tracking.	Mild evening fatigue; mood stable.
2	75%	Two birthday events led to higher intake; tracking inconsistencies.	Slight drop in energy; mood mildly affected.
3	85%	Work travel disrupted meal timing.	Energy stabilized; mood improved with routine.
4	90%	Reduced distractions (e.g., TV off during meals).	Felt more energetic; mood uplifted.
5	80%	Another work trip caused minor planning issues.	Energy steady; mood stayed positive.
6	88%	Started using the "Click Counter" app for accuracy.	Sustained energy; mood stable.
7	92%	Fully adjusted to the new pattern.	High energy; consistently good mood.
8	95%	No deviations; maintained target bite count.	Energetic and fully satisfied; excellent mood.

Discussion

For professionals juggling work, travel, and stress, calorie counting often fails—not because it's ineffective, but because it's impractical[15]. It requires constant tracking, portion guessing, and mental math. Most people underestimate intake anyway[16]. Bite count reduction, in contrast, offers a simpler path. It shifts focus from "what" we eat to "how"—which is easier to manage, especially in real life[4].

This case adds to the growing conversation around habit-based weight loss. Without changing his food or meal timing, the participant achieved 95% adherence, steady fat loss, and better satiety. Studies have shown that bite feedback can lower intake[17], and our findings reinforce that. The strong correlation between bite reduction and weight loss ($r = 0.818$, $p = 0.013$) shows that small, consistent changes can create big shifts. Importantly, this didn't feel like a diet. Hunger settled, fullness improved, and the participant felt more in control—often the hardest part of weight loss[18].

Impact on Weight, Body Composition, and Satiety

Losing 5.3 kg in eight weeks without touching food type or portions is rare. Most of it was lost by Week 4, a pattern similar to calorie restriction studies[19]. Body fat dropped from 19.86% to 17.8%, while muscle mass percentage slightly increased (52.59% to 53.1%)[20] confirming that the weight loss was primarily from fat. Hunger reduced steadily, and satiety duration increased from 3 to nearly 5 hours. These findings align with previous evidence that slowing down and eating mindfully help regulate intake[21].

Comparison to Previous Research

Prior studies using similar bite reductions reported weight loss of 1.2–1.6 kg over four weeks[7,8]. In contrast, this case achieved more than 5 kg over eight weeks—without wearables—relying on self-monitoring via app and diary. The observed correlation ($r = 0.818$) was also stronger than earlier reports[4]. While prior studies often required tech tools, this case shows it can be done with a simple click counter and discipline[6].

Why It Matters

Not everyone can track calories or measure food consistently. Bite count offers a low-effort, intuitive method. It fits well with Indian eating customs—fixed portions, eating by hand, and regular mealtimes. It holds promise for those with obesity, diabetes, or metabolic syndrome, where portion regulation is key

to managing health[22]. It may also help older adults who find calorie tracking overwhelming. Although not yet part of formal medical nutrition therapy, its simplicity and adaptability make it a strong candidate for integration into routine care. Clinics, workplace wellness programs, and digital platforms could explore this approach further.

The Participant's View

Adjusting to fewer bites wasn't easy at first. The first two weeks took effort—there was a tendency to eat faster or sneak in extra snacks. But with regular meal timing, mindful chewing, and staying hydrated, those urges gradually eased. By the end of eight weeks, bite count reduction felt natural. It became a habit, not a chore. As of March 2025, the weight stayed off, and the practice continued without the need for tracking tools. Using smaller plates and eating slowly also helped, showing how small tweaks can lead to lasting change.

Strengths, Limitations, and Future Directions

This case stands out for its real-world design. No labs or clinics—just structured intent and daily discipline. Bite count reduction fits into a high-stress, professional routine without disrupting food choices. Fat was lost, muscle was preserved, and energy levels stayed steady. Its compatibility with Indian eating habits—pre-set portions, hand-eating, and mindful pacing—added to its success.

That said, it's still a single case. Self-reported data introduces potential bias, especially in the early weeks. External variables like sleep, stress, and workouts weren't controlled. And the eight-week window doesn't confirm long-term sustainability. Still, the direction is promising. Future studies should explore bite count in larger cohorts, across age groups, and metabolic conditions. It should be compared with calorie tracking, intermittent fasting, and mindful eating. There's also room to build digital or AI-based tools to support consistency and engagement. Cross-cultural studies will help establish its broader value. With more evidence, bite count reduction could evolve into a simple, scalable, and sustainable tool for weight management.

Conclusion

This case study shows that bite count reduction is a practical, sustainable weight management strategy for professionals. A 30% reduction led to a 5.3 kg (5.82%) weight loss over eight weeks, with body fat dropping from 19.86% to 17.8%. The strong correlation between reduced bites and weight loss ($r = 0.818$, $p = 0.013$) supports the link between eating behavior and energy intake. The participant adapted well, with reduced hunger, longer satiety, and 95% adherence by the final weeks. Unlike calorie counting, this method requires minimal effort, making it ideal for busy routines. Its compatibility with Indian eating habits—structured portions and mindful eating—enhances its real-world relevance. While results are promising, this being a single-participant study limits generalizability. Future randomized trials comparing bite count reduction with other strategies are needed to confirm long-term value. Still, the findings suggest it could be a simple, scalable tool for sustainable weight loss and metabolic health.

Ethical Clearance Statement: This study is a self-experimentation case report involving a healthy, non-pharmacological intervention focused on behavioral modification. The author himself served as the sole subject, and no external participants were involved. Given the nature of this self-study, ethical approval was not required. Informed self-consent was obtained, ensuring voluntary data collection and publication.

Consent for Publication: A signed consent form has been provided by the participant, permitting the use of de-identified data for publication in this case report.

Conflicts of Interest Statement: The authors declare no conflicts of interest.

Funding Sources: No funding was received for this study.

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Review Article

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Prevalence, Risk Factors, and Outcomes of Gestational Diabetes Mellitus among Indigenous Population in Asia: A Systematic Review Protocol

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Abstract

Background: Gestational diabetes mellitus poses significant health risks, particularly among indigenous populations in Asia, where its prevalence and associated factors remain underexplored.

Objective: This systematic review aims to determine the prevalence of GDM, identify risk factors, and assess maternal and perinatal outcomes among indigenous populations in Asia.

Materials and Methods: The review will follow PRISMA-P guidelines, screening studies published in English over the last 20 years (2004-2024) from multiple databases, involving PubMed, Embase, Ebsco, Science Direct, Web of Science, Scopus, ProQuest, Shodhganga, and Google Scholar. Independent reviewers will extract data on study characteristics, prevalence, risk factors, and outcomes, with a narrative synthesis presented and a meta-analysis conducted if sufficient data is available.

Expected Outcomes: The review is expected to provide valuable insights into the prevalence and risk factors of GDM, informing targeted prevention and management strategies to enhance maternal and perinatal health in indigenous communities across Asia.

Keywords: Gestational diabetes mellitus; Indigenous population; Asia; Systematic review

Background

Noncommunicable diseases (NCDs) continue to be a major global concern with a growing prevalence among the indigenous population. Diabetes is an important public health problem and is one of four priority NCDs identified for action by international organizations. According to the etiological classification, one type of diabetes is gestational diabetes mellitus (GDM). Gestational diabetes increases the prevalence of type 2 diabetes mellitus, adding to the overall diabetes burden. GDM is characterized by increased blood glucose levels that are identified for the first-time during pregnancy[1]. The global prevalence of gestational diabetes is steadily increasing. Asia, the most populous and largest

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continent (60 percent of the world's population), is experiencing a rising prevalence of GDM[2]. Different countries use different diagnostic criteria, resulting in significantly varying prevalence rates. The prevalence of GDM in Asia varies between 0.7% and 51.0% which may be attributed to differences in ethnicity[3–5], population characteristics, and several other factors.

Risk factors for GDM involve older pregnant women, those with a family history of diabetes, and overweight women who are at high risk of developing gestational diabetes[6]. Gestational diabetes mellitus (GDM) is linked to negative maternal outcomes such as cesarean delivery, gestational hypertension, postpartum hemorrhage, and pre-eclampsia, as well as adverse perinatal outcomes like stillbirth, macrosomia, congenital anomalies, preterm birth, and neonatal death[7]. Several studies have reported an increase in health risks for Indigenous mothers and infants[8]. Indigenous population experience higher health risks and adverse outcomes as compared to the non-indigenous population. This disparity creates a significant 'health divide' between Indigenous and non-indigenous populations living in the same society[9]. Despite the health disparities, they have received relatively little attention in research. This systematic review will gather and analyze data on GDM among the Indigenous population in Asia. The goal is to determine their GDM prevalence, risk factors, and adverse pregnancy outcomes which affect overall mortality and morbidity in the community, and provide insights regarding targeted interventions.

Objectives

1. To determine the prevalence of gestational diabetes among the indigenous population in Asia
2. To identify the risk factors and assess the outcomes associated with gestational diabetes among the indigenous population in Asia

Research question(s)

What are the prevalence, risk factors, and outcomes of gestational diabetes mellitus among the indigenous population in Asia?

Methods

A systematic review will be carried out to evaluate the prevalence, risk factors, and outcomes of GDM among the indigenous population in Asia. This review will strictly adhere to methodological guidelines outlined by specified by the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols (PRISMA-P) statement[10]. To enhance transparency and reproducibility, a detailed protocol outlining the specific search strategies has been drafted adhering to PRISMA-P guidelines. This protocol has been registered in the PROSPERO database (CRD42024560358).

Eligibility criteria

Population	Pregnant women of all Indigenous populations in Asia
Intervention	Any intervention carried out for gestational diabetes mellitus in Asia
Comparator	Where appropriate, studies that compare different methods such as randomized controlled trials (RCTs), non-RCTs, etc.
Outcomes	GDM Prevalence and risk factors among the Indigenous population in Asia Health Outcomes of GDM among Indigenous Population in Asia
Study Design	Observational analytical studies such as cross-sectional studies, case-control and cohort Experimental study designs such as Randomized controlled trials (RCTs) and non-RCT (wherever applicable)

Inclusion criteria

- Studies conducted in Asia in the last 20 years (2004-2024)
- Studies published in English
- Studies examining the prevalence, risk factors, outcomes

Exclusion criteria

- Study designs such as case series and case reports
- Studies that involve women with pre-existing diabetes

Search strategy (electronic databases)

Various electronic databases involving PubMed, Embase, Ebsco, Web of Science, Scopus, and Science Direct will be searched. Each database will be searched using a specific search method. Grey literature will also be identified through databases like Google Scholar, ProQuest, and Shodhganga.

Study selection

The acquired studies will be assembled using citation managing software. Three independent reviewers will evaluate the studies using the search method to identify whether they align with the inclusion and exclusion criteria as indicated by their titles and abstracts. The independent reviewers will screen using the Rayyan QCRI program, and duplicates will be removed[11]. The studies, potentially eligible for the review based on inclusion will be selected for full-text screening. Any conflicts between the three reviewers will be addressed through discussion. If the disagreement persists, a designated adjudicator will be consulted to provide a final decision. The selection process will be recorded to complete the PRISMA flow diagram[10].

Quality and risk of bias Assessment

The articles will be evaluated for risk of bias assessment using a specific checklist (STROBE[12], and CONSORT[13]). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist will be utilized for reporting observational study designs, whereas the Consolidated Standards of Reporting Trials (CONSORT) checklist will be applied to experimental study designs.

Data extraction

Three reviewers will independently extract relevant data from the included studies using a standardized data extraction sheet to ensure consistency and reliability. The information that will be collected from all the studies are:

- Study characteristics
- Study setting
- Prevalence
- Risk factors
- Outcomes: maternal and perinatal

Data synthesis

A narrative synthesis of the findings from the included studies will be presented, adhering to the SWiM (Synthesis without meta-analysis) guidelines[14]. Based on the availability of sufficient studies with comparable outcomes, a meta-analysis will be conducted. Heterogeneity will be evaluated using statistical tests (such as chi-square, I^2). We will conduct the subgroup analysis based on the availability of the data.

Discussion

This systematic review focuses on a comprehensive understanding of the prevalence, risk factors, and outcomes of GDM among Indigenous populations in Asia. It will provide valuable insights into the factors that influence GDM prevalence and outcomes within Asian Indigenous populations. These findings can inform targeted prevention and management strategies to improve maternal and perinatal health in these communities.

Limitations

The present study may have limitations due to its reliance on six databases and its focus on English-language publications. This could have led to excluding relevant research published before 2004 or studies available in other databases. Furthermore, the inconsistent use of terminology may have hindered the accurate categorization of measures, potentially affecting the reliability of the findings. Excluding case series and case reports may lead to loss of valuable contextual information or rare outcome data, especially in under-researched indigenous populations where large studies may be scarce. Lack of indigenous communities or stakeholder involvement in protocol development may limit the cultural sensitivity and relevance of the review findings.

Declarations:

Competing interests

The authors declare that they have no competing interests.

Data availability

No data is associated with this article.

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors**.**

Ethics and Ethics and dissemination: Not Applicable

List of abbreviations

GDM	Gestational Diabetes Mellitus
NCD	Non-communicable disease
PRISMA-P	Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols
STROBE	Strengthening the Reporting of Observational Studies in Epidemiology
CONSORT	Consolidated Standards of Reporting Trials
SWiM	Synthesis without meta-analysis

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Review Article

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Nipah Virus Spillover and Transmission in Asia for Targeted Management Strategies: A Systematic Review Protocol

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Abstract

Introduction: Nipah virus (NiV) is a zoonotic pathogen that poses a significant public health threat in Southeast and South Asia, with case fatality rates ranging from 40% to 100%. This systematic review aims to identify key transmission and spillover patterns and management strategies to help in prioritizing resource allocation and intervention.

Methods and analysis: This systematic review will be conducted following PRISMA guidelines. The search will encompass multiple electronic databases, including PubMed, Embase, and Scopus, up to 2024. Study selection, data extraction, and quality assessment will be performed by three independent reviewers, with a fourth reviewer resolving any disagreements. Data will be synthesized to identify patterns in transmission dynamics and inform targeted management strategies.

Ethics and dissemination: Ethical approval was not required as no human participants were involved.

Registration details: This systematic review has been registered on PROSPERO with registration ID CRD42024546848.

Keywords: Asia; Nipah Virus; Outbreak; Transmission; Zoonotic spillover

Introduction

Nipah virus (NiV) is a zoonotic pathogen posing a major public health threat in Southeast and South Asia, with case fatality rates ranging from 40% to 100%[1]. From 1998 to 2015, more than 600 cases were reported globally[2], with recent severe outbreaks in India and Bangladesh, including a notable outbreak in Kerala, India, in 2018, which resulted in 18 confirmed cases and 16 deaths[3,4]. Bangladesh reported 322 confirmed cases between 2001 and 2021, with a 71% case fatality rate[5].

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NiV transmission primarily involves spillover from bats to intermediary hosts, such as pigs, and subsequently to humans. Key transmission routes include contact with infected bat saliva, urine, droppings, or consumption of contaminated fruits[6]. Factors such as encroachment into bat habitats, agricultural practices, and land use changes increase spillover risk[7]. Human-to-human transmission, often through respiratory secretions or close contact, along with nosocomial spread, further sustains outbreaks[8,9].

Despite ongoing research, there is a need to synthesize existing evidence on NiV transmission dynamics and their implications for outbreak management. The major risk factors have been previously reported. But the interplay between various risk factors and how they shape the spillover and transmission dynamics is yet to be known. Understanding the complex interactions among bats, intermediate hosts, and humans shaped by ecological and human activities is crucial for effective control measures. This systematic review aims to identify key patterns and trends in NiV transmission dynamics. This includes investigating the relative importance of different stages of transmission and the respective ecological management strategies. This will help in prioritizing resource allocation and interventions where they are needed the most.

Objective

To characterize the spillover events of Nipah virus (NiV) from bats to intermediate hosts, followed by transmission to humans, and investigate the diverse modes of NiV transmission.

Research question: What are the spillover and transmission dynamics of NiV in Asia and how can this understanding inform targeted management strategies for NiV outbreaks?

Methods

The protocol has been written according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses for systematic review protocols (PRISMA-P)[10] and registered on the PROSPERO database with registration ID CRD42024546848.

Eligibility criteria

Studies will be included if they report outbreak investigation on Nipah. Studies about spillover events will also be included. They should provide primary data on NiV transmission dynamics, including but not limited to epidemiological investigations. Reviews, Systematic reviews, commentaries, etc will be excluded. Only studies published in English language will be included. Detailed eligibility criteria is given below:

Population:

All patients who had Nipah virus infection during an outbreak and general population in case of management strategy studies will be included. There will be no differentiation on the basis of age, gender, ethnicity, etc.

Intervention:

Any intervention in case of management strategies for prevention or treatment of NiV will be included.

Comparator:

If applicable.

Outcomes:

- Incidence and categorisation of Nipah virus cases and their sources
- Spillover stages of NiV transmission
- Modes of NiV transmission

Study design:

All observational and analytical study designs, surveillance reports, hospital records will be included. For effectiveness of management practices, RCTs may be included.

Search strategy

Search will be conducted in PubMed, Embase, CINAHL, Scopus, Science Direct, and Web of Science. Search strategy will be made keeping in mind 4 concepts namely: Nipah, Outbreak investigation, Risk factors or sources of exposure, Management guidelines or practices. Grey literature relevant to Nipah virus will also be searched across various sources, including Google Scholar, Shodhganga and ProQuest.

Study selection

For the study selection process, Rayyan software will be utilized to ensure a systematic approach[11]. After importing all identified studies into the software, duplicates will be removed. Subsequently, three independent reviewers will screen titles and abstracts to assess relevance against pre-defined inclusion and exclusion criteria. Eligible studies will include research focused on Nipah virus outbreaks and management strategies, with any relevant information on transmission. Full-text versions of potentially eligible studies will undergo assessment by three independent reviewers, with proper documentation of inclusion and exclusion. Any disagreements will be solved through discussion with a fourth reviewer.

Assessment of methodological quality and risk of bias

Assessment of the articles will involve a thorough examination for quality using the Joanna Briggs Institute (JBI) Critical Appraisal checklist appropriate to the study's design[12] and Mixed methods appraisal tool (MMAT) version 2018.

Data extraction

A standardized data extraction form will be developed, capturing key variables including:

- Study characteristics (author, publication year, study design, etc)
- Population demographics (age, sex, geographic location, etc)
- Nipah virus outbreak details (index case, location, duration, etc)
- Transmission pathways (zoonotic spillover, human-to-human transmission etc)
- Source of infection
- Ecological management interventions implemented (surveillance, quarantine measures, infection control practices, etc)

Two independent reviewers will perform data extraction, with discrepancies resolved through discussion or consultation with a third reviewer if necessary. The extracted data will be synthesized and analysed to identify patterns, trends, and gaps in the literature, informing the synthesis of findings and development of recommendations for future research and practice.

The studies will be categorised into 4 groups depending on whether they report risk factors, spillover, transmission or ecological management strategies. These four groups will be compared and thematic analysis will be done.

Discussion

The study aims to elucidate the stages of spillover and transmission of Nipah virus, including the pathways through which the virus is transmitted from its natural reservoir to humans. Understanding these transmission dynamics is crucial for developing targeted interventions and preventive measures. By quantifying the number of cases and identifying sources of infection at each stage, we can gain insights into the epidemiological patterns of Nipah virus transmission and inform targeted surveillance and management efforts. If certain stages show higher case numbers or greater importance, our review will guide decision-makers on where to allocate resources and prioritize interventions. It will also inform the development of guidelines that address the ecological and epidemiological complexities of NiV transmission.

Limitations

The inclusion of studies with varying methodologies and quality levels may introduce heterogeneity into the analysis, potentially impacting the synthesis of findings. Geographical and temporal variability in Nipah virus outbreaks may limit the generalizability of the findings. Also studies published only in English language will be considered which might lead to selection bias.

Source of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors

Conflicts of interest

The authors declare that they have no conflicts of interest. No organization or person with a financial interest in the subject matter was or will be a part in this manuscript.

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Review Article

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Vitex Agnus Castus and Menstrual Health: A Review of Therapeutic Potential in Dysmenorrhea

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Abstract

Dysmenorrhea has a significant impact on the quality of life of reproductive aged women during their menstrual cycle. The condition is often overlooked. Severe cramps are the hallmark for primary dysmenorrhea. But severe menstrual cramps and other symptoms may reduce whatever social life women are able to muster. Affecting overall quality of daily life, it lowers work achievement and increases any kind of absenteeism. This paper discusses the division of primary and secondary dysmenorrhea. It also summarizes risk factors that can lead to primary dysmenorrhea, such as the gene predisposition and age-related but it also highlights the role of Vitex Agnus Castus, the traditional Chinese medicine method for relieving physical discomfort and symptoms of primary dysmenorrhea during menstrual periods. Through modulating hormone levels, this product affects the hypothalamic-pituitary-gonadal axis, but has no direct impact on lutein hormone (LH) or follicle stimulating hormone FSH. The extract helps to relieve the psychological and physical symptoms closely associated with dysmenorrhea. Agnus Castus is supported by many clinical studies and has no known drug interactions. Through various studies the extract's solid safety profile makes it a reliable possible alternative treatment for primary dysmenorrhea when compared with traditional therapies. It is non-pharmacological pain relief treatment while providing nutritional values and almost no side effects.

Keywords: Primary Dysmenorrhea, Agnus Castus, Non-Pharmacological Treatment, Menstrual Pain Relief.

Introduction

One of the most prevalent gynaecological conditions affecting women of reproductive age is dysmenorrhea, which is characterized by unpleasant menstrual cramps of uterine origin. Despite being widespread, the illness is typically underdiagnosed because the majority of females choose not to seek medical care. It is categorized as primary or secondary dysmenorrhea (SD) based on its aetiology. One of the most prevalent complaints in both young and adult females is primary dysmenorrhea (PD), which is characterized by painful and spasmodic cramps in

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the lower abdomen that start just before or at the start of menses without any pelvic pathology. It generally starts in adolescence, six to twenty-four months following menarche. Dysmenorrhea pain is often severe on the first day of menstruation, although it can last up to 72 hours and has a clear, cyclical pattern. Even though it is very common and interferes with everyday activities, it is often disregarded and even ignored because many young women would prefer to suffer in secret without seeking medical help. Women view PD as a taboo and an embarrassment, and they believe that the pain is a normal reaction to menstruation and should be accepted. Females with dysmenorrheic symptoms are frequently seen by primary healthcare professionals and thus contribute significantly to the diagnosis, education, comfort, and therapy necessary to maximize the overall results of PD treatment.

The average duration of PD discomfort is 8 to 72 hours, beginning 1 to 2 days prior to the commencement of menses or immediately following the menstrual flow. Apart from lower abdomen and pelvic pain, dysmenorrhea is typically accompanied with common symptoms that fall into two primary categories: psychological and physical symptoms. Systemic, gastrointestinal, and elimination-related physical symptoms are the most frequently encountered. In addition to painful knees and inner thighs, myalgia, arthralgia, and swollen legs, the systemic symptoms include headache, lethargy, weariness, sleepiness/sleeplessness, sore breasts, heavy lower belly, and backache. Increased or decreased appetite, nausea, vomiting, and bloating are examples of gastrointestinal symptoms; constipation, diarrhoea, frequent urination.

In terms of psychological symptoms, mood disorders such anxiety, depression, irritability, and anxiousness might be experienced by dysmenorrheic female. Females experiencing dysmenorrheic pain were shown to have three times the prevalence of depression, anxiety, and extra somatic symptoms. While the heritability of both PD and psychological symptoms may indicate a common genetic variant, the co-occurrence of dysmenorrhea and psychological symptoms may indicate a neurological brain disorder that causes menstrual discomfort. [1,2]

Impact on Quality of Life

High rates of absenteeism from work and school, together with a decline in quality of life, are associated with dysmenorrhea. In a Portuguese study, 8.1% of girls said they had missed work or school because of menstrual pain, which affected everyday activities in 65.7% of cases. Merely 27.9% sought medical assistance. It mostly impacts academic performance in terms of focus, athletic ability, socializing, and academic success. Along with causing sleep disturbances, daytime weariness, and drowsiness, it also affects pain tolerance. Women experience sleep disturbance during the first few days of their periods, and 28% said that their sleep was disturbed by menstrual pain, according to the National Sleep Foundation's Women and Sleep Poll.[3]

Risk Elements

Primary dysmenorrhea is associated with two categories of risk factors: behavioural and non-modifiable. A family history of dysmenorrhea, being younger than 20 years old (symptoms are more severe throughout adolescence), menarche before the age of 12 (since ovulatory cycles are established early), having a monthly flow that lasts longer than seven days, and nulliparity are among the risk factors that cannot be changed. A number of hypotheses, including decreased uterine norepinephrine in the third trimester of pregnancy, neuronal degeneration in the uterus following a term delivery, and decreased endometrial release of prostaglandins following a term delivery, can account for the association between multiparity and a lower risk of dysmenorrhea.[3]



Figure 1: Seeds of Vitex Agnus Castus (33)



Figure 2: Plant of Vitex Agnus Castus [34]

Vitex Agnus Castus

It is an herb which is found throughout the Mediterranean area and in Asia, as far as north west India. It thrives on the banks of rivers and in coastal areas, forming dense thickets. It is a traditional herbal cure used in Anglo-American and European medicine, vitex agnus castus is used to treat a number of female reproductive complaints. The fruit of the Vitex agnus castus, a plant in the Verbenaceae family, is used to treat a number of female reproductive disorders, including low fertility, menopause related complaints, PMS and related cyclic mastalgia, and PMDD, as well as lactation problems. The prevalence of PMS is high around the world. Around the world 40% of women suffers from Premenstrual syndrome (set of physical an emotional symptoms) whereas, another 3–8% (or possibly 13–18%) can be diagnosed with the more severe form of PMDD. About 70% of women have cyclical breast symptoms, and 22%of women are having cyclical mastalgia (breast pain linked to menstrual cycle), which ultimately leads to moderate to extreme discomfort. These frequent issues can all become serious enough to disrupt daily routines and decrease the productivity level. Many women may not favour conventional treatments like hormonal interventions and synthetic antidepressant medications.[4]

The Vitex genus belongs to the Lamiaceae family, which comprises of 7100 species distributed all over the world. The Mediterranean region, central Asia, and Southern Europe all have extensive riverbank and shoreline growth of Vitex agnus-castus (VAC). All of the herb's organs have therapeutic value and have been used for more than 2,000 years, dating back to the time of the ancient Greeks and Romans.

The ripe dried fruit, which is used to make extracts and concentrates, is the most widely utilized portion of the plant. VAC is one of the primary plants used to treat a number of female ailments, including menstruation discomfort and spasmodic dysmenorrhea, according to the ethnomedicine of numerous countries. Vitex agnus has been used in folk medicine to treat various conditions, including eye diseases, acne, snake and scorpion bites, pain, rheumatism, swelling, stomach aches, as an anti-inflammatory and emmenagogue agent. In addition, the plant has been found to have analgesic, anti-inflammatory, antimicrobial, diuretic and digestive properties. The effectiveness of VAC has been supported by scientific reviews. These medicinal benefits have been linked to specific bioactive substances that were separated from VAC fruits, including essential fatty acids (oleic, linolenic, palmitic, and stearic acids), volatile oils (limonene, pinene, and sabinene), flavonoids, tannins, iridoids, diterpenoids, and phenolic acids and their derivatives. Furthermore, one of the most widely used alternative treatments for these conditions is the use of extracts with non-specific side effects. However, VAC extracts are associated with some soft and infrequent side effects, including skin problems, headaches, diarrhoea, vertigo, and palpitations, which disappear after stopping its use.[5]

Through dopaminergic activity via binding to dopamine-2 (DA-2) receptors, these conditions may be affected by Vitex agnus-castus extracts in a prolactin inhibiting manner. Vitex is composed of iridoid glycosides, flavonoids, essential oil and dopaminergic chemicals that are part of the diterpenes, based on phytochemical analysis. The peppery-tasting dried fruits are the most widely used therapeutic form. Nowadays, Vitex is widely used in Europe and countries that speak English and comes in a variety of pharmaceutical forms, such as tinctures, fluid extracts, pills, and homoeopathic preparations.[4]

One non hormonal method is using vitex agnus (vitex agnus castus) which is rich in phytoestrogens (estrogen like compounds). Phytoestrogens have a positive effect on sex hormones and also have antioxidant, antiallergic, anti-inflammatory and antineoplastic activity. Even though their exact pathway of molecular action has not been proven, their effects are reduction of follicle-stimulating hormone and prolactin release and increase

luteinizing hormone secretion by affecting the hypothalamic-pituitary axis. The essential oil of vitex agnus has been traditionally used to treat many problems such as menstrual cramps, general pain, inflammation, sexual dysfunction, and nervous disorders.[6]

It has been said that the corpus luteum and agnus castus have comparable effects. Without specifically influencing luteinizing hormone or follicle stimulating hormone, the mechanism of action might also be linked to dopamine's control of stress-induced prolactin release. Neuroactive flavonoids, β endorphins, and opioid receptors may potentially be involved. Though a comprehensive assessment of the plant's effectiveness is relatively new, it has been used traditionally to alleviate premenstrual syndrome symptoms.[11]

Methods and Material

The protocol was prepared according to Preferred reporting items of Systematic Review and Meta analysis. (PRISMA) guidelines.

Study Design and Participants

The studies reviewed were **randomized, double-blind, placebo-controlled trials** conducted across various centers and locations to assess the effectiveness of **Vitex agnus castus** (VAC) extracts in the treatment of **Premenstrual Syndrome (PMS)**. The inclusion and exclusion criteria varied slightly across the studies but were based on the clinical diagnosis of PMS using the **DSM-III** criteria and self-reported questionnaires. The studies included women aged 18-45 who were not pregnant, lactating, or suffering from any severe medical conditions. A brief summary of each study design follows:

1. **Study 1** (D. Berger et al.)
    - 50 female participants with PMS, randomized to receive **20 mg daily** of **Vitex agnus-castus extract (Ze 440)** for three menstrual cycles.
    - The study was conducted across **three menstrual cycles** with **two baseline** cycles, **three treatment cycles**, and **three post-treatment cycles**.
2. **Study 2** (Mehrangiz Zamani et al.)
    - 134 female participants randomized into **active treatment** (62) and **placebo** (66) groups.
    - 40 drops of **Vitex agnus-castus extract** were administered 6 days prior to menstruation over **six consecutive cycles**.
3. **Study 3** (Zhong He et al.)
    - 128 participants with moderate to severe PMS, randomized into **Vitex agnus-castus treatment** or **placebo** groups.
    - Patients received **VAC extract or placebo** for **three cycles**, with assessments at baseline, Cycle 1, and Cycle 3.
4. **Study 4** (R. Schellenberg)
    - 170 participants, randomized into **active treatment** (86) and **placebo** (84) groups.
    - Participants received **dry extract tablets** of **Agnus castus** daily for **three consecutive cycles**, with assessments of irritability, mood, and other menstrual symptoms.

Interventions

- **Vitex agnus-castus extract** was used as the primary treatment in all four studies, delivered in varying forms (e.g., tablets, drops, or native extracts).
- **Placebo** treatments were matched in appearance to ensure blinding.

Outcome Measures

- **Primary outcomes**:
    - Change in **PMS symptoms** as assessed by self-report questionnaires, including the **Moos Menstrual Distress Questionnaire (MMDQ)** and other symptom-based assessments (e.g., irritability, mood alterations, headache, breast fullness, bloating).
- **Secondary outcomes**:
    - **Global clinical impression** (severity, improvement).
    - **Responder rate** (50% symptom reduction).

Statistical Analysis

- Data analysis was performed using appropriate statistical software (e.g., SPSS or similar).
- For **continuous variables**, comparisons between treatment and placebo groups were made using **Student's t-test** or **ANOVA**, as applicable.
- For **categorical variables**, **Chi-square tests** were used.
- Significance levels were set at **$p < 0.05$** for all studies, with additional levels of significance (e.g., **$p < 0.001$**) used where appropriate.

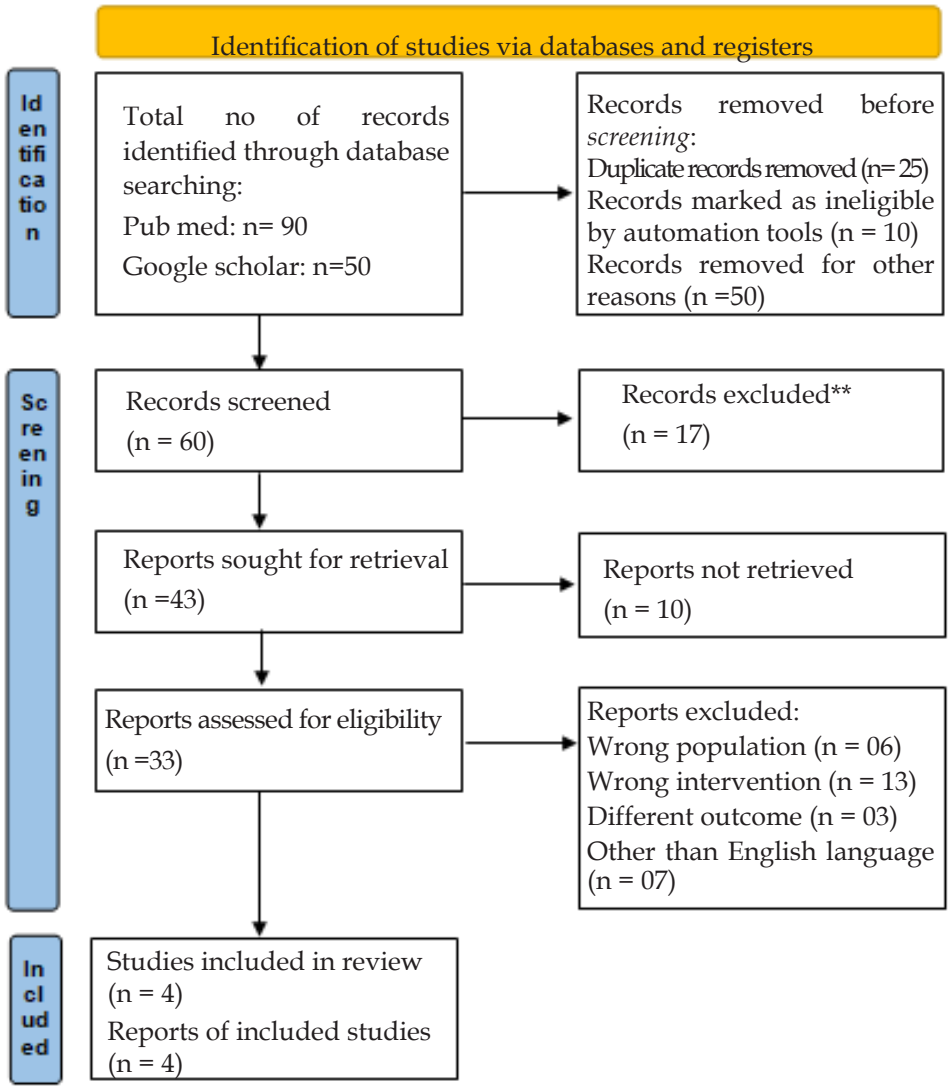
Ethical Considerations

All studies received **ethical approval** from the respective institutional review boards. Informed consent was obtained from all participants before enrollment, and the studies were conducted in accordance with the **Declaration of Helsinki**.

Table 1: Study Comparison Table

Study Tittle	Author	Study Design	Findings
Efficacy of Vitex agnus castus L. extract Ze 440 in patients with PMS	D. Berger, W. Schaffner, E. Schrader, B. Meier, A. Brattström	Randomized, double-blind, placebo-controlled trial, 50 women, 3 treatment cycles, 2 baseline, 3 post-treatment cycles.	**42.5% reduction** in PMS symptoms (MMDQ). Significant improvement observed during treatment phase.
Therapeutic Effect of Vitex Agnus Castus in Patients with PMS	Mehrangiz Zamani, Nosrat Neghab, Saadat Torabian	Randomized, double-blind, placebo-controlled trial, 128 women, 6 treatment cycles with drops of VAC extract.	**Significant improvement** in PMS symptoms ($p < 0.0001$). Psychological factors also played a role in symptom management.
Treatment for premenstrual syndrome with Vitex agnus castus	Zhong He, Rong Chen, Yingfang Zhou, Li Geng, Zhenyu Zhang, Shuling Chen, Yanjun Yao, Junli Lu, Shouqing Lin	Randomized, double-blind, placebo-controlled, multi-center trial, 128 women, 3 treatment cycles.	**Significant improvement** in PMS symptoms (PMSD and PMTS) with VAC treatment. Significant differences between groups ($p < 0.01$).
Treatment for the premenstrual syndrome with agnus castus fruit extract	R. Schellenberg	Randomized, double-blind, placebo-controlled, parallel-group comparison, 170 women, 3 treatment cycles.	Significant improvement in PMS symptoms, **greater improvement** in the active treatment group compared to placebo ($p < 0.001$).

Table 2: Prisma flow diagram



Results and Discussion

Numerous clinical studies have been done on Vitex Agnus Castus which investigated the efficacy of it in treating primary dysmenorrhea. The studies shows that vitex agnus castus when used in appropriate quantity leads to reduction in menstrual pain by acting on hormones. Vitex agnus castus influences the hypothalamic pituitary gonadal axis, leading to changes in hormonal levels that is particularly acting on progestogen and estrogen. Not only for primary dysmenorrhea but also vitex agnus castus has effect on one of the most common premenstrual symptoms, that is premenstrual mastodynia (mastalgia). Vitex Agnus Castus has also beneficial effects on other psychic and somatic symptoms of the PMS. A combination of iridoids and flavonoids can be found in Vitex agnus fruits, and several substances that resemble sex hormones in structure have been identified in the leaves and flowers. Without directly influencing LH and FSH, the mechanism of action might potentially be connected to dopamine's control of stress-induced prolactin release. Additionally, binding to endorphins, opioid receptors, and neuroactive flavonoids may be involved.

Conclusion

Women's self-assessment and the doctor's evaluation both confirmed that Agnus Castus is beneficial in treating primary dysmenorrhea. Following appropriate Agnus Castus ingestion, the symptoms of the participants improved more.

After taking Agnus Castus, participants showed a high level of acceptance and experienced minimal, moderate adverse effects.

According to the study's findings, women who suffer from primary dysmenorrhea that interferes with their everyday activities and lowers their productivity may benefit from using Agnus Castus as a herbal therapy. Compared to chemical therapy, people are more likely to use herbal cures because they rarely cause any side effects. This herb can be recommended by any certified dietitian.

Source of Funding: No

Ethical Permission: NA

Conflict of Interest: Nil

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Original Research Article

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Study of Storage-Related Changes in Whole Blood and Packed Red Blood Cells in the Blood Bank of a Tertiary Care Centre of Western Uttar Pradesh

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Abstract

Introduction: Blood transfusion services are integral to modern medicine. With the increasing shift toward component therapy, understanding the storage-related changes in blood products is essential. Whole blood and packed red blood cells (PRBCs) are commonly stored and used, but undergo significant biochemical and haematological changes over time, known as "storage lesions." This study was conducted to evaluate such changes during a 35-day storage period for both PRBCs and Whole blood.

Methodology: This observational study included 100 blood units—50 whole blood and 50 PRBC units—randomly collected from voluntary donors at a tertiary care blood center. Samples were assessed on Days 0, 7, 14, 21, 28, and 35 for haematological (Hb, RBC count, RBC indices) and biochemical (Na^+, K^+, LDH) parameters using standard analyzers. analysis was done by SPSS software® version 20.0.Statistical analysis was performed using repeated measures analysis of variance (RM ANOVA), appropriate for assessing intra-unit changes across multiple time points (Days 0, 7, 14, 21, 28, and 35). RM ANOVA accounts for the correlation between repeated measurements on the same blood unit and provides robust evidence for time-dependent changes in both haematological and biochemical parameters. Significance was set at $p \leq 0.05$.

Results: Significant haematological and biochemical changes were observed with increasing storage duration. In PRBCs, haemoglobin decreased from 17.25 ± 1.67 g/dL on Day 0 to 14.56 ± 2.2 g/dL on Day 35 ($p < 0.05$), while in whole blood it increased slightly. Potassium levels increased progressively, while sodium levels declined. LDH levels rose markedly, especially in PRBCs, indicating hemolysis. All changes were statistically significant ($p < 0.05$).

Conclusion: Storage leads to predictable and significant deterioration in blood quality. Monitoring haematological and biochemical parameters is crucial to ensure transfusion efficacy and patient safety, particularly beyond 14 days of storage.

Keywords: Storage lesions, PRBC, Whole Blood, Haematological, Biochemical, Potassium, LDH, Blood Storage.

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Introduction

Blood is a vital biological fluid that performs essential functions such as oxygen delivery, nutrient transport, waste removal, and immune defense in the human body. It comprises plasma and cellular elements, including red blood cells (RBCs), white blood cells (WBCs), and platelets, each playing a distinct physiological role. RBCs primarily function to transport oxygen and carbon dioxide due to the presence of haemoglobin, WBCs are critical for immune defense, and platelets are essential for hemostasis through clot formation [1].

The demand for safe and effective blood transfusions is a critical component of healthcare delivery. Advances in transfusion medicine have led to a shift from whole blood transfusions to component therapy, allowing targeted treatment using packed red blood cells (PRBCs), fresh frozen plasma, and platelet concentrates [2]. This practice enhances the efficiency of transfusion and optimizes the use of donated blood based on patient-specific clinical needs [3].

Despite improved preservation techniques, storage of blood—especially PRBCs and whole blood—is associated with various morphological and biochemical changes collectively termed as "storage lesions." These include decreased ATP levels, hemolysis, increased potassium, reduced 2,3-diphosphoglycerate (2,3-DPG), and elevated lactate dehydrogenase (LDH) levels, which may impair post-transfusion efficacy and safety. RBCs stored in CPDA-1 solution have a shelf life of 35 days, while the use of additive solutions like SAG-M can extend PRBC storage to 42 days [4].

Storage lesions not only reduce the deformability and oxygen-carrying capacity of RBCs but can also increase the risk of transfusion-related complications such as hyperkalemia, especially in vulnerable populations like neonates or patients requiring massive transfusions [5]. Moreover, biochemical deterioration, such as increased LDH and potassium and reduced pH, may influence transfusion outcomes and contribute to prolonged hospital stays [6].

Several studies, including those by Oyet et al. and Chaurasiya et al., have documented significant haematological and biochemical shifts in stored blood, reinforcing the need for careful evaluation of storage effects to guide clinical practice [7,8]. Whole blood, though less commonly used in modern transfusion protocols, is still vital in emergency settings and trauma care, especially in resource-limited areas where component separation may not be feasible [9].

In this context, the present study was undertaken to assess the storage-related haematological and biochemical changes in whole blood and PRBCs over a 35-day period at a tertiary care blood center. The findings aim to contribute to the growing body of evidence on storage lesions, with implications for optimizing transfusion practices and ensuring patient safety.

Material and Methods

This hospital-based study was conducted in the Department of Pathology at Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, over a period of 18 months, which included 12 months of data collection and 6 months of data analysis as an observational analysis of storage-related changes over time, with measurements taken longitudinally from the same blood unit at Day 0, 7, 14, 21, 28, and 35. Therefore, the within-unit trends in haemoglobin and other parameters primarily reflect storage-associated changes, rather than inter-donor variability. The haemoglobin values presented at each time point were derived from repeated measures on the same unit, not cross-sectional comparisons between donors.

That said, we acknowledge that initial baseline variability in haemoglobin among donors could influence the absolute starting values and may affect the magnitude of observed changes. To minimize this confounding we used a random sampling method and included only healthy, voluntary donors who met standard blood bank eligibility criteria, helping to narrow the physiological range of donor haemoglobin values, the statistical analysis focused on time-dependent changes within each product type (PRBCs and whole blood) rather than direct between-group comparisons of absolute values and all measurements were carried out under identical storage conditions and laboratory protocols to reduce technical variability.

A total of 100 blood units were randomly selected using a simple random sampling technique, including 50 units of whole blood and 50 units of packed red blood cells (PRBCs).

All blood was collected in citrate phosphate dextrose adenine (CPDA-1) anticoagulant bags and stored at 2–6°C. Donor demographic details such as age, gender, and blood group were recorded at the time of donation. The units were analyzedwith measurements taken longitudinally from the same blood unit at six time intervals: Day 0 (baseline), and subsequently on Days 7, 14, 21, 28, and 35 of storage.

Haematological parameters including haemoglobin (Hb), red blood cell (RBC) count, packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), and mean corpuscular haemoglobin concentration (MCHC) were measured using an automated hematologyanalyzer in the central clinical laboratory. Biochemical parameters—sodium (Na^+), potassium (K^+), and lactate dehydrogenase (LDH)—were estimated using an automated biochemistry analyzer.

Samples were excluded if the blood was clotted or if the blood bags tested positive for transfusion-transmitted infections. All measurements were carried out under standardized laboratory conditions to minimize pre-analytical variability. Data entry was made in MS Office Excel software in codes and analysis was done by SPSS software® version 20.0.Statistical analysis was performed using repeated measures analysis of variance (RM ANOVA), appropriate for assessing intra-unit changes across multiple time points (Days 0, 7, 14, 21, 28, and 35). RM ANOVA accounts for the correlation between repeated measurements on the same blood unit and provides robust evidence for time-dependent changes in both haematological and biochemical parameters. Significance was set at $p \leq 0.05$.Ethicalclearance for the study was obtained in accordance with institutional guidelines and protocols.

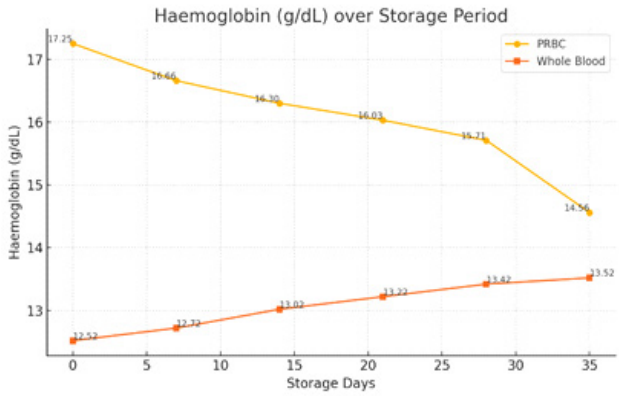
Results

This study analyzed a total of 100 blood units, comprising 50 units each of whole blood and packed red blood cells (PRBC), stored at 2–6°C in CPDA-1 anticoagulant solution. Haematological and biochemical parameters were measured on Days 0, 7, 14, 21, 28, and 35.

Haemoglobin (Hb)

In PRBC: Hb concentration declined significantly across storage ($F = 15.091$, $p = 6.41 \times 10^{-13}$). Mean Hb dropped from 17.25 ± 1.67 g/dL at baseline to 14.56 ± 2.20 g/dL on Day 35, a mean decrease of 2.69 g/dL.

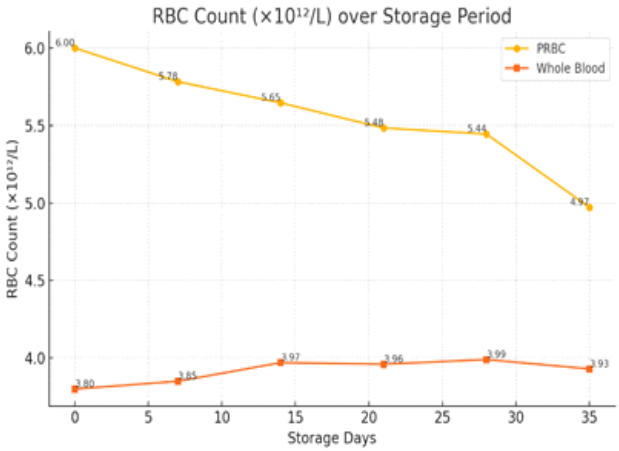
This decline was statistically significant from Day 7 onward.In whole blood, Hb showed no significant change over time ($F = 0.560$, $p = 0.731$), with a slight increase of 1.0 g/dL observed from 12.02 ± 1.96 to 13.02 ± 2.18 g/dL, likely reflecting variability.



RBC Count

RBC count in PRBC units declined significantly ($F = 16.387$, $p = 6.04 \times 10^{-14}$), falling from 5.999 ± 0.75 $\times 10^6/\mu L$ to 4.972 ± 0.86 $\times 10^6/\mu L$ by Day 35. This reduction of approximately 1.03 $\times 10^6/\mu L$ confirms red cell loss during storage.

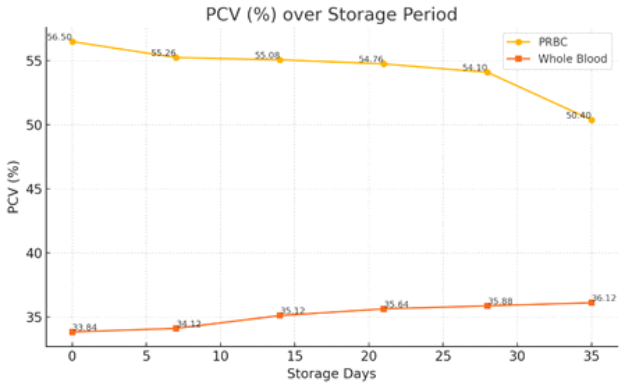
Whole blood showed a mild rise in RBC count over time ($F = 2.462$, $p = 0.034$), increasing from 3.80 ± 0.74 to 3.93 ± 0.78 $\times 10^6/\mu L$, though clinical relevance is limited.



Packed Cell Volume (PCV / Hematocrit)

HCT showed a significant decrease in PRBCs (F = 5.852, p = 3.97 × 10^{-5}), from 56.5 ± 5.66% to 50.4 ± 8.48%, a reduction of 6.1%. This likely reflects lysis-related plasma expansion.

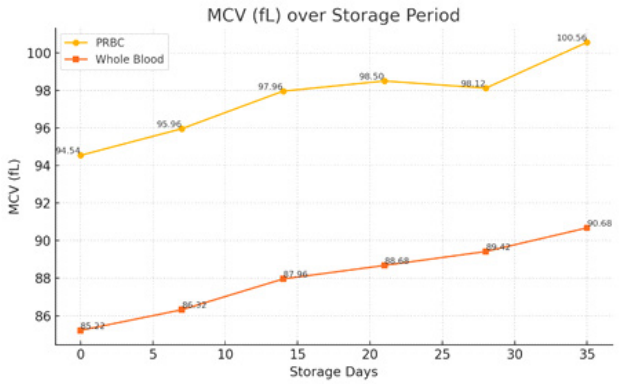
In contrast, whole-blood HCT increased from 33.84 ± 6.67% to 36.12 ± 7.42% (F = 5.654, p = 5.99 × 10^{-5}), consistent with hemoconcentration or storage-related shifts.



MCV (Mean Corpuscular Volume)

MCV increased significantly in PRBC (F = 12.938, p = 3.54 × 10^{-11}), rising from 94.5 ± 9.08 fL to 100.6 ± 10.65 fL. This cell swelling reflects osmotic changes during storage.

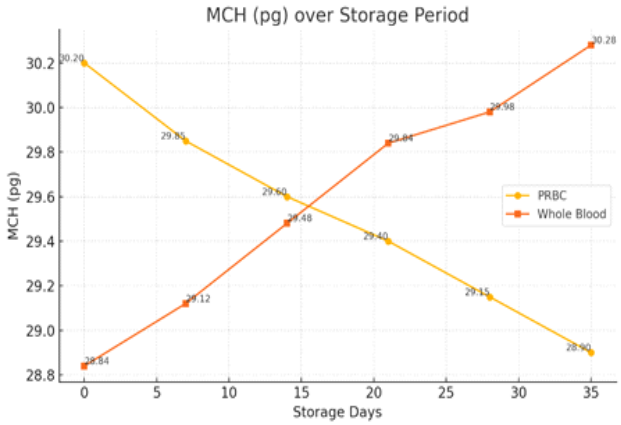
A similar trend was seen in whole blood with a sharp MCV rise (F = 68.142, p = 4.06 × 10^{-44}) from 85.22 ± 9.13 to 90.68 ± 11.78 fL, showing membrane instability.



MCH (Mean Corpuscular Haemoglobin)

MCH declined slightly in PRBCs (F = 2.289, p = 0.0466), with means shifting from 30.2 ± 1.72 to 28.9 ± 1.40 pg—just breaching significance.

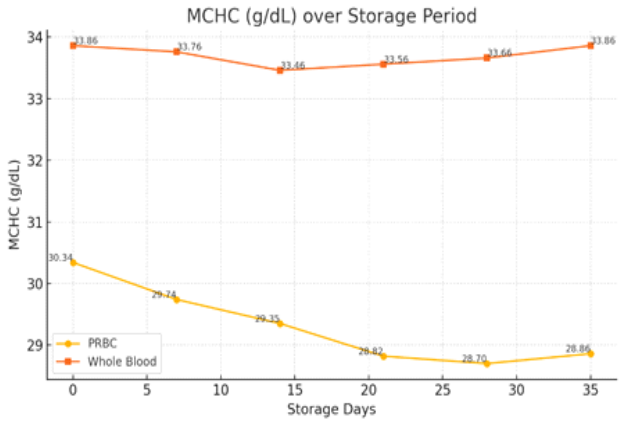
Whole blood displayed a marked MCH rise (F = 61.992, p = 2.62 × 10^{-41}); values peaked beyond Day 21, consistent with increased hemoglobin per cell volume.



MCHC (Mean Corpuscular Haemoglobin Concentration)

MCHC significantly decreased in PRBC units (F = 7.354, p = 1.92 × 10^{-6}), suggesting intracellular Hb dilution.

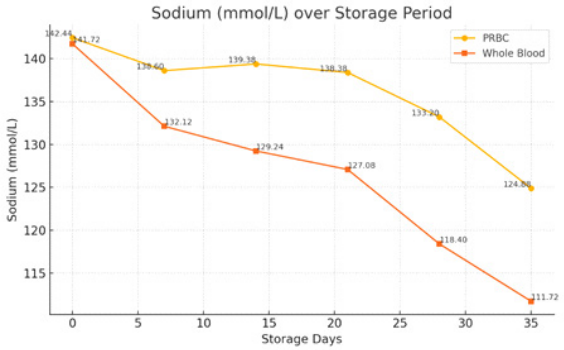
Whole-blood MCHC fluctuated mildly (F = 3.624, p = 0.0035), ending slightly lowerthan baseline.



Sodium (Na^+)

Na^+ fell by 17.6 ± 8.69 mmol/L in PRBCs (F = 18.086, p = 2.90 × 10^{-15}), from 142.4 to 124.9 mmol/L by Day 35, suggesting progressive electrolyte leakage.

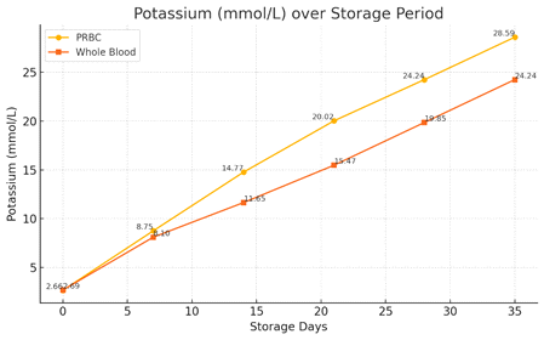
Whole blood units showed a steeper Na^+ drop of 30.0 ± 2.05 mmol/L (F = 90.664, p = 2.76 × 10^{-53}), reflecting greater ionic imbalance.



Potassium (K^+)

K^+ rose dramatically in PRBCs from 2.66 ± 1.34 to 28.59 ± 2.78 mmol/L (F = 13.748, p = 7.73×10^{-12}), a 25.93 mmol/L increase.

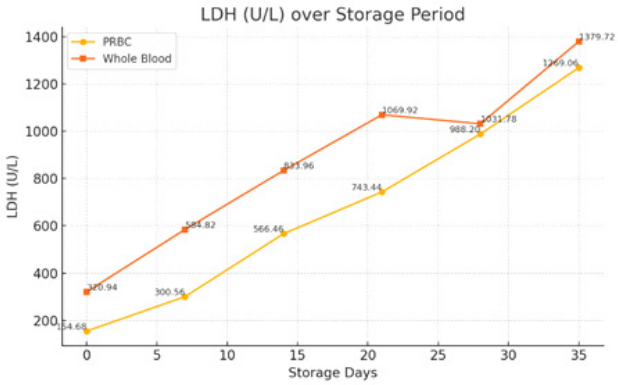
In whole blood, K^+ rose from 2.69 ± 0.78 to 24.24 ± 2.94 mmol/L (F = 852.909, p = 1.43×10^{-150}), confirming accelerated red cell lysis.



Lactate Dehydrogenase (LDH)

LDH levels surged in PRBCs from 154.7 ± 49.8 to 1269.1 ± 392.5 U/L (F = 201.978, p = 9.30×10^{-85}), reflecting haemolysis.

Whole blood showed similar rise from 320.9 ± 116.1 to 1379.7 ± 365.8 U/L (F = 115.064, p = 1.10×10^{-61}), confirming stored cell breakdown.



Repeated-Measures ANOVA

Parameter	Group	df_1	df_2	F	p-value	Interpretation (p < 0.05)
Hb	PRBC	5	245	15.091	6.41×10^{-13}	Significant fall with storage
	Whole blood	5	245	0.560	0.731	No significant trend
RBC count	PRBC	5	245	16.387	6.04×10^{-14}	Significant fall
	Whole blood	5	245	2.462	0.034	Mild but sig. fall
PCV / HCT	PRBC	5	245	5.852	3.97×10^{-5}	Progressive rise
	Whole blood	5	245	5.654	5.99×10^{-5}	Progressive rise
MCV	PRBC	5	245	12.938	3.54×10^{-11}	Cells swell over time
	Whole blood	5	245	68.142	4.06×10^{-44}	Very large rise
MCH	PRBC	5	245	2.289	0.0466	Marginal rise
	Whole blood	5	245	61.992	2.62×10^{-41}	Marked rise
MCHC	PRBC	5	245	7.354	1.92×10^{-6}	Falls significantly
	Whole blood	5	245	3.624	0.0035	Small but sig. wobble
Na^+	PRBC	5	245	18.086	2.90×10^{-15}	Steady decline
	Whole blood	5	245	90.664	2.76×10^{-53}	Steep decline
K^+	PRBC	5	245	13.748	7.73×10^{-12}	Sharp rise
	Whole blood	5	245	852.909	1.43×10^{-150}	Very sharp rise
LDH	PRBC	5	245	201.978	9.30×10^{-85}	Massive rise (haemolysis)
	Whole blood	5	245	115.064	1.10×10^{-61}	Massive rise

df_1 (numerator) = number of time-points − 1 (6 − 1 = 5);

df_2 (denominator) = (n − 1) × df_1 →PRBC: n = 50 → (50 − 1) × 5 = 245

Whole blood: n = 50 → (50 − 1) × 5 = 245

F compares between-day variance to within-subject variance; the smaller the p-value, the stronger the evidence that the parameter truly changes during storage.

Discussion

Blood storage plays a pivotal role in modern transfusion medicine, especially in settings where blood demand often exceeds immediate availability. However, storage-related changes, termed "storage lesions," can significantly affect the quality and safety of blood products over time. The present study evaluated both haematological and biochemical parameters in whole blood and packed red blood cells (PRBCs) stored for up to 35 days in CPDA-1 solution at 2–6°C, a common practice in blood banks across India.

Haematological Parameters

Haemoglobin and RBC Count

In the current study, PRBC haemoglobin levels declined significantly from 17.25 g/dL on Day 0 to 14.56 g/dL on Day 35 ($p < 0.05$), indicating degradation of haemoglobin over time. In contrast, whole blood haemoglobin showed a slight increase from 12.52 to 13.52 g/dL. This could be attributed to plasma water evaporation or redistribution of RBCs during storage, which falsely elevates Hb concentration in whole blood units [8]. These findings are consistent with Chaurasiya et al., who observed similar trends of haemoglobin reduction in PRBCs due to oxidative damage and hemolysis during prolonged storage [8].

RBC counts in PRBCs decreased progressively (5.9988 → 4.9718 million/µL), consistent with the findings of Marabi et al., who reported a decline due to membrane fragility and hemolysis[10]. In contrast, whole blood RBC counts remained relatively stable (3.80 → 3.93 million/µL), suggesting that leukocytes and platelets may help preserve RBC integrity initially, though their utility declines over time and align with the findings with Gupta et al [11].

Hematocrit (PCV), MCV, MCH, and MCHC

The hematocrit in PRBCs declined significantly from 56.5% to 50.4%, indicating RBC sedimentation and membrane loss, a well-documented effect during storage [5]. Interestingly, whole blood hematocrit increased from 33.84% to 36.12%, possibly due to plasma reduction and hemoconcentration—a pattern previously reported by Chhabra et al. [12].

MCV in PRBCs increased from 94.54 to 100.56 fL, indicating cellular swelling, possibly due to impaired Na^+/K^+ ATPase function and increased intracellular sodium. Similar findings were reported by Oyet et al. [7], who also observed increased MCV due to RBC fragility during storage. Whole blood MCV followed the same upward trend (85.22 → 90.68 fL), though less pronounced.

MCH and MCHC values in PRBCs slightly decreased over the storage period. MCH dropped from 29.04 to 28.76 pg, and MCHC from 30.34% to 28.86%. These changes reflect reduced haemoglobin content per cell and intracellular dehydration [13]. Notably, whole blood MCHC remained unchanged at 33.86%, indicating better maintenance of haemoglobin saturation, likely due to the presence of plasma buffering capacity.

Biochemical Parameters

Sodium and Potassium

A significant decline in sodium levels was observed in both PRBCs (142.44 → 124.88 mmol/L) and whole blood (141.72 → 111.72 mmol/L). This drop is attributed to the influx of sodium into RBCs due to membrane pump failure, an effect commonly seen during prolonged hypothermic storage [14].

Conversely, potassium levels increased markedly during the same period. In PRBCs, potassium rose from 2.66 to 28.59 mmol/L; in whole blood, from 2.69 to 24.24 mmol/L. This increase is a hallmark of storage lesions and is due to the efflux of intracellular potassium from erythrocytes into the extracellular medium as membrane integrity deteriorates [15]. Mukherjee et al. and Parshuram et al. confirmed similar findings, warning that hyperkalemia could

pose a risk in neonatal and massive transfusion scenarios [6,16].

LDH Levels

LDH serves as an indirect marker of RBC lysis and cellular injury. In this study, LDH levels rose sharply in both PRBCs (154.68 → 1,269.06 U/L) and whole blood (320.94 → 1,379.72 U/L). This pattern clearly reflects ongoing hemolysis and membrane breakdown, supporting previous observations by Oyet et al. [7] and Chaurasiya et al. [8].

Higher LDH values in whole blood than in PRBCs may be explained by the presence of leukocytes and platelets, which also release LDH upon lysis. However, both product types clearly show that LDH increases linearly with time, reinforcing its role as a reliable indicator of blood deterioration [17].

Clinical Implications

The cumulative impact of these storage-related changes has significant clinical implications. Increased potassium and LDH levels suggest caution in using older units for vulnerable populations such as neonates, patients with renal impairment, or those requiring large-volume transfusions. Decreased haemoglobin, hematocrit, and RBC integrity may reduce the efficacy of oxygen delivery, especially in critically ill patients [6,16].

Furthermore, routine monitoring of potassium and LDH during storage could guide quality assurance protocols in blood banks. Adoption of leukoreduction, additive solutions (e.g., SAGM), or newer storage methods may help mitigate these changes [5].

Comparison with Other Studies

The results of the present study align well with findings from other Indian and international studies. Oyet et al. and Chaurasiya et al. reported similar patterns of electrolyte imbalance and hemolytic markers in PRBC and whole blood stored at 2–6°C [7,8]. However, slight variations in absolute values may result from differences in sample processing, anticoagulant type, storage bags, and analysis techniques.

Additionally, while most international guidelines permit storage of PRBCs for up to 42 days, emerging evidence, including our data, suggests that qualitative deterioration becomes clinically relevant after Day 14–21, particularly for biochemical parameters like potassium and LDH [19,20].

Conclusion

The present study systematically evaluated the haematological and biochemical changes occurring in stored whole blood and packed red blood cells (PRBCs) over a 35-day period at a tertiary care blood center. The findings highlight that storage-induced alterations—commonly referred to as storage lesions—are both predicTable and significant.

Haematologically, PRBCs demonstrated a steady decline in haemoglobin concentration, RBC count, and hematocrit, while MCV increased due to cellular swelling. MCH and MCHC showed modest declines, reflecting intracellular haemoglobin loss and membrane fragility. In contrast, whole blood samples exhibited a slight rise in haemoglobin and hematocrit, likely due to plasma loss, while MCHC remained relatively unchanged.

Biochemically, both PRBC and whole blood units showed a progressive and significant increase in extracellular potassium and LDH levels—indicative of red cell lysis. Concurrently, sodium levels declined, reflecting ionic imbalance due to membrane pump failure. These changes became more pronounced beyond 14 days of storage, raising potential clinical concerns, particularly in vulnerable patient groups such as neonates, those with renal impairment, or individuals requiring massive transfusions.

The study underscores the need for stringent monitoring of storage parameters and supports the use of fresher blood units when clinically feasible. Adoption of improved storage technologies and leukoreduction practices may further enhance transfusion safety and efficacy.

Conflict of interest: Nil

Source of funding: Nil

Ethical Clearance was taken IEC of Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh dated 20/03/2023 with approval number MM/IEC/2023/243.

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Original Article

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Exploring Health Related Beliefs and Behaviours among Young Adults Attending a Professional College

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Abstract

Background: The college period is a critical phase of young adulthood which offers growth opportunities but also presents challenges such as maintaining nutrition, managing time, coping with stress, and developing identity. During this time, young adults form health-related beliefs and behaviours that significantly impact long-term well-being.

Aim & Objective: To assess health beliefs and behaviours, substance use prevalence, and common reasons for substance use among young adults in a professional college.

Methods and Material: A cross-sectional study was conducted among students aged 18–25 years enrolled in M.B.B.S., B.Sc. Nursing, BPT, and Yoga Sciences at a medical university in Northern India. Data was collected using a semi-structured questionnaire.

Results: Among 396 participants, the average healthy lifestyle belief score was 25.9. Nutrition- and physical activity-related behaviour scores were 22.22 and 19.47, respectively. MBBS students demonstrated better healthy lifestyle beliefs. Males engaged more in physical activity, while B.Sc. Nursing students showed better nutrition behaviours. Substance use was higher among males and B.Sc. Nursing students, often cited to feel good or relieve tension.

Conclusions: Health-related beliefs and behaviours vary among young adults. National health policies and prevention strategies in education are essential to improve outcomes and reduce substance use.

Key-words: Young adults; Programs; Health related beliefs; Health related behaviours; Substance use

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Introduction

The World Health Organization defines health as a "state of complete physical, mental, and social well-being, and not merely the absence of disease". Lifestyle includes a person's beliefs, attitude and behaviours towards life.[2] It contributes significantly, accounting for 60% of the quality of life.[2].Nutrition, physical activity, substance use, sleep habits, social interactions are some examples of lifestyle.

The college years mark a transformative period for young adults, characterized by new opportunities and challenges, including managing daily life, academic responsibilities, expanding social networks, and taking charge of personal health. This phase of early adulthood is critical, as individuals develop health-related beliefs and behaviours that are often carried into later life. However, the biological, social, and psychological transitions during this age make young adults particularly susceptible to high-risk health behaviours. Research indicates that adopting healthier behaviours becomes increasingly difficult as individuals age. [2,3]

Changes associated with starting college, such as greater independence, behavioural autonomy, increased workloads, and heightened stress levels, can impact health. These factors often lead to compromises in nutrition, physical activity, and stress management. Poor nutrition among students is driven by factors such as unlimited access to food, unhealthy dietary options, irregular meal patterns, and time constraints. The preference for fast food due to its convenience exacerbates nutritional imbalances, increasing risks of weight fluctuations and non-communicable diseases (NCDs) such as diabetes, cardiovascular diseases, hypertension, and deficiencies like anaemia and vitamin insufficiencies.

Additionally, significant proportions of university students fail to meet recommended physical activity levels and engage in prolonged sedentary behaviours.[4] Restful sleep, another essential component of health, is often inadequate among college students globally. [5,6] Substance use, including alcohol, tobacco, and drugs can further complicate health management, negatively impacting academic performance.[7]

Existing research on health beliefs and behaviours among young adults in college often overlooks the unique challenges faced by students in specific professional programs. Studies may lack focus on these specific contexts, neglect the influence of cultural and socioeconomic factors, and underrepresented diverse student populations.

This research gap is significant because understanding the unique health challenges faced by students in these demanding programs is crucial for improving their well-being. Addressing health concerns can significantly enhance academic performance and professional success, contributing to the achievement of SDG 3: Ensure healthy lives and promote well-being for all at all ages, specifically target 3.4 to reduce premature mortality from non-communicable diseases (NCDs) by one-third by 2030. Furthermore, this research can inform the development of targeted interventions, equitable support systems, and effective health promotion programs tailored to the specific needs of students in professional colleges.

Aim & Objective(s)

1. To assess the health-related beliefs among young adults (18-25 years) attending a professional college.
2. To assess the health-related behaviours in terms of nutrition and physical activity among them
3. To find substance use (Alcohol, Smoking, Tobacco and other Illicit drugs) patterns among them

Materials and Methods

Study Setting and Population: A cross-sectional study was conducted among students enrolled in the constituent colleges of a medical university in Northern India. These included students from Bachelor in Medicine and Surgery (MBBS), Bachelor in Sciences-Nursing (BSc. -Nursing), Bachelor in Physiotherapy (BPT), and Bachelor in Sciences-Yoga (Yoga Sciences) programs.

Sample Size Calculation: Done using formula $n=(Z1-\alpha/2)^2 P(1-P)/d^2$ where $(Z1-\alpha/2)$ =1.96 at 95% CI, anticipated proportion (P) of 50% and margin of error with absolute precision (d) of 5%.[2] This yielded an initial sample size of 385 (approximately 400). Adjusting for a finite population size of 2000

using the formula n′ = n / [1+ (n-1)/2000], the sample size was recalculated to be 323. Accounting for a non-response rate of 10%, a minimum of 355 respondents was required.

Inclusion Criteria: Participants were students aged 18–25 years attending the various programs of the medical university in Uttarakhand who were not suffering from any serious mental illness.

Sampling Technique: A simple random sampling technique was employed to select participants. A list of students aged 18–25 years attending the various medical programs was compiled. Participants were then randomly selected using a computer-generated random number table to achieve the desired sample size.

Study Instrument: The study utilized a weighing machine (Omron HN-286 Digital Weight Scale) for measuring weight and a stadiometer (Generic 220 cm wall-mounted stadiometer, Model No. EBIVAEB72126) for measuring height.

A semi-structured questionnaire was also administered, incorporating the following validated tools:

- Healthy Lifestyle Belief Questionnaire.[8]
- Healthy Lifestyle Behaviour II Questionnaire.[9]
- Alcohol Use Disorder Identification Test - Concise Questionnaire.[10]
- Fagerström Test for Nicotine Dependence Questionnaire.[11]
- Drug Use Disorder Identification Test - Concise Questionnaire.[12]

The questionnaire consisted of 47 items covering demographic details, healthy lifestyle beliefs, healthy lifestyle behaviours related to nutrition and physical activity, and substance use.

Data Collection Procedure: Participants were asked to complete the study questionnaire. Their height and weight were measured using the aforementioned equipment.

Statistical Analysis: The data were analysed using IBM SPSS version 2023. Qualitative variables were expressed as frequencies and percentages, while quantitative variables were summarized as means and medians. Chi-square test and Kolmogorov–Smirnov test were applied to compare qualitative and quantitative variables respectively, and to determine statistical significance. A p-value of <0.05 was considered statistically significant.

Results

The cross-sectional study conducted at the medical university included 396 participants. The mean age, height, weight, and BMI were 20.2 ± 1.7 years, 165.3 ± 10.2 cm, 62.6 ± 13.2 kg, and 22.8 ± 4.1 kg/m², respectively. The mean healthy lifestyle belief score was 25.9 ± 6.4, while the healthy lifestyle behaviour scores for nutrition and physical activity were 22.22 ± 6.0 and 19.47 ± 6.3, respectively. Demographic details are summarized in Table 1.

Differences were evaluated based on gender, age, and course pursued. Age was arbitrarily classified into three groups: 18 to < 20 years, 20 to < 22 years, and 22–25 years. Due to skewed data representation, the median was used as the measure of central tendency for statistical analysis. Physical activity differed significantly based on gender, with males being more active than females. Students aged 22–25 years had higher nutrition and physical activity scores compared to other age groups. MBBS students had better healthy lifestyle belief scores than other courses. Nutrition scores were highest among BPT students, while Yoga Science students were the most physically active. Differences in healthy lifestyle belief scores and the nutrition and physical activity domains of the healthy lifestyle behaviour scores based on socio-demographic variables are presented in Table 2.

Substance use was avoided by most young adults regardless of gender, age, or course. However, alcohol, smoking, oral tobacco, and illicit drug use were significantly higher among males compared to females. Males were more likely to engage in hazardous drinking than females. Young adults aged 22–25 years were significantly more likely to consume alcohol, smoke, and chew tobacco, while those aged 20 to < 22 years were more likely to engage in hazardous drinking. Among courses, B.Sc. Nursing students had the highest involvement in alcohol consumption, hazardous drinking, smoking, oral tobacco, and illicit drug use. Differences in substance use (alcohol, smoking, tobacco chewing, and illicit drugs) based on socio-demographic variables are shown in Table 3.

The most common reasons for substance use were to feel good or high and to relax and relieve tension (Figure 1).

Table 1: Demographic details of the participants.

Demographic details	**Num (%)** or **Mean±SD**
Gender	
Male	175(44.2)
Female	221(55.8)
Age (in years)	
18 to <20 yrs	153(38.6)
20 to < 22 yrs	165(41.7)
22-25 yrs	78(19.7)
Programs Pursued	
B.P.T.	67 (16.9)
BSc. -Nursing	93 (23.5)
M.B.B.S.	190 (48.0)
Yoga Sciences	46 (11.6)
Height (in cm)	
Males	172.8 ± 8.2
Females	159.4 ± 7.3
Weight (in Kg)	
Males	70.2 ± 12.5
Females	56.5 ± 10.3
Body Mass Index (Kg/m2)	
Males	23.5±3.9
Females	22.3± 4.1

Table 2: Differences in Healthy Lifestyle Belief Score and Nutrition and Physical Activity domains of Healthy Lifestyle Behaviour Score based on socio-demographic variables.

Study variables	**HLBS P value**	**HLBehv.S Nutrition P value**	**Physical activity P value**
Gender	.821	**.122**	**.004**
Male	26 (31-21)	22 (28-18)	21(22-16)
Female	27(31-20)	22(25-18)	17(23-15)
Age (in years)	.301	**.011**	**.046**
18 to ≤ 20	27(31-21)	22(26-18)	18(25-16)
20 to ≤ 22	27(31-20)	21(25-18)	17(24-14)
22 to 25	25.5(29-20)	24(29.5-18)	21(26-15)
Programs.	**.001**	**<.001**	**<.001**
BPT	21(29-18)	24(30-19)	20(27-16)
BSc. -Nursing	26(31-24)	22(29.5-17)	20(26-14)
MBBS	28(31-22)	20(24-18)	16(22-14.8)
Yoga Sciences	25(29.3-20)	23(28-20)	24(27-19.5)

Quantitative variables are expressed as Median (Interquartile range)

HLBS: Healthy Lifestyle Belief Score; HLBehv.S : Healthy Lifestyle Behaviour Score

Table 3: Difference in Substance Use (Alcohol, Smoking, Tobacco chewing and Illicit Drugs) based on sociodemographic variables

Substance use	Gender Num(%)		Age Groups(in years) Num (%)			Programs Pursued Num (%)			
	Male	Female	18 - < 20	20 - < 22	22-25	BPT	BSc. Nursing	MBBS	Yoga Sciences
[1] Alcohol Use									
Do not take alcohol	130(74.3)	189(85.5)	136(88.9)	130(78.8)	53(67.9)	56 (83.6)	64(68.8)	160(84.2)	39(84.8)
Non-Hazardous drinking	31(17.7)	22(10.0)	10(6.5)	23(13.9)	20(25.6)	11(16.4)	19(20.4)	18(9.5)	5(10.9)
Hazardous drinking	14(8.0)	10(4.5)	7(4.6)	12(7.3)	5(6.5)	0(0.0)	10(10.8)	12(6.3)	2(4.3)
P value	0.02		0.008			<.001			
[2] Smoking									
Yes	29(16.6)	7(3.2)	7(4.6)	16(9.6)	13(16.7)	1(1.5)	23(24.7)	8(4.2)	4(8.7)
No	146(83.4)	214(98.8)	146(95.4)	149(90.4)	65(83.3)	66(98.5)	70(75.3)	182(95.8)	182(95.8)
P value	.001		0.01			<.001			
[3] Oral Tobacco									
Yes	11(6.3)	1(0.5)	3(2)	5(3.0)	4(5.1)	0(0)	9(9.7)	3(1.6)	0(0)
No	164(93.7)	220(99.5	150(98)	160(97)	74(94.9)	67(100.0)	84(90.3)	187(98.4)	46(100.0)
P value	.001		.438			.001			
[4] Illicit Drugs Use									
Yes	21(12.0)	7(3.2)	9(5.9)	10(6.1)	9(11.5)	0(0.0)	16(17.2)	7(3.7)	5(10.9)
No	154(88.0)	214(96.8)	144(94.1)	155(93.9)	69(88.5)	67(100.0)	84(90.3)	187(98.4)	46(100.0)
P value	.001		.228			<.001			

[1]Alcohol Use: Score = 0: No use., 0 < Score < Hazardous: Non-hazardous and Hazardous: >4 (men), >3 (women).

[2]Smoking: Score =0: No., ≥1 = Yes.

[3]Oral Tobacco: 0: No., 1=Yes

[4]Illicit Drug Use: Score =0: No., ≥1 = Yes.

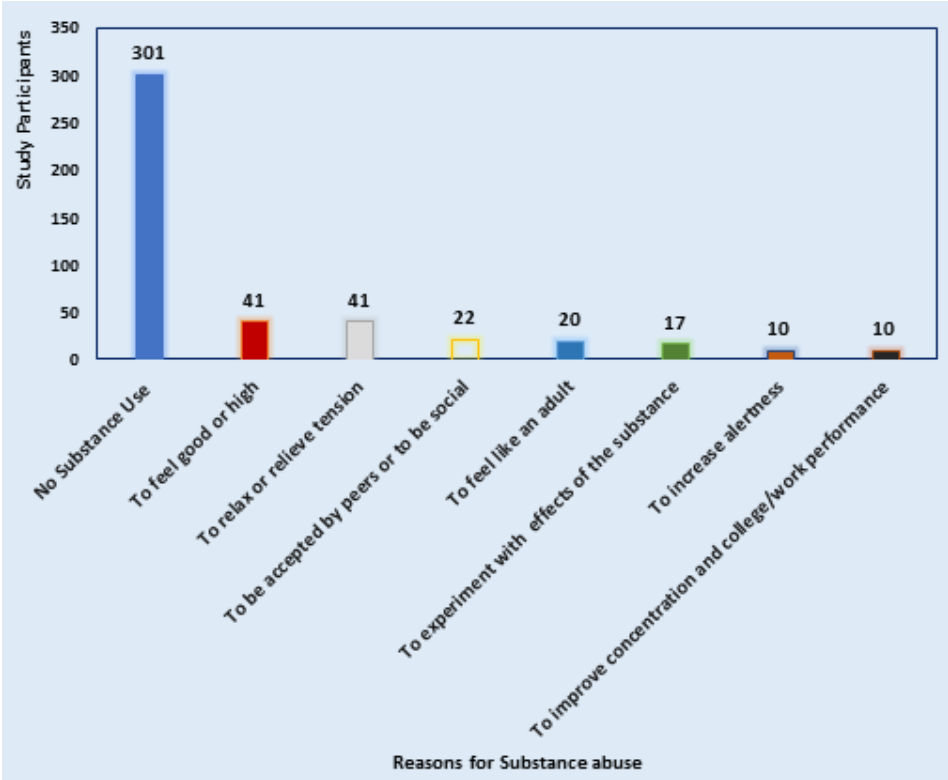


Fig 1: Reasons for Substance use among young adults

Discussion

College life marks a transition from adolescence to adulthood, with physical, psychological, and social changes alongside increasing responsibility for personal health. During this period, new health beliefs and behaviours can develop, making it crucial to understand these aspects in young adults to design effective interventions.

Significant differences in healthy lifestyle belief scores across four programs may reflect the level of health-related information provided within the curricula, influencing students' beliefs .Males being more physically active than females, possibly due to higher interest in body fitness, exercise, and gyms[13]. Studies show men are motivated by intrinsic factors, such as enjoyment and challenge, while women often need extrinsic motivation.[14]

The lowest scores in nutrition and physical activity among MBBS students suggests academic workload and stress may impact health behaviours. The Healthy lifestyle behaviour domains were independent, with good nutrition not necessarily correlating with high physical activity, and vice versa.

Substance use in college students is a global issue. [15,16] Alcohol (53.5%) was the most common substance, followed by smoking (27.3%), tobacco chewing (8.2%), and cannabis (6.8%). [15] Alcohol consumption and hazardous drinking were higher in males than females, [17] with smoking, tobacco chewing, and illicit drug use also more prevalent among males, [18,19] likely due to increased impulsivity and poor stress coping in males.

The most common reasons for substance use were to experience a high, relax, and relieve tension, followed by peer influence and experimentation. These findings align with previous research linking stress and social influences, like peers, to substance use in young adults. [20-22]

This study, using the healthy lifestyle belief and behaviour scores, provides insight into young adults' health attitudes. It suggests strategies for promoting healthy lifestyles among college students. Regular health education programs, integration of health-promoting activities into curricula, and campus facilities like gyms and sports complexes should be

provided. Mental health support, including stress-coping counselling, should be emphasized to reduce stress-related substance use. MBBS students should be encouraged to adopt better nutrition and engage in physical activity, while young males, those aged 20–25, and B.Sc. Nursing students require regular substance use screening and counselling.

This study applies a healthy lifestyle belief score along with a healthy lifestyle behaviour score that shows a glimpse of attitude about healthy lifestyle among youngsters. The study provides information that could help direct the creation of thorough and well-planned interventions for college students to encourage the adoption of healthy lifestyle attitudes and practices.

The study offers new insights into discipline-specific, gender and age patterns in health behaviours, as well as factors influencing substance use among young adults. It calls for the need for tailored health promotion, curriculum-based education, stress management, and substance use interventions.

Suggestions: There is a need for regular health education programs to increase awareness about health promoting lifestyles. Healthy lifestyle education programs should be added to the educational curriculum. Facilities like gym, sports complex, park, cycling tracks should be provided in the university/college campus for encouraging physical activity. Mental health should not be neglected and regular counselling especially coping with stress should be offered periodically to students as stress can potentially trigger substance use. MBBS students should be encouraged to adopt good nutritional habits and for physical activity. Young adult males, Age group 20-25 years and B.Sc. Nursing students are examples of target groups who require regular screening and counselling for substance use.

Conclusion

The study revealed a concerning gap between healthy lifestyle beliefs and actual behaviours among young adults in college. This is especially concerning because having bad habits as a young adult can greatly raise the chance of getting non-communicable illnesses (NCDs) such cancer, diabetes, heart disease, and stroke in their late age. It will take a multifaceted approach to solve this problem. Making thoughtful decisions about their food, exercise, and stress reduction are all ways that they can take action to enhance their health. Colleges and universities can create supportive environments by promoting healthy eating options, providing accessible fitness facilities, and offering mental health services. Government policies can also play a crucial role by regulating unhealthy food and beverage industries, subsidizing healthy food options, and promoting physical activity through public health campaigns. By working together, we can empower young adults to adopt healthier lifestyles, reduce their risk of NCDs, and build a healthier future for themselves and society.

Recommendation: The study highlights health education on nutrition, physical activity, and substance use, integrating health promotion into curricula. It recommends improved infrastructure, mental health support, substance use monitoring, targeted interventions, and national policies for young adults' health, alongside further tailored research.

Limitations of the study: The study had the following limitations: Data was collected through a self-reported questionnaire, which may have led to socially desirable responses. There was a lack of homogeneity in the number of responses across courses and genders, which could affect the generalizability of the results. During statistical analysis, to reduce complexity, the substance use questionnaires were not fully scored according to their scoring systems but were only used to capture whether subjects had used a particular substance.

Relevance of the study: The study addresses critical health areas for college students—nutrition, physical activity, mental health, and substance use—during a formative phase for lifelong habits. It focuses on high-risk groups and integration into national policies highlighting its importance in preventive healthcare and youth well-being.

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Informed consent: The participants for the study were selected only after obtaining informed consent.

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Original Article

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Gender Disparities in Sedentary Habits and Physical Inactivity Patterns: More Than it Meets the Eyes

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Abstract

Objectives: Our study aims to unravel the complex interplay between body mass index (BMI), physical activity, and sitting time, particularly focusing on gender differences.

Material and method: The study was conducted among 210 college students of age 18-25 years. Anthropometric variables taken were blood pressure, waist circumference, weight and height. Blood sample was drawn for fasting blood sugar and lipid profile. Physical activity levels were assessed using International Physical Activity Questionnaire.

Results: Although there was a highly significant difference between the males and the females in height and weight their BMI and waist circumference were not significantly different. The total moderate activity (TMA), total vigorous activity (TVA), total physical activity(TPA), total sitting minutes (TSM) and average sitting (AS) were very highly significantly different between the males and the females. Participants with higher BMI have significantly lower odds (p=0.027)of performing higher physical activity. Female gender also had significant lower odds (p= 0.003) of performing high physical activity.

Conclusion: Despite similar BMI, gender differences emerge in physical activity patterns, with females exhibiting lower levels of vigorous activity and higher sitting times in comparison to males. The findings underscore the limitations of BMI as a sole health indicator, advocating for additional measures like waist circumference.

Keywords: sedentary, inactivity, anthropometry, behavior, vigorous

Introduction

Humans naturally conserve energy for survival during scarcity, which can lead to sedentary behaviors when food is plentiful and physical activity isn't essential for survival[1]. Sedentary behavior, defined as sitting, reclining, or lying during waking hours with ≤1.5 metabolic equivalents (METs), differs

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from physical inactivity. Approximately 65-80% of individuals in developed and developing countries lead sedentary lifestyles[2]. Physical inactivity, or not meeting WHO guidelines, affects one-third of the global population aged 15 and older and is the fourth leading cause of mortality worldwide[3]. Environmental factors promoting these behaviors include a lack of sports facilities, insufficient parks, traffic congestion, air pollution, and personal habits like excessive screen time.

Sedentary behavior is linked to a higher incidence of cardiovascular disease, hypertension, obesity, diabetes, and certain cancers[4], while physical inactivity is associated with an increased risk of non-communicable diseases (NCDs). Numerous studies provide compelling evidence of this link, with a strong dose-response relationship: higher physical activity correlates with lower NCD risk[5-8]. The physical inactivity pandemic impacts the health and economics of nations[9]. This global trend affects all ages[10-13].

The rise in sedentary behavior among university students is particularly concerning, as this period is crucial for forming healthy habits[14]. A positive attitude towards physical activity can lead to long-term health benefits[15-17]. Recent research indicates that women are 8% less active than men[18]. WHO aims to reduce physical inactivity by 10% by 2025, achievable with modest increases in women's activity levels[19,20]. Understanding gender differences allows public health strategies to be more targeted, inclusive, and equitable, ultimately leading to better health outcomes for all university students. By recognizing the varied ways in which gender shapes health behaviors and needs, public health initiatives can address the diverse needs of the student population more effectively.

There is a gap in literature regarding gender differences in physical activity among university students in our region. So the aim of this study is to explore differences in sedentary habits and inactivity patterns of male versus female university students.

Material and Methods

The study was approved by the institutional ethics committee (Ethics/2016/0001 dated 25.11.2016) and conducted in the Physiology department. A list of all colleges in Chandigarh was created, and an invitation was sent to the heads of these institutions. Students consenting to participate were selected via stratified random sampling; details are published in an earlier study[21]. Based on a 14.5% prevalence of physical inactivity and a 95% confidence interval, the sample size was calculated to be 210 students, accounting for a 15% non-response rate.

Participants, aged 18-25 and free from diabetes, hypertension, or mobility issues, provided consent before enrollment. They were assessed in the lab after fasting. Waist circumference, weight, height, and body mass index (BMI) were recorded. Blood pressure was measured using a sphygmomanometer, and fasting blood samples were analyzed for fasting blood sugar, HDL, and triglycerides.

The International Physical Activity Questionnaire (IPAQ), developed by WHO, was used to assess physical activity levels, including walking, moderate and vigorous activities, and sitting time. MET-minutes/week were calculated by multiplying activity duration, frequency, and MET intensity scores[22].

Statistical Analysis

Data were analyzed using SYSTAT software version 13.2. Frequency and percentages were reported for categorical data, while means and standard deviations were used for continuous data. Median values were provided for skewed distributions. Independent t-tests and Mann Whitney tests compared two groups, while binary logistic regression identified predictors of high physical activity, with significance set at $p < 0.05$.

Results

After excluding three incomplete data entries, 207 students (78 males and 129 females) participated. Physical activity characteristics based on the IPAQ are detailed in Table 1.

Table 1: Physical activity categories of the study population

Variable	Category	Number of participants(%)
Physical activity	Low	4(1.9)
	Moderate	53(25.6)
	High	150(72.5)

On comparing the gender differences between various anthropometric, physiological and biochemical parameters (Table 2) there was significant difference between the males and the females in height, weight and triglycerides whereas there was no significant difference between the groups in pulse pressure, FBS and HDL.

Table 2: Gender differences between various anthropometric, physiological and biochemical parameters

Variable	Male (Mean±SD)	Female (Mean±SD)	P-value*
Height (cm)	171.3±7.0	160.4±6.2	<0.001
Weight(kg)	66.0±11.9	55.8±11.2	<0.001
Body Mass Index (kg/cm^2)	22.5±3.5	21.6±4.0	0.14
Waist circumference(cm)	80.7±11.5	82.1±9.9	0.35
Systolic Blood Pressure (mm of Hg)	124±10.7	116.7±9.3	<0.001
Diastolic Blood Pressure (mm of Hg)	81.0±8.2	75.11±7.99	<0.001
Pulse Pressure (mm of Hg)	43±9.68	41±8.09	0.22
Mean Arterial Pressure(mm of Hg)	95±7.88	88±11.0	<0.001
Fasting blood glucose (mg/dl)	86.2±17.9	84.8±15.4	0.56
High Density Lipoprotein (mg/dl)	40.7±10.1	41.8±7.7	0.37
Triglycerides(mg/dl)	131.3±47.3	118.5±29.0	0.02

*Independent t-test

Regarding the scores derived from IPAQ questionnaire, except for the total score of walking (TSW), all other scores i.e. total moderate activity(TMA), total vigorous activity (TVA), total physical activity(TPA), total sitting minutes (TSM) and average sitting (AS) were significantly different between the two groups.

Table 3: Gender differences between various scores derived from analysis of the IPAQ questionnaire

Variable	Male Median (Range)	Female Median (Range)	P-value*
TSW (MET minutes /week)	2178 (940-5346)	1947 (874-4125)	0.433
TMA(MET minutes /week)	4260 (1504-9590)	1660 (517-6075)	<0.001
TVA(MET minutes /week)	2880 (960-8100)	480 (0-5840)	<0.001
TPA(MET minutes /week)	12126.40 (4864.5-27146.25)	5604 (2059.75-16841)	0.002
TSM (minutes)	1800 (1080-2280)	2340 (1380-3120)	0.002
AS (minutes/week)	257.1 (154.2-325.7)	334.28 (197.1-445.7	0.002

*Mann Whitney test; TSW: Total Score of Walking; TMA: Total Moderate Activity; TVA: Total Vigorous Activity; TPA: Total Physical Activity; TSM: Total sitting minutes; AS: Average Sitting

Table 4 shows the comparison between various anthropometric, physiological and biochemical variables among high physical activity versus low-moderated physical activity group which showed no significant difference except for HDL and TG levels.

Table 4: Comparison between anthropometric, physiological and biochemical variables in high physical activity group versus low-moderated physical activity group

Variable	Low-Mod (Mean±SD) n=57	High (Mean±SD) n=150	P-value*
Age (years)	20±5.3	21±2.4	0.31
Height (cm)	165±8.8	165±8.3	0.91
Weight(Kg)	58±12.00	60.3±12.7	0.24
Body Mass Index (kg/m^2)	21.3±3.7	22.2±3.9	0.16
Waist circumference (cm)	81.4±12.4	81.6±9.8	0.91
Systolic Blood Pressure (mm Hg)	119±11.1	120±10.2	0.83
Diastolic Blood Pressure (mm Hg)	75.8±7.7	78±8.8	0.11
Pulse Pressure (mm Hg)	43.4±7.9	41.6±8.5	0.18
Mean Arterial Pressure (mmHg)	90.3±8.2	91.8±8.4	0.24
Fasting glucose (mg/dL)	86.3±15.2	84.9±16.8	0.60
HDL (mg/dL)	44.1±10.6	40.3±7.6	0.004
Triglycerides (mg/dL)	114.6±22.4	126.6±41.3	0.008

*Independent t-test ($p<0.05$)

Table 5 shows the binary logistic regression for predictors of high physical activity shows that participants with higher BMI have significantly lower odds (p=0.027) of performing higher physical activity. Female gender also had significant lower odds (p= 0.003) of performing high physical activity.

Table 5: Binary logistic regression showing predictors of high physical activity

Variables	Odd's ratio	P-value	95% confidence interval	
Age(Years)	1.002	0.960	0.914	1.099
Body Mass Index (kg/m^2)	0.361	0.027*	0.146	0.892
Waist Circumference (cm)	1.000	0.994	0.928	1.077
Systolic Blood Pressure(mm/Hg)	0.985	0.535	0.941	1.032
Diastolic Blood Pressure (mm/Hg)	1.027	0.331	0.974	1.083
Fasting Blood glucose(mg/dL)	0.996	0.704	0.975	1.018
High Density Lipoprotein(mg/dL)	1.002	0.923	0.958	1.048
Triglycerides (mg/dL)	1.009	0.181	0.996	1.022
Female	0.187	0.003*	0.062	0.560

*$p<0.05$, The dependent variable here is high physical activity and for gender the reference category is male

The receiver operating characteristics (ROC) curve for various physical activity parameters is shown in figure 1 and 2.All the physical activity parameters except TSW were very highly significantly more in males as compared to females (Table 6). The ROC model predicts a male subject with criterion value of TPA more than 11894 minutes which has sensitivity and specificity of 60.26% and 71.21% respectively.

Table 6: Receiver operating characteristics for different physical activity parameters among males

Variable#	Area under curve	95% Confidence Interval	P-value	Sensitivity	Specificity	Criterion for male gender
TSW	0.547	0.466-0.628	0.257	51.28	63.64	>2574
TMA	0.709	0.638-0.781	<0.001*	69.23	63.64	>2620
TVA	0.722	0.649-0.795	<0.001*	76.92	62.12	>960
TPA	0.696	0.622-0.770	<0.001*	60.26	71.21	>11894
TSM	0.641	0.572-0.706	0.0003*	76.92	46.21	≤2400
ASM	0.641	0.572-0.706	0.0003*	76.92	46.21	≤342.86

*$p<0.05$); # TSW, TMA, TVA, TPA measured in (MET minutes /week) and TSM and ASM measured in minutes

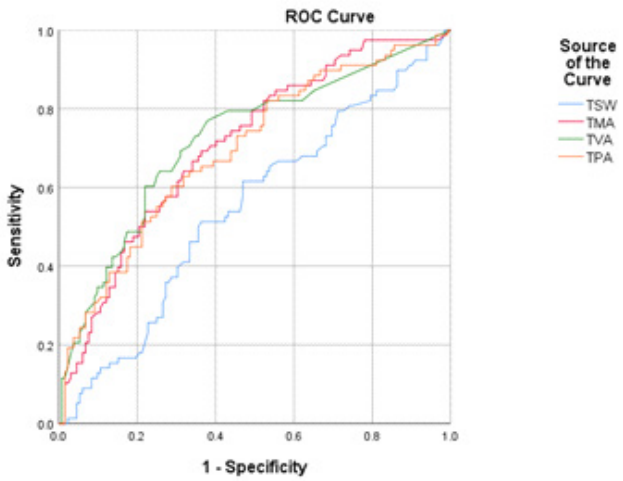


Figure 1: The receiver operating characteristics (ROC) curve for TSW, TMA, TVA and TPA

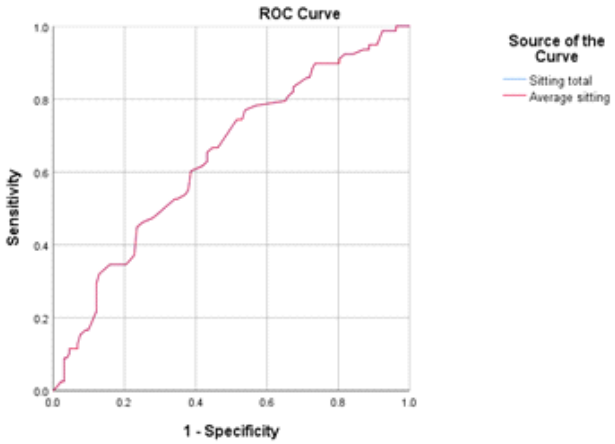


Figure 2: The receiver operating characteristics (ROC) curve for sitting total and average sitting in minutes

Discussion

Various approaches have been devised to gauge physical activity levels, falling into two main categories. The first category comprises self-reported measurements, exemplified by tools like the International Physical Activity Questionnaire, Global Physical Activity Questionnaire (GPAQ), and activity diaries. The second category encompasses direct measures of physical activity, involving the use of devices like calorimeters, accelerometers, and pedometers[23].

In our study although the mean BMI was not significantly different among male and female students yet a correlation between BMI and physical activity was found. Participants with higher BMI were observed to engage in lower levels of high physical activity as determined by the IPAQ. Female participants were also less likely to engage in vigorous physical activity.

In a similar study among on 225 university students[24], Hoseini et al observed significant associations between physical activity levels and factors like smoking habits, BMI, gender and occupation. The majority of participants in their study were also within the normal BMI range, male participants exhibited higher physical activity levels in comparison to females and a negative correlation was established between physical activity and BMI. However this study does not report the gender differences in the average sitting time. The university environment often prompts unhealthy practices, leading to diminished physical activity[25].

When examining activity patterns using IPAQ, we discovered that female participants displayed significantly lower levels of total moderate activity, total vigorous activity, and overall physical activity compared to their male counterparts. Interestingly, female participants also exhibited higher total sitting minutes and average sitting duration in contrast to males. In general females had a daily sitting time of more than or equal to 5.71 hours in comparison to males.

A recent meta-analysis indicates that university students frequently engage in prolonged periods of sitting, exceeding 9 hours per day, which could contribute to the initiation of obesity[26]. Results for the phase I ICMR– INDIAB Collaborative study[27] indicate that among Indian states Chandigarh had the highest prevalence of physical inactivity. This result is expected, given Chandigarh's high level of urbanization and its proximity to the affluent states of Punjab and Haryana.

A study among US adults reported differences in physical activity between men and women in an entirely different light. While both genders experienced the highest survival benefit at 300 minutes of weekly aerobic moderate-to-vigorous PA(MVPA), women enjoyed a more substantial 24% reduction in mortality compared to men, who had an 18% reduction for the same level of regular

exercise. Additionally, women consistently derived proportionately greater benefits than men for any given amount of PA leading up to 300 minutes per week. These sex-specific findings held true for both overall mortality and cardiovascular-specific mortality. The results emphasize that women, in particular, stand to gain significantly in reducing the risks of cardiovascular and all-cause mortality. These insights could serve as motivation to encourage greater PA participation among less engaged segments of the female population, especially those facing time constraints as a barrier to exercise[28].

In a recent study conducted in School of Physical Education, Zhengzhou University, China it was concluded that a technology-based physical activity intervention had positive effects on physical activity levels for participants of both genders. The intervention group experienced significant increases in physical activity compared to the control group. These findings align with previous research supporting the benefits of technology-driven interventions for promoting physical activity[29].The practical implications of this research are important for healthcare providers, as it supports the use of technology in encouraging physical activity. Healthcare professionals should consider incorporating technology-driven strategies into their treatment plans to improve physical activity levels among their patients.

Another concept that is getting growing recognition is that physical inactivity arises from the interplay of multiple factors within a complex social framework. The World Health Organization's Global Action Plan on Physical Activity emphasizes the need for whole system approaches (WSAs) to address these intricate influences, which include elements like infrastructure and transportation costs, societal norms (such as attitudes toward cycling), and individual factors (like knowledge and established habits).This shift towards WSAs represents a significant move away from traditional linear models of cause and effect and interventions that have historically relied on decision-making and individual agency as the primary mechanisms of change. There is now broad consensus around WSAs being required to help address an array of complex public health issues including physical inactivity[30].

Limitations: Since reporting physical activity was a self-reporting measure, recall bias leading to over- or under-reporting of physical activity cannot be ruled out in the study. Overestimation of own physical activities and social desirability bias might lead to higher estimates of physical activities.

Conclusion

The present study among students reveals the correlation between higher BMI and lower physical activity, particularly among females, highlighting the need for targeted interventions to address sedentary behaviors so as to bridge the gender gap. Further studies can focus on health education programs focused on promoting regular physical activity and changes in lifestyle in young adults especially students going to colleges.

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Original Article

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Antimicrobial Susceptibility Pattern of Methicillin-Resistant Staphylococcus aureus in Clinical Samplesfrom a Tertiary Care Center in Central Bihar

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Abstract

Objective: The objective of this study was to evaluate the Methicillin resistance *Staphylococcus aureus* isolates resistance pattern among the patients attending a tertiary care in central Bihar.

Materials & Method: The study included the clinical samples from the patients of either sex and across all age groups that had been submitted at the microbiology laboratory and processed. Bacterial growth identified as *S aureus* (based on colony morphology, Gram staining, catalase test and coagulase test) were subjected to Antimicrobial susceptibility testing (AST) by Modified Kirby-Bauer disk diffusion method and using 0 .5 McFarland as turbidity standard . Cefoxitin disk (30 µg) was used to identify MRSA isolates. Isolates with a zone of inhibition ≤21 mm were considered MRSA. Vancomycin MIC was determined by Vitek 2 compact according to CLSI guidelines.

Result: Among 122 *S aureus* isolates, 39 (31.9%) were reported as MRSA. All isolates were sensitive to vancomycin (100%) followed by chloramphenicol (97%), linezolid (92%), teicoplanin(90%), clindamycin (79%) and tetracycline(76%). The isolates were resistant to penicillin (100%), followed by ofloxacin (92.30%), ciprofloxacin (87.17%), erythromycin (69.23%) gentamicin (43.58%) and levofloxacin (66.66%).

Conclusion: This study shows the incidence of MRSA and their susceptibility pattern in central part of Bihar. This will help the clinicians and epidemiologists to know the local susceptibility pattern and also for monitoring resistance trends over time. It will also help the hospitals in formulating their antibiogram and antibiotic policy over the time and to choose empirical treatment wisely.

Key words: MRSA, Susceptibility Pattern, Tertiary Care Center, Clinical Samples.

Introduction

Staphylococcus aureus remains a major cause of both community- and hospital-acquired infections, posing significant challenges due to its evolving resistance[1]. Methicillin resistant S. aureus (MRSA) is now endemic in India. The incidence of MRSA varies

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from 25 per cent in western part of India[2]to50 per cent in South India[3]. Despite ongoing development of new treatments, active surveillance efforts, and advancements in infection control, the incidence of methicillin resistance has emerged as a major source of morbidity, higher costs of healthcare delivery services, and increased mortality in hospitals over the past decades[4]. Clinical outcomes from methicillin resistant infections are rather worse than those from methicillin-sensitive S. aureus infections[5].While MRSA has become endemic in India with regional variations in prevalence, its growing resistance to multiple antibiotics is a global concern, making treatment increasingly difficult. Changes in the drug susceptibility profile of S. aureus have been reported worldwide; thereby making treating infections caused by S. aureus more difficult[3,5]. Public health is seriously threatened by the pathogen's prevalence in many nations today, with isolates' resistance to the majority of anti-staphylococcal antibiotics including Penicillin, Gentamicin, Erythromycin, Ciprofloxacin, Rifampicin, Cotrimoxazole, Chloramphenicol, Norfloxacin and Tetracycline[6]. Moreover, once established, MRSA is frequently difficult to eradicate because it spreads more quickly than the other varieties when brought intohospitals[7].Methicillin-resistant Staphylococcus aureus is one of the most important nosocomial pathogens and has emerged as a serious threat to public health worldwide[8]. Once a S. aureus isolate is characterized as an MRSA, it is presumed to be multi drug resistance. Resistance to Oxacillin or Cefoxitin confers nonsusceptibility to all categories of β-lactam antimicrobials[9]. Thus, MDR-MRSA is an example of a continually evolving paradigmatic pathogen[10]. Several studies have reported the resistance to the newer antimicrobial agents like Linezolid, Vancomycin, Teicoplanin, and Daptomycin[11,12,13] Reports of resistance to last-line antibiotics such as vancomycin and daptomycin suggest the potential emergence of pan-drug-resistant S. aureus, similar to challenges observed in Gram-negative bacteria[14].

AIM

The antimicrobial susceptibility pattern of Methicillin-resistant Staphylococcus aureus (MRSA) can vary depending on factors such as geographic location, hospital setting, and local resistance trends**.** The knowledge of antibiotic sensitivity pattern of MRSA in any environment becomes necessary for selection of appropriate treatment for these patients. The aim of this study is to determine the antimicrobial susceptibility pattern of MRSA in a tertiary care hospital in Central Bihar.

Materials & Methods

The study was approved by Ethics Committee via letter number CREC/2022/015, dated 14/07/2022. A prospective study was carried out in the Department of Microbiology NSMCH during the period July 2022 to June 2023.

The study included the clinical samples from the patients of either sex and across all age groups that had been submitted at the microbiology laboratory & processed. Bacterial growth identified as S. aureus (based on colony morphology, Gram staining, catalase test and coagulase test) were subjected to Antimicrobial susceptibility testing (AST) by Modified Kirby-Bauer disk diffusion method and using 0 .5Mc Farland as turbidity standard . Cefoxitin disk (30 µg) was used to identify a MRSA isolates. Isolates with a zone of inhibition ≤21 mm were considered MRSA. For Vancomicin MIC was determined by Vitek 2 compact according to CLSI guidelines.

A total of 122 nonduplicate MRSA isolated from various clinical specimens like pus, blood, urine, central venous catheters tips, tracheal aspirates, and sputum were selected from different departments

The antibiotics tested were Chloramphenicol (30µg), Ciprofloxacin (5µg) Clindamycin (2µg), Cotrimoxazole (25µg), gentamicin(10µg), levofloxacin(5µg) Linezolid (30µg), Ofloxacin(5µg) Penicillin (10µg) Teicoplanin(30µg), Tetracycline (30µg) and Vancomycin(30µg) (not used in urinary isolates) and Erythromycin(15µg).

Result

Out of the122 Isolates 39 were found to be MRSA which was 31.9% of total isolates. (Table: 1) All isolates were seen sensitive to Vancomycin. They showed 97% susceptibility to Chloramphenicol, Linezolid(92%), Teicoplanin(90%), clindamycin(79%), Tetracycline (76%)

The isolates were resistant to Penicillin(100%), Ofloxacin (92.30%), Ciprofloxacin (87.17%) Erythromycin (69.23%) Gentamicin (43.58%) and Levofloxacin (66.66%).

Table 1: Distribution of isolates

Total Isolates	Mssa	Mrsa
122	83	39
	68.03%	31.96%

Table 2: Antibiotic susceptibilty pattern

Name of antibiotic	%SENSITIVITY	% Resistant
VANCOMYCIN	100	0
CHLORAMPHENICOL	97	03
LINEZOLID	92	08
TEICOPLANIN	90	10
CLINDAMYCIN	79	21
TETRACYCLINE	76	24
CO-TRIMOXAZOLE	69.2	20.8
GENTAMICIN	56.41	43.59
LEVOFLOXACIN	33.33	66.66
ERYTHROMYCIN	30.76	69.23
CIPROFLOXACIN	12.82	87.17
OFLOXACIN	7.60	92.30
PENICILLIN	0	100

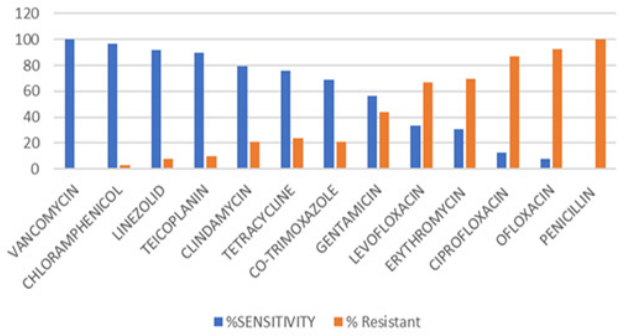


Figure 1: Diagram representing AST pattern

Discussion

The primary sources of MRSA transmission are hospital staff and patients who are infected or colonized with MRSA strains, predominantly through contact transmission. Risk factors that enhance the emergence and spread of MRSA include prolonged and repeated hospitalization, indiscriminate antibiotic use, lack of awareness, misuse of intravenous drugs, and the presence of indwelling medical devices.

The epidemiology of MRSA over different parts of India is not uniform. In our study the isolation of MRSA was (31.9%) of the total isolates from all clinical samples which is slightly lower than a similar study done by Rajkumar B.et al[15](2005) where a total of 140 (37.83%) MRSA were isolated from various clinical samples. MRSA frequency was reported to be around37% in India by Patil S et al[16](2022). In a study by Yasha Mukim et al [17] (2024) and Umar et al[18] (2024), methicillin resistance was seen among (58.2%) and (64.67%) respectively, which was higher than that found in our study . In a similar Study by Kandhakumari Gandhi et al[19] (2020) Methicillin resistance was seen in 67.3% of the total isolates. Better infection control practices in our hospital may have contributed to lower isolaton of MRSA.

In our study, all the isolates were sensitive to Vancomycin. They showed 97% Susceptibility to Chloramphenicol, Linezolid (92%) Teicoplanin (90%), Clindamicin (79%), Tetracycline(76%), cotrimoxazole (69.2%). The isolates were resistant to Penicillin(100%), Ofloxacin (92.30%), Ciprofloxacin (87.17%) Erythromicin (69.23%) Gentamicin (43.58%) and Levofloxacin (66.66%).

The result of our study tallied with a similar study done by Rajkumar B.et al[15], Kandhakumari Gandhi et al[20] and Indrani Mohanty, et al[19] where the isolated strains were 100% sensitive to Vancomycin In our study Sensitivity to Linezolid was 92% and Teicoplanin(90%), which was less than that found in the study by Umar et al[18] which showed strains to be 100.00% sensitive to Linezolid and Teicoplanin. Study by Kandhakumari Gandhi et al also showed 97%susceptibility to Linezolid. Linezolid resistance is a matter of concern. It is obvious from the studies undertaken so far that the increasing resistance to linezolid shown by MRSA strains leaves the clinicians with fewer choices. Glycopeptides, including Vancomycin, are the mainstay of the treatment of MRSA but high resistance to vancomycin has been reported from different parts of the country.

In our study chloramphenicol susceptibility rate was 97% and can be an excellent choice for treating MRSA isolated from ocular samples. The susceptibility to cotrimoxazole (69.2%) which was Among the various antibiotics tested Cotrimaxazole, tetracycline, showed less resistance pattern similar to study done by Indrani et al. but significantly higher than shown in study by Rajkumar B.et al.

All stains were resistant to penicillin which was in concordance with almost all the studies. The isolates were resistant to Ofloxacin (92.30%), Ciprofloxacin (87.17%) Erythromicin (69.23%) Gentamicin (43.58%) and Levofloxacin (66.66%).

In study by Umar et al, MRSA isolates showed 100% sensitivity to Teicoplanin and Linezolid. Sensitivity of isolates to Vancomycin was (95.88%), to Gentamicin (70.10%), and Tetracycline (60.82%). Resistant to Ciprofloxacin (97.94%), Erythromycin (79.38%), and Clindamycin (55.67%) was seen among the isolates. Antimicrobial resistance is a significant problem that threatens to diminish our therapeutic armamentarium. Misuse of antibiotics results in increased antibiotic selection pressure that can affect resistance locally or even globally by clonal dissemination.

Conclusion

This study shows the incidence of MRSA and their susceptibility pattern in Central part of Bihar. In our study chloramphenicol susceptibility rate was 97% and can be an excellent choice for treating MRSA isolated from ocular samples topically. By focussing on careful antibiotic stewardship, infection control, and Surveillances, the emergence of Vancomycin resistance and spread of Linezolid resistance can be minimized. Additional strategies like decolonization can be undertaken. This study will help the clinicians and epidemiologists to know the local susceptibility rates and also for monitoring resistance trends over time. It will also help the hospitals in formulating their antibiogram and antibiotic policy over the time and to choose empirical treatment.

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Original Article

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Perception and Experience of Medical Undergraduate Students Regarding Family Adoption Programme: a Cross-Sectional Study in Nil Ratan Sircar Medical College, Kolkata

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Abstract

Background and objectives: Family Adoption Programme (FAP) has been included in the undergraduate medical curriculum by National Medical Commission, in which students have to adopt a family, build relationship and do longitudinal follow up. This study aims to describe the perception of undergraduate medical students of NRS Medical College regarding the probable benefits they can gain and the allotted family can gain from FAP and to elicit their views regarding the adversities imposed by FAP and ways to improve the programme.

Methods: It was an observational descriptive study in cross-sectional design. Data collection was done in June, 2024 in NRSMCH, Kolkata, among the Medical Undergraduate students of NRSMCH with a pre-designed, pre-tested questionnaire, administered in Google Form with embedded consent form. Responses were analysed in MS Excel.

Results: More than half of the study participant sopined that FAP is advantageous in case of gathering real life experience and sharpening communication skills. 92% students thought that their understanding of the Health Care Delivery system has improved; 85.9% opined that their leadership skills has improved and 94.7% stated that their knowledge regarding health promotion has improved through FAP. More than two thirds felt that the adopted families will be benefitted from FAP. Proportionately more senior-year students perceived FAP problematic than their juniors. Regarding scope for improvement in FAP, majority had no opinion or opined that no improvement was needed.

Conclusion: Study participants found FAP useful and complimentary to classroom teaching in cognitive, affective and psychomotor domains, however senior-year students perceived more adversities.

Key words: Family Adoption Programme, Undergraduate Medical Students, West Bengal, Kolkata

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Introduction

Family Adoption Programme (FAP) was introduced and implemented to address the issue of 'Scarcity in abundance' and to improve community health care along with communication skills among Indian medical graduates. It was launched with the objective of orienting students towards primary healthcare and creating health related awareness among the community. It also aims at students acting as a conduit between the population and healthcare & analysing related data for improving evidence based clinical practices. The targets to be achieved by the Family Adoption Programme is to improve communication skills, understand the dynamics of urban setup under study and education about the various government sponsored health programmes. It also targets to continue active involvement of students to become the first doctor /reference point of the family by continued active interaction. For achieving the above-mentioned objectives, each MBBS student has to adopt families from a field under the Department of Community Medicine. They will visit and interact with the families and exchange their phone number with them. The visits will be done in their first, second and third academic year. Visits and the reports will be done under the mentorship of an assigned faculty of Community Medicine.[1-3]

A study in Andhra Pradesh, suggests that FAP improves students' community involvement, but the major drawback in implementing FAP were the lack of transport and logistics in government medical colleges and the faculty shortage in private medical colleges.[4] It is evident from other studies too,[5,6] that there are felt constraints in implementing the proposed framework of FAP. In between the ambitions of FAP and hesitations of its implementation, there remains the most important stakeholder of the programme, the medical undergraduate students. Moreover, it is the same students who are facing frequent rather dramatic changes in their curriculum and assessment planning, like, implementation of Competency Based Medical Education, introduction of changes in internship, proposal of National Exit Test etc.

It is important to review the appropriateness of the institutional capacity to implement FAP, it is important to find out the strength, weakness opportunity and threat to the family adoption programme, and it is crucial to find out the perception, views and opinion of them regarding FAP, for whom it is meant for and who are going to become Indian Medical Graduates in upcoming days. Evidence regarding students' perception is a valuable input to the success of the programme at different institutional level, at a cross section of time and also longitudinally; but only a few studies were found in West Bengal exploring the perspective of the Undergraduate Students in regard of FAP. In this background, the study was conducted with the objective to describe the perception of undergraduate medical students of NRS Medical College of different academic years during the study period, regarding the probable benefits they can gain and the allotted family can gain from FAP and to elicit their views regarding the adversities imposed by FAP and ways to improve the programme.

Methodology:

Study type and Design: An observational descriptive study was done to describe the perception of undergraduate medical students regarding FAP and the study design was cross-sectional as no follow up or intervention was planned.

Study Setting: The study was done in NRSMCH, Kolkata, West Bengal

Study Duration: The study was conducted in the month of June, 2024

Study Population: The study was done among the Medical Undergraduate students of NRSMCH

Inclusion Criteria: Students of academic years (Batch- 2020-21, 2021-22, 2022-23, 2023-24) for whom the Family Adoption Programme was implemented and who participated in Family Adoption Programme, at the time of data collection.

Exclusion Criteria: 1. Students who are involved in this research project. 2. Students who could not be contacted even after 3 attempts. 3. Students devoid of any required gadgets.

Sample Size and Sampling: Total enumeration of the study population was done.

Study Tools: 1. Pre-designed, pre-tested questionnaire 2. Google Forms platform 3. Social media (for sending the form) platforms

- Questionnaire:
  - Section-A Socio-demographic and academic information of the study population
  - Section-B Information regarding the course and the family(s) allotted in the Family Adoption Programme
  - Section-C Perception of the students regarding their benefits from Family Adoption Programme
  - Section-D Perception of students regarding the benefits of the families from Family Adoption Programme
  - Section-E Views of the students regarding Family Adoption Programme

Study Technique:- Phone calls, messages and social media platforms were used to inform about the research and follow-up

Data Collection:

- The questionnaire was developed using Google Forms and was pre-tested among the project students.
- The Form was circulated to the study population through their email IDs and WhatsApp whichever information was available.
- The sample frame was made for individual batches using names and phone numbers. A representative from the students in our group were made for each of the four batches who were responsible for the circulation of the google form links. The google form links were sent to the phone numbers of students through WhatsApp for consecutive 3 days.
- Data was collected and compiled on Google Spreadsheet and MS Excel.

Ethical Considerations:- Informed consent was obtained from all the students in electronic format embedded in the google form. Proper anonymity was maintained by avoiding collecting names and roll numbers. Necessary permissions were taken from Institutional Ethics Committee and departmental head.The study has been approved from Institutional Ethics Committee of Nil Ratan Sarkar Medical College, Kolkata (NRSMC/IEC/26/2024).

Data Analysis: The master table was prepared in MS Excel from Google Spreadsheets. The data was expressed in frequency and proportion.

Results

Among the study population who were approached, 356 students responded of whom 263 were consenting and submitted a response. Most of the students were aged between 20-22 years and 65.5% were male. Majority of the students belonged to Hindu religion and 53% of them stayed in hostel. Most prevalent medium of schooling was in English and most prevalent board was West Bengal Council of Higher Secondary Education followed by Central Board of Secondary Education. Table 1.

Table 1. Characteristics of the study participants and their adopted families (n=263)

Characteristics of study participants	Frequency (%)
Age in years	
18-19	101 (38.6)
20-22	149 (66.5)
23-24	13 (4.9)
Gender	
Male	171 (65.5)
Female	90 (34.2)
Preferred not to say	2 (0.3)
Religion	
Hindu	214 (81.3)
Muslim	41 (15.2)
Buddhist	5 (2.2)
Christian	3 (1.3)
Stays at	
Hostel	141 (53.6)
Stays outside hostel	122 (46.4)
Medium of schooling	
English	137 (52.1)
Bengali	123 (46.8)
Others	3 (1.1)
Board of schooling	
WBCHSE*	140 (53.2)
CBSE**	100 (38.1)
ISC***	19 (7.2)
Others	4 (1.5)

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Year of admission in MBBS	
2020-2021	10 (3.9)
2021-2022	14 (5.3)
2022-2023	114 (43.3)
2023-2024	125 (47.5)
Characteristics of the adopted families	
Type of allotted family	
Nuclear	172 (65.3)
Joint	91 (34.7)
Type of members present in the allotted families (at least one member)	
Pregnant or post-natal women	48 (18.3)
Under five children	128 (48.7)
Adolescent members	159 (60.5)
Geriatric members	151 (57.4)

*West Bengal Council of Higher Secondary Education;

**Central Board of Secondary Education;

***Indian School Certificate

Participants who provided an opinion, stated that their knowledge regarding role of environment and socio-economic condition on disease pathogenesis was improved and communication skills were fostered through Family Adoption Programme. More than half of them admitted that teachings in FAP had an edge over normal classroom teaching, especially in case of gathering real life experience and sharpening communication skills. Again, in communication, few of them identified areas in which they could acquire skills, like 'asking relevant questions', 'conversing with persons with diverse personality', 'discussing sensitive topics', 'developing patience'…etc., however a majority of the study population, though admits of the improvement of communication skills, have not identified any specific area of improvement. About two thirds of the students have not opined regarding learning to discuss sensitive topics, among the rest, most identified 'protecting privacy' and 'building trust' as important areas to learn discussing sensitive topics during their FAP visits. Low response rate was noted when the study participants were asked to give opinions regarding areas of improvement in Non-Communicable Diseases knowledge; among those who responded, thought 'practical knowledge', 'patient perception' and 'approach to lifestyle modification' were major areas of learning. A vast majority, i.e., 92% students think that their understanding of the Health Care Delivery system has improved; 85.9% opined that their leadership skills has improved and 94.7% stated that their knowledge regarding health promotion has improved through FAP. Table 2.

Table 2. Opinion of the study participants regarding their perceived benefit from Family Adoption Programme

Opined areas of knowledge/skill gain [263 responded and multiple response]*	
Role of environment on spread of communicable diseases	229 (86.7)
Improvement of communication skill	207 (78.4)
Socio-economic condition	134 (50.8)
Edge over classroom teaching as per their opinion [263 responded and multiple response]	
Real life experience	133 (50.6)
Improving communication skill	63 (23.9)
Others	26 (9.9)
No opinion	46 (17.5)
How communication skills will be improved as per their opinion (250 out of 263 provided a valid opinion in multiple response)	
Direct communication, asking relevant questions	36 (14.4)
Conversing with persons of different personalities from different socio-economic strata	18 (7.2)
Empathy and politeness	6 (2.4)
Discussing sensitive topics	7 (2.8)
Local language and dialect learning	9 (3.6)
Developing patience	4 (1.6)
No opinion	178 (71.2)
Opinion regarding learning areas to discuss sensitive topics(223 out of 263 responded in multiple response)	
Protecting privacy	40 (17.8)
Building trust	29 (12.9)
Educating about STDs	14 (6.3)
Being non-judgemental	5 (2.2)
Showing empathy	8 (3.6)
No opinion	148 (66.4)

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Opinions regarding areas of improvement in Non-Communicable Diseases knowledge(122 out of 263 responded in multiple response)	
Practical knowledge	35 (28.7)
Patient perception	18 (14.8)
Approach to lifestyle modification	18 (14.8)
Health education	13 (10.7)
Effect of environment	11 (9.0)
Others	15 (12.3)
No opinion	21 (17.2)
Understanding of Health Care Delivery System	
Improved by FAP	242 (92.0)
Not improved	21 (8.0)
Leadership abilities	
Improved by FAP	226 (85.9)
Not improved	37 (14.1)
Knowledge regarding Health Promotion	
Improved by FAP	249 (94.7)
Not improved	14 (5.3)

The perceptions of the students regarding areas in which adopted families can be benefitted were sought. More than two thirds felt that the adopted families will be benefitted from FAP. On a multiple response scale, 51.7% felt that knowledge of the family members regarding communicable and non-communicable disease will improve. About one third of the study participants said that they provided direct health intervention to the families. Table 3.

Table 3. Opinion of the study participants regarding the benefits adopted families can gain/have gained from Family Adoption Programme (n=263)

Opinion of study participants	**Frequency (%)**
Opinion that adopted family has benefitted from FAP	
Yes	177 (67.4)
No	86 (32.6)
Areas in which adopted families can be benefitted [multiple response]	
Knowledge about communicable and non-communicable disease	136 (51.7)
Hygiene and sanitation	91 (34.6)
Information regarding health care delivery system	60 (22.8)
Information regarding available health schemes	37 (14.1)
Direct health intervention to the family	
Provided	96 (36.4)
Not provided	167 (63.6)

According to the perception of students regarding difficulties faced due to Family adoption Programme, 15.6% faced difficulties in 'Feasibility to continue FAP', 24% faced communication problems and 58.6% faced problems to manage FAP with their hectic study schedule. In all three areas where problems were faced, a significant trend was seen where proportionately more senior year students perceived problems than their juniors. Table 4.

Table 4. Opinion regarding difficulties faced due to Family Adoption Programme across background characteristics of the study participants (n=263)

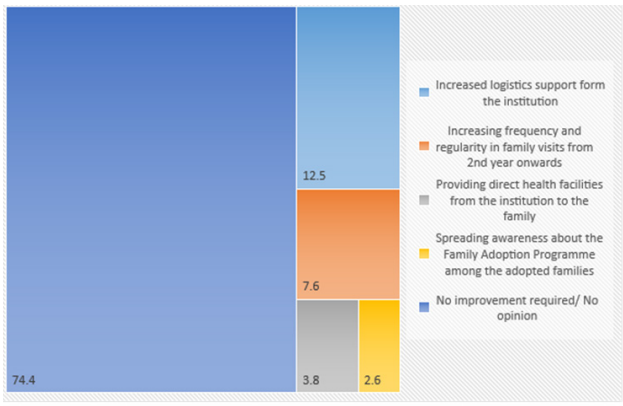
Background characteristics	**Feasibility to continue FAP**		**Total**	**p-value**
	Feasible	**Not feasible**		
	No. (%)	**No. (%)**		
Gender**				
Male	141 (82.5)	30 (17.5)	171 (100.0)	0.264#
Female	79 (87.7)	11 (12.3)	90 (100.0)	
Academic Year				
2023-24	108 (86.4)	17 (13.6)	125 (100.0)	0.037*
2022-23	97 (85.0)	17 (15.0)	114 (100.0)	
2021-22	12 (85.7)	2 (14.3)	14 (100.0)	
2020-21	5 (50.0)	5 (50.0)	10 (100.0)	
Total	222 (84.4)	41 (15.6)	263 (100.0)	

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	Communication problem faced			
	No	Yes		
	No. (%)	No. (%)		
Gender**				
Male	133 (77.8)	38 (22.2)	171 (100.0)	0.318#
Female	65 (72.2)	25 (27.8)	90 (100.0)	
Academic Year				
2023-24	104 (83.2)	21 (16.8)	125 (100.0)	
2022-23	80 (70.2)	34 (29.8)	114 (100.0)	0.013*
2021-22	10 (71.4)	4 (28.6)	14 (100.0)	
2020-21	6 (60.0)	4 (40.0)	10 (100.0)	
Total	200 (76.0)	63 (24.0)	263 (100.0)	
	Facing problems to manage FAP with hectic study schedule			
	No	**Yes**		
	No. (%)	**No. (%)**		
Academic Year				
2023-24	65 (52.0)	60 (48.0)	125 (100.0)	
2022-23	36 (31.6)	78 (68.4)	114 (100.0)	0.003*
2021-22	6 (42.8)	8 (57.2)	14 (100.0)	
2020-21	2 (20.0)	8 (80.0)	10 (100.0)	
Present residence				
Stays outside	48 (39.4)	74 (60.6)	122 (100.0)	0.520#
Stays at hostel	61 (43.3)	80 (56.7)	141 (100.0)	
Total	109 (41.4)	154 (58.6)	263 (100.0)	

Note: #Chi square test for independence;
*Chi Square test for trend;
**2 students who did not mention Gender were excluded.

On asking for their opinion regarding scope for improvement in FAP, majority had no opinion or opined that no improvement was needed. Among the rest, opinions like 'increasing logistics support', 'increasing number and duration of visits', 'providing direct health benefit from the institution' were important. Figure 1.



Note: Sizes of the boxes are proportionate to the proportion of the study population with the particular opinion.

Figure 1. Opinion of study participants regarding scope for improvement for the FAP.

Discussion

Medical Undergraduate Students of NRS Medical College, West Bengal of different academic years were approached for finding out their perspective regarding FAP. The study was done quantitatively since the phenomenon was previously studied among students and an estimate of the magnitude was aimed for. To reduce social desirability bias and keep students at ease, the Google Form platform was used to conduct online interview. A total of 263 valid responses were receive and analyzed.

Background characteristics of the students are comparable to the demographic characteristics of medical students in India as reported in other studies[7-9] and unique in some perspective of West Bengal like the board of education. From the study, it is evident that FAP is well accepted by the students and its out of the classroom approach and provision to gather real life experience was acclaimed as an edge by a significant proportion of students. Participants found FAP useful in sharpening communication skills and skills to discuss sensitive topics outside their comfort zone. Similar findings were elicited in another study[4] which quotes an undergraduate student saying "*Hospital communication is controlled by a doctor… very tense. Only the most important things are spoken. Here, the family can talk about anything with us, even gossip about neighbors' health.*" However, a negative finding that significant proportion of the students had not opined should also be noted. It may be a fact that many students have faced some non-cooperation and absence of the family members hindering rapport building, so they have not reached a place to give opinion regarding areas of communication skill improvement. This is evidenced as reality in a study by Rashmi S et. al.[10] Present study finds that 92% students thought that their understanding of the Health Care Delivery system has improved; 85.9% opined that their leadership skills has improved and 94.7% stated that their knowledge regarding health promotion has improved through FAP. These figures may reflect the experienced reliance and prospective confidence of students in FAP. A qualitative study to identify strengths, weakness, opportunities, and challenges of family adoption programs among students also finds a strength of FAP as 'beneficence to students' through focused group discussions conducted among them.[11] More than two thirds of the study participants felt that the adopted families will be benefitted from FAP. Similar views from students have been elicited in other studies.[4,11]

Feasibility to continue FAP longitudinally, communication problems in families and problems to manage FAP with their hectic study schedule were identified themes of adversities faced by the students. Among them, 58.6% students considered the addition of FAP a bit problematic to manage with their existing study schedule. Moreover, perceived adversities were more for senior year students. This may be explained by the fact that students who are senior year at present were the batch for whom FAP was rolled over initially. Apprehension for a new thing, absence of guidance from their seniors, for whom there were no FAP, made them feel more adversities due to FAP. Similar concerns and findings are expressed in other studies.[5,10] Among a few opinions received from students regarding scope for improvement in the family adoption programme, a major concern was deficient logistics. Availability of transport, equipment like sphygmomanometer, weighing scale is important as every student cannot buy them for their own use. Lack of logistics or limited resources are a major concern in many medical colleges among others.[4,12-14]

Conclusion

The study has been based on the previous qualitative research experience on student perception regarding FAP and explored magnitude of benefits perceived, areas in which they perceive and degree of adversity they feel or experience due to FAP. Study results may only have external validity at the level of the institution, but the findings have cohesion with studies conducted at other sites and may provide an important introspection and a roadmap for future multicentric studies. The fact that data was collected avoiding face to face interview may have its own limitations but also have the strength that it provided necessary space and freedom to express themselves at their feasible time. The scope of self-serving bias can also not be eliminated.

Conflict of Interest: Nil

Source of Funding: Nil

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Original Article

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Exploring Food Practices and Predictive Factors of Specific Ethnic People of Bangladesh: A Cross-sectional Study

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Abstract

Background: Bangladesh has a diversified ethnic minority with their own diverse food practice. This seems to be a cause of poor health status of these ethnic groups.This study aimed to assess the food practices and predictive factors of the specific ethnic people of Bangladesh.

Methods: A cross-sectional study was conducted among 350 adult Rakhain people of Cox's Bazar district of Bangladesh. Data were collected through face-to-face interviews.Food practice score was calculated based on healthy and unhealthy intake, categorized as 'good' or 'poor' based on a mid-point cut-off of 50%.

Results: This study revealed that the majority (66%) of participants exhibited poor dietary habits significantly ($p<0.01$) associated with increased consumption of fast food and soft drinks, low intake of fruits and meat, cultural food choice, food preparation techniques, sources and purification procedure of drinking water. Poor dietary habits were significantly associated with higher odds among individuals categorized as businessmen (aOR=3.43), those with >6 family members (aOR=4.53), those with >3 children (aOR=4.89) and non-standard sleeping status (aOR=3.45).

Conclusions: Many Rakhain people in Bangladesh have poor dietary habits influenced by demographics. This study identifies factors shaping ethnic food practices and recommends culturally tailored nutrition programs to improve health in these communities.

Keywords: food practices; predictive factors; ethnic people; Bangladesh

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Introduction

Bangladesh is home to diverse ethnic groups, primarily residing in the Chattogram Hill Tracts. These communities, including Marma, Chakma, and Mro, have distinct cultures, socio-economic backgrounds, literacy rates, and nutritional habits, differing significantly from Bengali people.[1]

Ethnic minorities in Bangladesh face discrimination, poverty, and neglect due to isolation, unrecognized status, limited opportunities, and land loss. [2-3] As they are underprivileged, they usually do need to survive on the natural resources of fooddue to limited resources. Sometimes, they are not very healthy and the food management procedure is not up to the mark. [4] Research on ethnic groups' dietary habits in Bangladesh, the UK, and the USA has revealed their food patterns to inform health education promoting nutrition and well-being. [5-7]

Bangladesh's tribes have unique food practices shaped by culture, religion, and geography, often resulting in unsafe and poor nutrition. [4, 8] A study of the Mro in Bandarban found traditional diets, including wildlife and plants, perceived as nutritionally and medicinally beneficial.[5] Another research was carried out among the ethnic population of Bandarban district, revealing deficiencies in nutritional status and inadequate hygiene practices.[1] Studies in ethnic children found significant effect between source of water, immunization, sanitation status, and monthly family income with their nutritional status. [9] All the studies in Bangladesh indicate a great vulnerability of the ethnic population towards different negative health outcomes due to their poor food habit and livelihood patterns.

Research on UK, USA, and Indian ethnic groups highlights the need for nutrition studies, though implementing health education strategies remains challenging. [5-7]

Many studies explore Bangladeshi ethnic minorities' diets, but comprehensive nutrition-focused assessments are lacking, especially for the Rakhain in Chattogram Hill Tracts. Their unique culture, isolation, and healthcare access challenges underscore this study's focus.[10]

This study aims to examine how underlying characteristics affect dietary behavior among specific Bangladeshi ethnic groups, using a rigorous scientific approach. Insights from this research may guide culturally tailored policy interventions to enhance nutrition and health outcomes. The findings could inform additional intervention plans addressing poor dietary practices, leading to substantial health improvements for these overlooked populations.

Methods

Study design

This cross-sectional study, conducted in Cox's Bazar with the Rakhain community, collected quantitative data from July-December 2023.

Study participants, sample size and sampling

Bangladesh has 45 ethnic communities, [11] totaling 1.65 million people,[12] with 60.05% in Chattogram. The Rakhain, representing 0.68% (over 11,000 individuals), were chosen as the focus group for this study.

This study focused on 350 adult Rakhain individuals, aged 18-64, residing in Teknaf, Cox's Bazar, within the Chattogram division. Participants, designated as household heads, consented to participate. A standard sample size of 384 was calculated using the formula "$n= Z^2pq/d^2$," with $Z=1.96$, $p=0.50$, and a margin of error of 0.05. The final sample size was 350, with a 91% response rate. Households were randomly selected from 992 provided by the local government.

Data collection

Data from Rakhain people were collected using a pre-tested, semi-structured questionnaire covering socio-demographics, lifestyle, food practices, and clinical conditions through the interviewer administrative method.

Ethical considerations

The study was approved by Northern University Bangladesh's Ethical Review Committee (NUB/DPH/EC/2023/25-a), following the Declaration of Helsinki. Participation was anonymous, voluntary, and included informed consent, ensuring participant autonomy.

Data analysis

Data were quality-checked, entered, and analyzed using SPSS. Continuous variables were presented as mean ± SD, categorical variables as percentages with 95% confidence intervals (CI).

An overall food practice was calculated considering the scores getting from the intake of seven types of foods which was categorized by more intake (always/ more times) & low intake (few times/ never). More intake of healthy foods like fish, fruits, meat and vegetables got a score of '1' and more intake unhealthy food like fast food, soft drinks and tea/ coffee got a score of '0'. The total score was categorized as 'good' or 'poor,' using the 50th percentile of the distribution as the cutoff. The mean and SD of the percentage score were 55 and 17, respectively, with a minimum of 14 and a maximum of 100.

Binary logistic regression with backward elimination analyzed food practices as the dependent variable, calculating odds ratios with 95% confidence intervals.

Results

Participant characteristics: A total of 350 Rakhain people were enrolled in this study with 53.1% of men and 49.7% of illiterate. Majority of the respondents were young adults (54.9%), married (76.0%) and housewives (30.3%). Most of the individuals lived in the extended family (77.1%), with <6 family members (88.95) and with <3 children (78.9%).

Overall food practices including food preparation pattern with traditional food consumption practice: It is unveiled that the majority (66%) of Bangladesh's ethnic group (Rakhain) practiced poor eating habits; whereas 34% of them had good food practices (Mean ±SD, 55.63± 17.32).

The study's cross-tabulation analysis identified the significant types of food intake associated with the respondents' overall food practices. Moreover, the overall food practices of the respondents were found to be significantly (p≤0.05)associated with intake of fast food, soft drinks, fish, fruits, vegetables, meatand tea/coffee of the respondents. (Table 1)

Table 1: Insights of overall food practices (n=350)

Types of food intake		Overall food practices						p
		Total		Good		Poor		
		Frequency (n)	Percent (%)	Frequency (n)	Percent (%)	Frequency (n)	Percent (%)	
Fast food	More	170	48.6	32	9.1	138	39.4	0.01
	Low	180	51.4	86	24.6	94	26.9	
Fish	More	269	76.9	86	24.6	183	52.3	0.20
	Low	81	23.1	32	9.1	49	14.0	
Fruits	More	82	23.4	17	4.9	65	18.6	0.01
	Low	268	76.6	101	28.9	167	47.7	
Meat	More	134	38.3	23	6.6	111	31.7	0.01
	Low	216	61.7	95	27.1	121	34.6	
Vegetables	More	335	95.7	105	30.0	230	65.7	0.01
	Low	15	4.3	13	3.7	2	0.6	
Soft drinks	More	203	58.0	18	5.1	185	52.9	0.01
	Low	147	42.0	100	28.6	47	13.4	
Tea/Coffee	More	170	48.6	15	4.3	155	44.3	0.01
	Low	180	51.4	103	29.4	77	22.0	

Data are presented as frequency (n) and percentage (%);Individual food intake was categorized by more (always/ more times) & low (few times/ never).

The food preparation and traditional eating habits of a specific ethnic people (Rakhain), the study also identified several important factors related to overall food practices. For example, it was discovered that the respondents' cultural food, sources of food collection, food preparation techniques, sources of drinking water, and purification procedure of drinking water were significantly ($p \leq 0.05$) correlated with their overall food practices. (Table 2)

Table 2: Pattern of food preparation and traditional food consumption practice (n=350)

Food preparation and traditional food consumption practice		Overall food practices						p
		Total		Good		Poor		
		Frequency (n)	Percent (%)	Frequency (n)	Percent (%)	Frequency (n)	Percent (%)	
Cultural food	Only Nappi	193	55.1	75	21.4	118	33.7	0.02
	Nappi with other foods	157	44.9	43	12.3	114	32.6	
Sources of food collection	Market	316	90.3	99	28.3	217	62.0	0.01
	Market & Sea	27	7.7	18	5.1	9	2.6	
	Market & forest	7	2.0	1	0.3	6	1.7	
Food preparation techniques	Normal cooked	124	35.4	44	12.6	80	22.9	0.01
	Over cooked	20	5.7	15	4.3	5	1,4	
	Both	206	58.9	59	16.9	147	42.0	
Fuel for food cooking	Supplied gas	124	35.4	41	11.7	83	23.7	0.32
	Wood	165	47.1	62	17.7	103	29.4	
	Supplied gas & wood	22	6.3	5	1.4	17	4.9	
	Wood & green energy	39	11.1	10	2.9	29	8.3	
Sources of drinking water	Deep tube well	261	74.6	96	27.4	165	47.1	0.03
	Water fall	89	25.4	22	6.3	67	19.1	
Purification procedure of drinking water	Filter	14	4.0	5	1.4	9	2.6	0.03
	Fitkiri/ Alum powder	8	2.3	1	0.3	7	2.0	
	Halogen tablet	31	8.9	4	1.1	27	7.7	
	Nothing	297	84.9	108	30.9	189	54.0	

Data are presented as frequency (n) and percentage (%)

Background characteristics associated with overall food practices: The study's regression analysis identified important factors linked to the overall food practices of specific ethnic people (Rakhain). The analysis of overall eating habits showed that significant ($p \leq 0.05$) poor food practices was found among the age group [Middle-aged adult (40-59 years): cOR=2.16; Older adult (60-64 years): cOR=9.13], education [<Primary: cOR=0.49], occupation [Business: cOR=3.92; Housewife: cOR=1.90; Others (student, unemployed etc.): cOR=3.38], family size [>6 members: cOR=7.04], number of children [≥3: cOR=6.43], sleeping status [Not standard (<5/>9 hours per night: cOR=5.26], medicine use [cOR=2.24], comorbidity [cOR=2.57] and for systolic blood pressure [cOR=3.16]. (Table-3)

Table 3: Background characteristics associated with the overall food practices (n=350)

Background characteristics	Overall food practices			p-value	COR (95% CI)	AOR (95% CI)
	Total n (%)	Good n (%)	Poor n (%)			
Age (years)						
Young adult (18-39)	192 (54.9)	85 (24.3)	107 (30.6)	0.01	Reference	
Middle-aged adult (40-59)	108 (30.9)	29 (8.3%)	79 (22.6)		2.16 (1.29-3.61) *	-
Older adult (60 -64 years)	50 (14.3)	4 (1.1)	46 (13.1)		9.13 (3.16-26.38) *	-
Education						
Illiterate	174 (49.7)	46 (13.1)	128 (36.6)	0.01	Reference	
<Primary	138 (39.4)	58 (16.6)	80 (22.9)		0.49 (0.30-0.79) *	-
Secondary≤	38 (10.9)	14 (4.0)	24 (6.9)		0.61 (0.29-1.29) *	-
Occupation						
Service	105 (30.0)	52 (14.9)	53 (15.1)	0.01	Reference	
Business	50 (14.3)	10 (2.9)	40 (11.4)		3.92 (1.77-8.66) *	3.43 (1.52-7.73)*
Housewife	106 (30.3)	36 (10.3)	70 (20.0)		1.90 (1.09-3.32) *	1.42 (0.79-2.57)*
Others (student, unemployed etc.)	89 (25.4)	20 (5.7)	69 (19.7)		3.38 (1.80-6.34) *	1.91 (0.97-3.75)*
Family type						
Nuclear	80 (22.9)	34 (9.7)	46 (13.1)	0.05	Reference	
Extended	270 (77.1)	84 (24.0)	186 (53.1)		1.63 (0.98-2.73) *	-
Family size						
<6 members	311 (88.9)	115 (32.9)	196 (56.0)	0.01	Reference	
>6 members	39 (11.1)	3 (0.9)	36 (10.3)		7.04 (2.12-23.37) *	4.53 (1.31-15.67)*
Number of children						
<3	276 (78.9)	111 (31.7)	165 (47.1)	0.01	Reference	
>3	74 (21.1)	7 (2.0)	67 (19.1)		6.43 (2.85-14.54) *	4.89 (2.06-11.47)*
Sleeping status						
Standard (6-8 hours per night)	319 (91.1)	115 (32.9)	204 (58.3)	0.01	Reference	
Not standard (<5/ >9 hours per night	31 (8.9)	3 (0.9)	28 (8.0)		5.26 (1.56-17.68) *	3.45 (0.96-12.43)*
Tobacco use						
Yes	310 (88.6)	99 (28.3)	211 (60.3)	0.05	1.92 (0.99-3.74) *	-
No	40 (11.4)	19 (5.4)	21 (6.0)		Reference	
Medicine use						
Yes	59 (16.9)	12 (3.4)	47 (13.4)	0.01	2.24 (1.14-4.41) *	-
No	291 (83.1)	106 (30.3)	185 (52.9)		Reference	
Comorbidity						
Had	69 (19.7)	13 (3.7)	56 (16.0)	0.01	2.57 (1.34-4.92) *	-
Didn't have	281 (80.3)	105 (30.0)	176 (50.3)		Reference	
Systolic blood pressure						
Normal (<120 mmHg)	257 (73.4)	102 (29.1)	155 (44.3)	0.01	Reference	
High (>120 mmHg)	93 (26.6)	16 (4.6)	77 (22.0)		3.16 (1.74-5.73) *	-

*Data are presented as frequency (n) and percentage (%); mmHg indicates millimeters of mercury. p-value was set as ≤0.05 and is indicated by *.*

Predictors associated with the poor food practices: After the adjusted modeling was completed and confounders were removed using the backward elimination process, the final significant($p \leq 0.05$) predictors were identified. The study revealed that occupation (Business: aOR=3.43), family size (>6 members: aOR=4.53), number of children (≥3: aOR=4.89) and sleeping status (not standard (<5/ >9 hours per night: aOR=3.45) showed higher odds of poor food practices of specific ethnic people (Rakhain). (Table 3)

Discussion

This study found that Rakhain people with poor eating habits consumed significantly ($p \leq 0.05$) fewer fruits, vegetables, and meat but more fast food and soft drinks. Limited research exists on ethnic groups, including the Rakhain population. Bangladesh, home to over 70 ethnic groups, showcases diverse dietary patterns influenced by culture, religion, socioeconomic, and geographical factors. These patterns often lie beyond the scope of food technologists. Ethnic minorities, such as the Rakhain, remain underrepresented in research and public health initiatives.[2, 13] In this study, we aimed to observe food practices and predictive factors from the perspectives of special ethnic group Rakhain.

Since ancient times,[1] Bangladeshi ethnic groups thrived on plant-based diets, with Monipuris and Khasis favoring rice as their staple. [4,5] In contrast, modern respondents predominantly consumed soft drinks and junk food, differing from earlier plant-based dietary preferences.

The study revealed 66% of Rakhains had poor food practices, with 55.1% consuming traditional Nappi, which recent research shows has significant market demand among local ethnic communities in Bangladesh.[13]The study revealed that 62% of Rakhain people with poor food habits collected food from the market, 42% used both normal and overcooked methods, and 29.4% used wood for cooking. Comparatively, Manipuri and Khasi communities preferred raw, flavored food and clay furnaces.[4] Moving to another component i.e. water for cooking, our study found that 47.1% Rakhain people used deep well water for cooking and didn't use any process for water purification. This finding matches with Manipuri and Khasi studies. [4]

Regression analysis revealed poor food habits among older adults (60-64 years), less educated Rakhains, large families, non-standard sleepers, tobacco users, individuals with comorbidities, high blood pressure, or frequent medication intake, highlighting unique findings previously unexplored. However, a systematic review showed that the food choice of ethnic groups is significantly associated with their socioeconomic status and food availability.[14] Adjusted modeling in regression analysis eliminated the confounders and showed that higher odds of poor food habits among individuals categorized as businessmen, those with >6 family members, and those with ≥3 children. No studies reported this finding, but others showed education and income significantly influenced healthier food behaviors.[15-18]

Effective solutions for healthy food practices in ethnic groups require comprehensive dietary assessments. This study recommends further research incorporating educational interventions to promote healthier food choices among Bangladesh's ethnic minorities.[19] In addition, another study highlighted the Rakhine community's geographic isolation, socio-political marginalization, and daily challenges, offering insights for policymakers to develop targeted support for this minority group. [20]

This study focused on Rakhains in Teknaf Upazila, limiting generalization due to resource and time constraints. Despite this, the data provides valuable insights, guiding future large-scale research on this significant indigenous population.

Conclusion

A significant proportion of Rakhain individuals in Bangladesh demonstrated poor dietary habits were linked to increased fast food and soft drink consumption, low intake of fruits, vegetables, and meat, cultural food choices, food preparation methods, and drinking water purification. Poor habits were more common among businessmen, individuals with >6 family members, >3 children, and non-standard sleeping patterns. Government and NGOs should implement health education and behavioral change programs to address the shift in Rakhain food habits from traditional plant-based to

modern processed foods, requiring further awareness and research to mitigate health impacts.

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Conflicts of interest statement: The authors declare that they have no competing interests.

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Original Article

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Lifestyle Factors and Determinants of Health Behaviour among School-going Adolescents in a Sub-urban Area of West Bengal

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Abstract

Background: Research into adolescents' health and behaviour and the lifestyle factors influencing them is essential to promote the effectiveness of health education, policies, programmes and practices. An adolescent's health development must be considered in its broadest sense, including physical, social, and emotional well-being, which may be impacted by lifestyle behavioural changes. This study determined factors related to adolescent health in Eastern India, where adolescents comprise 21.4% of the population.

Aims: to find out prevalence and pattern of different health related behaviours like eating habit, hygiene practice, substance abuse etc among school going adolescents.

Materials & Methods: This observational, descriptive, epidemiological cross-sectional study utilized Global School-based Health Survey (GSHS) questionnaires for India with added socio-demographic elements among 230 subjects.

Results: 56.96% were males, with most from classes VII, VIII, and XII (18.69% each). In nuclear families, 2.54% had no close friends. Underweight prevalence was 13.46%. While 64.78% never felt hungry, 3.04% faced food scarcity. Regarding diet, 8.69% skipped fruits, and 3.47% avoided vegetables in the last 30 days. Poor hygiene practices included 1.30% not brushing teeth, and 2.61% rarely washing hands before meals; 88.26% used soap. Teachers verbally abused 58.40%; 32.18% skipped school for over a day. Loneliness affected 13.04%, and substance use included smoking (5.22% after 14), tobacco chewing (3.05%), alcohol (6.52%), and drug use (3.48% in 12 months).

Conclusion: Dual nutritional issues, poor hygiene, sedentary lifestyle, substance use, lack of sex education, and persistent sadness highlight the need for urgent health interventions for adolescents.

Key words: Adolescent health, lifestyle factors, substance abuse, Hygiene practice, dietary habit

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Introduction

The term adolescence, derived from the Latin word 'adolescent,' signifying "to grow" or "to mature," embodies the journey of identity formation, a relatively contemporary concept in developmental discourse[1]. This phase marks the onset of puberty, characterized by profound hormonal shifts prompting rapid physical metamorphosis and the emergence of secondary sexual traits. Concurrently, adolescents navigate intricate psychological and emotional terrains, asserting their individuality, fostering independence, and awakening to burgeoning sexual desires and attractions[2].

As adolescents transition, they extend their social networks beyond familial boundaries, seeking validation and camaraderie among peers while endeavouring to carve a distinct niche within their social milieu. Typically spanning ages 10 to 19, this period is marked by a proclivity for novelty and experimentation, albeit often lacking in the requisite life skills to navigate the myriad influences of media and peer dynamics. Consequently, many succumb to the allure of risky behaviours such as substance abuse and early sexual activity, potentially jeopardizing their lifelong prospects[3].

Notably, adolescent girls face unique nutritional exigencies frequently overlooked, precipitating various health adversities including widespread anaemia, exacerbated by prevalent practices of early marriage prevalent in remote regions. Such practices not only imperil the health of young brides but also stifle their personal development and societal contributions, manifesting in a spectrum of obstetric complications and maternal health risks[2] .

Recognizing adolescence as a pivotal juncture in health development, comprehensive research into adolescent health behaviours is imperative for informing targeted health education and promotion strategies. Embracing the World Health Organization's holistic conception of health as a multifaceted resource for daily living, research endeavours must encompass not only the identification of risk factors but also the cultivation of positive health outcomes [4]. Similar studies were conducted in other parts of India but very few of them dealt with all the components of adolescent behaviour as mentioned in GSHS (Global School-based Student Health Survey)[6], so this study seeks to elucidate the prevalence of various health behaviours, their sociodemographic correlates, and their implications among adolescent cohorts in Eastern India, fostering a nuanced understanding to inform evidence-based interventions and policy formulation.

Methods and Methodology

A descriptive observational epidemiological study with a cross-sectional design was conducted in various Higher Secondary schools in Khardah West Bengal between June to August 2022. At first step, 4 schools were selected by simple random sampling from the list of all schools provided by District Inspector of schools (DI) office. Data was collected from Students of class V to class XII (both boys and girls), belonging to the adolescent age group. From class V to XII, randomly students were chosen to participate in the survey by using stratified random sampling technique. Students who were not willing to participate were excluded from this study. Sample size was calculated with alpha error as 5% and taking worst case scenario (50% prevalence) and design effect 2 and non response rate of 20%.

Power analysis was not done as it is descriptive study. The final sample was 230, after discarding 15 incomplete questionnaires. 'Health behaviour' is defined as an action taken by a person to maintain, attain, or regain good health and to prevent illness[5]. Although adolescence and young adulthood are generally healthy, several important public health and social problems either peak or start during these years. Homicide, suicide, motor vehicle crashes, including those caused by drinking and driving, substance use and abuse, smoking, sexually transmitted infections, including human immunodeficiency virus (HIV), homelessness, poor dietary behaviour, and negligible physical activity leading to obesity have been noted. To elicit these health behaviours among urban school-going adolescents a predesigned and pretested schedule containing a validated questionnaire of GSHS (Global School-based Student Health Survey)[6] was used as a data collecting tool. The Global Student Health Survey (GSHS) was developed by the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) in

collaboration with UNICEF, UNESCO, and UNAIDS. The preliminary questionnaire was composed and translated into the local language (Bengali) by a linguist and the Bengali questionnaire was retranslated into English to find out dissimilarities and corrected therefore. Before composing the final questionnaire, the preliminary questionnaire was tested among 30 students comprising students from classes V to XII. Then the final questionnaire was formulated after some modifications with the help of the Department of Community Medicine of the same institute.

All data was copied into an Excel sheet and was alaysed using the software Epi info 7.1.2.0

Result

Our study involved 230 subjects with an average age of 15.9 years, with 131 (56.96%) males. Most students were from classes VII, VIII, and XII (18.69% each). Among nuclear family students, only 2.54% had no close friends, while this increased over three times (8.92%) in joint families [p<0.05]. More joint family parents (8.92%) never understood their child's problems [p<0.01].

Dietary Habits: 19.12% of students were overweight, and 13.46% were underweight. While 64.78% never felt hungry in the past 30 days, 3.04% experienced food scarcity. 8.69% did not consume fruits, 3.47% avoided vegetables, and 19.56% abstained from carbonated drinks. 11.30% drank water at least five times a day, and 15.65% avoided fast food.

Hygiene Practices: 1.30% never brushed their teeth; 2.61% rarely washed hands before meals; 88.26% used soap. Seven males never washed hands after using the toilet. 98.70% reported handwashing facilities at school, yet 42.17% found toilets dirty. Male students (9.92%) were significantly less likely to wash hands after using the toilet than females [p<0.05].

Physical Injury & Mental Health: 19.13% suffered sports-related injuries, while 16.95% sustained injuries while walking/running. 58.40% experienced verbal abuse from teachers in the past year. 32.18% missed school for over a day, 13.04% frequently felt lonely, and 9.57% struggled with sleep. More females (19.19%) than males (5.34%) had sleep issues. 26.09% felt hopeless for two weeks or more, and 5.22% had no close friends. 21.30% struggled to focus on homework, and 15.65% had difficulty answering in class.

Substance Abuse: 5.22% of smokers started after 14 years. 12.61% smoked in the past 30 days, and 72.22% attempted to quit. 86.52% were exposed to second hand smoke, and 33.46% had a parent using tobacco. 9.13% (12.12% females) considered smoking masculine. Only 4.35% believed cigarettes were harmless. 3.05% chewed tobacco; 6.52% consumed alcohol, and 15 students had an alcoholic parent. 68.84% saw actors smoking, and 60.09% saw actors drinking in media. 3.48% used drugs in the past year. 12.99% of students with a smoking parent smoked, compared to 5.23% without. Similarly, 26.67% of students with an alcoholic parent drank, compared to 6.52% without [p<0.01].

Lifestyle & Exercise: 35.65% were inactive for 60 minutes/day, and 33.92% were completely inactive. 41.74% never attended physical education, and 24.35% did not do strength exercises. 26.09% spent 3+ hours daily on screens.

Sleep & Support System: 16.96% slept 8+ hours daily. 20.87% skipped school without permission. 25.65% reported students were rarely kind. 12.17% said parents rarely checked homework, and 81.74% said parents rarely monitored their free time. 66.52% lacked HIV/AIDS education, and only 30.87% learned about STD prevention this year.

Table 1: Distribution of study subjects according to their hygiene practice (n=230)

Tooth Brushing: past 30 days	**Male**	**Female**
Didn't do	2(1.52)	1(1.01)
≥1time/day	129(98.47)	98(98.98)
Hand Washing before eating: past 30 days		
Never/rarely	6(4.58)	0(0)
Sometimes/most of the time/always	125(95.42)	99(100)
Hand washing with soap: past 30 days		
Never/rarely	18(13.74)	9(9.1)

Continue.....

Sometimes/most of the time/always	113(86.25)	90(90.9)
Hand washing after toilet/ latrine: past 30 days		
Never/rarely	7(5.34)	0(0)
Sometimes/most of the time/always	124(94.66)	99(100)
Total	131(100)	99(100)

Table 2: Distribution of study subjects according to history of physical injury and status of mental health (n=230)

Most serious injury: last 12 months	**Male**	**Female**
no such injury last 12 months	58(44.27)	63(63.63)
playing/training for sports	36(27.48)	8(8.08)
walking/running not part of playing	24(18.32)	15(15.15)
Others including riding cycle/bike/scooter	13(11.91)	13(13.13)
Verbally abused by teacher: last 12 months		
0 times	40(30.53)	58(58.58)
1-5 times	76(58.02)	34(34.34)
6-9 times	11(8.4)	3(3.03)
≥10 times	4(3.05)	4(4.04)
Absent due to unsafe feelings at school: last 30days		
0 day	83(63.36)	73(73.74)
1-5 days	41(31.3)	19(19.19)
≥6 days	7(5.34)	7(7.07)
Feeling lonely most of the times/always: last 12 months		
Yes	16(12.21)	14(14.14)
No	115(87.79)	85(85.86)
Worried, couldn't sleep at night most of the times/ always: past 12 months		
Yes	7(5.34)	15(15.15)

Continue.....

No	124(94.66)	84(84.85)
Felt hopeless/sad for 2weeks or : past 12 months		
Yes	34(25.95)	26(26.26)
No	97(74.05)	73(73.74)
Number of close friends		
Zero	7(5.34)	5(5.05)
one to two	42(32.06)	36(36.36)
≥3	82(62.59)	58(58.59)
Hard time to focus most of the time/ always on homework/ others: past 12 months		
Yes	32(24.43)	17(17.17)
No	99(75.57)	82(82.83)
Hard time answering questions/ writing on blackboard most of the times/ always: past 12 months		
Yes	21(16.03)	15(15.15)
No	110(83.97)	84(84.85)
Disturbed due to comment by peers/ teachers/family: past 12 months		
Yes	9(6.87)	9(9.09)
No	122(93.13)	90(90.91)
Total	131(100)	99(100)

Table 3: Distribution of study subjects according to history of substance abuse (n=230)

Age when 1st tried cigarette		
Never	120(91.61)	92(92.94)
<14 *years*	4(3.05)	2(1.01)
≥14years	7(5.34)	5(5.05)
Smoked cigarettes ≥1 day: past 30 days		
Yes	4(3.05)	2(2.02)
No	127(96.95)	97(97.98)
People smoked in your presence: past 7 days		

Continue.....

0 *day*	21(16.03)	10(10.1)
1-6 *days*	47(35.88)	43(43.44)
All *7 days*	63(48.09)	46(46.46)
Parents/ guardians using tobacco:		
Neither *of them*	73(55.73)	63(63.63)
Father / *male guardian*	44(33.59)	27(27.27)
Mother / *female guardian*	2(1.53)	2(2.02)
Both	1(0.76)	1(1.01)
I *don't know*	11(8.39)	6(6.06)
Thought about a man smoking:		
Lacks *confidence*	33(25.19)	40(40.4)
Stupid	67(51.15)	39(39.4)
Loser	21(16.03)	8(8.08)
Successful	1(0.76)	0(0)
Intelligent	0(0)	0(0)
Macho	9(6.87)	12(12.12)
Smoking cigarettes harmful?		

Continue.....

Yes	125(95.42)	95(95.96)
No	6(4.58)	4(4.04)
Age when 1st chewed tobacco		
Never *chewed tobacco*	126(96.18)	97(97.98)
<14 *years*	4(3.05)	1(1.01)
≥14 *years*	1(0.76)	1(1.01)
Experiencing a drink of alcohol		
Yes	7(5.44)	8(8.08)
No	124(94.66)	91(91.92)
Parents/ Guardians drink alcohol		
Neither *of them*	115(87.79)	81(81.82)
Father / *male guardian*	8(6.11)	7(7.07)
Mother / *female guardian*	0(0)	0(0)
Both	0(0)	0(0)
I *don't know*	8(6.11)	11(11.11)
Total	131(100)	99(100)

Table 4: Association of parental addiction with substance abuse of the study subjects (n=230)

Parents' addiction behaviour	**Study subjects' addiction behaviour**			**Odd's ratio**	**p value**
	Ever smoked	**Never smoked**	**Total**		
Smoker	10(12.99)	67(87.01)	77(100)	2.7(1.02-7.16)	0.038
Non smoker	8(5.23)	145(94.77)	153(100)		
Total	18 (7.82)	212 (92.18)	230 (100)		

	Ever drunk alcohol	**Never drunk alcohol**		**Odd's ratio**	**p value**
Alcoholic	4(26.67)	11(73.33)	15(100)	6.74(1.84-24.62)	0.001
NonAlcoholic	11(5.12)	204(94.88)	215(100)		
Total	15(6.52)	215(93.42)	230(100)		

Discussion

We found a noteworthy 9.56% of the population was found to be overweight, with an additional 9.56% categorized as obese. Interestingly, there was a gender disparity in these statistics, with 12.21% of males and 6.06% of females classified as overweight, and 12.97% of males and 5.05% of females falling into the obese category. This mirrors previous research by Deoke A et al[7], conducted in Nagpur, which reported 5.84% overweight individuals and 0.35% obese. We believe this higher prevalence of overweight and obesity among boys as compared to girls, roots from their inactivity or reluctance to consume healthy meal.

The study also shed light on dietary habits, indicating that 8.69% of students did not consume fruits, while 3.47% did not include vegetables in their diet over the past month. Additionally, 18.25% consumed fruits less than once a day, and 13.03% consumed vegetables once a day. These figures, although concerning, are relatively favorable compared to a study by Karl Peltzer and Supa Pengpid[8] in Southeast Asia, where 28% reported inadequate fruit consumption and 13.8% reported insufficient vegetable intake.

In terms of hygiene practices, females exhibited a higher level of hygiene compared to males, underscoring the need for comprehensive hygiene education, particularly among male students. This is particularly pertinent in the context of the COVID-19 pandemic, where hygiene maintenance emerged as a critical preventive measure. Poor hygiene, unbalanced nutritional intake and reduced physical exercise all points to the development of a number of morbidities like diabetes, ischaemic heart disease in males.

The study also highlighted the prevalence of injuries among students, with 19.13% sustaining severe injuries during sports or training and 16.95% experiencing injuries while running or walking in the past year. Additionally, a concerning 58.40% of students reported verbal abuse by teachers over the same period, with boys being disproportionately affected. While we can justify the physical injury that occurred as a result of tussle, or during sport or training; what astonished us was that a majority of the participants claimed verbal abuse from their teachers. Our questionnaire did not allow us to go into the details of the abuse or what they considered to be abused actually verbally or in any other respects. However, it is our understanding that such concerns should have been identified earlier and investigated thoroughly. We like to believe that school plays a vast role in moulding a child's personality and is responsible for development of their academic, social and humanity. Unable to explore this particular region was one of our major limitation.

Regarding tobacco and substance use, the study found that 92.17% of students had never smoked, and only 12.61% of ever-smokers had smoked in the past 30 days. In a study done in Jhansi[9], 15.30% of students aged 14-19 years old tried cigarette/ bidi smoking at least once in their lifetime, while 5.46% of smokers tried smoking at an age less than 14 years. The results are similar to what we see in this study where 7.83% are ever smokers. This shows a lower frequency of adolescent smoking in this part of West Bengal using the GYTS questionnaire[10], but it is similar to a study conducted by the Centre for Disease Control (CDC) among middle school students in 2004, which found that 12% reported using tobacco at least once in the past 30 days.12.99% of students had smoked in their lifetime whose at least any of the parents were using tobacco which is more significant than those 5.23% smokers whose parents did not use [$p<0.05$]. However, 3.81% of males and 2.02% of females reported chewing tobacco, while 3.04% used other forms of tobacco such as pan masala or gutka. Notably, parental influence played a significant role, with 12.99% of students reporting smoking in their lifetime having at least one parent who used tobacco. Tobacco intake was higher among those with a history of parental tobacco intake in a study by Anindya Mukherjee al in West Bengal, India [11]. Only 4.35% of students believe that cigarettes are not harmful. This is a significant improvement from a previous study conducted in rural West Bengal where 26% of the students thought that smoking causes no health problems[11]. This shows better knowledge of this urban township regarding smoking.

Alcohol consumption was also prevalent among students, with 6.52% reporting alcohol use, and 15 students indicating parental alcoholism. This trend was particularly pronounced among girls, with paternal drinking emerging as a significant factor. Fathers' drinking (14.48%) was a significant factor in alcoholism in a study by Peeyush Kariwal et al.[9] in Jhansi. Nearly 89% of students had seen anti-tobacco advertisements in media last month, while 76% had watched their favourite heroes smoking on television or in cinemas in a study by Anindya Mukherjee[11]. In this study, 94.35% of students saw anti-smoking

messages in media in the past 30 days and 68.84% of those who watch TV have seen actors smoking which is congruent with the results of similar studies. 3.48% have used drugs in the past 12 months.

Hence, its quite evident that parental influence had significant role in substance abuse. Peer pressure is known to be a giant driving factor in initiating various addictive substances. This study just adds more strength to previously established findings[12-14].

Furthermore, the study revealed a lack of comprehensive sex education and communication between parents and children, with many students expressing constant sadness. This highlights the urgent need for improved parent-child communication and comprehensive sex education at both the family and school levels[15]. While the population of India is rapidly increasing, discussing anything related to sex is still quite taboo in the region[16]. While Khardah is a sub-urban region, the school welcomes student from quite remote places. Hence, sex education is undoubtedly a massive challenge even if its done by doctors or specialists. The awareness of STDs, including HIV/AIDS has thus taken a serious toll too[17].

Conclusion

In conclusion, the study underscores several pressing concerns among urban adolescents, including issues related to overweight and obesity, poor dietary habits, inadequate hygiene practices, injuries, tobacco and substance use, alcohol consumption, and lack of sex education and parental communication. Addressing these challenges requires concerted efforts from policymakers, educators, and healthcare professionals to ensure the holistic well-being of the younger generation.

Ethical Consideration: Ethical clearance was taken from institutional ethics committee of Medical College, Kolkata (MC/KOL/IEC/NON-SPON/1111//06/2021). Consent was taken from one of the parents of the students. Assent was taken from all the study participants.

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Knowledge, Attitude and Practice regarding Infection Control Measures Among Dental Students in South India: A Cross-Sectional Study

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Abstract

Background: Dental professionals are at high risk of exposure to infectious pathogens, primarily due to close contact with patients' oral cavities and contaminated instruments. Infection control protocols, including sterilization, are crucial in dental settings. However, previous studies have shown poor compliance among dental students regarding infection control measures. The aim of the study was to evaluate the knowledge, attitude, and practice (KAP) of dental students in South India regarding infection control measures.

Methodology: A cross-sectional study was conducted from May 2024 to October 2024 among final-year Bachelor of Dental Surgery (BDS) students, interns, and postgraduate (PG) dental residents in South India. A total of 346 students participated. A structured questionnaire with 21 questions was distributed via Google Forms, covering knowledge (10 questions) and attitude and practice (11 questions) on infection control. Data were analyzed using SPSS software, with Chi-square tests and ANOVA used to assess group differences. Pearson's correlation analyzed the relationship between KAP scores, with a significance level of $p<0.05$.

Conclusion: Moderate knowledge levels but inconsistent attitudes and practices highlight the need for improved infection control training in dental education, focusing on both knowledge and practical application to enhance patient safety.

Keywords: Dentistry, Infection, Knowledge, Students, Sterilization.

Introduction

Dentistry is one of the professions where dental health care professionals are at increased risk of exposure to various infectious blood-borne and air-borne pathogens because of their direct contact with the patient's oral cavity and the clinical environment. This risk is enhanced by dental injuries due to accidents caused by mishandling an instrument [1]. The patient's physical appearance does not apply to the health status as the patient might appear healthy according to clinical examination. Still, he/she might be a carrier to an infectious pathogen unknown.

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Among the serious and commonly transmitted oral infections, Microorganisms such as Mycobacterium Tuberculosis, Influenza virus, COVID 19 and Streptococcus mutans colonize the oral cavity in the majority. A dental environment is more susceptible to cross-infection through several routes such as blood, oral fluids, indirect contact with the contaminated instrument, etc[2]. An infection requires a chain of a host, a pathogen and a portal of entry, therefore to control the spread of disease, sufficient measures are to be taken to break this chain [3].

In the late 20th century, it was found that dentists were 3x more likely to be affected with hepatitis B than the general population. The Center for Disease Control (CDC) and the World Health Organization (WHO) have set a series of guidelines to be followed in a dental setup [3]. Dental schools are responsible for adequate training of their dental students as soon as they start with their cases to ensure the safety of the patients and establish a safe environment.

Several studies are conducted across various regions of the world to assess the knowledge, attitude, and practice of dental students and have implied poor compliance with infection control practices [1,4]. Considering the critical importance of infection control in a dental setting, it is necessary to assess and remind dental students about infection control protocols so that they may pave the way for a healthier practice.

Therefore, the aim of the present study is to assess the knowledge, attitude, and practice of dental students towards the infection control measures.

Materials and Methodology

The cross-sectional study was conducted among the dental students of various dental colleges in the south Indian population from May 2024 to October 2024. The study was approved by the institutional ethical committee (BDSC-IEC/2024/MAY/P-28) to proceed with the study. A questionnaire was prepared and validated to gain information about the knowledge, attitude and practice towards infection control measures. The questionnaire was uploaded in Google Forms and distributed across various dental colleges in South India. Participants were asked to click on an option of Yes/No for informed consent which was displayed on the first page before answering the questions.

The study population included BDS IV year, Interns and Postgraduate students who have varying levels of exposure to clinical practice, which allows for a more comprehensive assessment of Knowledge, attitude, and practice. The students of the first, second, and third-year undergraduates were excluded since the training about infection control is provided extensively from the final year of the dental curriculum. The participants who did not wish to participate were also excluded from the study.

The sample size was calculated using G power software V2 with a 95% confidence interval and a total of 346 dental students participated and completed the questionnaire comprising 21 questions of which the initial few questions were demographic details with no name to maintain the anonymity intact and 10 questions were knowledge-based and 11 questions were related to the attitude and practice of dental students towards infection control. The data obtained was entered into Microsoft Excel and statistically analyzed.

Statistical analysis

The data was analyzed and tabulated using the SPSS Software version 23. The consistency of the questionnaire was assessed using the Cronbach's alpha. Descriptive statistics was done to analyze the mean and standard deviation. Percentage and frequency were calculated for a quantitative variable. Pearson Chi-square test and ANOVA test were done to compare the mean score of the questions answered by the participants and analyze the difference between the groups respectively. The p-value <0.05 was considered statistically significant.

Results and Discussion

Table 1: Students' knowledge, attitudes and Practice regarding infection control measures, by number and percentage of total respondents to each item.

S.No.	Questions	Options	Response			Total	P value
			Interns	PG Residents	BDS IV Year		
1	What is the most reliable method of sterilization for dental instruments?	Autoclave	143	118	80	341 (98.5%)	0.644
		Disinfectants	2	1	2	5 (1.4%)	
2	What is the biological indicator in sterilization?	Bacillus Steothermophillus	109	102	60	271 (78.3%)	0.332
		Bacillus Subtilis	4	3	3	10 (2.8%)	
		Staphylococcus Aureus	13	4	8	25 (7.2%)	
		Streptococcus Mutans	19	10	11	40 (11.5 %)	
3	What is the chemical indicator in sterilization?	Change in color of the instrument label/ Strip.	115	104	62	281 (81.2%)	0.281
		Change in color of the instrument.	9	5	6	20 (5.7 %)	
		Corrosion of the Instrument.	21	10	14	45 (13.0%)	
4	What are autoclave strips made of?	Copper oxide	28	34	14	76 (21.9%)	0.247
		Lead carbonate	59	39	32	130 (37.5%)	
		Phenolphthalein	51	41	28	120 (34.6%)	
		Zinc	7	5	8	20 (5.7%)	
5	Which is the best chemical used to disinfect alginate impression?	0.5% of NaOcl.	47	22	21	90 (26.0%)	0.122
		5% Glutaraldehyde.	92	88	56	236 (68.2%)	
		Iodophor	6	9	5	20 (5.7%)	
6	What is the ideal temperature and time required for sterilization using autoclave?	121 C for 15 min	133	110	78	301 (86.9%)	0.092
		130 C for 3 min	5	0	0	5 (1.4%)	
		160 C for 1 hr	7	9	4	20 (5.7%)	
7	What is the acceptable number of bacteria in the water used in dental units?	500-1000 CFU per mL of heterotrophic water bacteria	28	26	16	70 (20.2%)	0.778
		less than 200 CFU per ml of heterotrophic water bacteria	24	22	9	55 (15.8%)	
		less than or equal to 250 CFU per mL of heterotrophic wate	29	25	17	71 (20.5%)	
		less than or equal to 500 CFU per mL of heterotrophic wate	64	46	40	150 (43.3%)	

Continue.....

8	Which is the common micro-organism present in Dental water pipelines?	Actinomyces	28	10	7	45 (13.0%)	0.021*
		Legionella Pneumoniae	65	59	31	155 (44.7%)	
		Staphylococcus	18	22	21	61 (17.6%)	
		Streptococcus	34	28	23	85 (24.5%)	
9	Highest rate of transmission via needle stick injury?	Hepatitis B	105	83	58	246 (71.0%)	0.102
		Hepatitis C	5	2	3	10 (2.8%)	
		HIV	35	29	21	85 (24.5%)	
		Tetanus	0	5	0	5 (1.4%)	
10	How much dosage do you think is required for a hepatitis B vaccination?	1 Dose every year	2	6	2	10 (2.8%)	0.058
		2 Dose (0,6 month)	21	6	8	35 (10.1%)	
		3 Dose (0,1,6 month)	122	107	72	301 (86.9%)	
11	What type of mask do you prefer to prevent microbial transmission?	3 ply mask	26	41	19	86 (24.8%)	0.013*
		Cloth mask	5	0	0	5 (1.4%)	
		Face shield	18	11	11	40 (11.5%)	
		N95 mask	96	67	52	190 (54.9%)	
12	How often do you think eye wear is necessary for a dental practice?	Always	76	55	39	170 (49.1%)	0.574
		Sometimes	69	64	43	176 (50.8%)	
13	How often do you wash your hands during patient care?	Before and after treating the patient.	90	83	47	220 (63.5%)	0.303
		Every time you remove your gloves.	43	28	24	95 (27.4%)	
		Only after treating the patient.	12	8	11	31 (8.9%)	
14	Do you wear gloves while arranging your instruments in the tray?	No, I don't wear.	31	48	27	106 (30.6%)	0.004*
		Not necessary	12	7	1	20 (5.7%)	
		Yes, I wear gloves every time I arrange my instruments.	102	64	54	220 (63.5%)	
15	How often do you disinfect dental water pipelines?	After every patient treatment for 20-30 sec	25	17	13	55 (15.8%)	0.103
		At the beginning of the day for 1 min	48	30	28	106 (30.6%)	
		At the end of the day for 10-20 sec	55	41	29	125 (36.1%)	
		Never	17	31	12	60(17.3%)	
16	What type of water do you use for patient care?	Drinking water	38	29	18	88 (25.4%)	0.153
		Distilled water	31	29	21	81(23.4%)	
		Saline	40	17	18	75 (21.6%)	
		Tap Water	36	44	25	105 (30.3%)	

Continue.....

17	What will you do if u drop an instrument?	Pick up immediately with gloves and use it.	5	0	0	5 (1.4%)	0.057
		Pick up with Gloves, disinfect it and use it.	6	3	6	15 (4.3%)	
		Pick up without Gloves, disinfect it and use it.	21	11	8	40 (11.5%)	
		Use an alternate instrument.	113	105	68	286 (82.6%)	
18	What method of sterilization do you use in your clinic?	Chemical method	17	8	5	30(8.6%)	0.396
		Dry Heat	24	24	12	60 (17.3%)	
		Moist Heat	104	87	65	256 (73.9%)	
19	Are you vaccinated for hepatitis B?	No	34	33	28	95 (27.4%)	0.221
		Yes	111	86	54	251 (72.5%)	
20	If yes, how many doses have you taken?	Zero dose	34	33	28	95 (27.4%)	0.001**
		One dose	41	28	26	95 (27.4%)	
		Three doses	16	28	2	46 (13.2%)	
		Two doses	54	30	26	110 (31.7%)	
21	What will you do immediately after a needle stick injury?	Apply a bandage directly.	5	0	0	5 (1.4%)	0.012*
		Apply a disinfectant immediately.	17	16	12	45(13.0%)	
		Squeeze the blood out and then apply pressure.	51	29	35	115(33.2%)	
		Wash with soap water first.	72	74	35	181(52.3%)	

Table 2: Descriptive mean scores of knowledge, Attitude and practice about Infection control measure among the students.

		N	Mean	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum	F	P-Value
					Lower Bound	Upper Bound				
Knowledge	Intern	145	6.94 ± 1.5	.131	6.69	7.20	3	9	1.129	0.325
	PG Resident	119	7.19 ± 1.4	.129	6.94	7.45	3	10		
	UG Final Year	82	6.94 ± 1.3	.152	6.64	7.24	3	9		
	Total	346	7.03 ± 1.4	.079	6.87	7.18	3	10		
Attitude	Intern	145	1.90 ± 0.8	.071	1.76	2.04	0	3	6.909	0.001**
	PG Resident	119	2.20 ± 0.7	.066	2.07	2.33	0	3		
	UG Final Year	82	1.83 ± 0.7	.086	1.66	2.00	0	3		
	Total	346	1.99 ± 0.8	.043	1.90	2.07	0	3		
Practice	Intern	145	3.59 ± 1.1	.097	3.40	3.78	0	7	0.563	0.563
	PG Resident	119	3.71 ± 1.4	.137	3.44	3.99	0	7		
	UG Final Year	82	3.52 ± 1.2	.138	3.25	3.80	0	7		
	Total	346	3.62 ± 1.3	.070	3.48	3.75	0	7		

Table 3: Correlation between Knowledge, Attitude and Practice scores

Correlation		Knowledge	Attitude	Practice
Knowledge	Pearson Correlation	1	.122*	.185**
	Sig. (2-tailed)		.023	.001
	N	346	346	346
Attitude	Pearson Correlation	.122*	1	.118*
	Sig. (2-tailed)	.023		.028
	N	346	346	346
Practice	Pearson Correlation	.185**	.118*	1
	Sig. (2-tailed)	.001	.028	
	N	346	346	346
*. Correlation is significant at the 0.05 level (2-tailed).				
**. Correlation is significant at the 0.01 level (2-tailed).				

The study assessed the knowledge, attitude, and practice (KAP) related to sterilization and infection control measures among dental students, including interns, postgraduate (PG) residents, and final-year undergraduate (UG) students. The findings provide critical insights into their KAP levels.

Knowledge

The overall knowledge score among participants was moderate, with a mean score of 7.03 out of 10. PG residents had a slightly higher mean score (7.19) compared to interns (6.94) and BDS IV Year students (6.94), likely due to advanced training (Table 2). Specific knowledge gaps were identified, such as the biological indicator for sterilization, where only 78.3% correctly identified *Bacillus steothermophilus*, and the acceptable number of bacteria in dental unit water, where responses varied. Additionally, 44.7% identified the predominant organism in dental water pipelines, and 71% correctly stated Hepatitis B as transmissible via needle stick injuries (Table 1).

Most students demonstrated familiarity with basic sterilization methods, but gaps remained in specific areas. Studies by Moradi et al. (2013) [5] and Singh et al. (2011) [6] reported similar findings, highlighting deficiencies in understanding indicators. In contrast, Shamiri et al. (2019) [7] found higher knowledge scores in Saudi Arabia, likely due to differences in curricula. Addressing these gaps through targeted educational programs with practical demonstrations could improve knowledge.

Attitude:

Attitude scores were low across groups, with a mean of 1.99 out of 3. PG residents scored higher (2.20) compared to interns (1.90) and BDS IV Year students (1.83) (Table 2). Low scores regarding eyewear use (49.1%) and hand hygiene practices (63.5%) (Table 1) suggest underestimation of infection control's importance.

Higher attitude scores were observed in El-Houfey et al.'s (2016) study in Egypt, especially for PPE use and hand hygiene [8]. Similar to this study, Alshiddi (2015) in Riyadh highlighted a lack of consistent use of PPE and hand hygiene, suggesting that despite adequate knowledge, attitudes towards these practices may be influenced by factors such as perceived risk, peer behavior, and the availability of resources[9]. Enhancing attitudes requires fostering a safety culture, integrating infection control practices in training, and faculty role modeling.

Practice:

Practice scores were moderate, with a mean of 3.62 out of 7. PG residents scored highest (3.71), followed by interns (3.59) and BDS IV Year students (3.52) (Table 2). Variability was observed in wearing gloves during instrument arrangement and disinfecting dental water pipelines. Notably, 27.4% were unvaccinated for Hepatitis B, and only 13.2% had completed all three doses ($p=0.001$). Washing with soap after needle stick injuries was reported by 52.3% ($p<0.05$) (Table 1).

A positive correlation was found between knowledge and practice (r = 0.185, p = 0.001), knowledge and attitude (r = 0.122, p = 0.023), and attitude and practice (r = 0.118, p = 0.028). These findings align with Otieno et al. (2020) in Nairobi, where practice inconsistencies stemmed from inadequate monitoring [10]. Similarly, Ghimire et al. (2018) in Nepal highlighted lapses in consistent hand hygiene and glove use [11].

Knowledge positively influences practice, but a supportive attitude is necessary for effective implementation. El-Saaidi et al. (2021) in Egypt reported strong knowledge-practice correlations, underscoring the importance of attitude in translating knowledge into action [12]. Ehsani et al. (2014) in Iran observed weaker correlations due to limited training [13]. Studies by Cheng et al. (2012) [14] and De Souza et al. (2006) [15]found that majority ofdental students followed basic infection control measures, including wearing gloves, masks, and eye protection during dental procedures. While some infection control protocols, such as the proper handling of contaminated instruments and surfaces, were not uniformly understood or practiced by students.

The positive correlations between knowledge, attitude, and practice highlight the importance of a comprehensive approach to infection control education. Enhancing knowledge, fostering positive attitudes, and ensuring consistent practices through audits and feedback can help standardize infection control measures. The study also highlights the need for continuous professional development, even beyond formal education, to ensure that dental professionals maintain high standards of infection control throughout their careers.

Limitations

The limitations of the study must be acknowledged. The sample size did not represent the entire student population limiting the generalizability of the study. Reliance on the data obtained from surveys might restrict the in-depth understanding of the students' clinical practices.

Implications for Future Research:

Future research could focus on identifying the barriers to the consistent application of infection control practices and exploring the role of continuous professional development and peer influence in shaping attitudes and behaviors. Additionally, longitudinal studies could provide insights into how KAP evolves with experience and how targeted interventions during dental education could lead to sustained improvements in practice.

Conclusion

The comparisons with other studies suggest that while the findings of this study are in line with global trends, there are specific areas where improvement is needed, particularly in fostering a more positive attitude towards infection control and ensuring consistent practice. The moderate correlations between KAP components underline the importance of a comprehensive approach that not only educates but also motivates and supports dental students in adhering to high standards of infection control.

These findings highlight the critical need for educational institutions to not only impart knowledge but also to cultivate a culture of safety and responsibility among dental students. By doing so, we can ensure that future dental professionals are well-equipped to protect themselves and their patients from infection risks, ultimately leading to better clinical outcomes and enhanced public health.

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Original Article

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Efficacy and Safety of Acetyl-L-Carnitine and Agmatine Sulfate Compared to Escitalopram in Major Depressive Disorder: A Double-Blind Study

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Abstract

Background: To evaluate the efficacy and safety of fixed dose combination (FDC) containing Acetyl-L-carnitine and Agmatine Sulfate versus Escitalopram in treating Major Depressive Disorder (MDD).

Methods: Sixty participants, aged 18-65, diagnosed with MDD, were randomized to receive either Fixed dose containing (FDC) containing Acetyl-L-carnitine and Agmatine Sulfate or Escitalopram for 28 days. Depression severity was measured using the Hamilton Rating Scale for Depression (HAM-D17) and Montgomery-Asberg Depression Rating Scale (MADRS). Safety was assessed by monitoring adverse events and vital signs. FDC containing Acetyl-L-carnitine and Agmatine Sulfate significantly reduced HAM-D17 and MADRS scores more than Escitalopram (mean changes: -8.67 vs. -3.80 and -12.33 vs. -9.66, respectively). Adverse events were fewer in the FDC containing Acetyl-L-carnitine and Agmatine Sulfate group, with only one reported case compared to seven in the Escitalopram group.

Conclusion: FDC containing Acetyl-L-carnitine and Agmatine Sulfate demonstrated superior efficacy and a better safety profile compared to Escitalopram, suggesting it as a promising alternative treatment for MDD. Further research is needed to confirm long-term benefits and optimal dosing.

Key words: MDD, Acetyl-L-carnitine, Agmatine Sulfate, Escitalopram, Depression.

Introduction

Major Depressive Disorder (MDD) is a mental health disorder characterized a persistently low or depressed mood and also loss of interest in enjoyable activities. Other symptoms are persistent fatigue, significant changes in appetite or weight and

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sleep disturbances. MDD also presents emotional challenges such as excessive guilt and a lack of drive, alongside cognitive impairments.[1]

Approximately 300 million people worldwide are getting affected by MDD, with increasing prevalence across all age groups, including pregnant women, the elderly, and children.[2-3]Globally, an estimated 5% of adults suffer from depression in any given year. In India, a recent study found that the overall weighted prevalence of depression is 8.6%, indicating a higher burden compared to the global average. Furthermore, among the estimated 29.6 million middle-aged and older adults affected by depression across the country, approximately 29.1 million remain untreated, highlighting a significant gap in mental health care.[4-5]

Clinical manifestations are consistent with those defined in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5): persistent depressed mood, reduced interest in daily activities, and an increased risk of suicide.[6-7]

Although Major Depressive Disorder (MDD) is common and associated with substantial psychological and socio-economic burden, treatment is limited by its heterogeneity and relatively poor response rates to standard antidepressants (SSRIs in particular). SSRIs, such as Escitalopram, are prescribed extensively; however, a high percentage of patients do not experience remission from all symptoms, and many will experience negative side effects. These challenges call for innovative therapeutic strategies with improved efficacy and safety profiles.

Acetyl-L-carnitine (ALC) as well as Agmatine Sulfate are novel candidates for the treatment of MDD. ALC supports mitochondrial energy production and exhibits neuroprotective and antidepressant-like effects by enhancing neuroplasticity and regulating neurotransmitters. Clinical research suggests that ALC is able to address depressive symptoms within a short time span through epigenetic effects and affect quality of life in a positive manner. [10-11] Agmatine, a polyamine derived from arginine, interacts with serotonin and glutamate systems, leading to modulation of inflammatory pathways and gut microbiota which have fast and long-term antidepressant effects.[12-13]

The present study assesses the effectiveness and safety of a fixed-dose combination (FDC) of Acetyl-L-carnitine and Agmatine Sulfate in MDD. The primary objective is to compare the reduction in depressive symptoms achieved by this combination to that of Escitalopram over 28 days. The secondary objective is to assess the safety and overall effectiveness of this FDC treatment, aiming to provide an alternative therapeutic option with synergistic benefits for patients with MDD.

Material and Methods

This is a double-blind, randomized, controlled trial was designed to assess the efficacy and safety of FDC of Acetyl-L-carnitine (500mg) and Agmatine Sulfate (250 mg) compared to Escitalopram (10 mg) in patients with Major Depressive Disorder (MDD). The study was conducted at a single center and included a total of 60 participants, both male and female, aged between 18 and 65 years. The study duration was 38 days, including a 3-day screening period, 28 days of treatment, and a 7-day follow-up period.

IMP Procurement, blinding and supply

The IMPs used in this study were procured from the market. A fixed-dose combination of Acetyl-L-carnitine and Agmatine Sulfate was manufactured by Celagenex Research (India) Pvt. Ltd. under the brand name Rejiyana®, while Escitalopram was manufactured by Sun Pharmaceutical Industries Ltd under the brand name of Nexito.

To maintain blinding, an unblinded pharmacist handled the repackaging and relabelling of the IMPs. As this was a double-blind study, the repackaged and relabelled study drugs were then shipped to the clinical site, ensuring that the blind was preserved throughout the study.

Participants were randomly assigned to one of two groups: Group A received FDC of Acetyl-L-carnitine and Agmatine Sulfate while Group B received Escitalopram. Both the participants and the study personnel were blinded to the treatment assignments to minimize bias.

Study Procedure and Assessments

The inclusion criteria for the study were participants with a HAM-D score of 18 and above,

those suffering from mild to severe depression, aged 18-65 years, and willing to provide signed informed consent. Additionally, participants with stable comorbid conditions such as diabetes or hypertension, receiving standard treatment for at least six months, were included. Exclusion criteria were patients with bipolar affective disorder, any form of schizophrenia, tuberculosis, or sarcoidosis, pregnant or lactating women, known allergies or intolerances to the study medication, women of childbearing potential not willing to use effective contraception, patients with high suicidal risk (MADRS >3), and those with significant medical disorders like hepatic insufficiency, uncontrolled diabetes, or renal impairment.

Primary outcomes were measured using the HAM-D17 and MADRS at baseline and at the end of the treatment period (Day 28). Secondary outcomes, including CGI scores and adverse events, were monitored throughout the study duration. Socio-demographic factors, known side effects of the experimental drug, severe adverse events, use of dietary supplements, and a full medication list were recorded at baseline and follow-up visits. Treatment adherence was assessed by counting the number of returned medication bottles at Day 28.

Data was analyzed using standard statistical methods. The efficacy of the treatment was evaluated by comparing the mean changes in HAM-D17 and MADRS scores from baseline to the end of the treatment period between the two groups. Secondary outcomes, such as CGI scores and the incidence of adverse events, were analyzed descriptively. This rigorous methodology ensures the reliability and validity of the study results, providing critical insights into the potential benefits of FDC of Acetyl-L-carnitine and Agmatine Sulfateas a novel treatment for Major Depressive Disorder.

Results and Discussion

The study included 60 participants, divided equally between the FDC of Acetyl-L-carnitine and Agmatine Sulfate group and the Escitalopram group, each consisting of 30 participants. All enrolled participants were Asian with mean age of 40.27 (FDC of Acetyl-L-carnitine and Agmatine Sulfate) and 37.2 years (Escitalopram). The gender distribution was relatively balanced, with 31 males (51.67%) and 29 females (48.33%).*(see figure 1)*

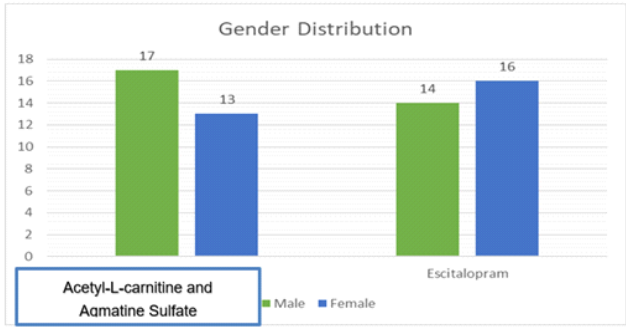


Figure 1: Gender distribution of the participants in each group

Vital signs of participants

The vital signs of participants were monitored at the start (Day 0) and the end (Day 28) of the study. In the Acetyl-L-carnitine and Agmatine Sulphate group, the mean pulse rate increased slightly from 80.83 to 81.96 beats per minute. Similarly, in the Escitalopram group, the pulse rate increased from 81.36 to 82.75 beats per minute.

For body temperature, the Acetyl-L-carnitine and Agmatine Sulfate group showed a slight increase from 97.46°F to 97.53°F, while the Escitalopram group remained relatively stable, changing from 97.44°F to 97.46°F.

The respiratory rate for Acetyl-L-carnitine and Agmatine Sulfate group increased marginally from 16.7 to 16.81 breaths per minute, whereas the Escitalopram group showed a slight decrease from 16.93 to 16.67 breaths per minute.

Seated systolic blood pressure in the Acetyl-L-carnitine and Agmatine Sulfate group rose slightly from 117.16 mmHg to 117.51 mmHg, and in the Escitalopram group, it increased from 117.2 mmHg to 117.64 mmHg. Finally, seated diastolic blood pressure in the Acetyl-L-carnitine and Agmatine Sulfate group increased from 79.83 mmHg to 80.37 mmHg, and in the Escitalopram group, it rose from 78.96 mmHg to 80.21 mmHg. Overall, the vital signs remained stable across both treatment groups, indicating that both treatments were well-tolerated with no significant adverse impacts on these parameters.*(see Table 1)*

Table 1: Vital Signs of Participants at Day 0 and Day 28

	Acetyl-L-carnitine and Agmatine Sulfate		Escitalopram	
	Day 0	Day 28	Day 0	Day 28
	(N=30)	(N=27)	(N=30)	(N=28)
Pulse Rate (Beats/Min)				
Mean (SD)	80.83 (3.86)	81.96 (4.27)	81.36 (3.25)	82.75 (3.32)
Median	81	82	82	83
Min, Max	70, 89	71, 89	73, 85	74, 88
Body Temperature (°F)				
Mean (SD)	97.46 (0.24)	97.53 (0.24)	97.44 (0.22)	97.46 (0.19)
Median	97.4	97.6	97.4	97.5
Min, Max	96.9, 98	97.1, 97.9	97, 97.9	97.1, 97.9
Respiratory Rate (Breaths/Min)				
Mean (SD)	16.7 (1.08)	16.81 (1.07)	16.93 (0.90)	16.67 (1.09)
Median	17	17	17	17
Min, Max	15, 18	15, 18	15, 18	15, 18
Seated Systolic Blood Pressure (mmHg)				
Mean (SD)	117.16 (5.45)	117.51 (5.48)	117.2 (5.16)	117.64 (5.02)
Median	119	118	120	119.5
Min, Max	110, 126	110, 127	110, 124	110, 125
Seated Diastolic Blood Pressure (mmHg)				
Mean (SD)	79.83 (2.52)	80.37 (1.94)	78.96 (2.79)	80.21 (3.25)
Median	80	80	80	80.5
Min, Max	72, 88	76, 84	70, 82	70, 88

Efficacy Outcomes

Hamilton Rating Scale for Depression (HAM-D17)

At baseline (Day 0), the mean HAM-D17 score for the Acetyl-L-carnitine and Agmatine Sulfate group was 20.46 (SD 1.94), which decreased to 11.79 (SD 3.29) on Day 28, reflecting a mean change of -8.67 (SD 1.35). The p-value for this change was 0.00, indicating statistical significance. In the Escitalopram group, the mean HAM-D17 score was 19.93 (SD 1.01) at baseline, which decreased to 16.13 (SD 3.00) on Day 28, resulting in a mean change of -3.80 (SD 1.98) with a p-value of 0.00.*(see Table 2)*

Table 2: Sum of the Hamilton Rating Scale for Depression (17-items) (HAM-D17)at Day 0 and Day 28

	Day 0	Day 28	Change from day 0
Acetyl-L-carnitine and Agmatine Sulfate			
Mean (SD)	20.46 (1.94)	11.79 (3.29)	-8.67 (1.35)
Median	20	12	-
Min, Max	18, 25	6, 18	-12, -7
p value	-	-	0.00
Escitalopram			
Mean (SD)	19.93 (1.01)	16.13 (3.00)	-3.80 (1.98)
Median	20	16	-
Min, Max	18, 22	11, 21	-7, -1
p value	-	-	0.00

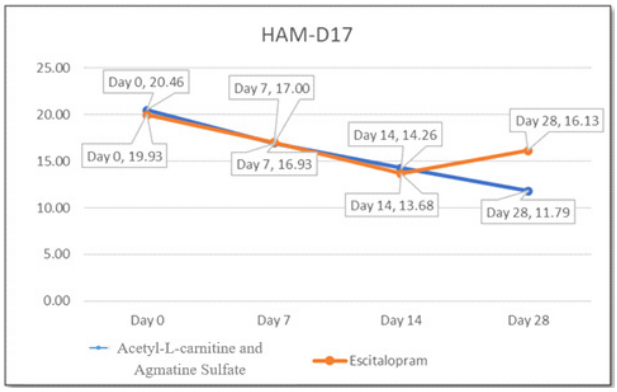


Figure 2: Sum of the Hamilton Rating Scale for Depression (17-items) (HAM-D17)at Day 0 and Day 28

Figure 2 shows sum of the Hamilton Rating Scale for Depression (17-items) (HAM-D17). The line graph shows that the decrease is is statistically significant in both group but REJIYANA® provided more favorable outcomes compared to Escitalopram.

Montgomery-Asberg Depression Rating Scale (MADRS)

For the Acetyl-L-carnitine and Agmatine Sulfate group, the baseline MADRS score was 30.70 (SD 4.38), which decreased to 18.36 (SD 4.87) on Day 28, showing a mean change of -12.33 (SD 0.49) with a p-value of 0.000. In the Escitalopram group, the baseline MADRS score was 30.43 (SD 4.09), which decreased to 20.76 (SD 5.56) on Day 28, resulting in a mean change of -9.66 (SD 1.46) with a p-value of 0.000.*(see Table 3)*

Table 3: Sum of Montgomery-Asberg Depression Rating Scale at Day 0 and Day 28

	Day 0	Day 28	Change from day 0
Acetyl-L-carnitine and Agmatine Sulfate			
Mean (SD)	30.70 (4.38)	18.36 (4.87)	-12.33 (0.49)
Median	30	19	-
Min, Max	24, 40	0, 24	-24, -16
p value	-	-	0.000
Escitalopram			
Mean (SD)	30.43 (4.09)	20.76 (5.56)	-9.66 (1.46)
Median	30	19.5	-
Min, Max	23, 38	11, 35	-12, -3
p value	-	-	0.000

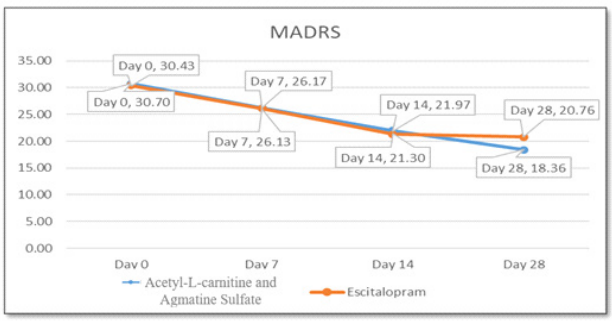


Figure 3: Sum of the Montgomery-Asberg Depression Rating Scale (MADRS):

The line graph (figure 03) shows that This decrease is statistically significant in both group but FDC of Acetyl-L-carnitine and Agmatine Sulfate provided more favorable outcomes compared to Escitalopram.

Clinicians Global Impressions (CGI) Score – Severity of Illness

There was a visible shift in the CGI severity of illness scores from moderately ill to mildly and borderline mentally ill conditions from Day 0 to Day 28, indicating better outcomes for the Acetyl-L-carnitine and Agmatine Sulfate group. (see Table 4)

Table 4: Change in number and proportion of subjects over severity of illness from Day 0 to 28

	Day 0	Day 28	Day 0	Day 28
	Acetyl-L-carnitine and Agmatine Sulfate		Escitalopram	
0 = Not assessed	0	0	0	0
1 = Normal, not at all ill	0	0	0	0
2 = Borderline mentally ill	0	16	0	10
3 = Mildly ill	1	13	0	18
4 = Moderately ill	28	0	29	2
5 = Markedly ill	1	0	1	0
6 = Severely ill	0	0	0	0
7 = Among the most extremely ill patients	0	0	0	0

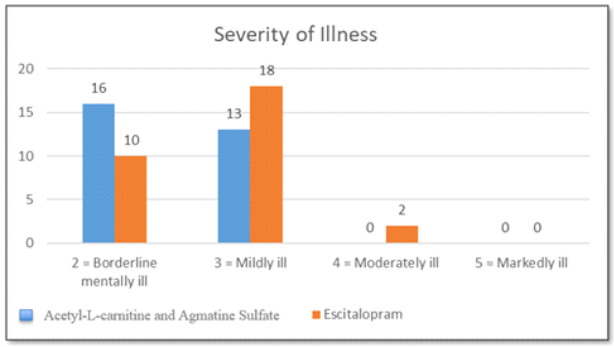


Figure 4: Sum of the Montgomery-Asberg Depression Rating Scale (MADRS):

In figure 04, there is a visible shift from moderately ill to mildly and borderline mentally ill condition from Day 0 to 28. This graph represents the number of patients at day 28 according to the severity of their illness, clearly demonstrating better outcomes for Acetyl-L-carnitine and AgmatineSulfategroup

Clinicians Global Impressions (CGI) Score – Global Improvement

By Day 28, 21 participants in the Acetyl-L-carnitine and AgmatineSulfategroup were rated as "much improved" compared to 11 participants in the Escitalopram group. Additionally, 8 participants in the Acetyl-L-carnitine and Agmatine Sulfategroup were "minimally improved," while 17 participants in the Escitalopram group fell into this category. Notably, 4 participants in the Escitalopram group showed no change, whereas all participants in the Acetyl-L-carnitine and Agmatine Sulfategroup exhibited some level of improvement, underscoring the superior outcomes of the Acetyl-L-carnitine and AgmatineSulfatetreatment. (see Table 5)

Table 5: Change in number and proportion of subjects over Global Improvement from day 0 to 28

	Day 0	Day 28	Day 0	Day 28
	Acetyl-L-carnitine and Agmatine Sulfate		Escitalopram	
0 = Not assessed	0	0	0	0
1 = Very much improved	0	0	0	0
2 = Much improved	0	21	0	11
3 = Minimally improved	0	8	0	17
4 = No change	30	0	30	2
5 = Minimally worse	0	0	0	0
6 = Much worse	0	0	0	0
7 = Very much worse	0	0	0	0

Safety and Adverse Events

The incidence of adverse events was lower in the Acetyl-L-carnitine and Agmatine Sulfategroup compared to the Escitalopram group. Only one participant in the Acetyl-L-carnitine and Agmatine Sulfategroup reported nausea and vomiting, while the Escitalopram group had a higher incidence of adverse events, including nausea and vomiting (3 participants), headache (1 participant), giddiness (1 participant), burning sensation (1 participant), and insomnia (1 participant). Overall, adverse events were reported in 7 participants in the Escitalopram group compared to 1 participant in the Acetyl-L-carnitine and Agmatine Sulfategroup.

Regarding the causality and severity of these adverse events in the Acetyl-L-carnitine and Agmatine Sulfategroup, the single adverse event was deemed unlikely related to the treatment and was mild in severity. In the Escitalopram group, 5 of the 7 adverse events were considered probable or likely related to the treatment, with all events being mild in severity. (see Table 6 and 7)

Table 6: Safety and Adverse events

	Acetyl-L-carnitine and Agmatine Sulfate (N=30)	Escitalopram (N=30)	Overall (N=60)
Nausea and vomiting	1 (100%)	3 (42.85%)	4 (50%)
Headache	0 (00.00%)	1 (14.28%)	1 (12.5%)
Giddiness	0 (00.00%)	1 (14.28%)	1 (12.5%)
Burning sensation	0 (00.00%)	1 (14.28%)	1 (12.5%)
Insomnia (Sleeplessness)	0 (00.00%)	1 (14.28%)	1 (12.5%)

Table 7: Causality and Severity of Adverse Events

	Acetyl-L-carnitine and AgmatineSulfate (N=30)	Escitalopram (N=30)	Overall (N=60)
All AEs	1 (100%)	7(100%)	8 (100%)
Causality			
4= Unlikely	1 (100%)	2 (28.57%)	3 (37.5%)
2= Probable/Likely	0 (00.00%)	5 (71.42%)	5 (62.5%)
Severity of AEs			
Grade 1= Mild	1 (100%)	7(100%)	8 (100%)

Lab Investigations

The laboratory investigations revealed no significant adverse effects related to the biochemical parameters monitored. In the Acetyl-L-carnitine and Agmatine Sulfategroup, the mean serum phosphate levels decreased slightly from 3.43 (SD 0.60) at baseline to 3.22 (SD 0.59) on Day 28. Similarly, the Escitalopram group showed a reduction in mean serum phosphate levels from 4.15 (SD 2.13) to 3.58 (SD 0.87). Serum calcium levels remained stable in both groups, with the Acetyl-L-carnitine and Agmatine Sulfategroup showing a minimal change from 9.66 (SD 0.50) to 9.62 (SD 0.41), and the Escitalopram group from 9.65 (SD 0.40) to 9.57 (SD 0.49).

Parathyroid hormone (PTH) levels decreased in both groups, from 64.79 (SD 38.77) to 59.79 (SD 30.30) in the Acetyl-L-carnitine and Agmatine Sulfategroup and from 61.01 (SD 26.23) to 54.24 (SD 21.81) in the Escitalopram group. HbA1c levels also showed a decrease, with the Acetyl-L-carnitine and AgmatineSulfategroup dropping from 6.17 (SD 1.56) to 5.87 (SD 1.22), and the Escitalopram group from 5.92 (SD 0.99) to 5.70 (SD 0.67).

For thyroid function, the Acetyl-L-carnitine and Agmatine Sulfategroup exhibited a slight increase in TSH levels from 2.95 (SD 4.52) to 3.39 (SD 7.62), while the Escitalopram group saw a decrease from 4.00 (SD 6.66) to 3.84 (SD 5.19). T3 levels remained stable in the Acetyl-L-carnitine and Agmatine Sulfategroup, changing minimally from 1.08 (SD 0.26) to 1.07 (SD 0.17), and slightly increased in the Escitalopram group from 1.01 (SD 0.24) to 1.03 (SD 0.16). T4 levels decreased in both groups, from 9.40 (SD 2.29) to 8.93 (SD 1.56) in the Acetyl-L-carnitine and Agmatine Sulfategroup and from 9.12 (SD 2.25) to 8.38 (SD 2.09) in the Escitalopram group.

Overall, these laboratory findings suggest that Acetyl-L-carnitine and Agmatine is not associated with significant adverse changes in key biochemical parameters, thereby supporting its favorable safety profile compared to Escitalopram.*(see Table 8)*

Table 8: Laboratory Investigation (Biochemical Estimations) at Day 0 and Day 28

	Day 0	Day 28	Change from day 0	Day 0	Day 28	Change from day 0
	Acetyl-L-carnitine and Agmatine Sulfate			Escitalopram		
Serum Phosphate Result						
Mean (SD)	3.43 (0.60)	3.22 (0.59)	-0.20 (-0.01)	4.15 (2.13)	3.58 (0.87)	-0.56 (-1.25)
p value	-	-	0.30	-	-	0.20
Serum Calcium Result						
Mean	9.66 (0.50)	9.62 (0.41)	-0.03 (-0.09)	9.65 (0.40)	9.57 (0.49)	-0.08 (0.08)
p value	-	-	0.91	-	-	0.46
PTH Result						
Mean (SD)	64.79 (38.77)	59.79 (30.30)	-5.00 (-8.47)	61.01 (26.23)	54.24 (21.81)	-6.76 (-4.42)
p value	-	-	0.42	-	-	0.07
HbA1c Result						
Mean (SD)	6.17 (1.56)	5.87 (1.22)	-0.29 (-0.33)	5.92 (0.99)	5.70 (0.67)	-0.22 (-0.32)
p value	-	-	0.21	-	-	0.03
TSH Result						
Mean	2.95 (4.52)	3.39 (7.62)	0.44 (3.09)	4.00 (6.66)	3.84 (5.19)	-0.16 (-1.46)
p value	-	-	0.51	-	-	0.63
T3 Result						
Mean	1.08 (0.26)	1.07 (0.17)	-0.01 (-0.08)	1.01 (0.24)	1.03 (0.16)	0.02 (-0.07)
p value	-	-	0.68	-	-	0.56
T4 Result						
Mean	9.40 (2.29)	8.93 (1.56)	-0.47 (-0.73)	9.12 (2.25)	8.38 (2.09)	-0.74 (-0.15)
p value	-	-	0.05	-	-	0.00

Discussion

The findings from this double-blind, randomized, controlled trial indicate that, a combination of Acetyl-L-carnitine and AgmatineSulfate, is a promising alternative to Escitalopram for the treatment of Major Depressive Disorder (MDD). The results demonstrated that FDC of Acetyl-L-carnitine and Agmatine Sulfate significantly improved depressive symptoms, as evidenced by the reductions in Hamilton Rating Scale for Depression (HAM-D17) and Montgomery-Asberg Depression Rating Scale (MADRS) scores over the 28-day treatment period.

The primary objective of the study was to determine whether Acetyl-L-carnitine and Agmatine Sulfate could provide greater reductions in depressive symptoms compared to Escitalopram.

The data showed that participants in the Acetyl-L-carnitine and Agmatine Sulfategroup experienced a more substantial decrease in HAM-D17 scores (mean change: -8.67± 1.35) compared to those in the Escitalopram group (mean change: -3.80± 1.98). Similarly, the MADRS scores exhibited a greater reduction in the Acetyl-L-carnitine and Agmatine Sulfategroup (mean change: -12.33) compared to the Escitalopram group (mean change: -9.66). These results underscore the superior efficacy of Acetyl-L-carnitine and Agmatine Sulfatein alleviating depressive symptoms.

Secondary objectives included assessing the safety and overall efficacy of FDC of Acetyl-L-carnitine and AgmatineSulfate. The Clinicians Global Impressions (CGI) scores supported the primary efficacy findings, showing a higher number of patients in the Acetyl-L-carnitine and Agmatine Sulfategroup who were rated as "much improved" by Day 28. Additionally, the incidence of adverse events was notably lower in the Acetyl-L-carnitine and AgmatineSulfategroup, with only one reported case of nausea and vomiting, compared to seven adverse events in the Escitalopram group. This highlights the favourable safety profile of Acetyl-L-carnitine and AgmatineSulfate. All reported adverse events were of mild in nature.

Vital signs, including pulse rate, body temperature, respiratory rate, and seated blood pressure, remained stable across both treatment groups, further supporting the tolerability of Acetyl-L-carnitine and AgmatineSulfate. The minor fluctuations observed in these parameters were not clinically significant, indicating that both treatments were well-tolerated without adverse impacts on these vital signs.

Though these findings are encouraging, the study has a number of limitations. The small sample size and short follow-up (28 days) limit generalizability and preclude and assessment of the long-term safety/efficacy of the FDC. Moreover, the lack of follow-up data after treatment completion limits our understanding of the long-lasting effects of Acetyl-L-carnitine and Agmatine Sulfate. In addition, the trial did not measure any economic impact of using this combination therapy versus Escitalopram, a key factor in real-life implications, especially in resource-limited environments.

The literature supports the potential of Acetyl-L-carnitine and Agmatine Sulfate as effective treatments for depression. Acetyl-L-carnitine has been shown to enhance neuroplasticity and improve depressive symptoms through epigenetic mechanisms, including the modulation of brain-derived neurotrophic factor (BDNF) levels and glutamatergic neurotransmission. [13,16-19]Studies indicate that low blood levels of Acetyl-L-carnitine are associated with the severity and duration of depression, suggesting its critical role in the pathophysiology of MDD [16]. Furthermore, research has demonstrated that Acetyl-L-carnitine produces rapid antidepressant effects, sometimes within days of administration, which is significantly faster than conventional antidepressants. [16]

Agmatine, on the other hand, modulates several neurotransmitter systems and exhibits rapid antidepressant effects. It has shown promise in preclinical models, influencing pathways involved in stress responses and inflammation, which are key factors in the development and maintenance of depressive symptoms. [14-15] Agmatine has also been found to have neuroprotective properties and can enhance the efficacy of other antidepressant treatments [20], making it a valuable component of combination therapies like Acetyl-L-carnitine and Agmatine Sulfate.The combination of these two compounds in REJIYANA® leverages their synergistic effects, offering a novel and effective treatment for MDD.

Based on these findings, larger, multi-center trials of long durations are warranted to ascertain the long-term safety and efficacy of this combination therapy. Dose optimization, drug interactions, and the economic aspects of the therapy should also be further studied in future clinical studies. For a better understanding of the extent of benefits, it would have been beneficial to do follow-up periods after treatment to comment on the long-term effects of Acetyl-L-carnitine and Agmatine Sulfate.

Conclusion

FDC of Acetyl-L-carnitine and Agmatine Sulfate showed better effectiveness and safety compared to Escitalopram for treating Major Depressive Disorder. It significantly reduced depressive symptoms and had fewer side effects, making it a promising

alternative to traditional SSRIs like Escitalopram. Further research is needed to confirm the long-term benefits and optimal dosage of Acetyl-L-carnitine and AgmatineSulfate combination. Given the current limitations of antidepressant treatments, Acetyl-L-carnitine and Agmatine Sulfate FDC offers a new and hopeful option for managing this challenging disorder.

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Original Article

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Seroprevalence & Epidemiology of Hepatitis C Virus Infections in North India: A Hospital Based Study

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Abstract

Background: Hepatitis C is a global health problem affecting a significant portion of the world's population. Published data in North India on epidemiology, prevalence and risk factors is very limited. This study was carried out to estimate the seroprevalence, associated demographic factors influencing transmission and distribution of hepatitis C virus (HCV) in a hospital-based population in Punjab.

Methods: A total of 16920 serum samples were tested for anti HCV antibodies using commercially available kits, from August 2021to August 2023. The study highlighted on different epidemiological aspects such as age groups, sexes, likely mode of transmission and probable cause for undergoing screening procedures.

Results: The seroprevalence for anti-HCV-Ab was found to be 1.6%. Multiple blood transfusions, hemodialysis & IV drug abuse were significant risk factors. Sero-prevalence rate of HCV infection was significantly more prevalent (77 %) in male patients. IgM anti HCV reactivity was highest (42%) inage group of 20-40 years.

Conclusions: The study findings, including the overall prevalence of HCV infection, associated risk factors and demographic characteristics, can guide prevention and control efforts against Hepatitis C. The need of the hour is to increase awareness about HCV among the public and practicing physicians.

Keywords: Genotype, hepatitis C virus, risk factors, seroprevalence.

Introduction

HCV infection is a serious health problem in both developed and developing countries.[1] Hepatitis C is a single stranded RNA virus that belongs to the Flaviviridae family .Chronic liver disease (CLD) and its associated complications like cirrhosis and carcinoma may cause significant mortality, morbidity, and economic burden. Published data show that the burden of CLD is large and increasing, primarily owing to the increasing burden of nonalcoholic fatty liver disease and alcohol-related

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liver disease (ALD)[2]. In 2017 WHO reported that more than 350000 people die every year from HCV-related liver diseases,[3,4.] Six major genotypes 1–6 have been identified with genotype 1 being the most prevalent genotype globally (46%), followed by genotype 3 infecting 22% and genotype 2 and 4 infecting 13% of patients .[5]

Despite of easy availability of effective antiviral treatments in the country the burden of disease in general population has not come down. However, due to the asymptomatic nature of hepatitis C and lack of routine medical examinations, a large group of HCV infected individuals with low-grade viremia remain unaware of their infection status for years and therefore, do not pursue treatment until the symptomatic stage of liver impairment.[6]

Hepatitis C virus (HCV) infections progressively lead to liver impairment, cirrhosis and hepatocellular carcinoma.[7] Since the discovery of HCV in 1989, these infections continued to propagate across the globe despite extensive research to understand various aspects of the virus and the disease.[8] The impact of this infection is also emerging in India due to flaws in India's blood-banking system and non-implementation of international standards concerning blood transfusion, reuse of unsterilized needles, syringes and surgical instruments by quacks and menace of intravenous drug abuse.[9] North India has high occurrence of risk factors for HCV infection & it poses a significant problem in the state of Punjab, owing to the higher prevalence of risk factors like unsafe medical practices (including unsafe injections and dental procedures) and intravenous drug use.[10] There is paucity of published data on epidemiology of Hepatitis C infection in North India, particularly in Punjab.

Population-based studies on prevalence of HCV infection in India are scarce. Most of the available data are based on blood bank screening, which may not be a reliable indicator of the true infection rate. Present study was undertaken to evaluate the frequency of HCV infection in the randomly selected population presenting to a tertiary care hospital in Punjab and to assess the prevalence rate of HCV infection in the different age groups and any sex differentiation in the prevalence of HCV infection in this population.

Methods

This study was undertaken in a tertiary care hospital in Punjab, India. A total of 16920 serum samples were tested. Blood samples were randomly collected from August 2021 to August 2023 for detecting the presence of Hepatitis C infection. Inclusion criteria included all the patients 13 year and above with consent (guardian /parent consent for below 18 years) among admitted or attending OPD in the hospital and were undergoing these serology tests as part of routine pre-operative screening or for diagnostic purposes. All those who did not give consent to be the part of research were excluded from the study.

Five millilitre of blood was collected aseptically by venepuncture into sterile, disposable vacutainers without anticoagulants & labelled with patient identification details. Sample was allowed to clot at room temperature for about 1 hour for clot retraction. Serum separation was done by centrifugation at a speed of 3000 rpm for 10 minutes & stored up to 48 hours at 2°- 8°C, and was subjected to qualitative detection of IgM Anti-HCV antibody by indirect third generation ELISA method. All samples were tested as per the manufacturer's instructions with adequate quality control & the absorbance value were read at 450nm as reference wavelength by ELISA reader.

All HCV reactive patients were analysed on the basis of their demographic profiles, probable reason for testing, symptomatic evidence & probable mode of transmission

Patients were reviewed for HCV acquisition, viz. blood transfusion, surgery, needle stick injury, tattooing, unprotected intercourse with multiple sexual partners, alcohol consumption and intravenous drug abuse etc.

The data was evaluated using Microsoft Office Excel worksheet and percentage and proportions for every variable was calculated. $P \leq 0.05$ was considered to be significant.

Results

During two year of study period, a total of 16920 serum samples were tested for detection of IgM

anti-HCV antibody and prevalence rate of HCV infection was 1.6 % (n=237) (**Table 1**)

Table 1: Prevalence of Hepatitis C infection among patients in a tertiary care hospital

Age group	Number	Percentage
<20 years	5	2
21-40 years	99	42
41-60 years	81	34
61-80 years	50	21
>80 years	2	1
Mean	47.5	

Table 2: Age distribution in the study group

	Total samples received	No. of positive samples	Percentage of positive sample
Anti HCV antibody	16920	237	1.6%

The mean age of the study population was 47.5 years, ranging from 13-85 years (**Table 2**). Seroprevalence of HCV was significantly higher in males (73%) as compared to females (27%) in our study **(Table 3**)

Table 3: Sex prevalence of HCV infection in percentage

	Male	Female
Total no. of anti-HCV Ab positive cases (n=237)	(173)73%	(64)27%

The risk factor profile is depicted in **Table 4**. Not all the HCV positive patients showed association with risk factors. 46% patients (109) did not have any apparent risk factor for HCV infection, whereas 54% patients had one or more than one risk factors. A total of 42 (17.72%) patients had history of blood transfusion in the past, 21 (8.86%) had history of haemodialysis, 4 patients (1.68%) had history of tattooing, 19 (8%)patients had history of IV drug abuse, and 7(2.95%) had undergone some surgical procedure. History of alcohol consumption was available in 68 patients of which 14 had history of alcohol abuse and rest had social consumption of alcohol.

Table 4: Categorization of Hepatitis C patients according to the risk factors associated

Associated risk factors	No. of HCV infected patients	Percentage of HCV infected patients
H/o alcohol consumption	68	28.69%
Multiple blood transfusion	42	17.72%
Haemodialysis patients	31	13.08%
IV drug abuse	21	8.86%
Multiple sexual partner	11	4.64%
H/o surgical procedure	7	2.95%
H/o tattooing	4	1.68%

Most of the tested patients i.e., 78% (13198) were from Punjab, 22% (3722) were from other parts of the country. Anti-HCV prevalence was higher among rural residents (66%) than urban residents (**Table 5**).

Table 5: Locality distribution of positive subjects

Locality	Number	percentage
Rural	158	66%
Urban	79	34%
Total	237	

Table 6 depicts distribution of cases as per districts of state. Among the districts of Punjab, the highest frequency distribution of subjects was found in Doaba region. The proportion of persons testing positive for HCV differed by district, ranging from 2.95% in Tarantaran to 13.50% in Jalandhar.

Table 6: Distribution of positive patients according to districts

District (Punjab)	Number	Percentage
Faridkot	10	4.21%
Ferozpur	9	3.79%
Bathinda	12	5.06%
Jalandhar	32	13.50%
Hoshiarpur	16	6.75%
Kapurthala	12	5.06%
Ludhiana	6	2.53%
Gurdaspur	26	10.97%
Moga	16	6.75%

Continue.....

Muktsar	16	6.75%
Amritsar	29	12.23%
Nawanshahr	18	7.59%
Patiala	11	4.64%
Ropar	12	5.06%
TarnTaran	7	2.95%
Other states	05	2.1%

Discussion

This study assessed the prevalence and risk factors for HCV infection in Punjab and reported an overall prevalence of anti-HCV of 1.6%. We found that males and persons living in rural areas had the greatest odds of being infected with HCV.

In present study, mean age is 47.5 years which is quite similar to a study of symptomatic patients, which reported mean age as 49 and resembles other studies of Chronic Kidney Disease associated HCV with mean age as 48 years.[11] In few other studies done on asymptomatic patients in hospital and community, similar mean age 41.89±18.38 years was reported in HCV positive patients,[12, 13] this may be because the above age groups are most likely to indulge in risky behaviour and practices such as unprotected sex and substance abuse.

Predominant rural distribution of subjects is most likely due to lack of proper health care facilities in rural areas, reuse of unsterilized instruments and syringes by quacks, iv drug abuse and lack of awareness about the prevention and the treatment of this disease among rural people.

In our study, Hepatitis C infection was found to be more prevalent in males as compared to females. This may be because of the fact that males are more prone to harbour the risk factors for this infection like drug abuse and unprotected sex. In a population based study done in Ludhiana, overall prevalence of HCV was found to be similar among males and females.[14] However, in another study done in Faridkot district of Punjab, prevalence of active HCV infection was high (73%) in males as compared to females (26%)[15]

The prevalence of HCV was 21% in thalassemia patients and correlated with advancing age as per a study in 2001[16]. Studies from Mumbai reported the prevalence of HCV in multiple transfused patients to be 16.7%.[17] In multiple transfused haemophiliac patients the prevalence of HCV was around 23.9% in western India.[18] In a study from Kolkata the prevalence of HCV was 13% in multitransfused patients[19]. Our study re-confirms blood transfusion as the most significant route of HCV

Analysis of study done by Soodetal[20] also revealed factors like advancing age, alcoholism & history of blood transfusion, as important risk factors. Another study done on pregnant females concluded most patients had no associated risk factors, similar to this study[21]. One study by Thakral et al done on blood donors, reported history of previous surgery in 25.8% and drug abuse in 6.4%.[22]Uttarakhand based population research also revealed, blood transfusion, surgeries in the past as important associated factors [23]

The finding that blood transfusion is a risk factor for HCV, highlights the need for improved blood safety practices in Punjab.

Nationwide surveillance of hepatitis C is also lacking in the country and focuses primarily on hepatitis A and E.[24] Testing for incident HCV and HBV cases is only supported by the country's national Integrated Disease Surveillance Programme (IDSP) in outbreak situations.[24] Fortunately, treatment costs for HCV infection in India have decreased significantly with the introduction of direct acting antiviral drugs in 2015, which have proven to be highly effective.[25]

A strict control approach is the need of the hour including a mandatory screening of all blood donors and awareness should be implemented on priority. In this study, highest percentage distribution of subjects is found from Doababelt. The reason for this may be due to the fact that the hospital in which study is done is located in this area and more patients from near districts due to relative proximity may approach the hospital.

Conclusion

Hepatitis C is an emerging infection in India whose long term implications will be felt in the decades to come. Present study is very important in depicting the frequency distribution of HCV infection in districts of Punjab. It is a pathogen that is already responsible for a significant proportion of

liver disease in various regions of India. Stringent blood banking laws need to be introduced and reuse of needles should be strictly discouraged. All this is not possible without increased public awareness of the magnitude and implications of this chronic infection and its mode of spread. Health authorities have to include hepatitis C on their radar as a disease which can result in significant morbidity and mortality in the years to come. Though this study is a basic study but will surely help the epidemiologist to go for further detail on epidemiology on HCV. As there is no vaccine available for HCV, the prevention of HCV infection can be achieved by screening of blood and blood products, avoiding sharing of needles or injecting equipment.

Limitation of study: The present study was done in a single centre and needs to be conducted in multiple phases and different centres to detect the true prevalence and burden of the disease.

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Original Article

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Socio Demographic and Clinical Profile of Psychiatric Cases Reported at Malla Reddy Institute of Medical Sciences, Hyderabad, Telangana

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Abstract

Mental health disorders are a significant global health concern, affecting approximately 13% of the population. In India, the burden of mental illness is substantial, with a prevalence of around 197.3 million affected individuals. Telangana, a state in southern India, experiences a high incidence of anxiety and depressive disorders. Understanding the socio-demographic and clinical factors contributing to mental illness in these regions is crucial for improving healthcare delivery and intervention strategies.

A prospective, cross-sectional study was conducted between October 1, 2022, and March 31, 2023, including 100 patients attending the psychiatry outpatient department. Data were collected using a pre-structured questionnaire, assessing socio-demographic factors, clinical details, and stress levels using the Holmes and Rahe Stress Scale.

The study population consisted of 48 males and 55 females, with a majority (69%) residing in urban areas. The highest prevalence of mental illness was found in individuals aged 31-50 years (51%). Anxiety disorders (26%), depression (15%), alcohol dependence (15%) and schizophrenia affecting (12%), were the most common psychiatric conditions. Socio-demographic factors such as lower educational attainment, unemployment, and lower socio-economic status were associated with a higher risk of mental health disorders. The stress index indicated that 73% of participants were at moderate to high risk for mental health issues, highlighting the significant role of stress in mental illness development.

Socio-demographic factors along with high stress levels were found to contribute significantly to the prevalence of mental health disorders in the study population. These findings emphasize the need for targeted mental health interventions addressing these risk factors. Further research is needed to explore the causal relationships and regional variations in psychiatric disorders to inform more effective mental health policies and practices.

Keywords: Socio-Demographic Profile, Clinical Profile, Psychiatric disorders.

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Introduction

Mental health is defined by the World Health Organization[1] (WHO) as a state of well-being in which an individual recognizes their own abilities, can cope with the normal stresses of life, work productively, and contribute to their community. Mental health disorders encompass a broad range of conditions characterized by abnormal thoughts, perceptions, emotions, behaviors, and relationships. Among the most prevalent of these are mental illnesses and substance use disorders, which together affect approximately 13% of the global population (WHO, 2020)[2]. In the United States, a national survey[2] revealed that nearly 59% of people have experienced a mental health disorder in their lifetime (National Institute of Mental Health, 2020).

In India, the burden of mental illness is substantial. According to a 2017 report by The Lancet[3], approximately 197.3 million people in India suffer from mental disorders. Depressive disorders account for the largest share of mental health issues (33.8%), followed by anxiety disorders (19.0%), idiopathic developmental intellectual disabilities (10.8%), schizophrenia (9.8%), and bipolar disorder (6.9%). Other conditions, including conduct disorders, autism spectrum disorders, eating disorders, and attention-deficit hyperactivity disorder (ADHD), contribute to the remaining cases (Lancet, 2017). Notably, Telangana, a state in southern India, has the third-highest incidence of anxiety disorders in the country, affecting millions of individuals with depressive and anxiety disorders.

The prevalence of mental disorders in India has varied across different stages of life. Mental disorders that typically onset in childhood and adolescence are more common in states with lower Socio-Demographic Index (SDI), while the reverse trend is observed in adulthood, where mental disorders are more prevalent in higher SDI states. From 1990 to 2017, the prevalence of mental disorders in children and adolescents decreased, especially in high and middle SDI states, whereas the decline was less pronounced in low SDI states[3] (Global Burden of Disease Study, 2017).

India faces significant challenges in addressing its mental health needs, particularly due to the shortage of mental health professionals. The country has only 0.75 psychiatrists per 100,000 population, far below the recommended level of 3 psychiatrists. Additionally, India has just 0.56 mental health beds per 100,000 population, a stark contrast to countries like Sri Lanka (3.96 beds per 100,000) and South Africa[4] (4.33 beds per 100,000) (World Health Organization, 2017). Despite these challenges, the National Mental Health Survey (2015-16) estimated that 150 million Indians require care for mental disorders, with approximately 10% suffering from common mental disorders (CMD) such as depression, anxiety, and emotional stress. In response to these issues, India introduced its first National Mental Health Policy in 2014, which was later revised in 2017, aiming to provide equitable, affordable, and universal access to mental healthcare services.

Given the significant burden of mental health disorders in India, particularly in regions like Telangana, it is crucial to investigate the socio-demographic and clinical factors that contribute to mental illness in these communities. Understanding these factors can help identify risk groups, improve early intervention strategies, and optimize the allocation of healthcare resources.

This introduction sets the stage by explaining the global and national context of mental health, the specific burden in India, and the study's focus on socio-demographic and clinical factors influencing mental illness. The structure and references follow the format typically found in peer-reviewed journals.

Aim of the Study:

To identify socio-demographic and clinical factors contributing to mental illness in the geographic area of the institution.

Objectives

- To address socio-demographic factors in relation to mental illness.
- To determine the risk factors for the development of mental illness.
- To find out the stress index in relation to psychiatric illness.
- To identify the most common clinical presentations and causes of psychiatric illness.

Implications of the Study

- This study will help to determine the magnitude of psychiatric illness in the community.
- The findings will assist in identifying the most common causes of psychiatric illness in the

study area, contributing to better healthcare infrastructure and service provision.

- Insights from the study will inform health authorities to implement effective measures to control the mental illness burden.

Materials and Methods

This is a prospective, cross-sectional study conducted at Malla Reddy Institute of Medical Sciences, Hyderabad, Telangana, from October 1, 2022, to March 31, 2023 for a period of six months. 100 patients attended the psychiatry outpatient department during the study period was considered. Study was conducted after obtained informed consent from each participant and the names of the participants were kept anonymous.

Inclusion Criteria & Exclusion Criteria:

Patients attended to the outpatient department with a diagnosed mental illness (Anxiety related disease, depression, alcohol dependence, schizophrenia and other psychiatric related diseases) who were willing to participate in the study. Patients who did not meet the inclusion criteria, other than psychiatric illness were excluded.

Data Collection: A pre-structured questionnaire was used to collect socio-demographic and clinical details, including:

1. Age, gender, religion, and residence (urban/rural)
2. Educational qualification, occupation, and socio-economic status (Kuppuswamy classification)
3. Family history of mental illness or genetic diseases
4. Previous psychiatric or medical history, including trauma
5. Personal habits (smoking, alcohol, drug use)
6. Marital status, family structure (nuclear/joint), and living situation (alone/family/friends)
7. Clinical presentation, diagnosis, and treatment history
8. Stress index (Holmes and Rahe Stress Scale)

Data were entered into a pre-designed data sheet and analyzed using Excel 2019 and SPSS (V22.0).

Results

Cross sectional study on socio demographic and clinical study on Psychiatric case profile was conducted at Malla Reddy institute of medical sciences, Hyderabad Telangana. 100 cases of mentally ill persons were considered for this study, which including 48 male and 55 female population.

Table 1: Socio demographic details of study population

Variable	Results	Variable	Results
Religion	Hindu-76%, Muslim-19% and Christian-5%	Age group	<10 years-1%, 10-20 8%, 21-30= 31%, 31-50=51% and above 50 years=12%
Residence	Urban-69%, Rural-31%	Type of family	Nuclear-91%, Joint-9%
Education	Illiterates-27%, up to 10th class-38%, Intemediate-12%, Graduates-24% and post graduates-2%	Occupation	Un-employed-54%, Employees-17%, professional work- 5% and others workers -24%

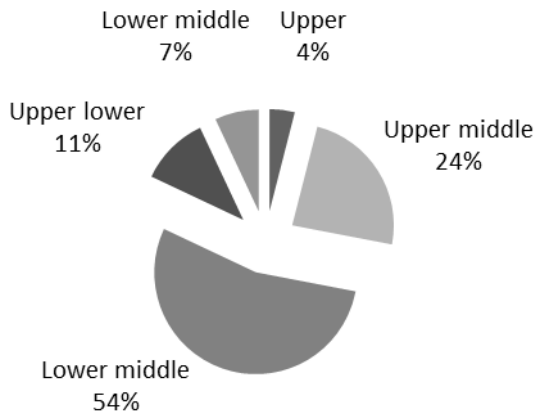


Figure 1: Showing the details of Socio economic status in the study population

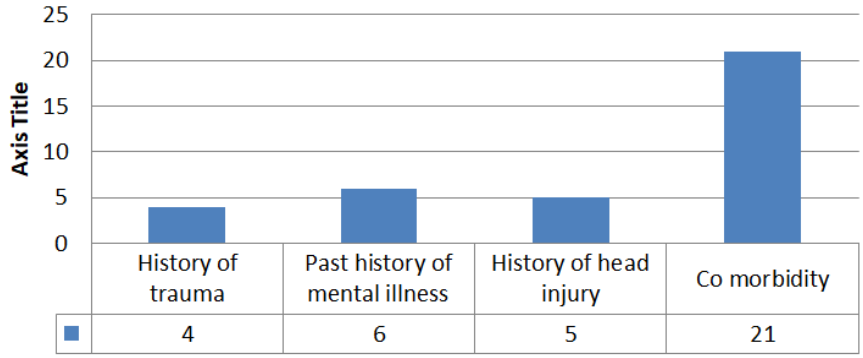


Figure 2: Showing the details of past history of illness and injury in the study population.

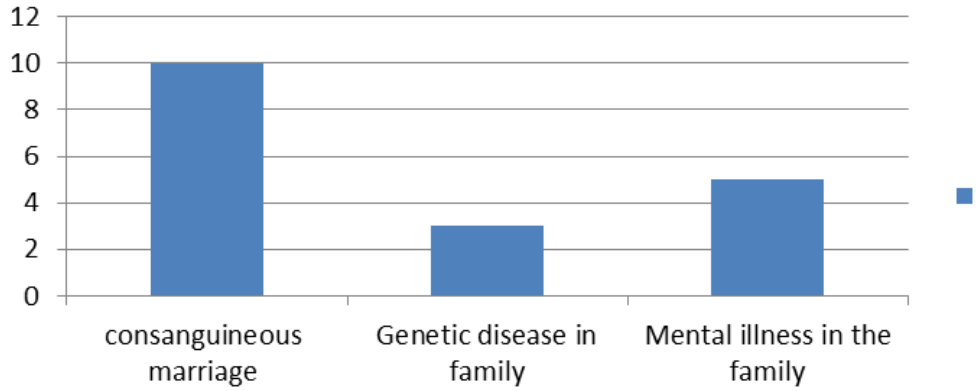


Figure 3: Showing the details of past history of illness and injury in the study group.

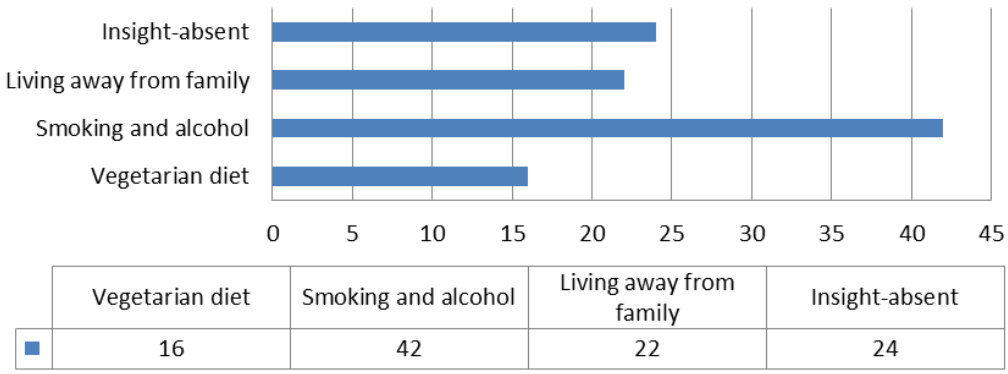


Figure 4: showing the details of personnel history in the study group.

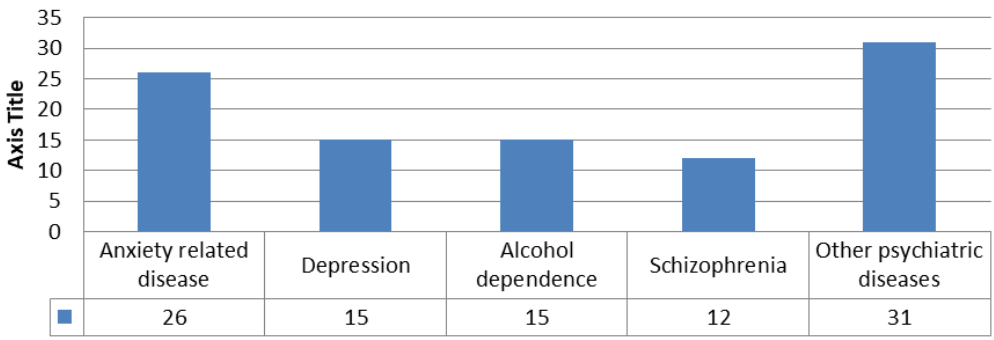


Figure 5: psychiatric diseases observed in the study group.

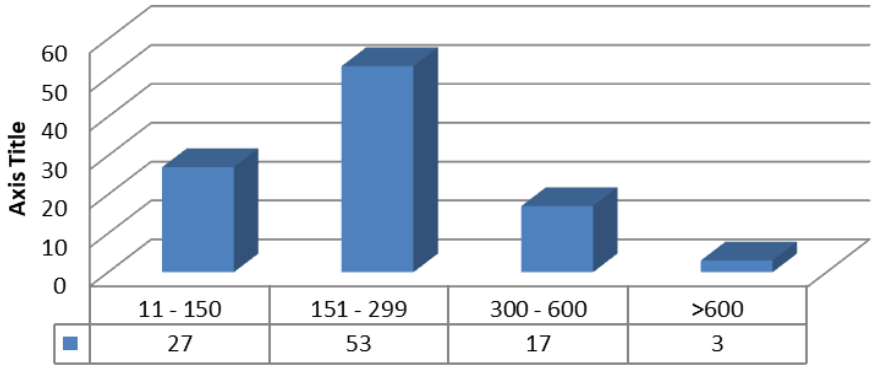


Figure 6: Stress index (Holmes and Rahe Stress Scale) in the study population.

Discussion

This cross-sectional study aimed to explore the socio-demographic and clinical profiles of psychiatric patients at Malla Reddy Institute of Medical Sciences, Hyderabad, Telangana. The study, conducted from October 1, 2022, to March 31, 2023, included 100 psychiatric patients (48 males and 55 females). The findings offer valuable insights into the socio-demographic factors, clinical presentations, and stress-related aspects that contribute to mental health disorders in this population.

Majority population 76% belong to Hindu religion, 19% Muslim and 5% belongs to Christian community. Highest population in the study group are living in urban area are 69% and remaining 34% living in the rural area. This urban-rural distribution highlights the higher prevalence of psychiatric disorders in urban settings, possibly due to factors such as stress, lifestyle changes, and limited access to mental health care in rural areas.

51% of the study population is in the age group of 31-50 years, 31% are in 21-30 years age group. In terms of age distribution, 51% of the study population fell within the 31-50 years age group, followed by 31% in the 21-30 years age group. This aligns with previous studies suggesting that middle-aged and young adults are more susceptible to mental health issues due to various life stressors, including career pressures, relationship issues, and financial challenges. Nutritional habit 16% vegetarians and 84% are non vegetarians belongs to 9% joint family and 91% belongs to nuclear family background.

The majority of the study participants (91%) came from nuclear families, with only 9% coming from joint families. The nuclear family structure is more prevalent in urban areas, potentially contributing to social isolation and increased mental health issues in individuals lacking familial support systems. Regarding marital status, 63% of patients were married, 26% were unmarried, and 1% was divorced. Marital stress, particularly in married individuals, can exacerbate mental health issues, as indicated by the higher number of married patients in the study. Family history of consanguineous marriage was found in 10% study population, history of mental illness in the family found in 5% study population. Co-morbidity was found in 21% if study group. Personnel habit in the study group reveals that 42% are having habit of smoking and alcohol. 78% of study population is living with their immediate family members, remaining 22% are living separate from the family. Past history of mental illness was found in 6% of the study group. Genetic diseases are present in 3% of the study population. History of trauma was found in 4% and history of head injury was observed in 5% population. Insight was present in 76% study group.

Educationally, 38% of the patients had completed up to the 10th grade, while 26% were graduates. Significant proportions (29%) were illiterate. These findings are consistent with previous literature that indicates a higher prevalence of mental illnesses in individuals with lower levels of education, as lower educational attainment may limit access to resources and coping mechanisms. The majority of participants (54%) were unemployed, and 24% were involved in semi-skilled occupations. This suggests

a potential link between unemployment and mental health disorders, as financial instability and lack of employment opportunities are known risk factors for developing psychiatric conditions.

Socio-economic status, as determined by the Kuppuswamy classification, showed that 54% of the study population belonged to the lower-middle class, with another 18% in the lower class. The findings suggest that individuals from lower socio-economic backgrounds are more vulnerable to mental health issues, a trend that has been consistently observed in global studies.

The most common psychiatric disorders in the study group were anxiety-related disorders (26%), depression (15%), and alcohol dependence (15%), with schizophrenia affecting 12% of patients. Other psychiatric conditions accounted for 31% of the cases. This distribution is similar to studies conducted in other parts of India and globally, where anxiety and depression are among the most prevalent psychiatric disorders.

The majority of patients (82%) reported symptoms lasting more than three weeks, highlighting the chronic nature of many psychiatric illnesses. A quarter of the patients (25%) had a history of continuous treatment, while the remaining patients were irregular in follow-up, underscoring the need for better patient adherence to treatment protocols. This irregularity in treatment could be due to various socio-economic factors, including financial constraints and lack of awareness.

The stress index by Holmes and Rahe, as measured by the Holmes and Rahe Stress Scale, revealed that 73% of the participants scored above 150, indicating moderate to high risk for developing mental health issues. This correlates with the findings that high levels of stress are a significant contributing factor to psychiatric disorders. These results emphasize the role of stress, both in personal and professional life, in the development and exacerbation of mental health conditions.

Our findings are consistent with studies conducted in Assam[6] by Prosenjit and in Delhi by Amit Khanna[7], where the majority of psychiatric patients were from urban areas, illiterate, and middle-aged. While the distribution of psychiatric disorders may vary slightly across regions, the demographic trends observed in this study align with these previous studies.

Similarly, a study conducted by Parveen M[8], Agarwal AK[9] and Mamaru[10] A reported similar clinical presentations, with anxiety and depression being the most common psychiatric disorders, corroborating our findings. These cross-regional similarities suggest that socio-demographic factors such as age, education, and socio-economic status play a critical role in shaping the psychiatric landscape in South Asia.

Conclusion

This study highlights the significant influence of socio-demographic and clinical factors on mental health. Key findings suggest that patients from urban areas, with lower levels of education, and from lower socio-economic backgrounds are more prone to psychiatric disorders. Stress, particularly as measured by the Holmes and Rahe Stress Scale, was a prominent factor in the development of mental illness. These results underline the importance of addressing socio-economic disparities and stress management in mental health interventions.

Further research is needed to explore causal relationships and examine regional variations in psychiatric illness to develop more targeted mental health policies and interventions.

Limitations:

This study was conducted at a single center, which limits the generalizability of the findings. The sample size was relatively small, and there was potential for recall bias in the self-reported data. Future studies with larger and more diverse samples are needed to validate these findings and explore the broader implications for mental health care in India and similar regions.

Source of funds: Self.

Conflict of Interest: Nil

Ethical clearance: Ethical clearance obtained from Institutional ethics committee. Reference No: MRIMS-DHR-IEC-13/2022.

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Original Article

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Autonomic Function Tests in Diabetic Hypertensive and Non-Diabetic Hypertensive Patients: A Case-Control Study

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Abstract

Background and Objective: Cardiovascular autonomic dysfunction is common in long-standing hypertension and diabetes, both of which carry elevated cardiovascular risk. Although extensively studied in each condition separately, the comparative assessment between diabetic hypertensive (DH) and non-diabetic hypertensive (NDH) patients is sparse. This study compared cardiovascular autonomic functions in these two groups using standard clinical tests, highlighting the degree and patterns of autonomic impairment in each.

Methods: This study included 260 participants split into two groups: 130 DH patients (cases) and 130 NDH patients (controls), matched for age, sex, and duration of hypertension. Data on baseline clinical characteristics, including body mass index (BMI), duration of hypertension, glycemic control, and comorbidities, were recorded. Standard cardiovascular autonomic function tests were performed, including the heart rate response to deep breathing (HRDB), Valsalva maneuver (Valsalva ratio), orthostatic blood pressure changes, handgrip test, and heart rate variability (HRV) analysis. Statistical comparisons were made using univariate and multivariate analyses to account for covariates such as age, sex, and body mass index.

Results: The DH group showed significantly lower HRDB and HRV indices than the NDH group ($p < 0.05$). Furthermore, the drop in systolic blood pressure upon standing was more pronounced in the DH group, while the Valsalva ratio was decreased to a similar extent in both groups, suggesting a significant parasympathetic impairment in DH participants. Duration of diabetes, poor glycemic control (higher HbA1c), and longer duration of hypertension were significantly correlated with impaired autonomic function.

Conclusion: Diabetic hypertensive patients exhibit more pronounced abnormalities in cardiovascular autonomic control when compared to non-diabetic hypertensive patients. Comprehensive autonomic function testing should be considered in routine clinical assessments for hypertensive patients, especially those with concomitant diabetes, to detect and manage autonomic dysfunction at an early stage.

Keywords: Diabetic hypertension, Non-diabetic hypertension, Autonomic function tests, Cardiovascular autonomic neuropathy, Heart rate variability, Valsalva maneuver, Orthostatic hypotension.

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Introduction

Cardiovascular diseases (CVDs) are leading causes of morbidity and mortality worldwide, with essential hypertension as a major contributor.[1] Type 2 diabetes mellitus (DM) is also a significant public health concern due to its rising prevalence and complications.[2] When hypertension and diabetes coexist, cardiovascular risk escalates. A critical complication of both is autonomic nervous system (ANS) dysfunction, which regulates cardiac function and vascular tone.[3]

Autonomic dysfunction (or autonomic neuropathy in diabetes) affects both parasympathetic and sympathetic components. Chronic hyperglycemia and metabolic derangements damage nerve fibers, leading to diabetic autonomic neuropathy (DAN). [4] DAN manifests as cardiovascular autonomic dysfunction, characterized by reduced heart rate variability, abnormal blood pressure responses, and impaired autonomic reflexes. Hyperglycemia-induced oxidative stress and advanced glycation end products (AGEs) further contribute to nerve damage.[5]

In hypertension, chronic blood pressure elevations affect vascular and autonomic reflexes. [6] Baroreceptor desensitization impairs blood pressure control, while structural changes in the heart and blood vessels contribute to autonomic imbalance. Over time, hypertension leads to blunted autonomic responses, further disrupting sympathetic-parasympathetic regulation.[7]

While autonomic dysfunction in diabetes and hypertension is well-documented separately, fewer studies compare the degree and pattern of dysfunction in diabetic hypertensive (DH) versus non-diabetic hypertensive (NDH) patients. The coexistence of these conditions may accelerate oxidative stress, endothelial dysfunction, and renin-angiotensin-aldosterone system (RAAS) activation, leading to more severe autonomic impairment.[8]

Unrecognized cardiac autonomic dysfunction increases the risk of arrhythmias, silent myocardial ischemia, and sudden cardiac death.[9] In DM, autonomic dysfunction may diminish ischemic pain perception, delaying myocardial infarction diagnosis. Additionally, it impairs blood pressure regulation, leading to dizziness or syncope. [10]These complications reduce quality of life and escalate healthcare costs, underscoring the need for early detection and intervention.[11]

Standard tests of cardiac autonomic function evaluate both parasympathetic and sympathetic function. Some of the most commonly employed clinical tests includeheart rate response to deep breathing (HRDB) evaluating parasympathetic function via heart rate variation during respiration; valsalvamaneuvermeasuring autonomic reactivity through RR interval changes during the maneuver, orthostatic blood pressure changes assessing sympathetic function via blood pressure and heart rate variations upon standing; isometric handgrip test evaluating sympathetic control based on blood pressure response to sustained handgrip; and heart rate variability (HRV) analysis: examining autonomic balance using frequency and time-domain parameters.

Given the high prevalence of hypertension and diabetes, understanding their combined impact on autonomic function is crucial. Identifying specific autonomic impairment patterns can improve risk stratification and guide targeted interventions. This case-control study compares autonomic dysfunction in DH and NDH patients to determine the additive effects of diabetes on hypertensive autonomic impairment. [4] The findings may aid clinicians in assessing autonomic dysfunction severity in DH patients, leading to improved screening and management strategies.[8]

This study evaluates cardiovascular autonomic function in DH and NDH patients using standard non-invasive tests, comparing autonomic parameters between groups. It also examines associations between autonomic dysfunction and clinical variables such as diabetes duration, hypertension duration, glycemic control, and BMI.

Methods

Study Design

This study was a hospital-based, case-control study conducted over 12 months at the Department of Medicine and Physiology of a tertiary care teaching hospital. Ethical clearance was obtained

from the Institutional Ethics Committee vide approval no CIMSH/IEC/MAR/2024/1 dated 11.03.2024 prior to the commencement of the study. Informed written consent was obtained from all participants.

Study Population

Participants were divided into two groups:

1. **Case Group (Diabetic Hypertensive, DH):**
    - Diagnosed with hypertension (as per Joint National Committee guidelines: systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg, or on anti-hypertensive medication).
    - Diagnosed with type 2 diabetes mellitus (fasting plasma glucose ≥126 mg/dL or on glucose-lowering agents).
    - Age range: 40-55 years.
    - No history of other causes of autonomic neuropathy (e.g., chronic renal failure, Parkinson's disease, etc.).
2. **Control Group (Non-Diabetic Hypertensive, NDH):**
    - Matched for age and sex with DH participants.
    - Diagnosed with hypertension (same criteria as DH).
    - No diagnosis of diabetes mellitus (fasting plasma glucose <126 mg/dL, HbA1c <6.5%).
    - Age range: 40-55 years.
    - No history of other causes of autonomic neuropathy.

Exclusion criteria for both groups included pregnancy, congestive heart failure, advanced kidney or liver disease, significant anemia, and severe musculoskeletal disorders that could interfere with test procedures.

Sample Size

A sample size of 260 participants (130 in each group) was determined based on power calculations from prevalence of 9.3%[17] with a power of 80% and an alpha error of 0.05.

Data Collection

Clinical Evaluation: All participants underwent a detailed clinical history and examination. Demographic data, duration of hypertension, duration of diabetes (where applicable), BMI, and current medications were recorded. A thorough neurological examination was also performed to rule out neurological conditions that might confound the autonomic function results.

Laboratory Investigations:

- Fasting plasma glucose, postprandial plasma glucose, and glycated hemoglobin (HbA1c) levels for the DH group to assess glycemic control.
- Lipid profile to assess dyslipidemia.
- Serum creatinine and estimated glomerular filtration rate (eGFR) to exclude significant renal impairment.

Anthropometric Measurements: Weight and height were measured to calculate BMI.

Autonomic Function Tests

All tests were performed in a temperature-controlled, quiet environment. Patients were instructed to refrain from smoking, caffeine, and alcohol for at least 12 hours and to abstain from strenuous exercise for 24 hours before testing.

1. **Heart Rate Response to Deep Breathing (HRDB)[12]:** Participants were instructed to lie supine and breathe at a rate of six breaths per minute (5 seconds of inspiration, 5 seconds of expiration). The difference between the maximum and minimum heart rates during each respiratory cycle was calculated. Three cycles were recorded, and the mean value was taken.
2. **Valsalva Maneuver[13]:** Participants blew into a mouthpiece connected to a mercury manometer and maintained a pressure of 40 mmHg for 15 seconds while ECG was continuously recorded. The Valsalva ratio was computed as the ratio of the longest RR interval shortly after the maneuver to the shortest RR interval during the strain phase.
3. **Orthostatic Blood Pressure Measurement[14]:** Blood pressure was measured after 5 minutes of supine rest and then 1 minute

and 3 minutes after standing. The change in systolic and diastolic blood pressure upon standing was recorded. A drop of ≥20 mmHg systolic or ≥10 mmHg diastolic was considered orthostatic hypotension.

4. **Handgrip Test (Isometric Exercise)[15]:** Participants were asked to maintain one-third of their maximum voluntary contraction for 3 minutes using a handgrip dynamometer. Blood pressure was recorded at rest and at 1 minute and 3 minutes of sustained handgrip. The rise in diastolic blood pressure was taken as the measure of sympathetic responsiveness.
5. **Heart Rate Variability (HRV) Analysis[16]:** A 5-minute ECG recording in the supine position under resting conditions was collected. Time-domain measures (SDNN, RMSSD) and frequency-domain parameters (LF, HF, LF/HF ratio) were computed using standard HRV analysis software.

Statistical Analysis

Data were entered and analyzed using SPSS version 26.0. Mean ± standard deviation (SD) was used for continuous variables, and frequencies/ percentages for categorical variables. Group comparisons were done with the Student's t-test or Mann-Whitney U test for continuous variables, and chi-square test for categorical variables. Multivariable linear regression was used to explore the relationship between potential predictors (duration of diabetes, HbA1c, duration of hypertension, BMI) and autonomic parameters. A p-value <0.05 was considered statistically significant.

Results

1. Baseline Characteristics

A total of 260 participants were included in this study, with 130 diabetic hypertensive (DH) patients serving as cases and 130 non-diabetic hypertensive (NDH) patients serving as controls. Table 1 summarizes the demographic and clinical parameters for both groups.

Table 1. Baseline Characteristics of the Study Population

Parameter	DH (n=130)	NDH (n=130)	p-value
Age (years), mean ± SD	53.49 ± 1.25	53.14 ± 1.77	0.049
Male/Female, n (%)	66 (51) / 64 (49)	61 (47) / 69 (53)	0.62
BMI (kg/m^2), mean ± SD	29.75 ± 1.33	29.43 ± 1.50	0.129
Duration of Hypertension (years)	7.61 ± 1.4	7.27 ± 1.9	0.106
Duration of Diabetes (years)	6.6 ± 1.20	-	-
HbA1c (%), mean ± SD	8.3 ± 0.24	5.47 ± 0.12	<0.001*
Systolic BP (mmHg)	148.50 ± 2.16	145.41 ± 1.93	<0.001*
Diastolic BP (mmHg)	92.60 ± 1.91	90.16 ± 1.71	<0.001*
Fasting Plasma Glucose (mg/dL)	155.90 ± 6.42	101.40 ± 3.76	<0.001*

** p < 0.05 denotes statistical significance.*

Both groups were well matched for age, sex distribution, BMI, and duration of hypertension. As expected, fasting plasma glucose and HbA1c levels were significantly higher in the DH group.

2. Heart Rate Response to Deep Breathing (HRDB)

In the DH group, HRDB was markedly reduced compared to the NDH group ($p < 0.001$), indicating significant parasympathetic dysfunction. The mean HRDB in DH patients was 10.90 ± 1.14 beats per minute (bpm), whereas in NDH patients, it was 17.40 ± 1.43 bpm.

3. Valsalva Maneuver

The Valsalva ratio was significantly reduced in DH compared to NDH (1.23 ± 0.03 vs. 1.30 ± 0.03; $p = 0.000$). While both values were borderline-low compared to a healthy population reference (commonly >1.2 is regarded as normal), the difference suggests an increased burden of autonomic dysfunction in DH.

4. Orthostatic Hypotension

Orthostatic changes in systolic blood pressure (SBP) were evaluated. In the DH group, 26 (20%) participants exhibited a drop in SBP ≥20 mmHg upon standing, while 11 (8.46%) participants in the NDH group showed this level of drop (p = 0.012). The mean decrease in SBP was 15.50 ± 1.29 mmHg in DH and 9.70 ± 1.62 mmHg in NDH (p = 0.000). This indicates a more pronounced sympathetic impairment in the diabetic cohort.

5. Handgrip Test

The isometric handgrip test results revealed that the mean rise in diastolic blood pressure (DBP) during sustained handgrip was significantly lower in the DH group (13.80 ± 0.98 mmHg) compared to the NDH group (18.80 ± 1.25 mmHg), p < 0.001. This further supports the presence of sympathetic dysfunction in DH patients.

6. Heart Rate Variability (HRV) Analysis

A 5-minute ECG recording was used to compute both time- and frequency-domain parameters.

- **Time-Domain Parameters:**
  - SDNN (ms): 69.50 ± 2.51 in DH vs. 85.80 ± 3.55 in NDH (p < 0.001).
  - RMSSD (ms): 20.80 ± 1.73 in DH vs. 29.10 ± 2.63 in NDH (p < 0.001).
- **Frequency-Domain Parameters (ms^2):**
  - Low Frequency (LF): 384.50 ± 14.62 in DH vs. 466.00 ± 17.65 in NDH (p = 0.01).
  - High Frequency (HF): 158.00 ± 9.03 in DH vs. 228.70 ± 11.09 in NDH (p < 0.001).
  - LF/HF Ratio: 2.44 ± 0.18 in DH vs. 2.04 ± 0.10 in NDH (p = 0.01).

Overall, HRV measures were significantly decreased in the DH group, indicating impaired autonomic modulation, especially in the parasympathetic domain (low HF), but also an increased sympathetic dominance (higher LF/HF ratio).

Table 2. Summary of Autonomic Function Tests

Parameter	DH (n=130)	NDH (n=130)	p-value
HRDB (bpm)	10.90 ± 1.14	17.40 ± 1.43	< 0.001*
Valsalva Ratio	1.23 ± 0.03	1.30 ± 0.03	< 0.001*
Δ SBP on Standing (mmHg)	15.50 ± 1.29	9.70 ± 1.62	< 0.001*
Orthostatic Hypotension [n (%)]	26 (20%)	11 (8.46%)	0.012
Handgrip Test (Rise in DBP, mmHg)	13.80 ± 0.98	18.80 ± 1.25	< 0.001*
SDNN (ms)	69.50 ± 2.51	85.80 ± 3.55	< 0.001*
RMSSD (ms)	20.80 ± 1.73	29.10 ± 2.63	< 0.001*
LF (ms^2)	384.50 ± 14.62	466.00 ± 17.65	< 0.001*
HF (ms^2)	158.00 ± 9.03	228.70 ± 11.09	< 0.001*
LF/HF Ratio	2.44 ± 0.18	2.04 ± 0.10	< 0.001*

** p < 0.05 denotes statistical significance.*

7. Correlational Analyses

Pearson's correlation was used to assess the relationship between key clinical variables (duration of diabetes, HbA1c, duration of hypertension, and BMI) and autonomic parameters. Multiple linear regression analyses were subsequently performed for parameters with significant correlations.

Duration of Diabetes: Negatively correlated with HRDB (r = -0.47, p < 0.001), Valsalva ratio (r = -0.48, p < 0.001), handgrip test (r= -0.408, p < 0.001), SDNN (r=-0.933, p < 0.001), RMSSD (r=-0.378, p < 0.001). Positively correlated with delta SBP on standing (r=0.324, p < 0.001) and LF/HF ratio (r=0.361, p < 0.001). Longer duration of diabetes significantly predicted lower parasympathetic indices.

HbA1c: Showed a significant negative correlation with Valsalva ratio (r = -0.619, p < 0.001), handgrip test (r= -0.208, p =0.017), SDNN (r=-0.555,

$p < 0.001$), RMSSD ($r=-0.380$, $p < 0.001$), delta SBP on standing ($r=0.318$, $p < 0.001$) Elevated HbA1c was an independent predictor of reduced parasympathetic function in multivariate analysis ($\beta = -0.29$, $p = 0.003$).

Duration of Hypertension: Moderately but significantly correlated with reduced Valsalva ratio ($r = 0.383$, $p < 0.001$), delta SBP on standing ($r=0.320$, $p < 0.001$), SDNN ($r = -0.24$, $p = 0.005$), RMSSD ($r=0.237$, $p=0.007$) and LF/HF ratio ($r=-0.413$, $p < 0.001$). In the combined multivariate model, duration of hypertension retained significance in predicting overall autonomic dysfunction ($\beta = -0.24$, $p = 0.01$).

BMI: BMI was significantly correlated with HRDB ($r=0.243$, $p=0.005$), Valsalva ratio ($r=0.192$, $p=0.029$), delta SBP ($r=-0.462$, $p<0.001$), handgrip test ($r=-0.208$, $p=0.017$), SDNN ($r=0.316$, $p=0.000$) and RMSSD ($r=-0.400$, $p<0.001$).

Discussion

The present study demonstrates that individuals with coexistent hypertension and type 2 diabetes have significantly greater cardiovascular autonomic dysfunction compared to those with hypertension alone. As measured by HRDB, Valsalva ratio, and HF power, the DH group displayed more severe parasympathetic dysfunction compared to NDH. Sympathetic dysfunction was also greater in DH, as evident from a higher incidence of orthostatic hypotension and a blunted handgrip response. Both time and frequency domain indices supported a shift toward sympathetic dominance in DH patients. Longer duration of diabetes, poorer glycemic control, and to a lesser degree, longer duration of hypertension were associated with more severe autonomic dysfunction. The results underscore the additive or synergistic adverse effects of chronic hyperglycemia on top of the vascular and autonomic consequences of hypertension. Several specific findings warrant detailed discussion in the context of existing literature.

A clear trend emerged indicating marked reductions in parasympathetic function in the diabetic hypertensive (DH) group, evidenced by lower HRDB, lower Valsalva ratio, reduced RMSSD, and reduced HF power in HRV analysis. These findings align with prior studies which noted that parasympathetic fibers are often affected earliest and most prominently in diabetic autonomic neuropathy. [18, 19] The chronic hyperglycemic environment leads to microvascular damage in the vasa nervorum, reduced nerve conduction velocity, and direct neurotoxic effects of advanced glycation end-products. Hence, the presence of diabetes, even when relatively well controlled, can exacerbate the autonomic dysfunction already present in hypertensive individuals.[20, 21]

In non-diabetic hypertensive (NDH) individuals, heightened sympathetic drive and decreased baroreflex sensitivity partially explain the observed mild reductions in parasympathetic markers such as HRDB. However, our findings suggest that superimposition of type 2 diabetes significantly amplifies these changes, possibly by direct neuronal injury, the generation of reactive oxygen species (ROS), and endothelial dysfunction that further impairs neural control.[22, 23]

Although traditional teaching holds that sympathetic fibers tend to be spared until later stages of diabetic neuropathy, our study revealed significant impairments in sympathetic function in DH patients. Notably, 20% of DH participants met the criteria for orthostatic hypotension, more than double the prevalence in the NDH group. A plausible explanation is that hypertension itself exerts chronic stress on the baroreceptors and vascular smooth muscle, contributing to a diminished capacity to respond to postural changes. The concurrent metabolic and vascular insults from diabetes further compromise neuronal function.[24]

Multiple studies corroborate these findings, indicating that diabetic neuropathy eventually involves both parasympathetic and sympathetic fibers, particularly in patients with longer disease durations or poor glycemic control.[8]Our correlational analyses, showing significant links between autonomic test abnormalities and both diabetes duration and HbA1c, reinforce the concept that prolonged exposure to hyperglycemia accelerates neuronal injury.

HRV analysis provides a more nuanced perspective on autonomic control, often detecting early subclinical dysfunction. We found that both time-domain (SDNN, RMSSD) and frequency-domain (HF

power, LF/HF ratio) parameters were significantly altered in DH. The combination of decreased HF (parasympathetic) and comparatively normal or even slightly elevated LF (sympathetic) results in an increased LF/HF ratio, reflecting autonomic imbalance. This result parallels prior literature in which type 2 diabetes is a well-documented risk factor for reduced HRV. [8] Concomitant hypertension accentuates these changes via reduced arterial compliance and amplified sympathetic outflow.

Interestingly, while NDH patients also displayed some reduction in HRV compared to healthy reference values reported in prior studies, the degree of decline was milder than in the DH group. This demonstrates that while hypertension alone compromises autonomic function, the superimposed diabetic state causes an appreciably greater insult.

Several earlier investigations have independently analyzed diabetic and hypertensive populations, but fewer have directly contrasted these two groups as we have. In one study by Ewing and Clarke[25], among patients with diabetes, abnormal HRDB and Valsalva ratios were frequently observed, indicating an early parasympathetic deficit. Studies also emphasizes that poor glycemic control is a prime driver of autonomic dysfunction in diabetes. [26] While these studies did not include a comparative hypertensive-only control group, their findings echo our results regarding the strong association between hyperglycemia and autonomic impairment.

On the hypertension side, studies have shown decreased baroreflex sensitivity and lower HRV in hypertensive patients compared to normotensives, pointing to an imbalance favoring sympathetic dominance. [27] However, the effect magnitude described in these papers is less pronounced than that observed in diabetic cohorts, underscoring that diabetes is likely the stronger determinant of autonomic neuropathy.

In a case-control analysis closer to our design, study by Low PA et al [28] investigated autonomic function in hypertensive diabetics versus normotensive diabetics. They found that hypertensive diabetics had worse autonomic indices than those with diabetes alone, highlighting the detrimental synergy of combined diseases. Our study expands on this perspective by comparing diabetic hypertensives with non-diabetic hypertensives, adding new clarity to the role of hyperglycemia.

The results of this study have immediate clinical relevance. Autonomic dysfunction increases the risk of arrhythmias, silent myocardial infarction, and sudden death in both diabetic and hypertensive populations. This risk is likely compounded when both conditions coexist, indicating an urgent need for vigilance. Study by Kaze et al [9] analyzing a large cohort of 4842 participants found that CAN was significantly associated with an increased risk of incident silent myocardial infarction. Standard screening tests such as HRDB, orthostatic blood pressure measurements, or short-term HRV could be implemented in routine clinical practice to identify at-risk individuals early. Our analysis suggests that good glycemic control (lower HbA1c) may offer some protection against severe autonomic dysfunction. Clinicians should therefore prioritize optimizing metabolic parameters in DH patients. Aggressive but safe control of blood pressure might mitigate further autonomic deterioration, as improved baroreflex sensitivity is documented after successful antihypertensive therapy in some studies. However, caution is essential when initiating therapy in a patient with significant autonomic dysfunction since orthostatic hypotension could be exacerbated. Beyond glucose and blood pressure, addressing lifestyle factors such as obesity, physical inactivity, and smoking cessation is vital. Pharmacological strategies that may exert beneficial effects on autonomic function (e.g., ACE inhibitors, ARBs, or beta-blockers) should be considered, although their specific impact on autonomic neuropathy remains an area of ongoing research.

This study has its strength in a direct head-to-head comparison of DH and NDH groups, which allowed for a clearer delineation of diabetes-specific contributions to autonomic dysfunction. Comprehensive autonomic testing, including both traditional bedside tests (HRDB, Valsalva, orthostatic BP) and HRV analysis, provides a robust assessment of autonomic function. Also, statistical controls for confounders like age, BMI, and duration of hypertension were beneficial.

However, limitations do exist. This was a single-center study with a moderate sample size, which may limit the generalizability of findings. Potential confounders such as medication types (e.g., beta-blockers, ACE inhibitors) could influence autonomic indices, although medication use was relatively well balanced between groups and accounted for in some analyses. The cross-sectional design precludes inferences about causality. Prospective longitudinal data would be ideal to confirm the progression of autonomic dysfunction over time.

Conclusion

Diabetic hypertensive patients show significantly worse autonomic dysfunction than their non-diabetic counterparts, with marked reductions in parasympathetic indicators (e.g., HRDB, Valsalva ratio, HF-HRV) and higher rates of orthostatic hypotension, suggesting impaired sympathetic control as well. Poor glycemic control and longer diabetes duration strongly correlate with this dysfunction. Clinically, unrecognized or uncontrolled autonomic impairment can precipitate serious cardiovascular events, highlighting the need for regular autonomic assessments in this population. Future studies should investigate whether better glycemic and blood pressure control can reverse or attenuate these deficits, ultimately improving cardiovascular outcomes for patients bearing the dual burden of diabetes and hypertension.

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Original Article

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Prevalence and Correlation of Cardiomyopathy in Type 2 Diabetes Mellitus Patients in South Rajasthan: A Prospective Observational Study

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Abstract

Background: Diabetes mellitus (DM) is a leading cause of cardiovascular morbidity and mortality worldwide. Among its cardiovascular complications, diabetic cardiomyopathy (DCM) is a distinct myocardial dysfunction occurring in diabetic patients without underlying coronary artery disease or hypertension. It manifests initially as diastolic dysfunction and progresses to heart failure if left undiagnosed and untreated. However, its early-stage detection remains a challenge due to the asymptomatic nature of the disease. This study aimed to determine the prevalence of DCM in Type 2 diabetes mellitus (T2DM) patients and evaluate its correlation with diabetes duration, lipid profile, and body mass index (BMI) in a tertiary care hospital in Rajasthan, India.

Methods: A prospective observational study was conducted at Maharana Bhupal Government Hospital, Udaipur, affiliated with R.N.T. Medical College, Rajasthan, involving 75 T2DM patients who underwent echocardiographic evaluation. Inclusion criteria included diagnosed cases of T2DM per ADA (2014) guidelines. Patients with ischemic heart disease, hypertension, and valvular heart disease were excluded. Echocardiography, lipid profile, HbA1c, and BMI were analysed to assess the prevalence and risk factors associated with DCM. Statistical analysis was performed using Microsoft excel, and results were interpreted using chi-square and t-tests.

Conclusion: The prevalence of DCM was 60%, with diastolic dysfunction as the predominant finding (75.5%). Significant associations were observed with higher BMI ($p < 0.0001$), HbA1c levels ($p < 0.0001$), and dyslipidaemia ($p < 0.05$). The findings suggest that routine echocardiographic screening in asymptomatic diabetic patients is essential to identify and manage DCM early, preventing progression to heart failure and reducing mortality.

Keywords: Diabetic cardiomyopathy, Type 2 diabetes mellitus, Echocardiography, Diastolic dysfunction, Cardiovascular complications.

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Introduction

Diabetes mellitus (DM) is a rapidly growing global health concern, affecting millions worldwide. According to the International Diabetes Federation (IDF) 2021, approximately 537 million adults are living with diabetes, and this number is expected to reach 783 million by 2045. India, often referred to as the diabetes capital of the world, accounts for 77 million diabetics, placing it among the top three countries with the highest diabetes prevalence[1].

The primary cause of diabetes-related morbidity and mortality is cardiovascular disease (CVD), which accounts for nearly 50% of deaths in diabetic patients[2]. Among the various cardiac complications of diabetes, diabetic cardiomyopathy (DCM) is a unique yet frequently overlooked entity. DCM is defined as structural and functional myocardial impairment in diabetic patients in the absence of hypertension, coronary artery disease (CAD), or valvular heart disease[3]. The condition is progressive, beginning with subclinical diastolic dysfunction before advancing to systolic dysfunction and heart failure. DCM is a significant but often underdiagnosed complication of diabetes mellitus (DM). Studies estimate that approximately 12–30% of diabetic patients develop some degree of DCM, with variations depending on diagnostic criteria and population characteristics. The prevalence is higher in type 2 diabetes mellitus (T2DM) due to the combined effects of insulin resistance, hyperglycaemia, and associated metabolic derangements. Women with diabetes appear to be at a higher relative risk of developing heart failure compared to men. Additionally, DCM contributes substantially to the increased risk of heart failure in diabetic patients, with diabetics having a two- to fivefold higher risk of heart failure compared to non-diabetics. The condition is more prevalent in older adults, those with longer diabetes duration, poor glycaemic control, and coexisting obesity.

The pathogenesis of DCM is multifactorial, involving chronic hyperglycaemia, insulin resistance, oxidative stress, microvascular dysfunction, autonomic neuropathy, and metabolic disturbances[4]. Persistent hyperglycaemia leads to increased myocardial fibrosis, left ventricular hypertrophy (LVH), and reduced myocardial compliance, which impairs diastolic filling[5]. Key risk factors associated with DCM include: Poor glycaemic control (high HbA1c)[6]; Obesity (high BMI)[7]; Dyslipidaemia (elevated triglycerides and total cholesterol)[8]; Duration of diabetes (longer duration associated with increased risk)[9]

Despite increasing recognition, DCM often remains undiagnosed in its early stages because many patients are asymptomatic until they develop heart failure. Echocardiography is the gold standard for early detection, enabling clinicians to identify myocardial dysfunction before the onset of overt clinical symptoms[10].

Given the high burden of diabetes in India and the limited awareness of DCM, this study was conducted to determine the prevalence of DCM in T2DM patients in Rajasthan and analyse its correlation with BMI, lipid profile, and diabetes duration.

Materials & Methods

This prospective observational study was conducted over 12 months (January 2017 - December 2017) at Maharana Bhupal Government Hospital, Udaipur, a tertiary care centre affiliated with R.N.T. Medical College, Udaipur, Rajasthan. The sample size was calculated using power analysis to detect a significant difference in the prevalence of diabetic cardiomyopathy (DCM) between the general population (18%) and Type 2 diabetes mellitus (T2DM) patients (38%), with 90% power and a significance level (α) of 0.01. Based on these parameters, the required sample size was determined to be 73 patients which was further enhanced to 75 for present study. A total of 75 patients with Type 2 diabetes mellitus (T2DM) were enrolled, based on American Diabetes Association (ADA 2014) criteria. Patients with coronary artery disease (CAD), hypertension, valvular heart disease, chronic kidney disease, chronic liver disease, or chronic respiratory illness were excluded to maintain the specificity of diabetic cardiomyopathy (DCM). Data collection included detailed clinical history, anthropometric measurements (BMI), and laboratory investigations (HbA1c, fasting blood sugar, and lipid profile). Echocardiography was performed to assess diastolic and systolic function, using mitral inflow E/A

ratio, deceleration time, left ventricular mass index (LVMI), and left ventricular ejection fraction (LVEF). The presence of diastolic dysfunction (isolated or combined with systolic dysfunction) was used to define DCM. Statistical analysis was performed using Microsoft excel, with continuous variables expressed as mean ± standard deviation (SD) and categorical data analysed using chi-square and t-tests. A p-value < 0.05 was considered statistically significant.

Result & Discussion

Table 1: Demographic and Clinical Characteristics

Group	n (%)
Diabetic Cardiomyopathy (DCM)	45 (60%)
Non-DCM	30 (40%)

Table 2: Demographic and Clinical Characteristics

Parameter	DCM (Mean±SD)	Non-DCM (Mean±SD)	p-value
Age (years)	60.1 ± 9.4	58.8 ± 7.1	NS
Male/Female	31/14	21/9	NS
BMI (kg/m²)	27.4 ± 3.9	25.9 ± 2.5	<0.0001
HbA1c (%)	8.5 ± 1.1	7.5 ± 0.8	<0.0001
FBS (mg/dL)	187.5 ± 28.4	159.4 ± 26.7	0.0001
Total Cholesterol (mg/dL)	176.3 ± 50.5	150.8 ± 27.1	<0.05
Triglycerides (mg/dL)	128.2 ± 47.8	106.9 ± 19.4	<0.05

The prevalence of DCM in our study was 60%, which is significantly higher than previous studies, such as Zabalgoitia et al. (2001)[9], which reported a 47% prevalence among normotensive, asymptomatic type 2 diabetics. Similarly, Boyer et al. (2004)[10] observed a 40–75% prevalence using Doppler echocardiography. Diastolic dysfunction was the most common abnormality detected, with 34 patients (75.5%) exhibiting isolated diastolic dysfunction. Systolic dysfunction was observed in 4 patients (8.8%), and both systolic and diastolic dysfunction were found in 7 patients (15.5%). This aligns with studies by Fang et al. (2003)[11] and Devereux et al. (2000)[12], which emphasized that diastolic dysfunction precedes systolic dysfunction in diabetes-related cardiomyopathy.

Table 3: Echocardiographic Parameters in DCM and Non-DCM Groups

Parameter	DCM (Mean±SD)	Non-DCM (Mean±SD)	p-value
LVMI (g/m²)	108.3 ± 33.0	88.4 ± 15.3	<0.001
Ejection Fraction (%)	58.1 ± 11.0	62.9 ± 3.9	<0.05

Our study found a significant increase in left ventricular mass index (LVMI) in DCM patients, which was consistent with the Strong Heart Study (2003)[13], which reported higher LVMI in diabetics compared to non-diabetics. The slightly reduced ejection fraction (EF) in DCM patients (58.1 ± 11.0%) suggests early impairment in systolic function, aligning with Bell et al. (2003)[14], who noted that systolic dysfunction in diabetics is often under recognized until overt heart failure develops.

Table 4: Correlations between Duration of Diabetes and DCM Risk

Duration of Diabetes (Years)	No. of DCM Patients (%)
< 3 years	6 (13.3%)
3-5 years	19 (42.2%)
6-10 years	13 (28.8%)
>10 years	7 (15.5%)

A higher prevalence of DCM was observed in patients with a diabetes duration of 3–5 years (42.2%), followed by 6–10 years (28.8%). This challenges the conventional assumption that DCM only develops after 10+ years of diabetes duration, as suggested by Attali et al. (1988)[15]. However, it aligns with Kiencke et al. (2010)[16], who found significant myocardial dysfunction in T2DM patients within the first five years of diagnosis.

Table 5: Correlations between Glycaemic Control (HbA1c) and DCM Risk

HbA1c Level (%)	DCM (Mean ± SD)	Non-DCM (Mean ± SD)	p- value
HbA1c (%)	8.5 ± 1.1	7.5 ± 0.8	<0.0001

A significantly higher HbA1c level was associated with DCM ($p < 0.0001$).This supports findings by Struthers et al. (2000)[17], who reported that for every 1% increase in HbA1c, the risk of heart failure increases by 8–10%. The Finnish Diabetic Cohort

Study (Soininen et al., 2018)[18] also found that HbA1c levels >8.0% doubled the risk of developing cardiac dysfunction.

Table 6: Obesity (BMI) and DCM Risk

BMI Range (kg/m²)	DCM (%)	Non- DCM (%)
< 25	9 (20%)	21 (70%)
25-29.9	22 (48.8%)	7 (23.3%)
≥ 30	14 (31.1%)	2 (6.7%)

Higher BMI was significantly associated with DCM ($p < 0.0001$). This supports studies by Galderisi et al. (1991)[19], who found that obesity was a strong predictor of diastolic dysfunction. Our findings also correlate with Karamitsos et al. (2007)[20], who reported that a BMI >30 kg/m² increases the risk of diastolic dysfunction by 2.1-fold.

Table 7: Lipid Profile and Cardiomyopathy Risk

Lipid Parameter	DCM (Mean ± SD)	Non-DCM (Mean ± SD)	p-value
Total Cholesterol (mg/dL)	176.3 ± 50.5	150.8 ± 27.1	<0.05
Triglycerides (mg/dL)	128.2 ± 47.8	106.9 ± 19.4	<0.05

Our study found that higher total cholesterol and triglyceride levels were significantly associated with DCM. This aligns with findings from Boyer et al. (2004)[10] and the Strong Heart Study (2003)[13], which established dyslipidaemia as an independent predictor of left ventricular hypertrophy in diabetics.

Conclusion

This study highlights the high prevalence (60%) of diabetic cardiomyopathy (DCM) in asymptomatic and symptomatic T2DM patients, with diastolic dysfunction being the most common abnormality (75.5%). Significant associations were observed between DCM and poor glycaemic control (HbA1c > 8.0%, $p < 0.0001$), obesity (BMI > 27 kg/m², $p < 0.0001$), and dyslipidaemia ($p < 0.05$), indicating that metabolic abnormalities play a crucial role in its pathogenesis. The early onset of DCM (42.2% cases occurring within 3–5 years of diabetes duration) suggests that subclinical myocardial dysfunction develops sooner than traditionally expected, necessitating routine echocardiographic screening for early detection and intervention. Given that 46.6% of DCM cases were asymptomatic, this study underscores the importance of proactive cardiovascular monitoring in diabetic patients, particularly those with risk factors such as obesity, hyperglycaemia, and dyslipidaemia. Early lifestyle modifications, glycaemic control, and lipid-lowering therapies may help prevent the progression of diabetic cardiomyopathy to overt heart failure, ultimately reducing cardiovascular morbidity and mortality in T2DM patients. Future longitudinal studies with larger cohorts are needed to evaluate the long-term impact of metabolic control on DCM progression.

Clinical Implications

- Routine echocardiographic screening should be considered for all T2DM patients, especially those with poor glycaemic control, obesity, and dyslipidaemia.
- Early intervention with lifestyle modification and optimal glycaemic control may prevent progression to heart failure with preserved ejection fraction (HFpEF).
- Future research should focus on long-term follow-up studies to determine whether strict metabolic control can reverse subclinical DCM.

Limitations

- Single-centre study, requiring larger, multicentre trials for broader applicability.
- Lack of follow-up data to assess progression from diastolic dysfunction to symptomatic heart failure.

Conflict of Interest: Nil

Source of Funding: Nil

Ethical Approval: Taken from IEC of RNT Medical College Udaipur, Vide Reference Number 165/IEC/2016 - 04/12/2016.

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Original Article

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Awareness of Stroke among General Population Residing in Urban Area of Western Maharashtra: An Observational Study

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Abstract

Background: Stroke is the second leading cause of death worldwide and was responsible for an estimated 6.5 million deaths and 113 million DALYs (Disability Adjusted Life Years) in 2013. Developing countries like India is facing a double burden of communicable and non- communicable diseases. Stroke is one of the leading causes of death and disability in India.

Objectives: 1.To study awareness of warning symptoms, risk factors and treatment of stroke in study population. 2. To study the correlation between socio-demographic factors with awareness of stroke.

Methodology: A Cross -sectional Observational study was conducted in the Urban Field Practice Area of Medical College in Western Maharashtra. The study was conducted in the age group of more than 30 years of the participants in the urban area. Sample size was 380 and two stage sampling was used for the data collection. The data collection was done with pretested semi -structured questionnaire by interview method. Written informed consent was obtained before inclusion in the study.

Results: A total of 380 participants were included in the study. In the study, 182 (47.89%) were females and 198 (52.10%) were males. It was found that 194 (51.05%) participants were aware about what is stroke. 56% of participants said that brain is the affected organ in stroke. Hypertension (78%) is the most important risk factor for stroke.

Conclusion: In the present study it was revealed that the participants had inadequate awareness about stroke, affected organ, symptoms of stroke, and risk factors for stroke.

Key words: Stroke, Hypertension, Brain

Introduction

As per World Health Organization, Stroke is defined as, rapidly developed clinical signs of focal (or global) disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than of vascular origin. Stroke

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is the second leading cause of death worldwide and was responsible for an estimated 6.5 million deaths and 113 million DALYs (Disability Adjusted Life Years) in 2013[1].

An Acquired Brain Injury (ABI) is an injury to the brain, which is not hereditary, congenital, degenerative, or induced by birth trauma. In India, rapid urbanization, economic growth and changes in lifestyle have led to tremendous increase in the incidence of ABI, so much so that it is being referred to as a 'Silent Epidemic'. Stroke is the non-traumatic cause of ABI[2].

Developing countries like India is facing a double burden of communicable and non- communicable diseases. Stroke is one of the leading causes of death and disability in India[3].

The prevalence of stroke in India varies in different regions of the country and ranges from 40 to 270 per 100,000 population. Approximately 12% of all strokes occur in the population less than 40 years of age.[4-7] In India, studies estimate that incidence of stroke population varies from 116 to 163 per 100,000 population[1].According to ICMR report, stroke was 4th leading cause of death and 5th Leading cause of Disability Adjusted Life Years (DALY) in 2016.[8]

In an effort to assist low-income and middle-income countries to establish surveillance systems for stroke, WHO recommended a stepwise approach (STEPS Stroke) through the use of standardized tools and methods for ongoing core, expanded, and optional data collection. STEPS approach consists of three steps representing the possible outcomes of stroke patients in the hospital and the community[9].

Few studies are conducted to study awareness of stroke in relation to risk factors, warning symptoms and treatment in India. Awareness about stroke warning symptoms in India is found to be 34% (at least 1 warning symptom is known) 29 % (at least 2 warning symptoms are known) and awareness about risk factors is found to be 51.2% (at least 1 risk factor), 18.5% (2 risk factors)[10].

The majority of stroke survivors continue to live with disabilities, and the cost of rehabilitation and long term-care are financial burden on their families[9].

Stroke may compromise cognitive, mood, functional abilities and quality of life. It results in caregiver burden and economic stress at individual, familial and national level. [(11)] India is facing an enormous socioeconomic burden to meet the costs of rehabilitation of stroke survivors because the life expectancy has increased and risk of developing stroke also on rise[10].

Treatments of acute ischemic stroke with thrombolytic can reverse the acute paralysis in many patients. However, such treatment can be utilized only within the window period of four and half hours with good hospital care. For maximum utilization of thrombolysis within golden time period, the identification of stroke patients and awareness among general masses is essential[11]. To reduce burden of stroke in community, public knowledge, the right attitude and practices, are required[12]. Lack of awareness, under usage of population-wide strategies, false reassurance of low risk, management of blood pressure and cost barrier are the gaps in prevention of stroke at primary level[1].

Hence it becomes important that public should have appropriate knowledge about stroke. With this background, the present study will be conducted to study awareness of stroke among the general population residing in urban area of western Maharashtra.

Aim and Objectives:

The present study aims at assessing the awareness of stroke among the general population in urban area. Specific objectives of this study are:

- To study awareness of warning symptoms, risk factors and treatment of stroke in study population.
- To study the correlation between socio-demographic factors with awareness of stroke.

Material and Methods

Study Design: A Cross -sectional Observational study

Study area: Urban Field Practice Area of Medical College in Western Maharashtra

Study Population: The study was conducted in the age group of more than 30 years of the participants in the urban area.

Inclusion Criteria: Person from selected household aged more than 30 years were included in the study.

Exclusion Criteria: Any person from the family suffered from stroke, all those family members will be excluded from the study.

Study duration: 6 months (1st Jan 2021 to 30th June 2021)

Sample size calculation:

Considering 55% awareness regarding the stroke [10] of with 95%

Confidence interval and 5% allowed error sample size was calculated using the formula $4pq/l^2$.

$$\text{Sample size (n)} = \frac{(1.96)^2 * p * q}{l^2}$$

$$= \frac{(1.96)^2 * 55 * 45}{5*5}$$

$$= 380.16$$

$$\approx 380$$

So sample size is = 380

The total sample size was 380 subjects in the study

Sampling:

Two stage sampling was used while collecting the data. In the first stage, as per census 2011, out of total 23 wards, 20% i.e. 5 wards were selected randomly covering the geographical distribution of Talegaon and in the Second stage, from these selected 5 wards, households were selected by proportionate sampling as per the population proportion of the selected wards. One person from each household aged 30 years and above was interviewed with pretested semi structured questionnaire from each selected 5 wards.

The data collection was done with pretested semi -structured questionnaire by interview method. The study participants were informed about the purpose of the study and written informed consent was obtained before inclusion in the study. The permissionwas taken from the Institutional Ethical Committee for conducting the study.

Questionnaire includes:

1. The first section includes demographic details- name, age, sex, education, occupation, address, and socio-economic status.
2. The second section includes- Questions related to awareness of stroke, risk factors, symptoms and treatment of stroke.

The data was entered in Microsoft Excel sheet and statistical analysis has been done using appropriate statistical tests. Percentage and chi- square test were carried out in the study. Chi – square test was applied to find the association between socio demographic factors and awareness of stroke.

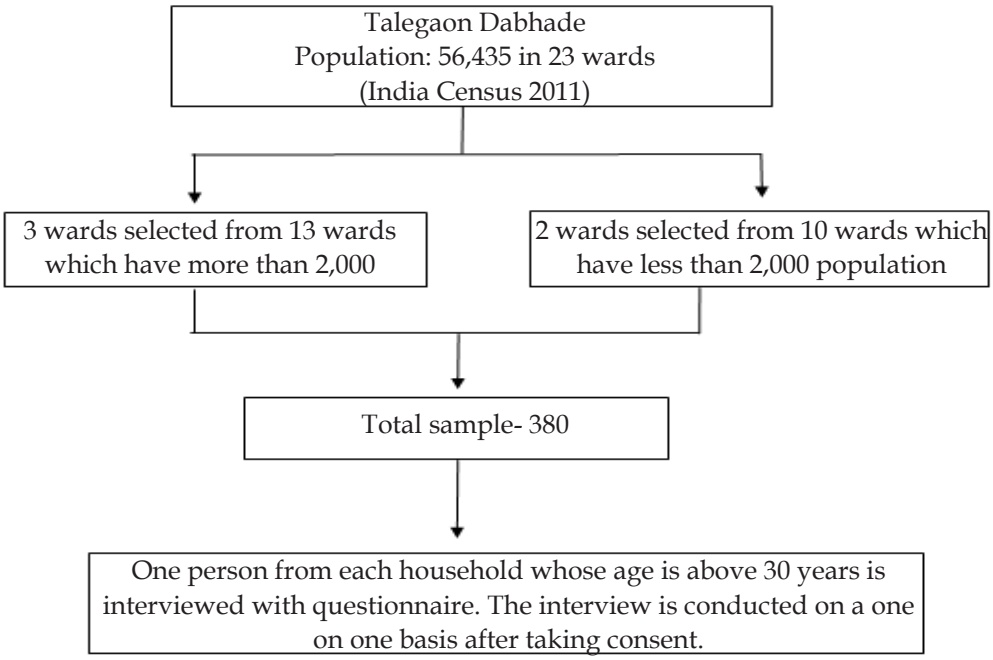


Figure 1: Flow chart depicting sampling and data collection in the study:[13]

Results

The present study was carried out in the Urban Field Practice Area of Medical College in Western Maharashtra to observe awareness of stroke, its risk factors, symptoms and treatment.

A total of 380 participants were included in the study. In the study, 182 (47.89%) were females and 198 (52.10%) were males.

Table 1: Distribution of Study Participants according to Age and Education

Age group	Study Participants (n=380) (%)
30-34	49 (12.89)
35-39	43 (11.32)
40-44	59 (15.53)
45-49	75 (19.74)
50-54	70 (18.42)
55-59	33 (8.68)
>60	51 (13.42)

Educational status	Study Participants (n =380) (%)
Primary	08 (2.11)
Secondary	68 (17.89)
Higher secondary/ diploma	30 (7.89)
graduate/ post graduate	274 (72.11)

Table 1 shows the age wise distribution of study participants. The maximum percentage of participants were from the age group of 45-49 years (19.74%) followed by 50-54 years (18.42%) and minimum were from 55-59 years (8.68%) among the participants. Mean age was observed 47.75 years among males and 47.74 years among females.

It was observed that 274 (72.11%) study subjects were educated up to graduation or post-graduation while higher secondary or diploma 30 (7.89%), secondary 68 (17.89%) and 8 (2.11%) up to primary education.

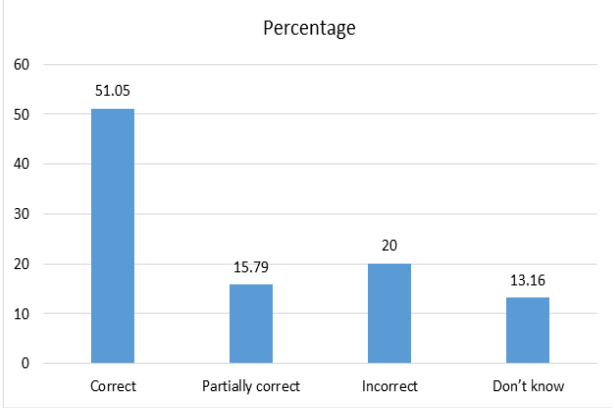


Figure 2: Awareness of stroke among study participants

It was found that 194 (51.05%) participants were aware about what is stroke while 60 (15.79%) were aware partially. 76(20%) participants answered incorrectly and 50 (13.16%) were not knowing about stroke.

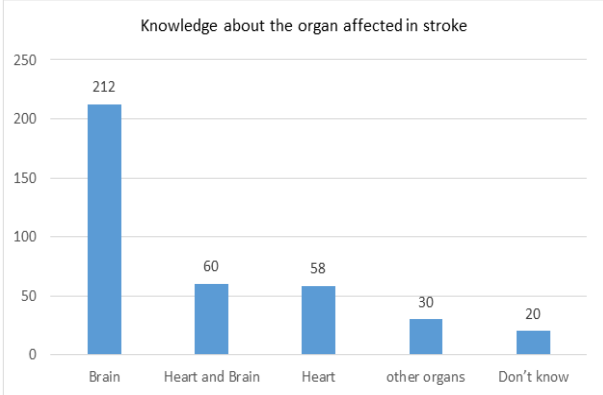


Figure 3: Knowledge about the organ affected in stroke among the participants

This figure shows the knowledge of organ affected in stroke among the participants. There were 212 (55.79%) participants who knew the brain is affected organ in stroke and 60 (15.79%) participants answered both heart and brain are affected in stroke. Among the participants, 58 (15.26%) told heart is affected organ and 30 (7.89%) told other organs which include liver, kidney, knee are affected in stroke, while 20 (5.26%) were now aware about the organ affected in stroke.

Table 2: Awareness of symptoms of stroke among the participants

Awareness of Symptoms of Stroke*	Frequency	Percentage
Loss of consciousness	193	50.79
Paralysis of one side	232	61.05
Headache	104	27.37
Loss of balance	170	44.74
Difficulty in speech	164	43.16
Loss of vision	83	21.84
Tingling sensation	112	29.47

* The numbers are mutually exclusive

Table 2 shows awareness of symptoms of stroke among the participants. Among awareness of symptoms of stroke, paralysis of one side 61.05% followed by loss of consciousness 50.79%, loss of balance 44.74%, difficulty in speech 43.16% tingling sensation 29.47% and loss of vision 21.84 percent.

Table 3: Awareness of risk factors for stroke

Risk factors for stroke*	Frequency	Percentage
Hypertension	298	78.42
Stress	260	68.42
Diabetes	137	36.05
Dyslipidemia/ high Cholesterol	122	32.10
Heredity	61	16.05
Obesity	107	28.16
Heart Disease	152	40
Lack of Exercise	141	37.10
Smoking	132	34.74
Tobacco	82	21.58
Black Magic	3	0.79
No idea	6	1.58

* The numbers are mutually exclusive

It was observed that maximum 298 (78.42%) participants were aware that hypertension is risk factor for stroke and minimum 61 (16%) answered as it is hereditary or familial. It was observed that, there was myth (black magic) regarding the risk factor for stroke. Knowledge of other risk factors includes, Stress (68.42%), heart disease 40%, lack of exercise (37.10%), Diabetes (36%), smoking 34.74%, Dyslipidemia 32%, obesity 28.16% and tobacco 21.58 percent.

Table 4: Awareness about the treatment of stroke

Treatment for stoke*	Frequency	Percentage
Don't know	107	28.16
Control BP	220	57.89
Oil Massage	41	10.79
Blood thinning	146	38.42
Aspirin	77	20.26
Surgery	67	17.63
Ayurvedic	74	19.47
Faith healing	9	2.36
Homeopathy	32	8.42

* The numbers are mutually exclusive

Out of total 380 participants, 57.89% were aware about control of Blood Pressure as treatment of stroke followed by blood thinning drugs 38.42% and aspirin 20.26 percent. 28.16% participants were not aware of treatment of stroke.

Table 5: Awareness about the first thing to do after stroke

First thing to do after stroke*	Frequency	Percentage (%)
Take to hospital	294	77.37
Call a doctor	66	17.37
Show to Reg. practitioner	56	14.74
Buy medicine from shop	2	0.53
Don't Know	64	16.84

* The numbers are mutually exclusive

Table 5 shows the awareness about the first thing to do after stroke among the study subjects. Around 77% study subjects were aware that it's an emergency so take the patient to the hospital.

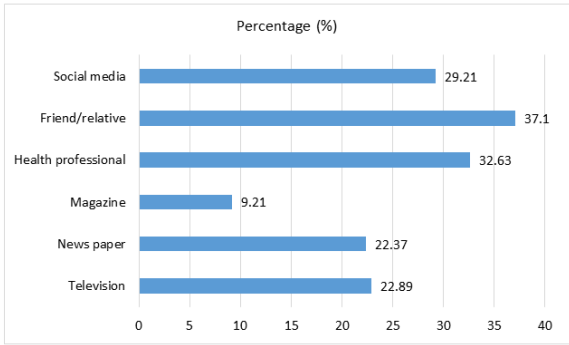


Figure 4: Source of information about stroke (the responses were mutually exclusive)

This figures hows about the source of information regarding stroke among participants. It was observed that 37.1% were from friends or relatives followed by health professionals 32.63%, social media 29.21 percent.

It was observed that older age group is more aware about stroke than the younger age group, this difference was not found to statistically significant ($p > 0.05$). Association between gender and awareness of stroke was not found to be significant ($p > 0.05$).

It was observed that awareness of stroke is associated with education of study participants. Chi Square value is 15.370 and the difference is found to be statistically significant ($p = 0.002$) while there was no significant association between age groups and awareness of stroke.

Discussion

The present study was carried out to observe the awareness among the population in urban area in western Maharashtra. Total 380 study subjects participated in the study. The Age- wise distribution was observed as 24.21% were less than 40 years, 62.37% were aged between 40 to 60 years and 13.42% were more than 60 years of age with mean age of population as 47.4 years. A study conducted by Pandian et al [10] has shown 54.6% were less than 40 years, 39.7% aged between 40 to 60 years and 5.7% were more than 60 years with mean age was 40.1 years.

In the present study, there were 52.1% were males and 47.89% were females. It was found that 194 (51.05%) participants were aware about what is stroke while 50 (13.16%) were not knowing about stroke. There is lack of awareness about stroke among the public even in developed countries like the United States[14] and Australia[15].

There were 212 (55.79%) participants who knew the brain is affected organ in stroke and 58 (15.26%) told heart is affected organ and 30 (7.89%) told other organs which include liver, kidney, knee are affected in stroke, while 20 (5.26%) were now aware about the organ affected in stroke. This finding is similar to study carried in Northwest India[10]. Study conducted by Sirisha et al[16] showed that 47% participants were aware that brain is the organ affected in stroke.

Among awareness of symptoms of stroke, paralysis of one side 61.05% followed by loss of consciousness 50.79%, loss of balance 44.74%, difficulty in speech 43.16% tingling sensation 29.47% and loss of vision 21.84 percent. The results were similar to the study conducted by Das S, et al[12]. Kurmi et al[17] and Deepthi et al[18] study findings about weakness on one side was observed to be 64%and 54% respectively.

In this study, 78.42% participants were aware that hypertension is risk factor for stroke and knowledge of other risk factors includes, Stress (68.42%), heart disease 40%, lack of exercise (37.10%), Diabetes (36%), smoking 34.74%, Dyslipidemia 32%, obesity 28.16% and tobacco 21.58 percent and heredity sixteen percent.

The findings of study carried by Pandian et al [10]showed awareness of risk factors, hypertension 45.1%, stress 40.9%, diabetes 10.7%, and high cholesterol 6.7percent.

Hypertension is the most important risk factor for stroke followed by diabetes, heart disease, dyslipidemia was observed by the studies conducted by Sirisha et al[16] and Deepthi et al[18].

In the present study, source of information about stroke, was observed that 37.1% was from friends or relatives followed by health professionals 32.63%, social media 29.21 percent the findings were similar to the study conducted by Pandian et al[10] except from health professional as source of information which was observed to be 3.6 percent.

The association between age, groups, gender and education with awareness of stroke was studied among these, educational status of participants was found to be significant with awareness of stroke.

Conclusion

In the present study it was revealed that the participants had inadequate awareness about stroke, affected organ, symptoms of stroke, and risk factors for stroke. Lack of knowledge about the disease may become an obstacle in preventive measures as stroke is one of the most common cause of morbidity and mortality worldwide leading to disabilities and long-term care. Hence, it is suggested to create awareness among community by health care professionals.

Ethical Clearance: Institutional Ethics Committee (Biomedical & Health Research)

Maharashtra institute of Medical Education & Research, Talegaon Dabhade

IEC/MIMER/2020/675 dated 7th March 2020

Conflict of interest: Nil

Source of funding: This was ICMR - STS project

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Original Article

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Investigation of a Gastroenteritis Outbreak among the Students of a Medical College in North Kerala, India

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Abstract

Background: There was an outbreak of gastroenteritis in the campus of a Private Medical College, Wayanad, Kerala in January, 2021. This study was planned to find-out the epidemiological factors responsible for the gastroenteritis outbreak among the students of the College and recommend prevention and control measures.

Methods: This study was conducted in a Private Medical College of Wayanad district Kerala in January 2021. Data was collected using a self-administered questionnaire from 11 cases and 42 controls. Water samples were collected from different sources in ladies' hostel new block and canteen.

Results: All the cases were from the ladies' hostel new block and from phase I MBBS. The first case was on 10/01/2021, last on 15/01/2021, with peak in the incidence of cases on 12/1/21 (7 cases). Majority of the cases presented with nausea, vomiting and abdominal pain (72.7% each). There was a very strong association between consumption of canteen chutney and sambar and gastroenteritis (OR=11 for both) and both these associations were found to be statistically significant (P=0.02 for both). No statistically significant association was detected between consumption of water from any particular water source and development of gastroenteritis (P>0.15 for all). Water samples from canteen showed the presence of Klebsiella, E coli and Pseudomonas and from Ladies hostel, Pseudomonas. However, Ejikman's test was negative. Conclusion: All the cases were from ladies' hostel new block and were from phase I MBBS. The outbreak was a point source single exposure epidemic. Majority of the cases presented with nausea, vomiting and abdominal pain. Consumption of canteen chutney and sambar were found to have a very strong and significant association with gastroenteritis. The organisms were of non-fecal origin.

Keywords: Gastroenteritis, outbreak, Medical College, Kerala

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Introduction

Annually about 300-500 crore cases of gastroenteritis occur worldwide, with about 15 lac deaths resulting in loss of 3.3 crore healthy life years (DALYs). In the WHO South East Asian region about 15 crore cases with 1.75 lac deaths occur annually. Gastroenteritis is caused by several pathogens viz., bacteria, viruses and parasitic organisms, which limits the adoption of vaccination strategy to prevent them.[1,2] Food-borne outbreaks are caused by lack of sanitation and unhygienic practices leading to contamination of food.[1-3] Hence, a significant proportion of them can be prevented through safe drinking water and adequate sanitation and hygiene.[4] Although specific food borne infections such as Typhoid, Choleraetc., are under regular surveillance by the Integrated Disease Surveillance Project of India, only limited number of food poisoning outbreaks are subjected to proper epidemiological investigation.[5]

There was an outbreak of gastroenteritis in the campus of a Private Medical College, Wayanad, Kerala in January, 2021. This study was planned to find-out the epidemiological factors responsible for the gastroenteritis outbreak among the students of the College and recommend prevention and control measures.

Methodology

There was an outbreak of gastroenteritis in the ladies' hostel new block of a Private Medical College, Wayanad, Kerala with onset on 10th January 2021. The Dean of the Medical College in response to this had constituted an Outbreak Investigation Committee consisting of faculties from the departments of Community Medicine, Microbiology and General Medicine to investigate into the causes of the outbreak and recommend control measures.

There were a total of 11 cases. 4 appropriately age and sex matched controls were set up for each case and the data was collected from a total of 53 subjects. Data was collected by using a self-administered questionnaire which comprised of the basic sociodemographic details, diet history of the preceding 3 days of the onset of outbreak, sources of drinking water, history of exposure to similar cases and details of symptoms and treatment history for the cases. Water samples were collected from different sources in ladies' hostel new block and canteen as per the 'Manual of Standards of Quality for Drinking Water Supplies'.[6]

Data was entered in MS Excel and analyzed using Statistical Package for Social Sciences 21.0. Descriptive statistics such as mean and percentage and also inferential statistics like Chi-square test to find out association were used. The identification details of the subjects were collected for the management of cases and institution of preventive measures. However, these were stored in password protected systems and were available only to the investigators. Oral consent was obtained from all the subjects.

Results

Data was collected from a total of 53 subjects, all the 11 cases and 42 controls.

Table 1: Distribution of subjects based on age, sex and year of study

Variable		Cases	Controls	Total
Age		20.73±1.3	20.76±3.06	
Sex	Male	0(0)	0(0)	0(0)
	Female	11(20.75)	42(79.25)	53(100)
Phase of study	Phase I	11(20.75)	42(79.25)	53(100)
	Phase II	0(0)	0(0)	0(100)
	Phase III, Part I	0(0)	0(0)	0(100)
	Phase III, Part II	0(0)	0(0)	0(100)
	Internship	0(0)	0(0)	0(100)

All the cases were from the ladies' hostel new block and from phase I MBBS

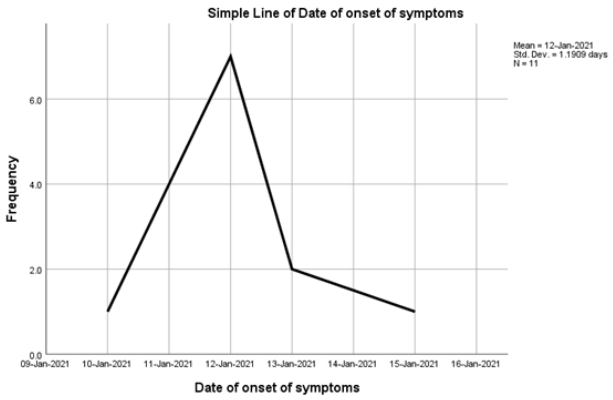


Fig 1: Epidemic curve

The first case was on 10/1/21 and there was a peak in the incidence of cases on 12/1/21 (7 cases), suggesting a point source single exposure epidemic

Table 2: Distribution of symptoms of cases

Sl. No	Symptoms	No (%)
1	Vomiting	8(72.73)
2	Abdominal pain	8(72.73)
3	Nausea	8(72.73)
4	Headache	3(27.27)
5	Body ache	0(0)
6	Fever	3(27.27)
7	Loose stools	4(36.36)
8	Giddiness	2(18.18)
9	Breathlessness	1(9.09)
10	Blood in stools	0(0)
11	Mucus in stools	1(9.09)

*Multiple responses present

Majority of the cases presented with nausea, vomiting and abdominal pain

Table 3: Association between various food items and gastroenteritis

Food consumed		Cases	Controls	OR	P Value
Dosa	Had	11	42	-	-
	Not had	0	0		
Chutney	Had	10	20	11	0.02*
	Not had	1	22		
Sambar	Had	10	20	11	0.02*
	Not had	1	22		
Noolputtu	Had	10	38	1.05	>0.99*
	Not had	1	4		
Kadala curry	Had	8	30	1.07	>0.99*
	Not had	3	12		
Poori	Had	10	36	1.67	>0.99*
	Not Had	1	6		
Bhaji	had	10	36	1.67	>0.99*
	Not had	1	6		
Kanji	had	2	1	9.11	0.21*
	Not had	9	41		
Noolputtu	Had	5	33	0.23	0.08*
	Not had	6	9		
Paneer curry	Had	4	9	2.1	0.51*
	Not had	7	33		
Gobi curry	Had	0	3	0	0.98*
	Not had	11	39		
Chicken curry	Had	8	34	0.63	0.82*
	Not had	3	8		

Continue.....

Upma	Had	0	2	0.00	>0.99*
	Not had	11	40		
Parotta	Had	8	34	0.63	0.82*
	Not had	3	8		
Beef curry	Had	4	26	0.35	0.24*
	Not had	7	16		
Ghee rice	Had	10	39	0.77	>0.99*
	Not had	1	3		
Veg kurma	Had	9	31	1.60	0.91*
	Not had	2	11		
Chapathi	Had	9	33	1.23	>0.99*
	Not had	2	9		
Chicken fried rice	Had	2	3	2.89	0.55*
	Not had	9	39		
Butter chicken	Had	0	6	0	0.46*
	Not had	11	36		
Butter nan	Had	0	6	0	0.46*
	Not had	11	36		
Instant noodles	Had	0	1	0	>0.99*
	Not had	11	41		
Chicken Biriyani	Had	1	7	0.5	0.94
	Not had	10	35		
Tandoori chicken	Had	0	3	0	0.98*
	Not had	11	39		

*Fisher's exact test was used instead of chi-square testas at least one expected value was < 5

There was a very strong association between consumption of canteen chutney and sambar and gastroenteritis (OR=11 for both) and both these associations were found to be statistically significant (*P*=0.02 for both) by Fisher's exact test.

Table 4: Association between different sources of drinking water and Gastroenteritis

Source of water		**Cases**	**Controls**	**OR**	**P Value**
Water purifier ground floor Ladies' Hostel (mess)	Had	9	22	4.09	0.15*
	Not had	2	20		
Water purifier 2nd floor Ladies Hostel	Had	8	34	0.63	0.82*
	Not had	3	8		
Water can-1st floor Ladies Hostel	Had	0	1	0.0	>0.99*
	Not had	11	41		

*Fisher's exact test was used instead of chi-square test as at least one expected value was < 5

No statistically significant association was detected between consumption of water from any particular water source and development of gastroenteritis

Table 5: Association between exposure to similar cases and Gastroenteritis

H/o exposure to similar cases	Cases	Controls	OR	P Value
Yes	6	17	1.77	0.62*
No	5	25		

There was no statistically significant association between history of exposure to similar cases and development of gastroenteritis (OR 1.77, *P*=0.62)

Table 6: Details of treatment received

Treatment received	No (%)
Antibiotics	2(18.18)
ORS	7(63.64)
IVF	2(18.18)
Proton Pump Inhibitors	7(63.64)
Antiemetics	6(54.55)
Probiotics	4(36.36)
Antispasmodic	1(9.09)
Enkephalinase inhibitors	2(18.18)
NSAIDs	1(9.09)

Majority of the cases were treated with ORS, PPIs (63.64% each) and antiemetics (54.55%)

Table 7: Microbiological analysis

Sl No.	Sample	Finding
1.	Water from Canteen main source (kitchen purifier)	Pseudomonas, E coli
2.	Water from Canteen juice section	E coli, Pseudomonas, Klebsiella
3.	Water from LH Ground floor purifier	Pseudomonas
4.	Water from LH 2nd floor purifier	Pseudomonas
5.	Food samples of 12/1/21	No significant contamination

*We learnt that food samples in canteen would be preserved for 72 hours only and hence samples of 8-11/1/21 were not available

**The cases refused to provide stool samples for analysis citing various reasons like they have exams the next day, they are asymptomatic etc., though the arrangement for sample collection in hostel was done. Hence stool sample analysis could not be done

Though Coliforms were detected in the water samples, Ejikman test was negative indicating that they were of non-fecal origin.

Discussion

All the cases of gastroenteritis were from ladies' hostel new block. However, the water samples from different sources there were negative for coliform bacteria indicating that the source of infection is elsewhere. Water from 2 sources in the canteen were positive for coliform bacteria. However there were no cases reported amongst gents' hostel inmates or staff. The food prepared in the canteen is transported and supplied in the respective hostels for the students. Hence, the food stuffs transported to the ladies' hostel new block alone or the utensils used there might have been contaminated.

This was a point source epidemic, indicating that only the raw materials used in the preparation of food stuffs/ contamination occurred over a shorter period of 1-2 days only.

Though bacteria like pseudomonas, E-coli and Klebsiella were detected in the water samples from both canteen and ladies hostel, Ejikman test was negative indicating that they were of non-fecal origin. The analysis of food samples from 8-11/01/2021 could not be done because of unavailability and stool samples because of refusal by the students. Hence, it could not be concluded as to whether the identified organisms were commensals or causes of infection, or whether there were any other organisms or sources of infection. In view of this specific preventive measures could not be recommended.

E. coli, Pseudomonas and Klebsiella were detected in water samples during a previous outbreak in the institution in January 2020. Environmental assessment had revealed contamination of the water source with sewage water due to overflowing. Specific corrective measures to prevent future contamination in addition to regular chlorination of water source were instituted.

In an outbreak of gastroenteritis reported among medical students of a Govt Medical college of Madhya Pradesh, coliforms were detected in food and water samples of the campus. It was a continuous exposure type of outbreak as the cases were spread over a long period of time. However, a specific source of infection could not be identified and general preventive measures like maintenance of water filters, hygiene among food handlers etc., were recommended.[7]Literature review reveals that there are no other outbreaks of gastroenteritis reported in any professional institutions of the country which points out towards under-investigation and under-reporting of such outbreaks.

Conclusion

- All the cases were from ladies' hostel new block and were from phase I MBBS
- There was a single peak, sudden rise and sudden fall in the epidemic curve suggesting a point source single exposure epidemic
- Majority of the cases presented with nausea, vomiting and abdominal pain
- Consumption of canteen chutney and sambar were found to have a very strong andsignificant association with gastroenteritis
- No significant association was detected between consumption of water from any particular water source and development of gastroenteritis
- Majority of the cases were treated with ORS, PPIs and antiemetics

Recommendations

- The contents and the process of preparation of chutney and sambar to be looked into
- Thorough washing of the cooking utensils in boiling water
- Regular and thorough disinfection of the toilets, bathrooms (especially the structures like door handles, taps etc.,) and also of the exterior of the water purifiers
- Regular maintenance of water purifiers
- Free residual chlorine level of 0.5mg/l for a contact period of at least 1 hour to be ensured during the chlorination of drinking water
- Health education to all food handlers regarding personal hygiene (i.e., washing of hands thoroughly with soap after defecation, urination and before handling of any foodstuff), voluntary reporting in the event of suffering from any infectious illnesses
- Regular screening of the food handlers for infectious diseases (viz typhoid, Hepatitis A carrier state)
- Vaccination of the food handlers with Typhoid and Hepatitis A vaccines

Public Health Implications

This article provides insights into the common sources of infection for gastroenteritis outbreaks in an academic institution campus, methodology of investigating the outbreak and recommendations to prevent such outbreaks in future.

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Authors' Constributions:

1. Conceptualization, questionnaire preparation, Data analysis, Drafting the manuscript,
2. Drafting the manuscript, Critical review
3. Data collection, sample collection, data entry

Conflicts of Interest: None declared

Source of funding: Nil

Ethical Clearance: IEC clearance could not be obtained as it was an emergency and the college management had requested to do the investigation immediately. Oral consent was taken from all the participants.

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Original Article

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Internet Addiction and Psychological Co-morbidities among Undergraduate Medical Students of a Medical College

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Abstract

Background: Internet addiction (IA) is a growing concern, especially among young adults. Undergraduate medical students, due to their demanding studies and extended online exposure, are particularly susceptible to IA and its effects. This study aimed to estimate the prevalence of IA and major psychological co-morbidities like depression, anxiety, and stress among undergraduate medical students at NRS Medical College & Hospital, Kolkata, and to find out determinants of IA, and its relationship with psychological co-morbidities.

Methods: A cross-sectional study was conducted with 268 undergraduate students, 67 from each academic year, selected via stratified random sampling. Data collection involved a self-administered questionnaire covering socio-demographic details, Young's Internet Addiction Test (IAT), and Depression Anxiety Stress Scale (DASS-21). Descriptive followed by inferential statistics were applied using Jamovi software.

Results: Among the participants, majority (61.3%) were male, with a mean age of 20.6 ± 1.37 years, came from urban backgrounds (65.8%), were in upper socio-economic class (67.6%), resided in hostels (45.8%), and preferred using mobile phones for internet access (90.2%). A significant proportion (61.7%) used internet mainly from night to late night (8pm – 3am), with an average usage time of 4.98 ± 2.45 hours weekly. IA was prevalent, with most (41%) showing mild to moderate addiction levels; while 36.4% experienced some stress, 60.4% faced anxiety, and 53.3% reported depressive symptoms. A positive correlation existed between severity of IA and higher levels of depression, anxiety, and stress. Binomial logistic regression revealed that spending over 5 hours weekly online and using mobile phones as preferred device were significantly associated with addiction.

Conclusions: The study findings emphasize need for targeted interventions to manage IA and its psychological effects, promoting a healthier lifestyle and academic environment for medical undergraduates.

Keywords: Anxiety, Depression, Stress, Internet Dependence, Eastern India

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Introduction

Internet addiction is characterized by excessive or poorly controlled preoccupations, urges or behaviors regarding internet access that lead to impairment or distress.[1] Internet addiction disorder (IAD) can be defined as a lack of control in the use of the internet, in such a way that it impacts the personal life of the user.[2]

After China, India has the world's second-largest mobile phone market and the second-largest number of users.[3] With the surge of internet-based smart gadgets worldwide in recent era, the problem of IAD is emerging as a major behavioral disorder of the 21st century.[4]

Many studies have been conducted all over the world reported internet addiction (IA) to be associated with a variety of psychological, physical, or social problems, which leads to impairment of workplace function and academic performance, sleep disturbances, social isolation, substance abuse, depression and anxiety, etc.[5–7]

The global prevalence of IA among medical students was reported as 30.1%.[8] Anxiety and depression in medical students was observed as 33.8% and 28% globally.[9,10] In March'23 the Telecom Regulatory Authority of India (TRAI) reported 881.255 million Internet subscriber in the country.[11]

It has also been reported that young adults are the most active internet users.[12,13] Medical students, with recent trend of online classes, especially after the COVID-19 pandemic, spending the majority of their time in hostels for years and being away from their families, are more likely to use mobile phones, increasing the risk of addiction, depression, and fear of losing it.[14,15]

A study conducted among first year medical students of various medical colleges in West Bengal after covid-19 lockdown to assess IA found 80.23% of the participants showed moderate levels of IA.[16]After the pandemic, Internet usage among the youngsters have doubled.[17,18] The use of the Internet led to addiction, anxiety, depression, and stress. Keeping this in mind, current study is undertaken to take a closer look on this issue among undergraduate medical students.

Several studies performed in India and globally have quantitatively assessed IA among different population groups; however, relationship between internet use and psychosocial co-morbidities like depression, anxiety, stress etc. among undergraduate medical students of Eastern India remain underexplored. So, this study aimed to address these issues in medical students of one of the leading medical colleges of West Bengal.

Methods

This descriptive cross-sectional study was conducted at NRS Medical College & Hospital, Kolkata, during March and April 2024. It included undergraduate medical students from the 1st to 4th academic years, aged 18 and above, who were willing to participate. Students with diagnosed psychiatric disorders or on related medications were excluded. Data were collected using a pre-designed and pre-tested self-administered questionnaire, consisted of three sections: socio-demographic characteristics and patterns of internet use, Young's Internet Addiction Test (IAT), and the Depression, Anxiety, and Stress Scales (DASS-21).[19,20]

The study employed stratified random sampling to select 268 participants, calculated using Cochran's formula, based on an 80.23% prevalence of moderate IA[16], with a 5% margin of error and 10% non-response allowance. Each of the four academic years, with 250 students, formed a stratum, and 67 participants were randomly selected from each year using computer-generated random numbers. Students below 18 years of age were excluded, and if a selected student was unavailable, the next student on the list was chosen from the same stratum.

Data was entered in Microsoft Excel and analysed using Jamovi (version 2.5.3). Descriptive statistics were presented as proportions, means and standard deviations. Chi-square tests assessed associations between IA, sociodemographic variables, internet usage patterns, and psychological status.

Results

Total of 268 undergraduate students participated with a mean age of 20.9 ± 1.48 years, ranging from 18 to 25 years. The majority were male (61.6%), Hindu (88.1%), resided in urban areas (66.0%), and belonged to the upper socio-economic class (68.3%) as per the Modified B.G. Prasad scale, with a mean per capita income of Rs. 15,348 ± 10,220.Nearly half of the participants (47.1%) lived in hostels, 35.4% at home, and 17.5% in rented accommodations. All four academic years were equally represented (25% each). Most students came from nuclear families (89.9%), with a mean family size of 4.17 ± 1.83. The medium of schooling was predominantly English (56.7%), with nearly equal attendance at government (50.7%) and private schools (49.3%). (**Table 1**)

Table 1: Distribution of undergraduate students according to demographic characteristics (n=268)

Demographic Characteristics	Descriptive Statistics	
Age (in completed years)	Mean 20.9 ± 1.48, Median 21, IQR (20,22), Range 18 – 25	
Sex	**Number**	**%**
• Male	165	61.6
• Female	103	38.4
Religion		
• Hindu	236	88.1
• Muslim	27	10.1
• Christian	3	1.1
• Buddhism	2	0.7
Residence		
• Urban	177	66.0
• Rural	91	34.0
Socio-Economic Status	Mean PCI (Rs.) 15348 ± 10220	
• Upper	183	68.3
• Upper Middle	49	18.3
• Middle	25	9.3
• Lower Middle	11	4.1
Current place of stay		
• Hostel	126	47.1
• Home	95	35.4
• TO-LET	47	17.5
Current academic year		
• 1st year	67	25.0
• 2nd year	67	25.0
• 3rd year	67	25.0
• 4th / final year	67	25.0

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Type of family	Mean family size 4.17 ± 1.83	
• Nuclear	241	89.9
• Joint	27	10.1
Medium of schooling		
• English	152	56.7
• Bengali	114	42.6
• Hindi	2	0.7 %
Type of school attended before		
• Government	136	50.7 %
• Private	132	49.3 %

The mean age of first internet use was 14.1 ± 2.99 years, ranging from 5 to 20 years. Internet connectivity was intermittent for 51.9% and always on for 48.1%. Mobile phones were the preferred device (90.7%), and mobile internet was the primary connection type (58.6%), followed by Wi-Fi (40.3%). Night (8 PM–12 AM) was the most preferred time for internet use (38.8%), with an average usage of 4.94 ± 2.50 hours per day. The primary purposes for internet use among participants were educational (95.4%) and social media networking (84.3%). Other uses included online shopping (42.9%), gaming (30.9%), and entertainment (3.4%). Multiple responses were recorded, highlighting diverse usage patterns. (**Table 2**)

Table 2: Distribution of students according to internetusage pattern (n=268)

Internet Usage Pattern	**Number**	**%**
Mean age of first internet use	14.1 ± 2.99 years, Range 5 – 20	
Internet connectivity status		
• Intermittently on	139	51.9 %
• Always turned on	129	48.1 %
Preferred devices of access		
• Mobile phone	243	90.7 %
• Tablet	17	6.3 %
• Laptop / PC	8	3.0 %
Preferred type of connection		
• Mobile phone internet	157	58.6 %
• Wi-Fi	108	40.3 %
• Landline broadband	3	1.1 %
Preferred time of internet use	Mean time spent on internet 4.94 ± 2.50 hours/ week	
• Morning (6am - 12noon)	3	1.1 %
• Afternoon (12noon - 5pm)	46	17.2 %
• Evening (5pm - 8pm)	56	20.9 %
• Night (8pm - 12am)	104	38.8 %
• Late night (12am - 3am)	59	22.0 %

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Use / purpose of internet for		
• Educational purpose	256	95.4
• Social media networking	226	84.3
• Online shopping	115	42.9
• Gaming	83	30.9
• Entertainment	9	3.4

Based on Young's IAT, the majority of participants (57.1%) had normal internet usage (scores 0–30). Mild addiction was observed in 27.6% (scores 31–49), moderate addiction in 13.1% (scores 50–79), and severe addiction in 2.2% (scores 80–100). The mean IAT score was 31.8 ± 18.4, with a median of 28.5, an interquartile range (IQR) of 20–40, and a score range of 0–100.(**Table 3**)

Table 3: Distribution of students according to Young's Internet Addiction Test (IAT) score (n=268)

Internet Addiction Category	Score	Number	%	Descriptive Statistics
Normal	0-30	153	57.1 %	Mean 31.8 ± 18.4 Median 28.5 IQR 20,40 Range 0 – 100
Mild	31-49	74	27.6 %	
Moderate	50-79	35	13.1 %	
Severe	80-100	6	2.2 %	

Based on the Depression, Anxiety, and Stress Scale (DASS-21), the results showed varying levels of stress, anxiety, and depression among participants. For stress, 62.7% had normal levels (0–7), while 14.6% experienced moderate stress, with a mean score of 6.57 ± 4.74. In terms of anxiety, 38.4% had normal levels (0–3), while 17.5% had extremely severe anxiety, with a mean score of 5.54 ± 4.31. For depression, 47.8% had normal levels (0–4), while 28.4% experienced moderate depression, with a mean score of 5.65 ± 4.83.(**Table 4**)

Table 4: Distribution of students according to DASS-21 score (n=268)

Stress Category	Score	Number	%	Descriptive Statistics
Normal	0-7	168	62.7 %	**Total Stress Score –** Mean 6.57 ± 4.74 Median 6 IQR 3,10 Range 0 – 19
Mild	8-9	29	10.8 %	
Moderate	10-12	39	14.6 %	
Severe	13-16	22	8.2 %	
Extremely Severe	≥ 17	10	3.7 %	
Anxiety Category	**Score**	**Number**	**%**	**Descriptive Statistics**
Normal	0-3	103	38.4 %	**Total Anxiety Score –** Mean 5.54 ± 4.31 Median 5 IQR 2,8 Range 0 – 19
Mild	4-5	42	15.7 %	
Moderate	6-7	41	15.3 %	
Severe	8-9	35	13.1 %	
Extremely Severe	≥ 10	47	17.5 %	
Depression Category	**Score**	**Number**	**%**	**Descriptive Statistics**
Normal	0-4	128	47.8 %	**Total Depression Score –** Mean 5.65 ± 4.83 Median 5 IQR 2,9 Range 0 – 21
Mild	5-6	27	10.1 %	
Moderate	7-10	76	28.4 %	
Severe	11-13	16	6.0 %	
Extremely Severe	≥ 14	21	7.8 %	

The study found a significant and positive correlation between IA and psychological factors, including depression, anxiety, and, stress among students. Furthermore, the psychological factors themselves showed strong inter-correlations, with the highest being between anxiety and stress (r = 0.841), followed by depression and stress (r = 0.776) and depression and anxiety (r = 0.773).(**Table 5**)

Table 5: Correlation of Internet Addiction with Stress, Anxiety, and Depression among Students (n=268)

		Internet Addiction	Depression	Anxiety	Stress
Internet Addiction	Pearson's **'r'**	-			
	p-value	-			
Depression	Pearson's **'r'**	0.502	-		
	p-value	**< .001**	-		
Anxiety	Pearson's **'r'**	0.494	0.773	-	
	p-value	**< .001**	**< .001**	-	
Stress	Pearson's **'r'**	0.561	0.776	0.841	-
	p-value	**< .001**	**< .001**	**< .001**	-

There were no significant association between IA and socio-demographic variables like age, sex, residence, socio-economic status, current place of stay, schooling medium, type of schooling, or academic year (p > 0.05).

Significant associations were found in logistic regression analysis between IA and the time spent on the internet (p = 0.001), internet connectivity (p = 0.009), and preferred device (p = 0.015). Those spending more than 4 hours per week on the internet, having continuous internet connectivity, and using mobile phones had higher odds of IA, with AOR (95% CI) of 1.99(1.19-3.32), 1.81(1.09-3.00), and 2.85(0.99-8.21), respectively. Preferred time of internet use (night to late night) also showed a significant association (p = 0.005), with an AOR (95% CI) of 1.85(1.09-3.15). However, the age at first access to the internet and preferred device showed no significant association with IA. The overall model was statistically significant (p < 0.001), with an accuracy of 61.6%.(**Table 6**)

Table 6: Binary Logistic Regression for association between Internet Addiction & Internet Usage Pattern (n=268)

Internet Usage Pattern		Internet Addiction n (%)	Chi Square X^2 [df = 1] p-value	OR (95% CI)	AOR (95% CI)	p-value
Age @ first access to internet*	≤ 14 years	62 (45.9%)	1.01	1.28		
	> 14 years	53(39.8%)	0.32	(0.79-2.08)	-	-
Time spent on internet* (h/week)	> 4 hours	69(53.1%)	10.7	2.26	1.99	
	≤ 4 hours	46(33.3%)	**0.001**	(1.38-3.71)	(1.19-3.32)	**0.008**
Internet connectivity	Always turned on	66(51.2%)	6.91	1.92	1.81	
	Intermittently on	49(35.3%)	**0.009**	(1.18-3.14)	(1.09-3.00)	**0.023**
Preferred device of use	Mobile phone	110(45.3%)	5.91	3.31	2.85	
	Other devices^	5(20.0%)	**0.015**	(1.20-9.10)	(0.99-8.21)	0.051
Preferred time of internet use	Night to late night (8pm-3am)	81(49.7%)	7.81	2.06	1.85	
	Other (3am-8pm)	34(32.4%)	**0.005**	(1.24-3.44)	(1.09-3.15)	**0.023**
Total		115(42.9%)				

* ≤ median

^ Laptop, Tablet, PCs

Model Fit Measures: Overall Model Test - χ^2 41.6 [df=4], p < .001

R_2 Cox & Snell's - 0.095, Nagelkerke's - 0.127, McFadden's - 0.073

Accuracy - 0.616, Specificity - 0.706 and Sensitivity - 0.496

Discussion

This study assessed the prevalence of IA and its psychological co-morbidities among undergraduate medical students of the NRS Medical College & Hospital, Kolkata, revealing key insights into their online behavior and mental health profiles. The findings indicate that while a majority of students (57.1%) demonstrated normal internet usage, a significant proportion (27.6%) exhibited mild addiction, with moderate (13.1%) and severe (2.2%) cases also identified. These rates align with prevalence trends reported among medical students in various studies across India, highlighting the increasing relevance of this issue in similar settings.[21–28]

The mean age of first internet use was around 14 years, with mobile phones being the primary access device for most participants (90.7%), which was found to be similar to a mixed-method study conducted among undergraduate college students from western Rajasthan.[21] Average daily internet usage was 4.94 ± 2.50 hours, with a preference for nighttime access, reflecting a behavioral trend toward prolonged online engagement, which was in consistency with previous studies undertaken in medical undergraduates from other parts of India.[25,26] This trend aligns with research linking extended screen time to higher addiction risks.[25,26,29,30] The widespread use of mobile phones further enables continuous connectivity, contributing to addictive behaviors.[21] Internet use was primarily for education (95.4%) and social media (84.3%), followed by shopping (42.9%), gaming (30.9%), and entertainment (3.4%).[26,27,29]

In terms of psychological impact, the study found a noteworthy prevalence of depression (52.2%), anxiety (61.6%), and stress (37.3%) among participants. The prevalence rates observed in this study reflect similar trends reported among medical students in various studies.[16,21,22,24] The positive correlation between IA and these psychological factors (r = 0.502 for depression, r = 0.494 for anxiety, and r = 0.561 for stress) is consistent with literature that identifies excessive internet use as a risk factor for mental health disturbances.[16,22,24,25,28,31] These findings highlight a bidirectional relationship wherein psychological distress may drive excessive internet use, which in turn exacerbates mental health symptoms.

There were no significant association between IAand socio-demographic variables like age, sex, residence, place of stay, schooling medium, type of schooling, or academic year (p > 0.05). English-medium schooling showed a higher, but non-significant, (UOR 1.53, 95% CI: 0.93–2.50). Overall, socio-demographic and academic factors showed no association with IA in this study, despite previous literature highlighting links between these variables.

The logistic regression analysis revealed that spending more than 4 hours online daily and utilizing mobile phones as a preferred device were significant predictors of IA, which were also observed in various literatures.[21,23,25,26,32,33] Students accessing the internet during nighttime hours (8 PM–3 AM) were also more likely to develop addiction, likely due to disrupted sleep cycles and reduced offline social interaction. These behavioral trends are particularly concerning in the context of medical education, where mental health and academic performance are closely interlinked.

The current study had some inherent limitations of its kind due the nature of the study design. Lack of temporality hindered the establishment of causal association. The results might had been influenced by social-desirability bias. The study had been conducted in only one medical college of Kolkata, hence the findings faced lack of external validity. Despite of such limitations the current study was a unique one to find no association of socio-demographic factors with IA highlighting the fact that usage pattern had to be modified irrespective of socio-demographic background to modify IA and its subsequent harmful health related complications.

Conclusion

This study highlighted the prevalence of IA among undergraduate medical students, with 42.9% of participants identified as having addictive tendencies. The current study also revealed a strong association between IA and psychological factors such as depression, anxiety, and stress, as evidenced by significant positive correlations which was specifically not explored in previous studies conducted in Eastern India. Interestingly, diverging from existing literatures, it highlighted that only usage patterns were important predictors of IA rather than socio-demographic ones.

The present study underscores the urgent need for targeted interventions to promote healthy internet usage habits and mental health awareness among medical students. Institutions should implement strategies such as digital well-being programs, stress management workshops, and accessible mental health support and professional counselling to mitigate the risks associated with IA. Further research is warranted to explore causal relationships and evaluate the effectiveness of intervention strategies in reducing both addiction and its psychological impact.

Declarations

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Original Article

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Unpacking Gender Disparities in Work-Related Well-Being: A Comprehensive Analysis of Employment and Life Challenges in Abu Dhabi

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Abstract

Gender disparities in well-being remain a critical yet understudied issue, particularly in diverse socio-cultural contexts like Abu Dhabi. This study examines these disparities across four groups—working adults, the unemployed, retirees, and migrant domestic workers—using data from the fifth cycle of the Quality-of-Life Survey. Key well-being determinants such as mental health, social support, economic satisfaction, and life satisfaction are analysed to understand gendered differences in well-being. Findings reveal significant gender-based disparities. Working adults differed in economic perceptions, work-life balance, and mental health, while the unemployed exhibited gaps in mental health and social support. Among retirees, differences in financial stability, social engagement, and mental health were evident, particularly affecting women. Migrant domestic workers faced disparities in job security, physical and mental health, and social networks, with women displaying greater resilience but fewer external support mechanisms. Understanding these disparities is crucial for shaping equitable policies that address systemic barriers to well-being. This study highlights the need for gender-sensitive, culturally attuned interventions to enhance life satisfaction, mental health, and social equity. The findings offer actionable insights for policymakers and stakeholders, contributing to a deeper understanding of gender and well-being in Abu Dhabi's evolving socio-economic landscape.

Keywords: Gender Disparities; Well-Being Determinants; Working adults; Unemployed; Retirees; Domestic workers; Mental Health; Abu Dhabi.

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Introduction

Well-being is a multidimensional concept encompassing physical health, mental health, social relationships, financial stability, and environmental factors, all of which shape individuals' quality of life and satisfaction.[1] In Abu Dhabi, cultural norms, rapid urbanization, and evolving societal structures create distinct challenges and opportunities in understanding well-being across demographic groups.[2]

Gender disparities in well-being have been widely studied, showing differences in health, economic participation, and psychological resilience between men and women.[3] While global trends suggest women report poorer health and higher stress levels, local socio-economic contexts influence these disparities.[3,4] Determinants such as mental health, life satisfaction, social support, and economic stability play key roles in shaping well-being.[5] Women often face higher levels of stress and anxiety due to societal expectations and gendered roles, while also contending with financial inequality and restricted access to opportunities.[6] Limited access to healthcare, education, and social inclusion further exacerbates gender-based well-being gaps.[7]

This study examines four groups—working adults, the unemployed, retirees, and domestic workers—each with distinct well-being challenges. Working adults experience disparities in work-life balance, job satisfaction, and stress, with women often encountering career stagnation and unequal domestic responsibilities.[8] Gendered differences in work-life balance and career progression remain significant obstacles to well-being.[9]

Unemployment affects men and women differently. Men often struggle with identity crises and mental health challenges linked to traditional expectations as primary earners.[10] Women, in contrast, face financial instability and caregiving responsibilities, which hinder re-employment.[6] While men may suffer from a loss of social identity, women often rely on family roles for psychological support.[3]

Retirement introduces financial and social disparities. Women often face economic insecurity due to lower lifetime earnings and pension benefits, which can increase their vulnerability to social isolation.[11] Men, however, may struggle with identity loss post-retirement, particularly if their sense of purpose was tied to professional roles.[12] Differences in healthcare access and pre-existing health conditions further contribute to gendered disparities in later life.[13]

Migrant domestic workers face severe gendered challenges, including exploitative working conditions, long hours, and lack of legal protections, which impact physical and mental health.[14] Due to the isolated nature of their work, they often experience limited access to healthcare and social networks.[15] While many female domestic workers demonstrate resilience, their well-being is tied to workplace conditions and community support.[16] Studies also indicate heightened anxiety and depression among domestic workers due to poor employment conditions.[17]

By analyzing these groups, this study offers a comprehensive perspective on gendered well-being disparities and their socio-economic influences. Using data from the Quality-of-Life Survey, it aims to inform policies that promote gender equity and enhance quality of life. As Abu Dhabi evolves, addressing these disparities will be essential for fostering inclusion and sustainable well-being across its diverse population. Understanding gender-based differences not only provides insight into universal challenges but also highlights region-specific factors influencing well-being outcomes, contributing to more effective policymaking and social development efforts.

Research methods and design

Respondents and Survey Instrument

This study utilized data from the fifth cycle of the Quality-of-Life Survey in Abu Dhabi, conducted between September 2023 and April 2024. The survey, which gathered responses from over 100,000 residents, provided a comprehensive view of well-being across various themes, including demographics, housing, income, education, health, family dynamics, social connections, mental well-being, and digital practices. For this analysis, only respondents with complete data on well-being determinants were included to ensure robustness and accuracy. The final sample consisted of 30,710 working adults,

3,006 unemployed individuals, 3,775 retirees, and 2,041 domestic workers. This methodological rigor reduces bias from incomplete data and strengthens the validity of gender-based well-being comparisons. Respondents were categorized based on their employment status using specific survey questions. Working adults were identified through the question, "Which of the following best describes what you have been mainly doing in the last four weeks?" with selected responses including full-time, part-time, and self-employed. The unemployed were those selecting "unemployed," retirees were those choosing "retired," and domestic workers were identified from the question on employer sector, where "domestic workers" was a response option.

A set of well-being determinants was selected based on extensive literature review and pre-analysis from QoL-5, covering key economic, health, and social factors (household income (compared), ability to pay for necessary expenses, satisfaction with household income, satisfaction with current residence, job security, sleep quality, subjective health, perceived obesity, mental health, frequency of eating healthy food, social support, trust in others, quality time spent with family, satisfaction with family life, satisfaction with social relationships, hours spent online, and life satisfaction). By integrating these measures, the study provides a structured assessment of gender disparities in well-being across different demographic groups.

Analysis

To examine gender disparities across the four groups—working adults, the unemployed, retirees, and domestic workers—we will employ Analysis of Variance (ANOVA) to compare well-being determinants between males and females. ANOVA is particularly well-suited for this study as it allows for the identification of statistically significant differences between groups, providing insights into how gender influences various dimensions of well-being. This method is robust in analysing categorical independent variables (gender) against continuous dependent variables (well-being determinants) and is widely used in social and behavioural research to understand group-level variations. In addition to identifying significant differences, the analysis will report the mean values for each well-being determinant across the four groups, providing a clear understanding of how these determinants differ by gender. By leveraging ANOVA and reporting these descriptive statistics, the analysis aims to highlight key areas of disparity, informing targeted interventions and policy recommendations for each group.

Results

Table 1 provides some more details of respondents in the four groups.

Table 1: Profile of respondents in the four groups

Working adults	**Number**	**Percentage**
Gender		
Male	23,002	65.5%
Female	7,708	34.5%
Marital status		
Married	23,186	75.5%
Single	5,590	18.2%
Others	1,933	6.3%
The unemployed	**Number**	**Percentage**
Gender		
Male	1,613	65.5%
Female	1,453	34.5%
Marital status		
Married	1943	63.4%
Single	676	22.1%
Others	444	14.1%
The Retired	**Number**	**Percentage**
Gender		
Male	2,880	65.1%
Female	895	34.9%
Marital status		
Married	3258	86.3%
Single	132	3.5%
Others	385	10.2%
Domestic workers	**Number**	**Percentage**
Gender		
Male	679	38.2%
Female	1470	61.8%
Marital status		
Married	1479	68.9%
Single	679	30.1%
Others	106	1%

Table 2 presents the ANOVA results for working adults, highlighting significant gender disparities in well-being determinants. Men reported higher satisfaction with household income (2.603 vs. 2.556), ability to pay expenses (2.690 vs. 2.596), and satisfaction with household income (3.029 vs. 2.896), reflecting more favourable economic perceptions. Women, however, had slightly better job security (3.610 vs. 3.556), suggesting differences in workplace stability. Regarding lifestyle and health, men reported higher sleep quality (3.458 vs. 3.368) and work-life balance satisfaction (3.313 vs. 3.046), while women exhibited worse mental health (2.627 vs. 2.321). No significant gender differences emerged for subjective obesity (1.805 vs. 1.792). Women spent significantly more time online (6.093 vs. 5.029), a factor potentially impacting mental health and social engagement. Social relationships revealed nuanced disparities. Men reported greater satisfaction with family life (3.943 vs. 3.831) and relationships with others (3.790 vs. 3.702), while women scored lower on trust (2.586 vs. 2.776) and social support (2.591 vs. 2.619). Interestingly, women reported slightly higher overall life satisfaction (7.109 vs. 7.003). These results highlight the complex nature of gender disparities in well-being, emphasizing the need for targeted interventions addressing economic stability, work-life balance, and mental health for each gender.

Table 2: Gender disparities (THE WORKING ADULTS). Total (30,710)

Wellbeing determinants	Male (23,002)		Female (7,708)		ANOVA	
	Mean	S.D.	Mean	S.D.	F-value	Sig,
C3: Household income (compared)	2.603	0.846	2.556	0.790	18.319	0.001
C4: Ability to pay for necessary expenses	2.690	0.790	2.596	0.833	46.398	0.001
C5: Satisfaction with household income	3.029	0.833	2.896	1.064	91.682	0.001
B7: Satisfaction (current residence)	3.711	1.064	3.653	1.025	31.509	0.001
D1: Job security	3.556	1.025	3.610	1.055	25.719	0.001
E3: Sleep quality	3.458	1.055	3.368	1.066	77.238	0.001
E6: Satisfaction (work-life balance)	3.313	1.066	3.046	1.031	464.96	0.001
F1: Subjective health	3.537	1.031	3.417	1.059	158.336	0.001
F3: Subjective (obesity)	1.792	1.059	1.805	1.061	1.635	0.201
COMP: (Mental health)	2.321	1.061	2.627	1.099	894.5	0.001
F6: Often eating healthy food	3.506	1.099	3.484	1.075	7.080	0.008
I2: Other people Support	2.619	1.075	2.591	1.085	4.440	0.035
I9: Most people could be trusted?	2.776	1.085	2.586	1.051	336.77	0.001
I11: Quality time spent with family	3.030	1.051	2.955	1.073	31.77	0.001
I12: Satisfaction with family life	3.943	1.073	3.831	1.033	100.985	0.001
I13: Satisfaction with relations (others)	3.790	1.033	3.702	1.028	116.313	0.001
N2: Hours spent online	5.029	1.028	6.093	1.032	744.13	0.001
O1: Life satisfaction	7.003	1.032	7.109	1.166	19.825	0.001

Table 3 presents ANOVA results for the unemployed, highlighting gender disparities in well-being. Women reported higher household income perceptions (2.097 vs. 1.973) and satisfaction with their residence (2.118 vs. 2.001), while men showed a slight advantage in paying necessary expenses (2.097 vs. 2.032). Satisfaction with household income showed no significant gender difference, suggesting similar financial struggles. Health-related disparities were evident. Women reported better subjective health (3.425 vs. 3.391) but worse subjective obesity (3.413 vs. 3.425). Mental health differences were stark, with men reporting significantly better outcomes (3.413 vs. 1.698), emphasizing the psychological burden on unemployed women. Social dynamics varied. Women reported stronger social support (2.581 vs. 2.341) and higher family life satisfaction (2.540 vs. 2.499), whereas men had slightly better

satisfaction with social relationships (2.540 vs. 2.525) and greater trust in others (2.581 vs. 2.501). Women also spent more time online (6.440 vs. 5.905), possibly as a coping mechanism. Life satisfaction was slightly higher for men (6.440 vs. 6.250), though the difference was small. These findings highlight the multifaceted impact of unemployment on well-being and emphasize the need for gender-specific interventions addressing economic stability, mental health, and social support.

Table 3: Gender disparities (THE UNEMPLOYED). Total (3,006)

Wellbeing determinants	Male (1,613)		Female (1,453)		ANOVA	
	Mean	S.D.	Mean	S.D.	F-value	Sig,
C3: Household income (compared)	1.973	0.920	2.097	0.935	13.742	0.001
C4: Ability to pay for necessary expenses	2.097	0.935	2.032	0.929	10.465	0.001
C5: Satisfaction with household income	2.032	0.929	2.001	0.997	0.485	0.486
B7: Satisfaction (current residence)	2.001	0.997	2.118	1.005	1.373	0.241
D1: Job security	------	------	------	------	------	------
E3: Sleep quality	------	------	------	------	------	------
E6: Satisfaction (work-life balance)	------	------	------	------	------	------
F1: Subjective health	3.391	1.190	3.425	1.071	1.373	0.241
F3: Subjective (obesity)	3.425	1.071	3.413	1.113	14.496	0.001
COMP: (Mental health)	3.413	1.113	1.698	1.010	16.812	0.001
F6: Often eating healthy food	1.698	1.010	1.799	1.058	19.349	0.001
I2: Other people Support	2.341	1.191	2.581	1.214	37.469	0.001
I9: Most people could be trusted?	2.581	1.214	2.501	1.212	2.046	0.153
I11: Quality time spent with family	2.501	1.212	2.499	1.083	56.557	0.001
I12: Satisfaction with family life	2.499	1.083	2.540	1.042	62.464	0.001
I13: Satisfaction with relations (others)	2.540	1.042	2.525	1.057	11.382	0.001
N2: Hours spent online	5.905	4.440	6.440	4.788	18.730	0.001
O1: Life satisfaction	6.440	4.788	6.250	4.674	239.12	0.001

Table 4 presents ANOVA results for retirees, highlighting gender disparities in well-being. Males reported higher satisfaction with household income (2.430 vs. 2.284) and current residence (3.863 vs. 3.591), while females had slightly better perceptions of their ability to pay expenses (2.395 vs. 2.284) and household income (2.487 vs. 2.395), reflecting nuanced economic differences. Health disparities were evident, with females reporting worse mental health (1.623 vs. 3.218). Subjective obesity scores (3.239 vs. 3.218) showed minor differences, while females reported healthier eating habits (1.922 vs. 1.623).Socially, males reported greater family life satisfaction (4.220 vs. 4.078), quality time with family (3.838 vs. 3.635), and trust in others (2.613 vs. 2.371). However, females spent more time online (5.381 vs. 4.161), possibly reflecting different coping strategies. Despite challenges in mental health and trust, females reported higher overall life satisfaction (7.929 vs. 7.294). These findings highlight the gendered nature of well-being in retirement, emphasizing the need for targeted interventions addressing financial security, mental health, and social inclusion.

Table 4: Gender disparities (THE RETIRED). Total (3,775)

Wellbeing determinants	Male (2,880)		Female (895)		ANOVA	
	Mean	S.D.	Mean	S.D.	F-value	Sig,
C3: Household income (compared)	2.430	0.893	2.284	0.834	18.824	0.001
C4: Ability to pay for necessary expenses	2.284	0.834	2.395	0.882	25.189	0.001

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C5: Satisfaction with household income	2.395	0.882	2.487	1.120	64.335	0.001
B7: Satisfaction (current residence)	3.863	1.155	3.591	1.280	54.127	0.001
D1: Job security	------	------	------	------	------	------
E3: Sleep quality	------	------	------	------	------	------
E6: Satisfaction (work-life balance)	------	------	------	------	------	------
F1: Subjective health	3.206	1.054	3.239	1.058	1.094	0.296
F3: Subjective (obesity)	3.239	1.058	3.218	1.055	113.552	0.001
COMP: (Mental health)	3.218	1.055	1.623	0.900	147.20	0.001
F6: Often eating healthy food	1.623	0.900	1.922	1.047	17.153	0.001
I2: Other people Support	2.792	1.309	2.725	1.275	2.108	0.147
I9: Most people could be trusted?	2.613	1.101	2.371	1.037	50.745	0.001
I11: Quality time spent with family	3.838	1.093	3.635	1.163	32.525	0.001
I12: Satisfaction with family life	4.220	0.963	4.078	1.001	21.336	0.001
I13: Satisfaction with relations (others)	3.923	0.816	3.818	0.874	15.751	0.001
N2: Hours spent online	4.161	3.497	5.381	3.849	118.01	0.001
O1: Life satisfaction	7.294	2.755	7.929	2.544	9.349	0.002

Table 5 presents ANOVA results for migrant domestic workers, revealing gender disparities in well-being. Women reported higher satisfaction with residence (4.241 vs. 4.136), job security (4.151 vs. 3.929), sleep quality (4.258 vs. 4.070), and subjective health (4.037 vs. 3.838), indicating greater stability and better lifestyle conditions. In contrast, men reported worse outcomes in subjective obesity (1.511 vs. 1.246) and mental health (1.720 vs. 1.406).Social differences were evident, with women reporting lower social support (1.762 vs. 2.302), while men had slightly better satisfaction with relationships (3.848 vs. 3.705). However, women had marginally higher life satisfaction (8.600 vs. 8.270). Men spent more time online (4.048 vs. 3.615), possibly reflecting different coping mechanisms. These findings highlight the need for targeted interventions to improve mental health support, enhance social connections, and address disparities in job security and physical health among migrant domestic workers.

Table 5: Gender disparities (THE MIGRANTS-Domestic workers). Total (2.041)

Wellbeing determinants	**Male (-----)**		**Female (----)**		**ANOVA**	
	Mean	**S.D.**	**Mean**	**S.D.**	**F-value**	**Sig,**
C3: Household income (compared)	------	------	------	------	------	------
C4: Ability to pay for necessary expenses	------	------	------	------	------	------
C5: Satisfaction with household income	------	------	------	------	------	------
B7: Satisfaction (current residence)	4.136	0.752	4.241	0.533	13.411	0.001
D1: Job security	3.929	0.828	4.151	0.596	46.525	0.001
E3: Sleep quality	4.070	0.789	4.258	0.545	38.45	0.001
E6: Satisfaction (work-life balance)	------	------	------	------	------	------
F1: Subjective health	3.838	0.937	4.037	0.752	27.135	0.001
F3: Subjective (obesity)	1.511	0.865	1.246	0.607	64.593	0.001
COMP: (Mental health)	1.720	0.945	1.406	0.733	57.769	0.001
F6: Often eating healthy food	3.465	1.138	3.505	1.083	0.567	0.453
I2: Other people Support	2.302	1.053	1.762	0.717	102.10	0.001
I9: Most people could be trusted?	3.044	1.009	3.094	0.953	1.2023	0.273
I11: Quality time spent with family	------	------	------	------	------	------
I12: Satisfaction with family life	------	------	------	------	------	------

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I13: Satisfaction with relations (others)	3.848	0.686	3.705	0.696	19.291	0.001
N2: Hours spent online	4.048	3.017	3.615	2.830	10.143	0.001
O1: Life satisfaction	8.270	2.054	8.600	1.612	15.715	0.001

Discussions

The findings from this study highlight significant gender disparities in well-being across four demographic groups in Abu Dhabi: working adults, the unemployed, retirees, and migrant domestic workers. These disparities reflect the interplay of socio-economic, health, and social determinants, shaped by gender-specific challenges and cultural contexts. This discussion synthesizes the results with prior research, emphasizing policy and intervention implications.

Gender disparities among working adults reveal differences in economic, health, and social well-being. Men reported higher satisfaction with household income and financial stability, aligning with studies on systemic income biases favouring men.[11] Women exhibited better job security, often tied to their employment in more stable but lower-paying sectors.[8] Health disparities were also pronounced, with men reporting higher sleep quality and work-life balance, while women faced greater mental health challenges, reflecting the global trend of dual work-home responsibilities disproportionately impacting women.[5] Socially, men reported higher satisfaction with family life, yet women's slightly higher life satisfaction suggests relational resilience as a mitigating factor.[18]

Among the unemployed, gender differences were most pronounced in mental health and social support. Women reported worse mental health outcomes due to compounded caregiving responsibilities and economic vulnerability.[19] However, they also reported stronger social support networks, which align with findings on the protective role of family support.[20] In contrast, men exhibited better mental health but lower social support, reflecting the stigma and identity crises often associated with male unemployment.[10] These findings emphasize the need for gender-specific interventions, such as mental health support for unemployed women and social reintegration programs for men.

For retirees, gender disparities were evident in economic security, health, and social well-being. Men reported higher satisfaction with household income and financial stability, consistent with their higher lifetime earnings.[11] Women, however, demonstrated better healthy eating habits and overall life satisfaction, potentially reflecting adaptive coping mechanisms.[21] Health disparities persisted, with women experiencing poorer mental health outcomes, a trend aligned with broader research on gendered health inequalities in older populations.[13] Socially, men reported higher trust and family satisfaction, while women engaged more in online interactions, indicating alternative social coping strategies.[3,12]

Migrant domestic workers exhibited distinct gender disparities. Women reported higher job security, sleep quality, and subjective health, highlighting their resilience despite difficult working conditions.[16] However, they also had lower levels of social support, underscoring vulnerabilities in accessing external assistance.[15] Male domestic workers, in contrast, faced greater mental health challenges and higher perceived obesity, suggesting different physical and psychological burdens.[17] Their greater online engagement may reflect differing coping strategies.[14]

These results underscore the importance of gender-sensitive policies tailored to each group's needs. For working adults, addressing workplace inequities through flexible work arrangements, equal pay, and mental health support is essential.[22] Unemployment programs should focus on social support networks for men and targeted mental health interventions for women.[6] Among retirees, financial planning initiatives and accessible mental health services can mitigate disparities.[11] For migrant domestic workers, stronger labor protections, healthcare access, and social support programs are crucial to improving well-being.[16]

This study highlights the multidimensional nature of gender disparities in well-being across working adults, the unemployed, retirees, and

migrant domestic workers in Abu Dhabi. The findings provide actionable insights for policymakers to design interventions that promote gender equity and enhance quality of life. By fostering inclusive and culturally sensitive policies, Abu Dhabi can serve as a model for addressing gender disparities in well-being on a global scale.

Conclusions

This study provides a comprehensive exploration of gender disparities in well-being among working adults, the unemployed, retirees, and migrant domestic workers in Abu Dhabi. The findings underscore the nuanced interplay of socio-economic, health, and social factors that shape well-being outcomes across these groups. Significant disparities emerged in areas such as mental health, social support, economic satisfaction, and life satisfaction, reflecting the multifaceted challenges that men and women experience differently within these demographic categories. For instance, working adults demonstrated disparities in economic perceptions and mental health, while the unemployed faced pronounced differences in mental health and social support. Retirees exhibited variations in financial stability and mental health outcomes, and migrant domestic workers showed unique challenges in job security, social connections, and mental well-being.

These findings emphasize the importance of gender-sensitive policies and interventions that address specific needs within each group. Promoting equitable workplace practices, enhancing social support networks, and addressing mental health disparities are critical steps toward fostering well-being for all genders. The study also highlights the importance of culturally sensitive approaches that align with Abu Dhabi's socio-cultural landscape, ensuring that interventions are both effective and contextually appropriate.

Despite its contributions, this study has limitations that warrant consideration. First, the reliance on self-reported data may introduce biases, as respondents' perceptions may not always align with objective measures of well-being. Second, while the study examined a range of well-being determinants, other critical factors, such as intersectionality with age, education, or marital status, were not deeply explored. Future research could expand on these dimensions by incorporating additional biographic and socio-economic variables to provide a more holistic understanding of well-being disparities. Third, this study focused on four specific groups; future research could broaden its scope to include other underrepresented populations, such as youth outside formal employment or expatriates in other occupational roles, to capture a more comprehensive picture of gender disparities in Abu Dhabi.

This study underscores the complexity of gender disparities in well-being and highlights actionable insights for policymakers and practitioners. By addressing these disparities through targeted, evidence-based interventions, Abu Dhabi can move closer to achieving greater equity and enhancing the overall quality of life for all residents. These findings provide a foundation for further research and action, encouraging a continued focus on promoting inclusive and equitable well-being across diverse populations.

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Implementation of December 2024 round of Vitamin-A Supplementation Program and awareness among Beneficiaries in a Teaching Hospital in Kolkata

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Abstract

Background: Vitamin A (VA) deficiency is an important public health problem in India. According to NFHS-5 report of West Bengal, 34.6% children aged 6 to 59 months received a single dose of VA within last 6 months. Given the low coverage of VA, we planned a study to assess a round of biannual Vitamin A supplementation program conducted at the immunisation clinic of a teaching hospital. Additionally, we also assessed awareness of caregivers on VAS.

Methods: We recruited 104 children, aged 16-59 months coming for Vitamin A supplementation (VAS) dose unlinked to measles-rubella (MR) vaccine. Data collection was by interviewing caregivers accompanying the child using a structured schedule. We checked Mother and child protection card (MCPC) to gather information on age of the child and number of previous doses of VA.

Results: Median age of children was 28 months. There were 26% children who missed one or more dose of VA and 59.6% caregivers were aware of benefit of Vitamin-A. Most of the care givers (77.9%) got information about VAS round by providers at Immunisation Clinic. Association of children's age & respondents' awareness with missed dose was statistically significant (p-value = 0.002 and 0.02)

Conclusion: One out of every four children missed a VA dose while almost every second caregiver did not know about the benefits provided by VA. Repeated health talks on the danger of VA deficiency and benefits of supplementation may improve awareness and coverage of VA.

Keywords: Awareness, National Health Program, Preschool Children, Vitamin A, Dietary Supplement.

Introduction

Vitamin A (VA) is a fat-soluble vitamin essential for vision, especially dark adaptation, functioning of the immune system, integrity of skin and mucous membrane, and overall growth and development of children. Adequate amount of VA can be obtained

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from diet. Yet, VA deficiency (VAD) is the leading cause of preventable childhood blindness and increases the risk of death from common childhood infections like measles and diarrhoeal diseases. In 2013, the World Health Organization (WHO) classified VAD as a public health problem, as it was affecting about one in three children aged 6 to 59 months. As with all other health conditions, in this case also vulnerable are the worst affected with highest rates of VAD in sub-Saharan Africa and South-East Asia. [1,2] VAD continues to be an important public health problem in India, with highest proportion of world's VA deficient children.[3,4]

As a strategy to combat VAD, WHO recommended routine vitamin A supplementation (VAS) in infants and children aged 6-59 months where VAD is a public health problem.[1] VAS has been shown to reduce the risk of all-cause mortality among these children by 12-24%. [5] VAS is a low-cost, highly effective, key child health intervention which is successfully linked with immunisation services. VA doses are given with first and second doses of measles containing vaccines (MCV), thereafter during biannual VAS rounds conducted in June and December among under-five children. Every child should receive nine mega dose of VA before their fifth birthday. [6]

Despite National and International will, only 14 among 70 VAS implementing countries achieved two-dose annual coverage at 80% or higher. While United Nations Children's Fund (UNICEF) provides information on VAS semesters till 2022, India has reported coverage till 2020, with two-dose coverage of mere 54%. Coverage was comparatively higher for the December round at 70%.[2] Moreover, National level data on VA coverage collected in National Family Health Survey (NFHS-5 conducted during 2019-21) reports between 49.8% to 74.9% children of 6-59 months receiving a dose of VA within last six months of survey. It was highest for 12-17 months age group. This value for the state of West Bengal (WB) is 34.6%. Data for VA dose in NFHS-5 was collected based on mother's recall although Mother and Child Protection Card (MCPC) informs on administered VA doses. Surprisingly, none of the mothers of children aged 36-59 months reported administration of VA dose during last six months.[7]

Another National level survey, The Comprehensive National Nutrition Survey (CNNS) reported relatively low prevalence of sub-clinical VAD at 17.6% among children aged 1–4 years as assessed by the measure of serum retinol levels below 20 µg/dl. VAD can be considered as a severe public health problem with prevalence of ≥ 20% in 10 of the 30 states/union territories that were surveyed. [8] This finding has prompted The Expert Group constituted by the Ministry of Health, Government of India to recommend modification in the existing national programme with changing VAS from universal coverage of children to a geographically targeted approach. [9]

In a situation of incomplete data and possibility of change in VAS implementation, it is necessary to assess current status of VAS rounds. We planned the present study to assess the 2024-25 December-January biannual VAS program in terms of number of beneficiaries, doses administered, awareness of beneficiaries on benefit of Vitamin A and VAS at a tertiary level centre. We further examined demographic factors associated with awareness on benefit of Vitamin A and doses missed during VAS rounds.

Methods

Present study was of descriptive type and cross-sectional design conducted from November 2024 – January 2025 at the immunisation clinic of RG Kar Medical College and Hospital, Kolkata. Data collection was conducted during the 2nd Semester of biannual VAS program during 10th December 2024 to 10th January 2025. Study population included all children aged 16-59 months coming for VAS dose unlinked to measles-rubella (MR) vaccine. If any caregiver accompanied two eligible children, both were included for data collection. Considering peak footfall and other competing departmental activities, the data collection time was restricted from 10am to 2pm. We estimated to cover at least 50% of beneficiaries by this strategy.

Data was collected by interviewing caregiver accompanying the child using a structured schedule. MCPC was checked to gather information on age of the child and number of previous doses of VA.

Variables included in the study were demographic variables related to the child and the respondent caregiver, number of VA doses received, number of

missed doses, source of information about VAS and awareness on VAS.

We defined '*awareness'* as caregiver having correct information on benefit of VA. Awareness and missed doses were recoded and dichotomised into response categories- aware/not aware and doses missed/all doses received.

We obtained informed consent from all study participants.

Statistical analysis: We handled continuous and categorical data differently. We calculated measures of central tendency (mean and median) and measures of dispersion (standard deviation and interquartile ranges)for continuous data. Selection of measures was conditional on normal distribution of data. For categorical data frequencies and percentages were calculated followed by Chi-square test for association. Statistical significance was considered at $p<0.05$. For statistical analysis Statistical package for social sciences (SPSS) version 23 (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.) was used.

Results

Bi-annual vitamin A supplementation campaign was conducted at R G Kar Medical College under West Bengal from 10th December, 2024 to 10th January, 2025.Total 185 beneficiaries attended in this round for taking VA in oil. Out of 185 beneficiaries, 104 children came during data collection time of 10 am to 2 pm and were selected as our study participants (participation rate of 56%). Majority of attended children lived in urban area (3.84%). Among them, 32 (30.8%) children attended ICDS centre, 19 (18.2%) attended school or pre-school and rest 52 (50%) did not attended any institute point where VA can be administered. At the beginning of the campaign there was stock of seven bottles of vitamin A oil. Out of these, four bottles ware used during campaign period.

Table 1 shows the distribution of socio-demographic characteristics of children attending bi-annual vitamin A supplementation programme. The study revealed median age of participating children to be 28 months with IQR 24-38. Median age of respondents were 30 years with IQR 25 -33.8. Median was used as central tendency age for both children and respondents did not follow normal distribution (tested by Kolmogorov -Smirnov test). Most of the study participants were Hindu (70.2%) and in case of 85.6% mother was the respondent.

Table 2 shows supplementary VA doses and caregivers' awareness about Vit-A supplementation programme. There were missed doses of VA in 26.0% of children attending the campaign. 33.7% caregivers responded the benefits of VA supplementation can improve vision.

Table 3 shows association of missed supplementary VA doses with to respondents' awareness and sociodemographic factors by Chi-square test. The factors like gender, religion & family income of children did not play any significant role on missed dose. The result shows age of children & respondents' awareness has significant role on missed dose. Association of children's age & respondents' awareness with missed dose was found statistically significant (p-value = 0.002 & 0.02)

In Figure 1, Box-plots shows the distribution of children's age with VA doses clustered by respondents' awareness on benefit of Vit-A supplementation. Median age of children was higher for the group missing one or more doses both for aware and unaware respondent group. However, for the group where all doses were taken, median age was higher for the cluster where caregivers were aware about VA. Thus, it can be inferred, aware caregivers will come for VAS till higher age of children, but age is nevertheless a strong factor for dropping out from VAS rounds.

Table 1: Socio-demographic characteristics of children attending Bi-annual vitamin A supplementation programme (December 2024 round) at R G Kar Medical College (n=104)

Continuous variables	Median (IQR)	Mean (SD)
Age of child (in months)	28 (24-38)	31.38(10.72)
Age of respondent (in years)	30 (25-33.80)	29.93(6.61)
Monthly income (INR)	15000 (10000-25000)	20884.62 (17544.43)

Categorical variables		Frequency (%)
Sex of child	Male	52 (50)
	Female	52 (50)
Birth order	1st	63 (60.6)
	2nd	36 (34.6)
	≥3rd	5 (4.8)
Religion	Hindu	73 (70.2)
	Muslim	31 (29.8)
Respondent	Mother	89 (85.6)
	Other	15 (14.4)
Gender of respondent	Male	10 (9.6)
	Female	94 (90.4)
Education of respondent	<Secondary	56 (53.8)
	≥Secondary	48 (46.2)

Table: 2 Supplementary Vit- A doses and caregivers' awareness about Vit-A supplementation programme (n=104)

variable		Frequency (%)
Number of missed dose of Vit-A	No missed dose	77 (74.0)
	1 missed dose	13 (12.5)
	2 missed dose	6 (5.8)
	3 & more missed dose	8 (7.7)
Responses on benefits of supplementation**	Improves vision	35 (33.7)
	Prevents vitamin A deficiency	7 (6.7)
	Improves skin	3 (2.9)
	Improves immunity	14 (13.5)
	General wellbeing	8 (7.7)
Number of correct responses on benefits of supplementation	Any correct response/s	62 (59.6)
	1 correct response	28 (26.9)
	2 correct responses	10 (9.6)
	3 & more correct responses	4 (3.9)
Source of information on VAS round**	Immunisation Clinic	81 (77.9)
	MCPC record	21 (20.2)
	Health Care workers	3 (2.9)
	AWW	7 (6.7)
	Friends and family	6 (5.8)
Place of last dose	RG Kar immunisation clinic	91 (87.5)
	Other venue	11 (10.6)
	No dose taken before	2 (1.9)

** Multiple responses were possible

Table: 3 Association of missed supplementary Vit-A doses with respondents' awareness and sociodemographic factors (n=104)

Variables		All doses taken according to age No. (%)	One or more Missed doses No (%)	X^2 Value (Degree of Freedom)	P value
Sex of child	Male child	36 (69.2)	16 (30.8)	1.25 (1)	0.26
	Female child	41 (78.8)	11 (21.2)		
Religion	Hindu	56 (76.7)	17 (23.3)	0.91 (1)	0.34
	Muslim	21 (67.7)	10 (32.3)		
Age of respondent (years)	≤ 30	50 (76.9)	15 (23.1)	0.75 (1)	0.39
	> 30	27 (69.2)	12 (30.8)		
Age of child (months)	≤ 28	46 (86.8)	7 (13.2)	9.15 (1)	0.002*
	> 28	31 (60.8)	20 (39.2)		
Education of Respondent	Below secondary	41 (73.2)	15 (26.8)	0.04 (1)	0.84
	Secondary or above	36 (75.0)	12 (25.0)		
Monthly Income	≤15000	44 (69.8)	19 (30.2)	1.47 (1)	0.23
	>15000	33 (80.5)	8 (19.5)		
Respondents' awareness	Aware	51 (82.3)	11 (17.7)	5.40 (1)	0.02*
	Unaware	26 (61.9)	16 (38.1)		

* p<0.05

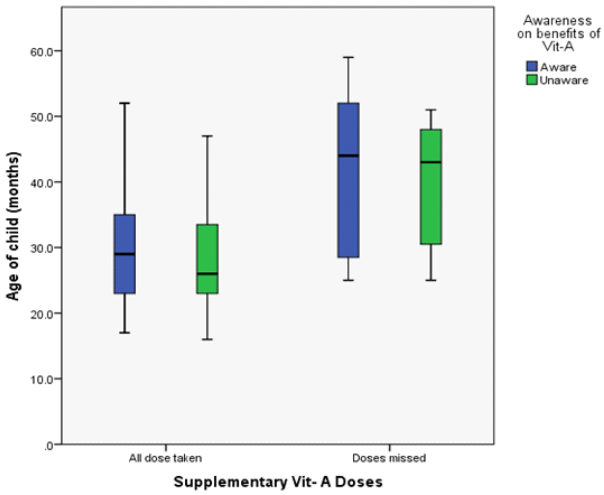


Figure 1: Box-plots showing distribution of children's age with Vit-A doses clustered by respondents' awareness on benefit of Vit-A supplementation

Discussion

During December January 2024-25 biannual VAS at the study site total 185 children were administered with supplementary VA. There were 104 children included in present study. Median age of children was 28 months. Mothers were respondent in most cases. Majority were urban population with monthly income15000 INR. There were 26% children who missed one or more dose of Vit-A and 59.6% were aware of benefit of Vit-A. Higher age of children and lower awareness of caregivers were associated with missing of Vit-A doses.

A study conducted in Ethiopia determined VAS coverage of the children at 58%, while another study conducted in Chandigarh showed 38.52% coverage of VA supplementation. Both studies report much lower coverage than the present study, where 77 (74.0%) children taken vit A supplementation at per their age [10,11]. This difference may be attributed to different settings of the study as our study was conducted at immunisation clinic during VAS program as opposed to community settings of two other studies.

The administration of vit - A supplementation significantly increases the survival rate and improves vision. In our study 35 (33.7%) caregivers of attending children were aware about effect of vit A on improved vision. A study conducted in Ethiopia showed 170 (48.2%) did not know the medical consequence of VAD whereas 37.1% of the respondent mentioned night blindness because of VA [10]. These finding is agreement with our study.

In the same study majority of mothers (72.2%) were living in a rural area and 64.8% mothers were

attending primary and secondary school. Whereas in our study majority of (96.2%) of study children were coming from urban area & education level of 56 (53.8%) caregivers was below secondary level and 48 (46.2%) caregiver was above secondary level. Regarding the economic status of the family 270 (57.3%) had less than 2000 Ethiopian birr monthly income but in our study 63 (60.57%) family has monthly income had < than 15000 INR [10]. Such demographic differences also attributed to differences in result.

In the Ethiopian study 247 (52.65%) mothers heard about vitamin A supplementation, among them 44.76% of them heard from health workers, followed by 29.03% from books and magazines and 24.6% from media. But majority caregiver of our study got information from immunization clinic (77.9%) and MCPC (20.2) [10]. This points out towards completely different channels of accessing health information. Our study shows participation of VAS round decreased with increase age of children. Drop out of first and second dose minimal as first and second doses were delivered with vaccine. Participation in VAS round depends on care givers belief on the benefit of VA. This is consistent with Health Belief model which consists of six primary cognitive constructs or "dimensions" that influence behaviour (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy, and cues to action). In the present situation, perceived benefits and severity could have been motivators to participate in VAS program. The program itself may provide cues to action [12].

Strengths: Immunisation clinic-based study with comprehensive approach of data collection, education and future follow-up. This study directly assessed children who participated in VAS round & thus linking the study objectives with action (supplementation with vit A and health talk).

Limitations- Single centre study with a purposive sample limits generalisability to other settings. We recruited mostly urban children who were catered by the study hospital. Moreover, we included only those children who were coming for VAS and more vulnerable non-participating children were not covered.

Conclusion

One out of every four children missed a vit-A dose while almost every second caregiver did not know the benefit provided by vit-A. The dose of vit A given in VAS round unlinked with vaccine may be missed. However, caregiver's awareness can protect against this. Thus, repeated health talk on the danger of vit A deficiency and benefits of supplementation must be delivered at various point where mothers and children can be contacted.

Implications of study findings:

In the present study, missed supplementary vitamin A doses were found to be significantly associated with the age of child and the responders' awareness (p value 0.002 and 0.02 respectively). This is because injectable vaccines are seen to be more vital than oral vitamin A oil, which is already found in food. It is crucial to do public health campaigns throughout the year to increase awareness about vitamin A oil supplementation rather than right before a supplementary program. Additionally, vaccination campaigns for younger children should be directed towards Anganwadi centres, while primary schools should concentrate on the same for older children.

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Consent: Informed and written consent was taken from all study participants.

Conflict of interest: none

Ethical Clearance: The study protocol was approved by Institutional Ethics Committee, R. G. Kar Medical College with approval number RKC/IEC/1093 Dated 25/05/2024

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Original Article

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MRI Brain Changes in Neonatal Hypoglyceamia in a Rural Tertiary Care Centre

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Abstract

Introduction: Approximately half of a newborn baby's energy needs are fulfilled by glucose during birth, and glucose is an essential fuel for brain metabolism. The purpose of this study is to evaluate the neuroimaging characteristics of hypoglycaemia in neonates using MRI.

Methods: A prospective observational study was conducted among 30 neonates who were enrolled in the study after taking informed written consent from parents or attendant accompanying the neonate in the Department of Paediatrics of SHKM GMC, Nalhar, Nuh. All babies with hypoglyceamia underwent MRI brain when they were stabilized at discharge. All babies' MRI changes were recorded.

Results: In our study Neonatal Hypoglycaemia was found more commonly in 34-37 weeks of gestational age(50%), specially in appropriate for gestational age babies(90%) compared to term babies. Majority of the cases were Male(63.3%) with majority of normal vaginal mode of delivery with Birth weight between 1.5-2.5 kg in most cases(63.3%).Maximum patients had Lower Blood Glucose level between 20-40 mg/dl (80%), with sepsis with meningitis(30%) as most common cause of hypoglycaemia. In our study Lowest blood glucose level observed was 11 mg/dl which was associated with abnormal MRI Brain change (Focal hemorrhagic lesions over parietal and occipital regions).Most common abnormal MRI Brain change were observed in parietooccipital region with

Sepsis with meningitis as most common cause of hypoglycemia in these patients. Sepsis was present in most cases with abnormal MRI findings (10 cases) among which 9 cases were positive for Meningitis, 2 of them had proven sepsis (Acinetobacter species). 1 patient was found to have prolonged hypoglyceamia who received GIR above 12 and steroids, associated with abnormal MRI finding Periventricular Leukomalacia.

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Conclusion: This study had shown that, MRI results suggested aberrant hyperintensity in regions of brain. The lesions ranged from hyperintensity, signal intensity and hemorrhages across the parietal and occipital regions.

Keywords: Hypoglycaemia, occipital region, haemorrhage, periventricular leucomalacia, Sepsis

Introduction

Approximately half of a newborn baby's energy needs are fulfilled by glucose during birth, and glucose is an essential fuel for brain metabolism. For over a century, blood sugar levels have been monitored in newborns, and neonatal Hypoglyceamia was initially documented eighty years ago.[1] Nonetheless, there is a dearth of convincing data and disagreement regarding the definition of newborn Hypoglyceamia.[2] Neonatal blood glucose concentrations often follow a distribution that is influenced by birth weight, postnatal age, dietary intake, and additional variables. Some babies with low blood glucose levels experience clinical indications, but these are not very specific.

Hypoglycaemia is one of the most common metabolic problems seen in both the new- born nursery and neonatal intensive care unit (NICU). Many babies with low blood sugar have no clinical symptoms, while others have symptoms that can cause permanent brain damage. Data have shown that if the neonatal hypoglycaemia is not timely and properly treated, the infants may develop permanent brain injury, namely, neonatal hypoglycaemic encephalopathy the neonatal brain develops rapidly. Persistent or recurrent hypoglycaemia may lead to long- term visual disturbance, hearing impairment, cognitive abnormalities, secondary epilepsy, and other disorders in the central nervous system.[4]

The most common abnormal findings were located on the parietal and occipital lobes of the brains.[6]

Neonatal Hypoglycaemia can also be manifested as haemorrhage or middle cerebral artery infarction and parietooccipital cortex injury, although the basal ganglia and thalamus can also be involved.[7]

Brain injury related to neonatal hypoglycaemia seldom involves deep grey matter nuclei.

Neonatal hypoglycemia can show more abnormal imaging findings than expected. The brain injury patterns seen on imaging vary, and the severity of hypoglycemia does not always match the extent of the injury. [6]

Hypoglycaemia in neonates usually effects occipital region of the brain and occipital region of brain can be assessed by VEP (visually evoked potential) & MRI.

The severity of neonatal hypoglycemia does not significantly correlate with specific MRI injury patterns. Furthermore, MRI findings in symptomatic neonatal hypoglycemia are heterogeneous, indicating diverse underlying mechanisms of injury. Abnormal imaging findings in hypoglyceamia of newborns may be more common than the insult suspected. Neonatal hypoglyceamia is prone to occur and requires vigilant management because of the risk factors for hypoglyceamia, which include preterm, small for GA or intrauterine growth retardation, maternal diabetes mellitus, or large for GA.[8]

Need for study:

As discussed, neonatal hypoglycaemia is more common than is believed and may lead to more serious neurological squeal. The purpose of this study is to evaluate the neuroimaging characteristics of hypoglycaemia in neonates using MRI.

Aim and Objectives

AIM: To assess Neuroimaging Patterns in Neonatal Hypoglycaemia with the help of MRI .

OBJECTIVE: To evaluate all the MRI images of Brain in Neonates with Hypoglycaemia

Material and Methods

A prospective observational study was conducted among 30 neonates who were enrolled in the study after taking informed written consent from parents or attendant accompanying the neonate in the Department of Paediatrics of tertiary care center of rural North India. This study was conducted for a period of 1 year. Clearance from institutional ethics committee was obtained and an informed consent form was obtained from all the parents. The inclusion and exclusion criteria were as follows:

Inclusion Criteria:

- All neonates with hypoglycaemia admitted in the Paediatric Department of tertiary care center of rural north India.

Exclusion Criteria:

- Neonates with kernicterus
- Neonates with severe perinatal asphyxia
- Neonates with brain malformations

Methodology

All neonates who were at risk of hypoglycaemia (Preterm, Neonatal Sepsis, Small for Gestational Age(SGA), Infant of Diabetic Mother (IDM), Perinatal asphyxia with HIE-1 and HIE-2) were monitored for blood glucose level by glucometer (Accusure) and one reading of glucometer was confirmed by laboratory value daily.

Criteria for Diagnosis of Hypoglycemia:

A blood glucose levels of less than 45mg/dl was defined as hypoglyceamia.

MRI brain image used for this study was plain MRI T2 weighted, FLAIR Sequences and DWI band contrast enhanced with T1 weighted imaging using Philips multiva 1.5T-16 channel MRI with FMRI. All the Expenses of MRI Brain was covered under "Janani Sishu Suraksha Karyakram". [43]

Statistical analysis

All the data was checked, edited and coded for computer entries. Two groups were made, one with no MRI brain changes & other with MRI brain changes. Paired t-test was applied with the data. After compilation of collected data, Data was entered in Excel and compiled and analyses by using Statistical Program for Social Sciences (SPSS) Version 20. Appropriate statistical tests were used during analysing the data. A p value of less than 0.05 was considered as statistically significant.

Power analysis calculation-

Sample size

The sample size was calculated by using the following formula,

$n=Z^2pq/d^2$

n= sample size

Z = 1.96= Standard normal deviate

p = Expected proportion in population Incidence of hypoglycaemia in neonates according to Roeper et al=15%

d= Absolute error or precision = 15%

n = 1.96 × 1.96 × 0.15 × 0.85/0.15×0.15= 0.489804/0.0225 =23.94

Although the minimum required sample size was calculated to be 24 participants, the decision was made to include 30 participants.

Ethical Consideration

All neonates were enrolled in study after obtaining informed consent from parents. No extra blood sampling was done. Investigations and treatment was done as per standard protocol.

Results

A total of 30 neonates were included in this study. The key findings include: Most consistently involved area was found to be parieto occipital regions.

Table 1: MRI Findings

MRI FINDING	FREQUENCY	PERCENT
NORMAL	18	60%
ABNORMAL	12	40%
TOTAL	30	100

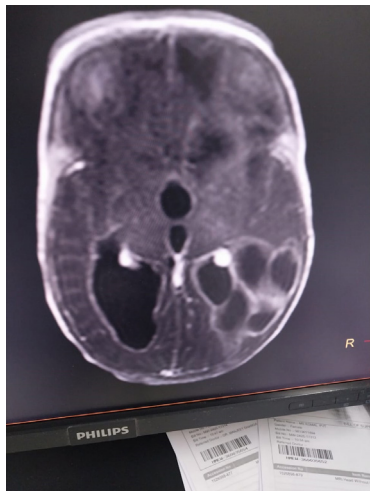


Figure 1: MRI Images showing axial section showing multiple cystic lesions in the brain, likely within the parietal and occipital lobes

Table 2: Abnormal MRI findings

MRI findings	Frequency	Percent
Abnormal hyperintensity in parietal and occipital lobes.	1	8.3
Abnormal Hyperintensity in the globi pallidi and mixed hypointensity and hyperintensity in occipital cortex and white matter.	1	8.3
Abnormal intensities over basal ganglia with posterior limb of internal capsule involvement	1	8.3
Abnormal signal intensity with cortical infarction and hemorrhage over parieto occipital region	1	8.3
Bilateral areas of increased signal in posterior limb of internal capsule, cerebral cortex, hippocampus and basal ganglia	1	8.3
Focal hemorrhage in white matter involving bilateral occipital lobes	1	8.3
Focal hemorrhagic lesions over parietal and occipital Regions	1	8.3
Hyperintensity in parietal and occipital lobes and progressive parenchymal loss of predominant occipital lobe.	1	8.3
large areas of encephalomalacia in parietooccipital regions bilaterally.	1	8.3
Periventricular leukomalacia	1	8.3
Periventricular leukomalacia ?hypoxic insult	1	8.3
White matter injury with focal hemorrhage in occipital and parietal lobes.	1	8.3
Total	12	100

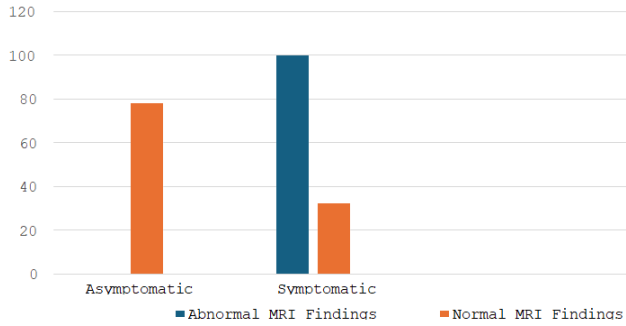


Figure 2. Distribution of the study group according to symptoms

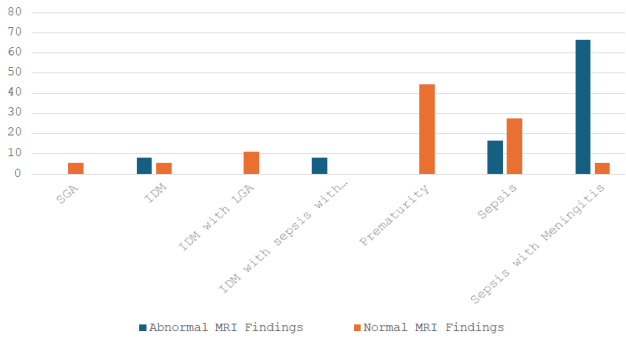


Figure 3. Distribution of the study group according to Cause of Hypoglycaemia

Discussion

During birth, glucose meets around half of a newborn baby's energy needs, and it is a vital fuel for brain metabolism. Newborn blood sugar levels have been tracked for more than a century, and neonatal hypoglyceamia was first reported eighty years ago.[1] However, there is a lack of compelling evidence and controversy surrounding the definition of hypoglyceamia in neonates.[2] Neonatal blood glucose concentrations frequently exhibit a distribution that is impacted by a number of factors, including food intake, postnatal age, and birth weight. Clinical indicators are experienced by some babies with low blood glucose levels, however they are not very precise.

17(56.67%) presented at <24 hour of life, 7(23.3%) presented at 24-48hours of life, 5(16.6%) presented at 48 -72 hours of life and 1(3.33%) presented at 72 hoursof life.

There were 19(63.33%) male and 11(36.67%) female. There was male predominance out of which 7(58.3) males had abnormal MRI findings. In a study

by Gu et al, 72.22% of the cases with abnormal MRI findings and 53.33% with normal MRI findings were males.[6] In a stud by Wong et al, about 54% of the cases with no hypoglycaemia and 67% with hypoglycaemia were males.[39] In a study by Nivins et al, 50.0% of the cases with no hypoglycaemia and 47.0% with any evidence of hypoglycaemia were males.[38]

In this study, 14(46.67%) cases were delivered via LSCS and 16(53.33%) cases were delivered via Normal vaginal delivery.

7(23.33%) cases belonged to <34 weeks of gestational age, 15(50%) cases belonged to 34-37 weeks of gestational age group and 8(26.67%) belonged to >37 weeks of gestational age group. In a study by Gu et al, the mean gestational age was 38.44 weeks in cases with abnormal MRI findings and 38.6 weeks in cases with normal MRI findings.[6] In a study by Wong et al, the mean gestational age was 39.26 weeks in cases with no hypoglycaemia and

39.12 weeks in cases with hypoglycaemia.[39] In a study by Nivins et al, the mean gestational age was 38.4 weeks in cases without hypoglycaemia and 38.3 weeks in cases with hypoglycaemia.[38]

Of study population 2(6.67%) cases belonged to <1.5kg Birth weight category, 19(63.33%) cases belonged to 1.5-2.5 kg Birth weight category and 9(30%) belonged to >2.5 kg birth weight category. In a study by Gu et al, the birth weight was 3001 gms in cases with abnormal MRI and 3341.33 gms in cases with normal MRI.[6] In a study by Wong et al, the birth weight was 33.89 grams in cases with no hypoglycaemia and 3194 gms in cases with hypoglycaemia.[39] In a study by Nivins et al, the mean birth weight in cases without hypoglycaemia was 3230 gms and 3206 gms in cases with hypoglycaemia.[38]

Of study population 5(16.67%) cases had lower blood glucose levels <20mg/dl. Out of these 2 patients belonged to gestational <34 weeks,and 2 cases had sepsis as cause of hypoglycemia, in 1 of those 5 cases sepsis with meningitis was cause of hypoglycaemia .

24(80%) cases has lower blood glucose levels between 20-40 mg/dl . 9(37.5%) cases of these were found to have abnormal MRI findings. Lowest blood glucose level observed was 11 mg/dl which was associated with abnormal MRI Brain change (Focal hemorrhagic lesions over parietal and occipital regions).

1(3.33%) had blood glucose levels >40mg/dl. In a study by Gu et al, the lowest serum glucose level was 27mg/dl in cases with abnormal MRI and 30mg/dl in cases with normal MRI.[6] In a study by Nivins et al, mean blood glucose was 3.8 in cases with no hypoglycaemia and 3.3 in cases with hypoglycaemia.[38]

As per study Age at discharge/death was <7 days in 2(6.67%) cases, 7-10 days in 27(90%) cases and > 10 days in 1(3.33%) cases.

Sepsis was present in 10(83.3%) cases of abnormal MRI findings and 3(16.7%) of the cases of normal MRI findings. This difference was statistically significant.

All of the cases with abnormal MRI findings had symptomatic hypoglycemia– Of which most common symptom was seizures (6), 3 had Symptomatic - Apnea and 2 had symptomatic Cyanosis and 1 had lethargy. About 77.8% were asymptomatic.

In 8 (66.7%) patients, sepsis or meningitis was the primary cause of Hypoglyceamia, while 8(44.4%) of those with normal MRI results also had prematurity. Between the two groups, there was a statistically significant difference.

10(55.6%) cases with normal MRI findings received feeding only, while 10(83.3%) of the ones with unfavourable MRI findings received GIR 10-12 . There was a statistically significant difference. 1 patient was found to have prolonged hypoglyceamia who received GIR above 12 and steroids, associated with abnormal MRI finding Periventricular Leukomalacia.

10(83.3%) of the cases with abnormal MRI findings received GIR for 48-72 hrs, 1(8.3%) case received GIR >72 hrs and 8.3% of the cases with abnormal MRI findings received GIR for 24- 48 hrs. GIR was not given in 55.6% of cases with Normal MRI findings . 38.9 % of cases with normal MRI findings and 5.6% of cases with normal MRI findings were given GIR for 24-48 hrs and <24 hrs respectively.

As per study Age at discharge/death was <7 days in 2(6.67%) cases, 7-10 days in 27(90%) cases and > 10 days in 1(3.33%) cases.

In 9(75.0%) of cases with aberrant MRI results and 1(5.6%) of those with normal MRI findings, the CSF was indicative of meningitis. There was a statistically significant difference.

In cases with low blood glucose, the MRI results suggested aberrant hyperintensity in many brain regions. Most consistently involved area was found to be parieto occipital regions .

18(60%) cases had normal MRI findings. Out of abnormal MRI findings, 50% of the abnormal findings were found to be involving Parietooccipital regions . 2(16.6%) cases had severe changes involving Basal Ganglia and Internal Capsule . Hippocampus and Globi Pallidi were involved in 8.3% cases each . 2 cases (16.67%) were found to have leukomalacia changes. In a study by Gu et al, most of the infants had some changes in white matter, 6.06% had severe WM injury had focal haemorrhage. All injuries were present in occipital and parietal lobe. About 33.3% of the cases had moderate abnormality in high signal and 14 cases had severe changes in the posterior WM. About 21.21% of the cases had abnormal signal intensity associated with cortical infarction and haemorrhage.[6] In a study by Wong et al, the clinical evidence of no injury was present in 47% of the cases, watershed injury was present in 9%, Basal ganglia in 14% of the cases.[39]

Conclusions

This study was undertaken to study the MRI changes in cases with neonatal hypoglycaemia. This study had shown that, MRI results suggested aberrant hyperintensity in regions of brain. The lesions ranged from hyperintensity, signal intensity and hemorrhages across the parietal and occipital regions.

Research gap:

A major research gap is the lack of clear understanding regarding the specific brain regions most vulnerable to hypoglycemia-induced damage, particularly when considering the variability in injury patterns across different individuals, and how the severity of hypoglycemia correlates with the extent and location of MRI abnormalities, especially in milder cases where clinical symptoms may be absent; further research is needed to better define the sensitivity and specificity of MRI in detecting subtle brain injuries in neonates with hypoglycemia.

Key points about this research gap:

Inconsistency in findings:

While studies often point to the occipital lobe as a primary site of injury in neonatal hypoglycemia, there is variability in reported patterns of brain damage across different studies, with some showing involvement of other regions like the parietal lobe or deep brain structures.

Correlation with clinical severity:

A significant gap exists in determining the precise relationship between the severity of hypoglycemia and the extent of MRI abnormalities, making it challenging to predict long-term neurological outcomes based on imaging findings alone.

Subtle changes and early detection:

Identifying subtle MRI changes in early stages of hypoglycemia, especially in asymptomatic infants, is crucial for early intervention but requires further research on sensitive imaging techniques and standardized interpretation criteri.

Limitations

This study was not without limitations. The sample size was small to generalize the findings.

A prospective study design with adequate sample size and standardized MRI protocols can bring out more facts about the hypoglycaemic MRI changes in neonates.

Ethical Clearance: Ethical clearance was taken before study.

IEC number- SHKM GMC IEC, Date-22/8/2022, Reference no-SHKM/IEC/2022/63

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Conflict of Interest: NIL

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Original Article

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Knowledge, Attitude and Practice of Biomedical Waste Management among Intern Doctors at a Tertiary Care Centre in Eastern India

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Abstract

Objective: To assess the knowledge, attitudes, and practices (KAP) regarding biomedical waste (BMW) management among intern doctors at a tertiary care center in Eastern India.

Methods: An observational, cross-sectional study was conducted between August and December 2024, involving 150 intern doctors from a medical college in Eastern India. Data were collected using a structured, pretested questionnaire encompassing 30 KAP-related items. Descriptive and inferential statistical analyses were performed using SPSS version 16.0, with a significance level of $p<0.05$.

Results: Out of 150 interns, data of 139 participants who returned completed questionnaire (mean age: 24.3 ± 1.2 years; 52.5% males) were analysed. The mean scores for knowledge, attitude, and practice were 7.19 ± 2.14, 7.83 ± 1.77, and 6.88 ± 1.91, respectively. Interns demonstrated strong knowledge in areas such as sharps disposal (80.6%) and color-coded segregation (79.1%) but showed gaps in understanding specific protocols like sodium hypochlorite concentration (54.7%). Attitudes were generally favourable, with 93.5% recognizing the necessity of safe disposal. However, 51.8% perceived BMWM as an added burden. Practices such as proper PPE use (90.6%) and immediate sharps disposal (82.7%) were adhered to, but participation in audits (29.5%) and protocol reviews (63.3%) was limited.

Conclusions: Intern doctors displayed moderate KAP levels regarding BMW management, with significant gaps in specific knowledge and inconsistent practices. Targeted training programs emphasizing practical application and streamlined workflows are recommended to enhance compliance and foster a culture of safety in healthcare.

Keywords: Biomedical Waste Management, Knowledge-Attitude-Practice, healthcare workers, Infection control

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Introduction

Biomedical waste (BMW) refers to waste generated during the diagnosis, treatment, or immunization of humans or animals, or in research activities pertaining to these fields. Its proper management is crucial to prevent adverse health and environmental impacts[1]. Inadequate BMW management has been linked to the spread of infectious diseases, environmental pollution, and occupational hazards for healthcare workers[2]. The World Health Organization (WHO) estimates that approximately 15% of healthcare waste is hazardous and can pose serious risks due to its infectious, toxic, or radioactive nature[3]. Thus, proper BMW management practices are fundamental in maintaining public health and ensuring environmental safety. For the same, the Government of India, under the Ministry of Environment, Forest and Climate Change introduced the Biomedical Waste Management Rules, 2016, with subsequent amendments in 2018 and 2019, to provide comprehensive guidelines for the segregation, handling, treatment and disposal of BMW[4]. Despite these guidelines, gaps persist in adherence to BMW management practices, particularly among healthcare workers, due to insufficient knowledge, improper attitudes, and inadequate training[5].

Intern doctors, who are at the inception of their medical careers, play a pivotal role in patient care as frontline healthcare providers, and are integral to the implementation of BMW management protocols. Their knowledge, attitude, and practice (KAP) are critical to ensuring adherence to guidelines and fostering a safe healthcare environment. However, prior studies have highlighted gaps in the KAP of intern doctors regarding BMWM, due to factors such as inadequate training, lack of awareness, and limited practical exposure[6,7].

In India, tertiary care centers serve as critical hubs for advanced medical services, catering to a vast and diverse patient population. These centers generate substantial quantities of BMW daily, necessitating stringent adherence to management protocols. However, studies indicate that many healthcare institutions face challenges such as limited resources, lack of infrastructure, and inconsistent training programs [8]. Therefore, there is a continuous need to assess and appraise the KAP of intern doctors regarding BMWM to identify existing gaps and address them effectively through targeted training programs [5].The present study aims to assess the knowledge, attitude, and practices of biomedical waste management among intern doctors at a tertiary care center in Eastern India.

Methods

This observational, cross-sectional study was conducted at a tertiary care center in Eastern India between August 2024 and December 2024, among intern doctors posted in various Departments of a Medical College and Hospital of Eastern India. Data collection was initiated after obtaining approval from the Institutional Ethics Committee. The study was conducted on census population and therefore sample size calculation was not required. A total of 150 intern doctors were invited to participate and informed written consent was obtained prior to enrolment in the study.

Data was collected using a pre-designed, pretested self-administered, structured, questionnaire which had two parts. First part included questioned to record sociodemographic data, namely, age, sex and place of residence. The second part contained 30 questions to evaluate the KAP of the participant regarding BMW management.

The second part has three sections, each consisting of 10 questions assessing the knowledge with specific responses, 10 questions assessing the attitude with agree/disagree/no comment as answers and 10 questions assessing the practices with yes/ no responses. There usual practice with regards to BWM was self-reported.

The participants filled up the self-administered questionnaire without scope for undue help.The identity of the study respondents was maintained anonymous at various stages of the study.

Data Analysis. Data was entered into Microsoft Excel 2016 and analyzed using SPSS version 16.0. Results were presented through tables, graphs, and diagrams. Continuous variables (age, domain-specific scores) were expressed as mean ± standard deviation (SD), while categorical variables (gender, domain-specific-responses) were represented as relative frequencies and percentages. The responses to all domain-specific items indicative of correct knowledge, favourable attitude, and proper practice

were scored 1 each. The total knowledge score, attitude score and practice score were obtained for each participant. Knowledge scores, attitude scores and practice scores of the study population did not have normal distribution, therefore Mann-Whitney U test (non-parametric test of significance) was employed to compare between domain scores. A "p-value" <0.05 was considered as statistically significant.

The study adhered to the STROBE guidelines for reporting observational research.

Results

Out of 150 study participants, 139 participants completely filled the questionnaire and their data was included in the analysis. There were 73 males (52.5%) and 66 female interns (47.5%). The mean age was 24.3 (±1.2) years with minimum age of 22 years and maximum age of 27 years. 69.8% of the participants resided either in hostels or as paying guests.

The knowledge of the study participants regarding BMW management is given in Table 1.While most respondents displayed good knowledge in areas such as the governing body (68.3%), the use of color-coded bins (79.1%), and sharps disposal (80.6%), there were gaps in understanding specific topics like the concentration of sodium hypochlorite for pre-treatment (54.7%) and waste storage time limits (59.7%).

Table 1: Knowledge regarding BMW management of the study participants (N=139)

Knowledge-related items	Correct response	Incorrect response
1. Which government body in India regulates the Biomedical Waste Management Rules?	95 (68.3%)	44 (31.7%)
2. What is the significance of using color-coded bins in biomedical waste management?	110 (79.1%)	29 (20.9%)
3. Which area of the hospital has the highest chance of producing biomedical waste?	85 (61.2%)	54 (38.8%)
4. What type of waste is disposed of in yellow-coloured bags according to the Biomedical Waste Management Rules?	98 (70.5%)	41 (29.5%)
5. What is the recommended method for the disposal of sharps, such as needles and scalpels?	112 (80.6%)	27 (19.4%)
6. What concentration of sodium hypochlorite is recommended for pre-treatment of microbiological waste?	76 (54.7%)	63 (45.3%)
7. Which color-coded bag is used for disposing of infectious plastic items like IV tubes and catheters?	91 (65.5%)	48 (34.5%)
8. Which colour-coded bag is recommended for the disposal of used mask (triple layer mask, N95 mask, etc.)?	87 (62.6%)	52 (37.4%)
9. What is the maximum permissible time for biomedical waste to be stored before treatment or disposal?	83 (59.7%)	56 (40.3%)
10. All healthcare workers must follow universal precautions regardless of the patient's infection status.	121 (87.1%)	18 (12.9%)

Table 2 reveals a generally favourable attitude among intern doctors toward BMW management, with over 85% demonstrating satisfactory attitudes in key areas such as the necessity of safe disposal (93.5%), the importance of PPE (92.1%), and the use of color-coded segregation (91.4%). However, attitudes toward certain challenges, such as the perceived burden of biomedical waste management (51.8%) and the time-consuming nature of segregation (57.6%), indicate mixed opinions.

Table 2: Attitude regarding BMW management of the study participants (N=139)

Attitude-related items	Satisfactory attitude	Unsatisfactory attitude
1. Safe disposal of biomedical waste is necessary in healthcare setups.	130 (93.5%)	9 (6.5%)
2. Biomedical waste management is teamwork.	125 (89.9%)	14 (10.1%)
3. Biomedical waste management creates an extra burden on routine work.*	72 (51.8%)	67 (48.2%)
4. Biomedical waste management is a risk for the transmission of any infectious disease.*	95 (68.3%)	44 (31.7%)
5. Segregation of hospital waste into different categories is time-consuming.*	80 (57.6%)	59 (42.4%)
6. PPE is essential while handling biomedical waste.	128 (92.1%)	11 (7.9%)
7. De-contamination and disinfection reduce the risk of infection.	123 (88.5%)	16 (11.5%)
8. The use of colour coding for segregation of waste is essential.	127 (91.4%)	12 (8.6%)
9. Proper biomedical waste management enhances the quality assurance of healthcare sectors.	119 (85.6%)	20 (14.4%)
10. Upgrading knowledge on biomedical waste management is mandatory.	122 (87.8%)	17 (12.2%)

*Negatively phrased statements and reversely scored.

Table 3 indicates that intern doctors generally exhibit correct practices in biomedical waste management, particularly in using PPE during procedures (90.6%), and avoiding the mixing of general and biomedical waste (84.9%). However, areas like segregation into color-coded bins (66.9%), adherence to protocols (63.3%) and participation in audits (66.9%) show room for improvement.

Table 3: Practice regarding BMW management of the study participants (N=139)

Practice-related items	Correct practice	Incorrect practice
1. Do you correctly segregate biomedical waste into designated color-coded bins during patient care activities?	93 (66.9%)	46 (33.1%)
2. Do you wear appropriate personal protective equipment (PPE), including gloves and masks, during procedures that generate biomedical waste?	126 (90.6%)	13 (9.4%)
3. Do you immediately dispose of sharps, such as needles and scalpels, into puncture-proof containers after use?	115 (82.7%)	24 (17.3%)
4. Are you mindful of not overfilling the waste bins to prevent spillage and contamination?	98 (70.5%)	41 (29.5%)
5. Do you ensure proper hand hygiene after handling biomedical waste or waste bins?	110 (79.1%)	29 (20.9%)
6. Do you promptly notify the appropriate authority if you observe improper waste segregation or disposal practices?	95 (68.3%)	44 (31.7%)

Continue.....

7. Do you ensure that waste bins in your department are closed properly and replaced when full to prevent accidental exposure?	100 (71.9%)	39 (28.1%)
8. Do you avoid mixing general waste with biomedical waste?	118 (84.9%)	21 (15.1%)
9. Do you participate in periodic audits or checks for proper biomedical waste segregation in your assigned area?	41 (29.5%)	98 (70.5%)
10. Have you attended or reviewed the hospital's biomedical waste management protocol during your internship?	88 (63.3%)	51 (36.7%)

The study participants showed moderate overall performance in knowledge (6.92 ± 2.14), attitude (6.60 ± 1.70), and practice (6.73 ± 1.78), which were not significantly different from each other.

Table 10a: Total knowledge, attitude and practice scores among the study participants (N=21)

Domains	Mean ± SD score	p-value
Knowledge	7.19± 2.14	0.529[a]
Attitude	7.83± 1.77	0.316[b]
Practice	6.88± 1.91	0.820[c]

p-values were calculated using Mann-Whitney U test

[a] comparison between knowledge and attitude scores

[b] comparison between attitude and practice scores

[c] comparison between knowledge and practice scores

Discussion

Effective management of BMW is crucial to prevent environmental contamination and safeguard public health. The findings provide a snapshot of the current understanding, perspectives, and behaviours of intern doctors regarding the safe and responsible segregation of BMW.

Knowledge of Biomedical Waste Management

Knowledge serves as the cornerstone of any effective BMW management system. Intern doctors, in this study, displayed a relatively good level of knowledge concerning biomedical waste management. The mean knowledge score was 6.92 ± 2.14, which reflected a generally adequate understanding of key concepts such as the use of color-coded bins, sharps disposal, and the role of the governing body in India. This foundational knowledge is crucial because it equips healthcare workers with the necessary awareness to identify risks, understand their responsibilities, and take appropriate action.

A study by Patil and Pokhrel[9] reported a considerable level of awareness and knowledge of hospital waste management practices among the staff. Another study by Patil and Shekdar[10] in Indian hospitals also highlighted satisfactory awareness regarding waste segregation and sharps disposal among healthcare workers, with over 70% demonstrating accurate knowledge of these areas. On the contrary, a study by Mathur et al.[5] found that as compared to doctors, nurses had better knowledge regarding the colour coding and waste segregation at source. In a more recent study conducted by Thapa et al.[11] in a hospital in the North-East India, 66% of the healthcare workers were observed to have adequate knowledge scores.

However, there were certain areas where knowledge gaps were observed. For instance, only 54.7% of participants correctly identified the recommended concentration of sodium hypochlorite for pre-treatment of microbiological waste, and 59.7% knew the maximum permissible storage time for biomedical waste. These gaps indicate that while basic knowledge may be in place, more specialized details regarding waste treatment protocols and storage guidelines are not adequately understood. A possible reason for these knowledge deficiencies could be that such topics are less frequently emphasized during clinical rotations or training programs, with a greater focus placed on patient care. Additionally, the complex nature of biomedical waste management, which involves adherence to

strict and sometimes cumbersome regulations, may lead to gaps in practical knowledge.

Attitudes Toward Biomedical Waste Management

Good knowledge, when reinforced by proper guidance, fosters favourable attitudes toward BMW management. The attitude of intern doctors toward BMW management was generally positive, with a mean score of 7.83 ± 1.77. A high percentage of respondents expressed favourable attitudes toward the necessity of safe disposal (93.5%), the importance of using personal protective equipment (PPE) (92.1%), and the significance of using color-coded bins (91.4%). These findings suggest that intern doctors recognize the importance of safe and effective BMW management, which is crucial for minimizing the risks of infection and cross-contamination.

These attitudes are influenced by both prior knowledge and the guidance provided during training. Structured orientation sessions, hands-on demonstrations, and mentorship from senior healthcare workers help intern doctors understand the rationale behind BMW management practices. When intern doctors see these practices integrated into the daily workflow and emphasized as a collective responsibility, it reinforces the perception that BMW management is not just a regulatory requirement but a critical aspect of patient safety and public health.

In a prior study by SP et al.[12] 98.2% had a favourable attitude towards biomedical waste management, with an overall mean attitude score of 8.77 ± 0.98. Jalal et al.[13] had 73.1% favourable attitudes. In the study by Dalui et al.[14], almost two-thirds (74.1%) had a favourable attitude. Among doctors, 91% and, among nurses, 81% had a favourable attitude towards biomedical waste management.

However, challenges remain. For example, only 51.8% of participants agreed that BMW management creates an extra burden on routine work, while 57.6% felt that waste segregation was time-consuming. These perceptions are consistent with findings by Dalui et al.[14], who noted that 60.3% of participants were either neutral or viewed BMW management as adding to their workload, particularly in settings with inadequate staffing or resources. These responses among our study participants, suggest that despite understanding the importance of BMW management, intern doctors may feel burdened by the time and effort required to properly segregate waste and adhere to regulations. The perception of BMW management as an additional task may be due to the high workload and fast-paced environment that intern doctors experience, which often leaves little room for non-clinical tasks like waste segregation. This underscores the need for ongoing guidance to streamline workflows and reduce the perception of BMW management as a burden.

Practices in Biomedical Waste Management

Good knowledge and favourable attitudes create a strong foundation for translating intent into action, as reflected in the mean practice score of6.88 ± 1.91. Intern doctors who are well-informed and positively inclined toward BMW management are more likely to adopt correct practices such as proper segregation of waste (86.3%) and consistent use of PPE (90.6%). These practices are not only essential for ensuring compliance with BMW guidelines but also critical for preventing infections and maintaining a safe environment for both patients and healthcare workers. A similar finding where 79.3% of healthcare professionals always followed BMWM guidelines was reported by Jalal SM et al.[13] in their study. Also, the study by Sharma S et al.[15], reported proper practice of segregation of BMW by 82% of their participants.

However, the study also highlights areas where gaps in knowledge or insufficient guidance hinder good practices. For instance, only 63.3% of participants reported participating in periodic audits, and 66.9% had reviewed BMW management protocols during their internship. These lower rates may reflect a lack of emphasis on institutional activities or insufficient encouragement from supervisors. Addressing these issues through structured mentorship programs and routine engagement with BMW protocols would reinforce the importance of BMW management at a systemic level, ensuring more consistent practice across all domains.

The interplay between knowledge, attitude, and practice is a dynamic process. Knowledge provides the "what" and "why," while attitudes influence the "how" healthcare workers perceive and approach these tasks. When these elements align, they result in good practice, which not only ensures compliance

but also builds a culture of accountability and safety in healthcare settings. For example, an intern doctor who understands the risks of improper sharps disposal (knowledge) and believes it is their responsibility to prevent infections (attitude) is more likely to immediately discard sharps in puncture-proof containers (practice). Similarly, guidance from supervisors and role models helps reinforce positive behaviours and attitudes, creating a feedback loop where good practices further enhance knowledge and reinforce favourable attitudes.

Moreover, while the overall attitude toward BMW management is positive, the perception of increased workload and the time-consuming nature of segregation may indicate a lack of integration between clinical and waste management tasks. A more streamlined and efficient approach to BMW management, such as digital waste tracking systems or simplified segregation guidelines, may help alleviate some of these concerns.

Limitations of the Study

This study has several limitations. First, it was conducted at a single tertiary care center, meaning the results may not be generalizable to other healthcare settings, particularly those with different infrastructural or training conditions. Additionally, the study relied on self-reported data, which may be subject to response bias. Intern doctors may have over-reported their compliance with BMW management practices, especially when they were aware that their responses would be used for academic or institutional purposes. Finally, the study did not assess the effectiveness of specific training programs or institutional policies related to BMW management, which could have provided further insights into the factors influencing knowledge, attitude, and practices.

Recommendations

This study highlights the need for a comprehensive approach to BMW management that integrates knowledge-building, attitude development, and practical guidance. Based on the findings, several recommendations can be made to improve BMW management practices among intern doctors. First, training programs should be more comprehensive and focus on not only the basic knowledge of BMW management but also on more specialized topics such as waste treatment and storage protocols. Regular workshops, refresher courses, and interactive sessions can help reinforce this knowledge. Second, it is essential to integrate BMW management tasks more seamlessly into the clinical workflow, minimizing the perception of additional burden. Simplifying waste segregation guidelines, using clear labelling on bins, and streamlining the disposal process can make these tasks more manageable for intern doctors. Additionally, hospital administration should focus on creating a work environment that encourages engagement in non-clinical activities like audits without overwhelming intern doctors with additional responsibilities.

Conclusion

In conclusion, this study highlights the importance of ongoing education and structured interventions to improve biomedical waste management among intern doctors. While intern doctors generally possess adequate knowledge and a positive attitude, there is room for improvement in specialized areas and institutional practices. Addressing these gaps through targeted training, mentorship, and streamlined protocols can create a safer and more efficient healthcare environment. Ultimately, a well-informed and guided workforce will not only comply with BMW regulations but also contribute to the broader goals of patient safety and public health.

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Original Article

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Etiology of Anemia in Adult Males in a South Indian Tertiary Care Hospital: A Clinical Study

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Abstract

Objective: Anaemia is a prevalent health condition with various etiological factors, contributing significantly to morbidity and mortality. This study investigates the causes of anaemia in adult male patients admitted to a tertiary care hospital in South India, with a focus on understanding the prevalence of different aetiologies and their impact on public health.

Methods: This was a descriptive cross-sectional study conducted over a period of 18 months. A total of 75 male patients diagnosed with anaemia were included. Detailed clinical histories were obtained, followed by comprehensive laboratory investigations, including complete blood count (CBC), serum iron studies, vitamin B12 and folic acid levels, stool occult blood test (SOBT), endoscopy, and bone marrow aspiration.

Results: The majority of patients were aged between 51-60 years (32.0%). Iron deficiency anaemia (IDA) was the most common aetiology, found in 37.3% of patients, followed by haematological malignancies (28.0%) and vitamin B12 deficiency (17.3%). Gastrointestinal (GI) malignancies were identified in 16.0% of cases. Peripheral smear examinations revealed microcytic hypochromic RBCs in 53.3% of cases. Endoscopic findings were normal in 82.6% of patients, and bone marrow examination revealed megaloblastic erythroid hyperplasia in 37.1% of cases.

Conclusions: The study highlights iron deficiency anaemia as the leading cause of anaemia in adult males in our patient cohort, followed by haematological malignancies and vitamin B12 deficiency. Public health initiatives should focus on improving nutrition, early diagnosis, and management of anaemia, particularly in middle-aged and older male populations. Further studies are needed to explore the multifactorial aetiology and long-term outcomes of anaemia in this demographic.

Keywords: Anemia, Males, South India, Iron Deficiency.

Introduction

Anaemia, a condition marked by insufficient red blood cells or hemoglobin, is a widespread global health issue with significant implications for public health. It is a major contributor to morbidity and mortality, especially in low- and middle-income

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countries, where it disproportionately affects vulnerable populations.[1] The causes of anaemia are multifactorial and can vary by age, sex, and socio-economic factors.[2] In developed countries, common causes include anaemia of chronic disease (ACD), iron deficiency anaemia (IDA), renal anaemia, and vitamin B12 or folic acid deficiencies.[3,4] However, in developing nations, anaemia is often linked to nutritional deficiencies, parasitic infections, and chronic illnesses, which complicates the diagnostic process.[5] Several common causes of anaemia include iron deficiency, haematological malignancies, vitamin B12 and folic acid deficiencies, as well as gastrointestinal (GI) malignancies and chronic kidney disease (CKD).[6]

In India, anaemia continues to remain a critical health challenge, with a high prevalence across both genders, though its causes are not always clearly identified.[7] The incidence of anemia in adult Indian males is estimated to range between 25% and 30%. It is predominantly associated with dietary deficiencies, especially iron, and is commonly observed in individuals with chronic illnesses.[8,9] In the clinical setting, the diagnosis of anaemia typically involves a combination of laboratory tests, including complete blood count (CBC), iron studies, and vitamin and mineral level assessments. Bone marrow aspiration may be used to further investigate haematological causes of anaemia, providing valuable insights into the underlying mechanisms.[10] While various studies have focused on anaemia across different populations, there is limited research on the specific aetiologies of anaemia in adult males in the South Indian region.[11] This lack of detailed data hampers the development of effective public health strategies aimed at addressing anaemia in this group.

Therefore, the aim of this study was to identify and analyze the aetiological factors contributing to anaemia in male patients admitted to a tertiary medical center in Tamilnadu which could inform future interventions that address the public health burden of anaemia in this demographic.

Methods

Study Design

This study was a descriptive cross-sectional investigation conducted over 18 months, from [August 2022] to [September 2024] at a tertiary care institution located in South India. The study aimed to evaluate the aetiology of anaemia in adult male patients using a comprehensive diagnostic approach that included clinical evaluation, laboratory testing, and advanced diagnostic procedures such as bone marrow aspiration. The study was conducted in compliance with ethical standards, and informed consent was obtained from all participants.

Sample Size Calculation

According to the study by Oliver Didzun et al., the prevalence of anaemia among men was estimated to be 23.2%.[12] Using this estimate (p), a precision of 10% (d) and a confidence level of 95% (Z = 1.96), the sample size was calculated using the formula $n = Z^{2*} p * (1 - p) / d^2$ which is used for cross-sectional studies similar to the current study. A 10% non-response rate was expected - therefore the final sample size was adjusted to 75.

Study Population

The study included male patients who were diagnosed with anaemia based on blood tests including low haemoglobin levels and were admitted to the hospital during the study period. Only patients who consented to participate were included. Exclusion criteria included female patients, individuals with a history of gastrointestinal malignancies or chronic kidney disease, and those with established diagnoses of haematological disorders or other conditions that could clearly explain anaemia. Participants were selected using a convenience sampling method, ensuring that all individuals who met the inclusion criteria and agreed to participate were included. Demographic and clinical data were collected from all subjects upon admission. Ethical clearance for the study was obtained from the Institutional Ethics Committee of our institution.

Methods of Data Collection

After obtaining informed consent, patient data were collected through structured interviews, including medical history, lifestyle factors, and socioeconomic status. A clinical examination was conducted, and blood samples were taken for laboratory testing. Tests included a Complete Blood Count (CBC) and peripheral smear to classify anaemia

and detect abnormalities, iron studies to diagnose iron deficiency anaemia (IDA), and measurements of vitamin B12 and folate levels to identify deficiencies. Bone marrow aspiration was performed in selected cases to assess for haematological disorders, and endoscopic investigations (GI scopy and colonoscopy) were done to check for gastrointestinal causes of anaemia. All results were documented for further analysis.

Statistical Analysis

Data collected from patient interviews and diagnostic tests were entered into Microsoft Excel and then analyzed using SPSS software (Version 27.0). Continuous variables were presented as means and standard deviations (SD), while categorical variables were expressed as frequencies and percentages. Visual representations of data, including bar charts.

Results

Demographic and Clinical Characteristics

The study included 75 male patients, with an age range from 18 to 80 years. The majority of patients were in the age group of 51-60 years (32.0%), followed by those under 30 years of age (21.3%). A significant portion (20.0%) of patients were between the ages of 31 and 40, and 13.3% were in the 41-50 and over 61 age groups (**Table 1**). These findings suggest that anaemia is a condition that affects individuals across all age groups, with a notable prevalence in middle-aged men.

Haematological Parameters

The mean haemoglobin level among the patients was 6.87 g/dL, which is indicative of severe anaemia. Other haematological parameters such as serum ferritin (105.35 ± 48.11), transferrin saturation (27.52 ± 7.51%), and TIBC (368.88 ± 96.03) suggest that iron deficiency played a significant role in the anaemia observed in this study population (**Table 2**). Other causes were also identified as described in the Diagnostic Impressions section.

Peripheral Smear Findings

The distribution of patients based on peripheral smear findings revealed that the most common abnormality observed was microcytic hypochromic red blood cells (RBCs), found in 40 patients, which accounted for 53.3% of the study population. The second most frequent finding was dimorphic RBCs, seen in 10 patients (13.3%). Other notable abnormalities included macrocytic RBCs (5.3%), and increased counts with predominant blast cells or myeloid lineage, each found in 3 patients (4.0%). Plasma cells were identified in 3 patients (4.0%), and rouleaux formation with plasma cells was observed in 2 patients (2.7%). Additionally, normocytic RBCs with plasma cells, lymphocytosis with smudge cells, and normocytic normochromic RBCs were noted in 2 patients each (2.7%). Lymphocytosis with basophilia, marked lymphocytosis, and megaloblastic anaemia were the least common findings, each observed in only 1 patient (1.3%). This distribution underscores the varied hematological abnormalities associated with anaemia in the study population, with a predominance of microcytic hypochromic anaemia.

Stool Occult Blood Test (SOBT) and Endoscopic Findings

The majority of patients (86.7%) showed negative results on the stool occult blood test, suggesting that gastrointestinal bleeding was not a major contributor to anaemia in this cohort. Only 13.3% of patients tested positive for occult blood, which may point to underlying gastrointestinal issues that require further investigation.

The distribution of patients based on gastrointestinal endoscopy findings showed that 57 of the 75 patients (82.6%) had a normal endoscopic examination. Sigmoid growth was observed in 6 patients, accounting for 8.7% of the population. Caecal and fundus growth were each identified in 2 patients (2.9% each). Gastric growth and prepyloric ulcer were each observed in 1 patient (1.4%). These findings suggest that most of the patients did not show significant abnormalities on endoscopic examination, with a small proportion exhibiting various types of growth in the gastrointestinal tract.

Bone Marrow Findings

Bone marrow aspiration was performed on a subset of patients, and the majority (37.1%) exhibited megaloblastic erythroid hyperplasia, which is commonly associated with vitamin B12 or folate deficiencies. Other findings included increased plasma cells (20.0%) and mature myeloid

lymphocytosis (11.4%). These results highlight the potential role of both nutritional deficiencies and haematological disorders in the aetiology of anaemia in this cohort (**Table 3**).

Diagnostic Impressions

As shown in **Table 4**, analysis of the final diagnosis that was made for the patients in our cohort indicated that 37.3% of patients had iron deficiency anaemia (IDA), followed by 28.0% with haematological malignancies. Vitamin B12 deficiency was identified in 17.3% of patients, and gastrointestinal malignancies were suspected in 16.0% of patients. Folic acid deficiency was found in a very small number of patients (2.7%).

Table 1: Age range of enrolled patients

		No of Patients	Percentage
AGE	< 30	16	21.3%
	31-40	15	20%
	41-50	10	13.3%
	51-60	24	32%
	> 61	10	13.3%

Table 2: Haematology parameters of enrolled patients

Parameter	Mean ± SD
CBC-Hb	6.87 ± 1.36
S. Ferritin	105.35 ± 48.11
Transferrin Saturation	27.52% ± 7.51%
TIBC	368.88 ± 96.03
Vitamin B12	267.95 ± 136.58
Folic Acid	7.47 ± 2.25

Table 3: Distribution of patients based on bone marrow findings

Bone Marrow Findings	No. of Patients	Percentage
Megaloblast erythroid	13	37.1%
> 20% Plasma cell	7	20.0%
Mature myeloid lymphocytosis	4	11.4%
Mature lymphocytosis with no blast cell	3	8.6%
Myeloblast cell	3	8.6%
Lymph node biopsy - RS cell with lymphocytosis	2	5.7%

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Dysplasia cell	1	2.9%
Hypercellular marrow	1	2.9%
Predominantly blast cell	1	2.9%

Table 4: Distribution of patients based on impression

Impression	No. of Patients	Percentage
IDA (Iron Deficiency Anaemia)	28	37.3%
Haematological malignancy	21	28.0%
Vitamin B12 deficiency	13	17.3%
GI malignancy	12	16.0%
Folic acid deficiency	2	2.7%

Discussion

Anaemia is a multifactorial condition is recognized to be an emerging public health challenge and its aetiology can vary significantly across populations.[13] In this study, the most common cause of anaemia in male patients was iron deficiency, which is consistent with findings from similar studies both nationally as well as in South India.[14,15] The prevalence of iron deficiency anaemia (IDA) highlights the importance of ensuring adequate dietary intake of iron, as well as addressing other contributing factors such as gastrointestinal bleeding or malabsorption.

The second most common cause of anaemia in this cohort was haematological malignancy, which accounts for a significant proportion of cases in older adults. A previous study conducted in Haryana also indicated that hematological and solid tissue malignancies may be a significant cause of anemia in adult males.[16] The presence of megaloblastic erythroid hyperplasia in the bone marrow, along with elevated plasma cells, suggests that nutritional deficiencies, particularly vitamin B12 and folate, were also contributing factors. Further investigation into the nutritional status of patients in this region is needed, as deficiencies in these essential vitamins are common in populations with limited access to diverse foods.

Despite the prevalence of iron deficiency, other causes such as vitamin B12 deficiency, gastrointestinal malignancies, and haematological disorders should

not be overlooked. The study's findings underscore the importance of a comprehensive diagnostic approach that includes both laboratory and clinical evaluations, as well as advanced tests such as bone marrow aspiration and endoscopy.

In terms of public health implications, this study suggests the need for increased awareness and screening for anaemia, particularly in middle-aged and older male populations. Public health initiatives should focus on improving nutrition, promoting early diagnosis, and providing appropriate treatments for conditions like IDA and vitamin B12 deficiency.

Conclusion

In conclusion, the study provides valuable insights into the aetiology of anaemia in male patients in South India, with iron deficiency anaemia emerging as the most common cause. Haematological malignancies, vitamin B12 deficiency, and gastrointestinal malignancies also contribute significantly to the overall burden of anaemia. Public health strategies should aim to address these factors through improved nutrition, early detection, and targeted interventions.

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Informed Consent: All patients in this study were enrolled after their full and informed consent which was provided by them after a study information sheet was read by/read to them.

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Original Article

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A Retrospective Study: To Study the Prevalence of Anemia among Antenatal Females in a District of J&K

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Abstract

Introduction: Globally, the prevalence of anemia among women of reproductive age is about 29.4%, and anemia impacts about 40% of pregnant women and more than 20% of non-pregnant women. Anemia is one of the most common nutritional deficiency disorders affecting pregnant women; the prevalence in developed countries is 14%, in developing countries 51%, and in India, it varies from 65% to 75%. In India, anemia during pregnancy is a significant public health problem, with 45.7% of pregnant women in urban areas and 52.1% in rural areas having hemoglobin levels <11 g/dl. Anemia is the underlying cause or contributing factor for 20-40% of maternal deaths in India, which accounts for 80% of maternal deaths attributable to anemia in South Asia. The aim of the study is to determine the magnitude of anemia in antenatal females according to severity and to find out its association with different variables.

Methodology: Retrospective record-based study conducted at Rural Health Training Centre Garhi, Udhampur, J&K. Data regarding pregnancy were collected for 3 years i.e. from 1st April 2020 to 31st March 2023, and 495 females were registered during that period. Data was analyzed using SPSS 22.

Result: The most common age group seen was 18-25 years (42.2%), majority of females were Hindu (90.9%) and belonged to middle socio-economic status (51.9%). The obstetrics history of the antenatal females shows, most of them registered themselves in their 1st trimester (79.8%) and around 20.4% of the females had birth interval between 1-2 years, followed by <1 year. The majority of them had moderate anemia (58.2%), followed by mild anemia (38.6%). Less than 1% of females had severe anemia while the rest had no anemia (3%).

Conclusion: High prevalence of anemia in pregnant women indicates that anemia continues to be a major public health problem in rural areas of India. Anemia in pregnancy increases the maternal and fetal risks. Gravida status, female literacy, and bad obstetric history were important risk factors contributing for anemia in pregnant women. The findings of our study can contribute to the formulation of strategies for the prevention and treatment of anemia during pregnancy.

Keywords: Anaemia, pregnant women, hemoglobin

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Introduction

Anemia is characterized by a reduction in the concentration of hemoglobin in the blood. It ranks among the most prevalent nutritional deficiency disorders worldwide. Anemia is recognized as one of the most prevalent nutritional deficiency disorders among pregnant women, with rates of 14% in developed nations and 51% in developing countries. In India, the prevalence ranges from 65% to 75%. Anemia during pregnancy poses a considerable public health challenge in India, where 45.7% of pregnant women in urban settings and 52.1% in rural areas have hemoglobin levels below 11 g/dl. Furthermore, anemia is a primary or contributing factor in 20-40% of maternal deaths in India, representing 80% of maternal fatalities related to anemia in the South Asian region. This condition poses a significant public health challenge across all age groups, with the highest rates found in children under five years old and in pregnant women. In developing nations, anemia during pregnancy is a critical factor contributing to both maternal and fetal health issues, leading to increased morbidity and mortality among expectant mothers.[1,2,3,4,5]

The Global Nutrition Report of 2017 highlighted that anemia affects 125 countries globally, representing a considerable health challenge. Policy-makers ought to prioritize the actions to achieve the global nutrition goal of a 50% reduction in anaemia among women of reproductive age. Estimates suggest that nearly 25% of the world's population suffers from anemia, with a notable 89% of those affected residing in developing nations. Anaemia is believed to impact approximately 500 million women aged 15 to 49 and 269 million children between 6 and 59 months globally. It is estimated that worldwide, 40% of children between the ages of 6 and 59 months, 37% of pregnant women, and 30% of women aged 15 to 49 are impacted by anaemia. This condition presents a significant public health issue, especially in South Asian and Sub-Saharan African countries, where rates exceed 40%. In contrast, countries like Australia, China, and those in the Americas report lower anemia prevalence, ranging from 5% to 20%.[6,7,8,9,10]

Anemia is influenced by multiple factors, such as nutritional deficiencies, genetic predispositions, and infectious diseases. Notably, iron deficiency accounts for 75% of all anemia cases. This form of anemia significantly impacts a nation's progress by hindering children's cognitive development and reducing adult productivity. The primary factor contributing to anaemia among women of reproductive age worldwide is iron deficiency, which arises from a sustained negative iron balance. The negative iron balance can result from insufficient dietary iron intake or absorption, heightened iron requirements during pregnancy, and increased iron losses due to menstruation, parasitic infections, and other health issues. Additionally, various genetic, socio-demographic, and economic factors affecting women play a significant role in the prevalence of anaemia and should be considered when developing preventive strategies for pregnancy-related anaemia. The World Health Organization (WHO) advises that women of menstruating age in areas where anaemia prevalence exceeds 20% receive intermittent iron and folic acid supplementation, while pregnant women should receive daily supplementation as part of their antenatal care to mitigate the risk of anaemia during pregnancy.[11,12,13] Regular assessment of hemoglobin levels in pregnant women and their determinants is crucial for guiding treatment and preventive services. This study aims to evaluate the prevalence of anemia among antenatal females based on severity and to explore its association with various factors.

Methodology

This study is a retrospective analysis conducted over three years, from April 1, 2020, to March 31, 2023, within the Department of Community Medicine at GMC Udhampur, specifically at the Rural Health and Training Center in Garhi. Data was collected from the antenatal care (ANC) registers maintained by the female multipurpose worker at the center. This data encompasses patient details such as name, age, residence, registration number, parity, birth intervals, last menstrual period (LMP), estimated due date (EDD), ANC visits, vital signs, and immunization records. Each year, the data is organized into distinct registers, covering the period from April 1st to March 31st. The village of Garhi has a total population of 7,968, with 495 antenatal females registered during the study period. Information regarding age, religion, socio-economic status, gestational age at registration, gravida, para, birth interval, and hemoglobin levels was extracted from the registers. Hemoglobin levels were classified according to WHO standards, where a value of less than 11 g/dL

indicates anemia in pregnancy, further categorized into mild (10.0–10.9 g/dL), moderate (7.0–9.9 g/dL), and severe anemia (less than 7 g/dL)[14]. The data was entered into Microsoft Excel and analyzed using the Statistical Package for Social Sciences (SPSS) version 22. Descriptive statistics, including frequency and percentages, were employed to summarize both dependent and independent variables, with a p-value of less than 0.05 deemed statistically significant.

Result

In the current study, a total of 495 pregnant women were included. The demographic details of these participants are illustrated in Figure 1. The predominant age group identified was 18-25 years, comprising 41.8% of the sample. A significant majority of the participants were Hindu (90.9%) and classified as belonging to the middle socio-economic class (51.9%). Table 1 presents the obstetric history of the pregnant women, indicating that most registered during their first trimester (79.8%). Approximately 20.4% of the women reported a birth interval of 1-2 years, with the next most common interval being <1 year. Among the registered pregnant women, the majority experienced moderate anemia (58.2%), followed by mild anemia (38.6%). Only a single case was diagnosed with severe anemia, while 3% had no anemia (as shown in Figure 2). Regarding the relationship between anemia in pregnant women and factors such as age group, religion, socio-economic status, parity, gestational period, and birth interval (Table 2), the associations with socio-economic status, parity, gestational period, and birth interval were found to be statistically significant (p=<0.05).

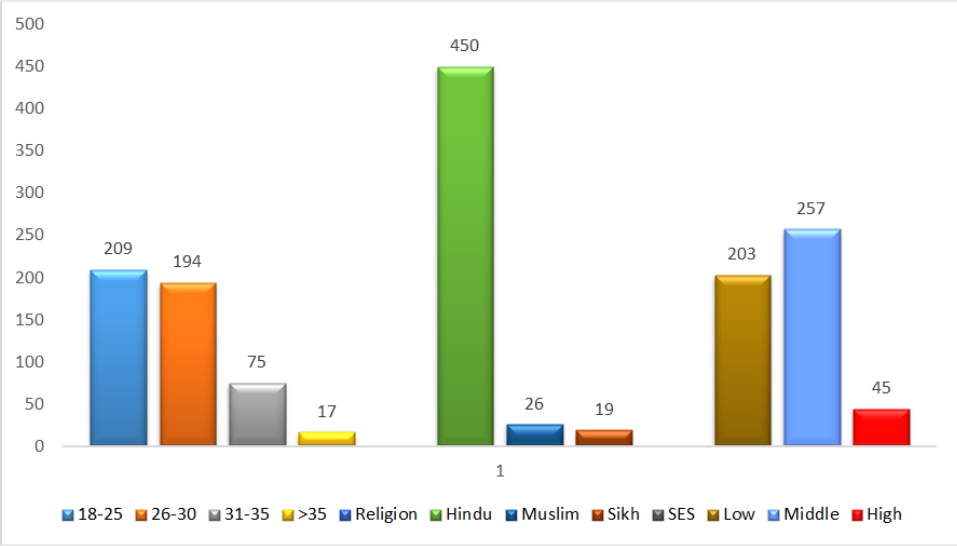


Figure 1: Distribution of antenatal females according to different variable characteristics.

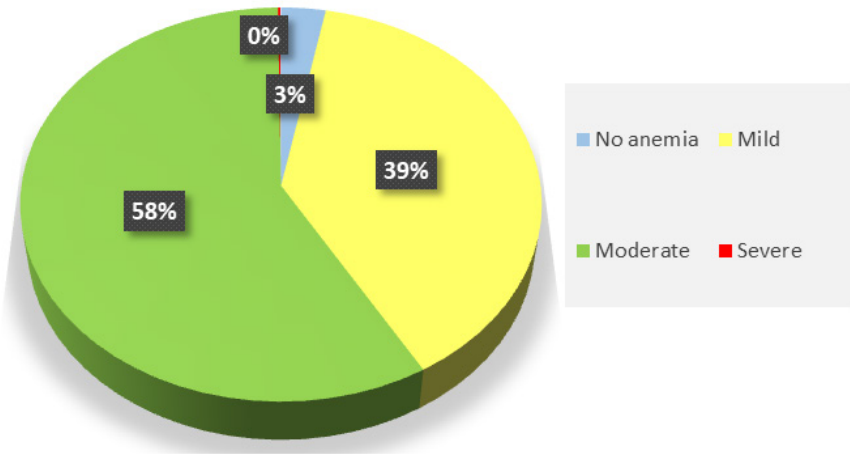


Figure 2: Distribution of severity of anemia among the antenatal females according to WHO classification

Table 1: Distribution of antenatal females according to their Obstetrics history.

Gestational age at the time of registration	Percentages
1st trimester	81.3%
2nd trimester	18.1%
3rd trimester	0.6%
Gravida	
Primi	47.1%
2	41.8%
3	9.1%
>3	2%
Para	
0	47.1%
1	44.4%
2	7.3%
3	1.2%
>3	-
Birth Interval	
<1	15.3%
1-2	20.4%
2-3	10.2%
>3	7%
Not applicable	47.1%

Table 2 Association of anemia in antenatal females with age group, religion, socio-economic status, parity, period of gestation and birth interval.

Age/ anemia classification	No anemia	Mild	Moderate	Severe	P value
18-25	09	91	109	-	0.062
26-30	04	64	126	-	
31-35	02	31	40	01	
>35	-	04	13	-	
Religion					
Hindu	13	175	261	01	0.84
Muslim	01	07	18	-	
Sikh	01	09	09	-	
Others	-	-	-	-	
SES					
Lower class	12	91	99	01	**< 0.0001***
Middle class	14	166	77	-	
High class	22	12	01	-	
Gravida					
Primi	12	116	110	-	**0.0006***
2	03	67	142	01	
3	-	13	27	-	
>3	-	04	06	-	
Para					
Primi	12	116	110	-	**0.003***
1	03	68	142	01	
2	-	13	23	-	
3	-	02	05	-	
>3	-	-	-	-	

Continue.....

Period of gestation					
1st trimester	10	151	232	01	**<0.00001***
2nd trimester	05	38	56	-	
3rd trimester	02	-	-	-	
Birth Interval					
<1	03	43	25	-	**0.00004***
1-2	07	91	134	01	
2-3	-	34	61	-	
>3	-	19	26	-	
Not applicable	05	04	42	-	

*P value <0.05 is significant

Discussion

Anemia during pregnancy represents a significant health concern in our nation. Contributing factors include low socioeconomic status, inadequate dietary intake of iron and folic acid, closely spaced pregnancies, excessive bleeding during childbirth, and infections such as malaria and hookworm infestations, all of which increase morbidity and mortality rates for both mothers and infants. Additional factors involve nutrient losses due to blood loss from parasitic infections, hemorrhage during delivery, menstrual loss, impaired absorption, low iron reserves at birth, and interactions between nutrients that affect iron bioavailability. The current study indicates a prevalence of anemia at 96.8%, which aligns with findings from other Indian research conducted by Sinha A et al., Lokare et al., ICMR Taskforce Multicenter Study, and Alene KA et al.[15,16,17,18]. Conversely, studies conducted in Africa by Mahamud et al., Omete V et al., and Wemakor A, as well as in southern India by Vindhya J et al., revealed a lower prevalence.[19,20,21] This discrepancy may be attributed to variations in geographical regions, socio-economic conditions, dietary practices, and access to healthcare services, among other factors

The majority of the antenatal females in our study exhibited moderate anemia (58.2%) and mild anemia (38.6%), with only <1% presenting with severe anemia. These findings are consistent with the research conducted by Sinha A et al., Vindhya J et al., Mahamud et al., Sarla V et al., Singh K et al., Razdan N et al.[15,19,22,23,24,25]

The analysis revealed no statistically significant association between anemia and age group or religion (see Table 2), consistent with the findings of Sinha A et al.[15] In contrast, a significant correlation was identified between socioeconomic status, the timing of the first antenatal visit, and birth intervals, aligning with the research conducted by Sinha A et al., Viveki RG et al., and Gautam VP et al.[15,26,27] Additionally, increased parity emerged as a significant risk factor for gestational anemia when compared to nulliparous individuals, a finding that corroborates the results of Baksh FM et al. and Elzahrani SS[28,29]. This may be attributed to factors such as iron loss, reduced dietary intake, and the effects of multiple pregnancies.

Limitation

Our research is subject to several limitations. A primary limitation is the cross-sectional design, which prevents the exploration of causal relationships. Being based on existing records restricts our ability to account for all socio-demographic variables and antenatal factors, including maternal education, occupation, actual intake of iron and folic acid, pre-pregnancy hemoglobin levels, and antenatal nutrition. A prospective study design would likely yield more robust findings. Moreover, the study did not conduct independent hemoglobin assessments for the women; it relied on hemoglobin estimates documented in the ANC booklets by the hospital for anemia diagnosis. A lack of motivation and awareness regarding the advantages of supplementation may contribute to the elevated rates of anemia. However, merely providing supplementation during pregnancy is inadequate, as other factors such as hookworm infections, malaria,

and other illnesses must also be taken into account. Additionally, the morphology of red blood cells was not evaluated, which could offer important insights into the root causes of anemia.

Conclusion

This study highlights a significant prevalence of anemia during pregnancy. Maternal anaemia is a prevalent and significant issue that warrants attention from healthcare professionals, public health experts, and the affected women themselves. Anemia appears to be widespread in this area, driven by various adverse socio-demographic conditions. Recognizing that prevention is preferable to treatment, these insights could assist policymakers and healthcare professionals in revising existing policies, implementing new strategies, and educating the community to mitigate maternal anemia. Both governmental and non-governmental health organizations should focus on providing health education to expectant mothers regarding the prevention of infectious diseases, including intestinal parasitic infections. It is essential to promote health education, nutritional assessments, and iron supplementation during antenatal care, while also evaluating the effectiveness of these interventions. The rising rates of anemia across the nation pose a significant risk to our economic productivity. Identifying key risk factors and epidemiological determinants is essential for developing effective interventions and informing health policies. Such research initiatives will clarify the intricate causes of anemia, facilitating the creation of targeted, evidence-based strategies to address this growing health challenge. This study identifies critical gaps in evidence, particularly concerning the management of anaemia during the antenatal period, screening practices, and the most effective treatment interventions. There is notable variability in the gestational age at which treatment is initiated, as well as in the dosages and types of iron supplements used. To address this complex issue, it is crucial to enhance our research efforts.

Declaration

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Conflict of interest: None declared

Ethics approval: The study was approved by Institutional Ethics Committee, Government Medical College Udhampur with reference no: GMCU/IEC/MEETING/2024-2025/25 dated 11-09-2024.

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Original Article

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Intensity of Microsporidia Spores among HIV-infected Patients and their Non-HIV-infected Counterparts in a Tertiary Hospital in Nigeria

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Abstract

Background: Microsporidia infection still remains a public health challenge in immuno-compromised subjects particularly in developing countries.

Objective: A study was carried out among HIV-infected patients at a University of Ilorin Teaching Hospital in Nigeria to determine the prevalence and intensity of microsporidiasis.

Methods: Seven hundred and fifty stool samples were collected from HIV-infected patients and 375 samples from their non-infected counterparts matched for age, sex and socio-economic variables. Microsporidia species were characterized morphologically, using Chromoptrope 2R staining technique. Pure microsporidia spores were isolated from the stool samples by the Ficoll-Hipaque technique. The size of microsporidial were confirmed by the comparison with the reference specimen (No. UN3373) obtained from the Center for Disease Control and Prevention (CDC) Atlanta, USA.

Results: The overall prevalence of microsporidia isolates in the stool samples of 750 HIV-infected patients was 42.4%. This infection rate was significantly higher than among the HIV-non-infected subjects (19.2%) ($P<0.05$). The intensity of microsporidia spores among HIV-infected patients (mean ± SD=176±52.3) was significantly higher than the intensity among the non-infected control group (mean ± SD=23±8.2) ($P<0.05$). This intensity spores among HIV-infected patients who were on HAART treatment and among those who were not on HAART treatment were similar. In general, the intensity of microsporidia spores by age, sex, marital status, occupation and education was significantly higher among HIV-infected patients than among their HIV-non-infected counterpart ($P<0.05$).

Conclusion: Microsporidiasis is prevalent among immuno-compromised (HIV/AIDS) patients with a very high intensity. Therefore, it is highly desirable that a drug of choice for the treatment of microsporidiasis should be developed. Health education campaigns to promote awareness, prevention and control of microsporidiasis should be mounted.

Keywords: Intensity, Microsporidia, patients, Nigeria.

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Introduction

Chronic Diarrhoea is common in patients with suppressed immunity particularly among HIV-infected patients [1] However, in more than 50% of these patients, no enteric pathogen are identifiable [2]. Two possible reasons for these cases of unexplained Diarrhoea are; intestinal infection with HIV that has been associated with enteropathy in these patients and infection with yet to be identified enteric organisms [3].

The HIV/AIDS pandemic has revealed the propensity of microsporidia species to infect man, where they have being implicated in causing intestinal, ocular, pulmonary and renal diseases. However, latent cases of the infection in healthy individuals becoming exacerbated when such individuals become immuno-suppressed have been reported [4].

At present, microsporidiasis is being recognized as an important medical and public health problem both by the World Health Organisation and the National Institute of Allergy and Infectious Diseases (NIAID), Bethesda, Maryland [5].

In spite of its medical, public health and socio-economic implications, there is paucity of information on microsporidia species, particularly in developing countries where no concerted effort has been made to ascertain the prevalence, intensity, mode of transmission and tissue pathology caused by microsporidiasis, especially in the HIV-infected patients.

Justification

Based on the position, status, condition, circumstances, and paucity of information enumerated above, it is anticipated that the knowledge and baseline data which hitherto has remained obscured about this intracellular opportunistic protozoan, will be elucidated in this study.

Objectives

To determine the prevalence and intensity of microsporidiasis among HIV/AIDS patients.

Materials and Methods

The Study Area

The University of Ilorin Teaching Hospital (U.I.T.H) where this research was carried out is a tertiary and referral hospital located in Ilorin, North-central Nigeria. It is involved in teaching, research and training of medical students, resident doctors and other paramedical studies. It is an affiliate of the University of Ilorin, through the College of Health Sciences. Ilorin the State capital is located at longitude 8^0 30N and latitude 4^0 30E. This study was conducted between May 2022 to December 2023 spanning through 19 mouths.

Study Design

A cross sectional study was designed to determine the prevalence and intensity of microsporidia species from human stool specimens of immuno-compromised (HIV-infected) patients and immuno-compromised (non-infected) individuals as control and morphologically characterized, the isolated microsporidia species.

Ethical clearance.

Ethical clearance was sought for and obtained from the Ethical Review Committee of the University of Ilorin Teaching Hospital, (Ref: UITH/032ERC2022), relevant cooperation and assistance of various heads of clinical departments was mobilized for and granted.

Sample Size.

This sample size was predicted on the high prevalence (39-97%) rate of chronic Diarrhoea among the HIV-infected patients [6].

Sampling Technique.

In this study, the non-probability sampling technique was used. Non-probability sampling is not based on any known probability and was adopted for sampling only for the 750 HIV-infected patients.

Stool Specimen Collection.

Stool specimens were obtained from both the HIV/AIDS patients and the HIV-non-infected control in sterile universal bottles. Sterile universal bottles were used for this study for collection of stool samples

for two main reasons; to avoid contamination which would have been acquired environmentally that could affect isolating microsporidia spores in its pure form and to conform with the internationally accepted standard on stool collection in the contemporary world.

The Modified Trichrome Stain (Chromotrope2R) Staining Method.

The Trichrome staining method was modified by the CDC Atlanta Georgia, USA, for the identification of microsporidia spores from human stool samples. method to differentiate microsporidia spores from background faecal elements. The main dye, Chromotrope2R, was acquired from Sigma-Aldrich^{Tm} (Sigma-Aldrich Co.3050 Sprule St. Louis, mo, C 3143-25G; Cust PO No. ZSA/NGO/ISA/AMASE/001. Other reagents that make up the modified Trichrome stain were acquired locally.

Specimen = Stool:

A thin smear of approximately 10 µl of 10% formalin fixed stool suspension (un-concentrated) was made on a glass slide. The smear was heat fixed on a slide warmer at 60^{o}C until completely dried (5 – 10 minutes).

Quality Control:

As a quality control measure, a control slide of microsporidia spores in a 10% formalin preserved specimen from the CDC Atlanta, USA (No. UN 3373) was viewed alongside with the prepared slides. Only the 100 x objective oil immersions magnification was used to detect the organism.

Image capturing and measurement of the spore

The microsporidia photomicrographs and measurement of the spore size was done using Phenix Microimage Analysis Software (PMIAS 3.3). Microscope model ME 100.

Determination of Intensity of the Spores

The intensity of the spores in the stool samples was determined by counting the total number of spores in a 10µl stained smear of stool on a glass slide.

Determination of CD4+ Cell Count

The CD4+ Cell Count was determined by the use of a CD4/8 Cyflow machine (Partec Cyflow SL-3). In this machine, when a sample of blood in a EDTA bottle is inserted into the machine, a switched-on of the machine with proper timing automatically gives the CD4+ cell count result of an individual among other parameters as commanded by the machine.

Data Compilation and Analysis

The Statistical Packages for Social Sciences (SPSS version 24.00) was used. Conclusions were drawn for significant difference at 95% (p-value at 0.05).

Results

Out of the total 1,125 patients examined, seven hundred and fifty (66.7%) were HIV-infected patients while 375 (33.3%) were HIV-non-infected patients. The prevalence of microsporidia infection among the 750 HIV-infected patients was 42.4%. The corresponding prevalence among the HIV-non-infected patients was 19.2%. This difference in the prevalence of microsporidia infection among HIV-infected patients and their HIV-non-infected counterparts was statistically significant ($p<0.05$) (Table1).

Table 1: Prevalence of Microsporidiasis among HIV-infected and HIV-non-infected Patients (N=1125).

Infection Status	Total No. Examined	No. (%) +ve*
HIV-infected patients	750	318 (42.4)
HIV-non-infected patients	375	72 (19.2)
Total	1125	390 (34.7)

P<0.05, * = Microsporidiasis.

Intensity of Microsporidia Spores by Sex and HIV-infection Status

Table 2 shows that, among the HIV-infected patients, the means ± SD of microsporidia spores was 168 ± 37.2 and 184 ± 56.7 for males and females respectively, while among the HIV-non-infected patients, the means ± SD of microsporidia spores was 12±3.2 and 11±3.0 for males and females respectively. The overall mean ± SD of microsporidia spores among HIV-infected patients was 176 ±52.3 and among HIV-non-infected patients was 23 ±8.2. The difference in the overall mean ± SD intensity was significantly higher among HIV-infected patients and the HIV-non-infected counterparts (P<0.05).

Table 2: Intensity of Microsporidia Spore among HIV-infected and HIV-non-infected Patients by Sex, N=1125

Infection Status	Mean ± SD Microsporidia Intensity		Overall Mean ± SD Microsporidia Spore Intensity
	Male (N=356)	Female (N=394)	
HIV-infected patients (n=750)	168 ± 37.2	184 ± 56.7	176 ± 52.3
HIV-non-infected patients (n=375)	12 ± 3.2	11 ± 3.0	23 ± 8.2
Total (N=1,125)	90 ± 11.4	98 ± 12.1	

P < 0.05

Intensity of Microsporidia spores by age and HIV-infection Status

As shown in table 3 below, among the HIV-infected patients, the highest mean ± SD intensity of 268 ± 25.3 was observed in the age group of 52-61 years, and 62±16 in the age group 32-41years in their HIV-non-infected counterparts. The least intensity rate of 16 ± 5.2 for the age group of ≤1years and 0.0±0.0 in the age group of 2-11years was observed among the HIV-infected and HIV-non-infected patients respectively.

Table 3: Intensity of Microsporidia Spores among HIV-infected and HIV-non-infected Patients by Age.

Age group (years)	No. Examined	Prevalence of Microsporidiasis	Mean ± SD of Microsporidia Spores	
			HIV-infected Patients	HIV-non-infected Patients
≤1	17	5 (29.4)	16 ± 5.2	9.2 ±1.6
2 - 11	81	14 (17.3)	113 ± 28.4	0.0 ± 0.0
12 - 21	283	70 (24.7)	158 ± 31.0	11 ± 3.4
22 - 31	251	96 (27.4)	212 ± 62.3	26 ± 9.8
32 - 41	216	116 (53.7)	253 ± 74.2	62 ± 16.0
42 - 51	146	68 (46.6)	214 ± 64.6	46 ± 12.1
52 - 61	31	21 (67.7)	268 ± 75.3	6.0 ± 0.4

Intensity of Microsporidiasis by Age, CD4+ Cell Count and HAART Status

Table 4 shows that, the highest mean ± SD microsporidia intensity of 277 ± 94.0.for the age group of 52-61 years for patients not on HAART AND 234±88.0 for the patients on HAART from the age group of 32-41 years. The difference in intensity among those patients on HAART and those not on HAART in relation to age was statistically significant. The highest CD4+ Cell Count (916 ± 311) of patients on HAART was in the age group of 2-11 years and that of those not on HAART (891 ± 304.4) was from the age group of ≤ 1 year. While CD4+ cell count decreases as age increases in both patients on HAART and those not on HAART, the mean ± SD of microsporidia intensity increased with age also in both patients on HAART and those not on HAART.

Table 4: Intensity of Microsporidia Spore by Age and CD4+ Cell Count of HIV-infected Patients On and Not On HAART (N = 750)

Age	Number of Patients		Mean ± SD Intensity of Spores		Mean ± SD CD4+ Cell Count	
	On HAART N=411)	Not on HAART (N=339)	On HAART	Not on HAART	On HAART	Not on HAART
≤1	0	11	0.0 ±0.0	16±5.2	0.0 ± 0.0	891±304.4
2 – 11	4	14	6 ± 1.8	140±57.0	916±311	544±198.3
12 – 21	82	93	28 ± 9.6	164±59.0	371 ± 92	263±72.6
22 – 31	148	90	104 ± 36.0	201±62.0	212 ± 81	145±58.4
32 – 41	102	50	234 ±88.0	244±82.0	124 ± 53	112±21.1
42 – 51	61	38	193 ± 61.0	241±78.0	217 ± 83	114±22.3
52 – 61	14	8	201 ± 66.0	277±94.0	131 ± 56	11±3.3

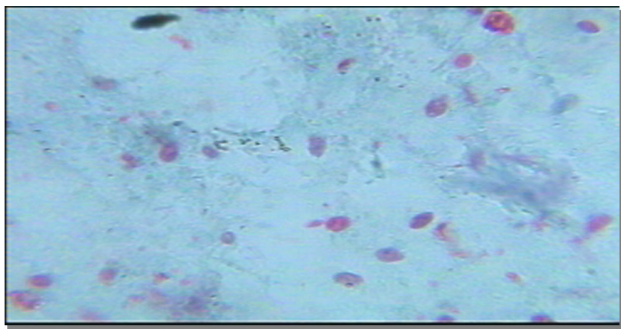
P<0.05

Intensity of Microsporidia Spores by Age, Duration on HAART in relation to CD4+ cell count

The highest mean ± SD of microsporidia intensity (234 ± 88.0) among patients on HAART was from the age group of 32-41 years. While the least (6.0 ± 1.8) was from the age group of 2-11 years. The highest mean ± SD CD4+ cell count 916±311was from the age group of 2-11 years and the least (124 ± 53) was from the age group of 32-41 years. The higher the CD4+ cell count, the lower the microsporidia intensity and the lower the CD4+ cell count, the higher the microsporidia intensity as shown in table 5.

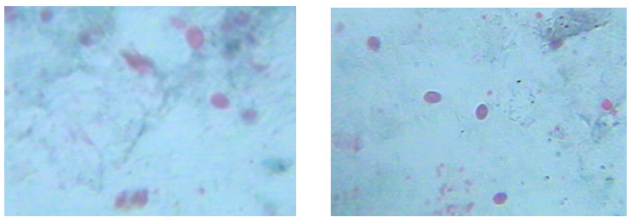
Table 5: Intensity of Microsporidia Spores by Age, Duration of Drug Use (HAART) and CD4+ Cell Count of HIV-infected Patients on HAART (N = 411).

Age	Duration of Drug Use (in months)	Mean ± SD	
		CD4+ Cell Count	Microsporidia spore Intensity
≤1	0.0	0.0 ± 0.0	0.0 ±0.0
2 – 11	3.0	916 ± 311	6 ±1.8
12 – 21	5.2	371 ± 92	28 ± 9.6
22 – 31	7.0	212 ± 81	104 ± 36.0
32 – 41	11.0	124 ± 53	234 ±88.0
42 – 51	5.0	217 ± 83	193 ±61.0
52 – 61	18.0	131 ± 56	201 ±66.0



O = The CDC control slide, (No.UN3373)

Fig.1: O, A & B: Images (Photomicrographs) of Microsporidia Stained Samples from Stool Specimens in this Study in Comparison with the Control (the CDC prepared slide 100X)



A B

Figs. 1: A & B (100X); are the Chromotrope 2R stained slides of microsporidia spores from this study, measuring from 1.0-1.8µm x 0.6-1.0µm to 2.0 – 3.5µm x 1-2.0µm using PMIAS 3.0.

Discussion

The overall prevalence of microsporidiasis recorded in this study (42.4%) using Chromotrope 2R is relatively high for an infection which is hardly known. This high prevalence of the infection among the HIV-infected patients strongly suggests that microsporidiasis is common among the HIV-infected patients at the University of Ilorin Teaching Hospital, Nigeria. This prevalence of microsporidiasis among the HIV-infected patients poses a concern particularly when it was discovered further from this study that the infection cuts across all ages, sex, educational status, religion and other socio-demographic variables.

Like in the HIV-infected patients, the young and the old alike were also seen to habour microsporidia among the HIV-non-infected control, conforming the wide spread and epidemiological relevance of this organism. The infection as seen, remain relevant, particularly among the aged immuno-compromised patients, thus confirming what Lores *et al*.[7] concluded in 2012. The argument appears to be unnecessary, as findings from this study which revealed that microsporidia was prevalent despite HAART treatment, contradicts the earlier assumptions and confirms the latter. It is expedient to note that, the difference in the biology of microsporidia, its mode of infection and the ability of the spores to thrive well on any living cell are facts that support the argument that microsporidia persist despite HAART treatment. Also, other opportunistic infections like cryptosporidiosis which are cell specific, are gotten rid off when the mechanism of action of the HAART drug favours such cells, the HIV-patients on HAART still habour microsporidia spores.

The intensity of microsporidia infection in HIV-infected patients was also seen to be high and of great implication for the complication observed in these patients (microsporidia-positive HIV-infected patients). The fact that intensity of the parasite was determined only from stool samples which could produce microsporidia spore only when the infection had disseminated to other organs and only in heavy infections, support earlier submissions that the intensity of microsporidiasis and the damages it causes are far beyond findings on the presence of the parasite from stools [8].

Whereas an average mean ±SD of 201± 62 of intensity of microsporidiasis among the HIV-infected patients who were not on HAART therapy has produced all the clinical complications like cough, body rash, weakness, wasting etc, it is interesting to note also that those HIV-infected patients on HAART with mean ±SD of 104 ± 360 produce similar clinical signs too. This explains that although the number of parasite spore among the HIV-infected patients on HAART may be low, complications as a result of the intensity which most have been acquired before commencement of HAART treatment remain untreated even after HAART treatment had been effected. The difference recorded for intensity of the parasite among the HIV-infected patients on HAART treatment and those not on HAART treatment affirms the report by Ismail *et al.* [9] that at present, there is no successful chemotherapy for microsporidiasis and that, the HIV-drugs are not effective against microsporidia species.

Karimi *et al.*, [10], while reporting the prevalence and intensity of microsporidia, relate both terms and (prevalence & intensity) concluded that intensity depicts prevalence in microsporidiasis. However, findings from this study show that intensity relates more with the level of CD_4 cell count of HIV-infected patients than presumed by their conclusions. In this study the level of CD_4 cell count in relation to prevalence and intensity of microsporidiasis remain a reference point of concern.

Presently, this study presents with a high prevalence and intensity of microsporidiasis in both HIV-infected patients and the HIV-non-infected control, creating an epidemiological challenge in both the immuno-compromised and the immuno-competent groups.

The intensity of microsporidia spores in relation to age as found in this study, strongly suggest that the severity of the infection depends on the amount of spores and not just on the presence of spores. In the young, it is believed that the high intensity of microsporidiasis could arise because of their low resistant ability to infections, particularly when they are again HIV-positive, while in the old, it could be as a result of the low immune status and other environmental factors that predispose re-infection. Despite the high intensity of microsporidia as revealed by several studies, there are no adequate understanding about microsporidia, its route of infection and the damages it causes to its host, primarily because of neglect as a result of ignorance and secondarily because of the lack of conventional tools for the study and diagnosis of microsporidiasis. The Chromotrope2R staining technique and the Ficoll-hypaque which reveal all findings from this study appear to be promising for studies on microsporidia species.

Furthermore, this study reveals that, microsporidia will remain a parasite of interest for further studies in the morbidity and mortality rates among the immuno-compromised patients worldwide. While much more is expected to be established about microsporidia, findings from these pioneering initiations are encouraging and enough to substantiate that, epidemiological significance of this parasite and knowledge about the parasite are relevant to man.

Conclusion:

Microsporidiasis affects all age groups, all sexes and every occupation and prevalence and intensity of microsporidia spores (an opportunistic infection) is relatively common among the immuno-compromised (HIV/AIDS) patients, thus posing a serious threat to complicate morbidity and mortality in areas where HIV/AIDS is common. We recommend that there is an urgent need that an ideal drug for the treatment of microsporidiasis be developed. And that since Microsporidiasis has been shown to be epidemiologically important where everybody, irrespective of sex, age, social status appears to be at risk of the infection, health education campaigns to promote awareness, prevention and control of microsporidiasis should be promoted.

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Original Article

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Plasma Urokinase Plasminogen Activator and Pro-Adrenomedullin as Biomarkers in Hypertensive Individuals with Malaria Co-Infection at Nauth, Nnewi, Nigeria

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Abstract

Background: Hypertension (HTN) and malaria remain major causes of comorbidity and mortality in low- and middle-income countries (LMICs), including Nigeria. The coexistence of these conditions poses a significant double disease burden. Malaria infection may influence hypertension progression, possibly through inflammatory and endothelial pathways. This study aimed to evaluate plasma levels of urokinase plasminogen activator (uPA), a serine protease involved in fibrinolysis and tissue remodeling, and pro-adrenomedullin (Pro-ADM), a precursor of a vasoactive peptide associated with endothelial function, in hypertensive individuals with and without malaria infection.

Methods: This cross-sectional study was conducted at NAUTH, Nnewi, Nigeria, and included 90 participants aged 22–79 years. Participants were grouped into 30 hypertensive individuals with confirmed *Plasmodium*

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falciparum malaria infection, 30 hypertensive individuals without malaria, and 30 apparently healthy controls (46 females and 44 males). Five milliliters of venous blood was collected from each participant. Malaria diagnosis was performed using Giemsa-stained thick and thin blood smears. Plasma uPA and Pro-ADM levels were measured using Enzyme-Linked Immunosorbent Assay (ELISA). Exclusion criteria included HIV infection, diabetes mellitus, chronic kidney or liver disease, pregnancy, or other acute infections.

Results: Hypertensive individuals with malaria infection had significantly higher mean plasma levels of uPA (7.02±3.57 ng/mL) and Pro-ADM (52.02±27.23 pg/mL) than hypertensive individuals without malaria (2.14±0.52 ng/mL, 20.39±2.34 pg/mL) and healthy controls (2.39±2.48 ng/mL, 21.23±2.51 pg/mL) (p = 0.000 respectively). A significant positive correlation (r = 0.640, p = 0.000) was observed between uPA and Pro-ADM levels in the malaria-infected hypertensive group.

Conclusion: The concurrent elevation of uPA and Pro-ADM in hypertensive individuals with *Plasmodium falciparum* infection may suggest a combined response to endothelial dysfunction and inflammatory stress. These findings point to a potential pathophysiological link between infectious and cardiovascular diseases. However, given the cross-sectional design, causality cannot be established. Further longitudinal studies are warranted to explore these biomarker relationships and their clinical implications in malaria-endemic settings.

Keywords: Hypertension, *Plasmodium falciparum*, Urokinase Plasminogen Activator, Pro-adrenomedullin, Endothelial Dysfunction, Comorbidity, Nigeria.

Introduction

Hypertension, commonly referred to as high blood pressure, is a leading global health challenge, contributing significantly to cardiovascular morbidity and mortality. The World Health Organization (WHO) estimates that over 1.28 billion adults aged 30–79 years globally have hypertension, with two-thirds living in low- and middle-income countries[1]. In Nigeria, the burden of hypertension has increased markedly over recent decades, owing to lifestyle changes, urbanization, and lack of awareness or effective management[2]. The situation becomes more complex when hypertension coexists with infectious diseases endemic to sub-Saharan Africa, such as malaria[3].

Malaria remains a major public health concern in Nigeria, which accounts for approximately 25% of global malaria cases[4]. Plasmodium falciparum, the most prevalent species in Nigeria, is known for causing severe and sometimes fatal forms of malaria. The interplay between malaria and hypertension is of emerging clinical interest, especially given that both conditions can influence vascular function, immune response, and endothelial integrity[3, 5]. Co-infection or co-existence of malaria in hypertensive individuals may exacerbate systemic inflammation, endothelial dysfunction, and coagulation abnormalities. There has been an inter link between hypertension and high risk infectious disease such as malaria. The general view that malaria being endemic in the low-income countries, coupled with observations that non communicable diseases like hypertension are often associated with harsh economic and environmental conditions, have provided a basis for speculations for the possible linkage between malaria and hypertension [3]. Urokinase plasminogen activator (uPA) and pro-adrenomedullin (pro-ADM) are biomarkers and therapeutic targets which have been associated to play specific roles relating to vascular function and blood pressure regulation. However, the exact mechanisms and clinical implications of these biomarkers in hypertension with relation to malaria infection have not been completely understood. In this context, biomarkers that reflect endothelial activation, inflammation, and fibrinolytic balance are essential for understanding disease progression and possible interactions. Urokinase-type plasminogen activator (uPA) is a serine protease that plays a critical role in fibrinolysis, tissue remodeling, and cellular migration[6]. It is involved in the conversion of plasminogen to plasmin and has been implicated in both vascular remodeling in hypertension and immune responses during infections [7]. Elevated uPA levels may signal heightened fibrinolytic activity or inflammatory responses, which are key components of both hypertensive pathophysiology and malaria infection[8]. It's soluble form, suPAR, has potent proinflammatory and chemotactic properties with highly stable serum levels. It has

been reported that serum suPAR levels are elevated in acute inflammatory processes, such as sepsis, systemic infection, and malignancy, as well as in chronic inflammatory processes, such as diabetes, glomerulosclerosis, and cardiovascular disease[9].

Pro-adrenomedullin (pro-ADM), a stable precursor of adrenomedullin, is a peptide with potent vasodilatory and immunomodulatory properties with several metabolic effects [10]. It has gained attention as a biomarker in cardiovascular diseases and sepsis and is associated with endothelial dysfunction and severity of disease states[11]. Elevated plasma levels of pro-ADM have been reported in hypertensive individuals and patients with infectious diseases, including malaria [12]. It serves as a marker of systemic inflammation and endothelial stress, both of which are crucial in understanding hypertension and malaria interactions.

Adrenomedullin is a hormone with blood pressure lowering effect including vasodilation, diuresis, natriuresis, increasing capillary permeability, and aldosterone inhibition [13]. The most important functions of AM in the vasculature are vasodilation and the maintenance of vascular integrity. Adrenomedullin is thought to maintain vascular tone through direct action on vascular smooth muscles cells and the formation of nitric oxide. The vasodilative ability of AM is as strong as that of ANP. The administration of AM decreases blood pressure in vessels but increases blood flow[14]. Adrenomedullin is a potent vasodilatory peptide that is overexpressed in many cardiovascular diseases, including pulmonary hypertension (PH). Previous research has provided evidence suggesting that adrenomedullin administration may attenuate PH in animal models, and might even improve hemodynamics in PH patients[15]. Although ADM is secreted from various organs and tissues, it is produced mainly by vascular endothelial cells and serves a number of physiological functions. Of note, plasma ADM levels are elevated in patients with hypertension, congestive heart failure or myocardial infarction, renal disease, diabetes mellitus, the acute phase of stroke, septic shock, arterial stiffness, and the magnitude of the elevation is in proportion to the severity of the disease involving vascular damage[16].

Despite the individual significance of these biomarkers in hypertension and infectious diseases, limited studies have investigated their combined behavior in hypertensive patients with concurrent malaria infection. Understanding the plasma levels of uPA and pro-ADM in such patients could provide novel insights into the inflammatory and vascular burden imposed by this comorbidity. This is particularly important in Nigeria, where malaria is endemic and hypertension prevalence is rising hence, the study design.

Materials and Methods

Study Area

This research was carried out in Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi, Anambra State, Nigeria.

Study design

This cross sectional study was conducted to assess the serum levels of urokinase plasminogen activator (uPA) and pro-adrenomedullin in hypertensive individuals with and without malaria attending the cardiovascular health clinic in Nnamdi Azikiwe University Teaching Hospital (NAUTH) Nnewi, Anambra State, Nigeria. Selection of individuals was by random sampling. Written consent (questionnaire) was obtained from the individuals and the individual's request form was used to get their bio-data. A total of 90 subjects was recruited for the study which includes 30 hypertensive individuals with malaria, 30 hypertensive individuals without malaria and the control group, 30 non-hypertensive without malaria.

Study recruitment

The individuals for this study were recruited at Internal medicine (cardiovascular unit), Nnamdi Azikiwe university teaching hospital (NAUTH) Nnewi, Anambra state Nigeria. Permission was obtained from participants and selection was by random sampling whereby Questionnairres were given to the subjects to fill out and the patient's request form were used to obtain their bio-data.

Inclusion nd Exclusion criteria

The inclusion criteria for this study were both male and female hypertensive individuals with and

without malaria, non - hypertensive individuals without malaria who were the control individuals, all within the age range of 22-79 years while, the exclusion criteria were individuals outside the age range of 22-79 years. HIV infected individuals were excluded. Participants with diabetes and/or with other metabolic problems were excluded. Pregnant women and children were also excluded from the study.

Ethical clearance and Informed consent

The ethical approval for this research was obtained from board of ethics committee of Nnamdi Azikiwe University Teaching Hospital, (NAUTH), Nnewi with ref: NAUTH/CS/66/VOL.17/VER.3/61/2024/196 in accordance with the Helsinki declaration by the World Medical Association (WMA) on the ethical principles for medical research involving human subjects.

Sample collection

About Five (5) ml of venous blood was collected for this study. Plasma was extracted after centrifugation at 5000 RPM for 4 minutes. Samples were stored at 4 Degree centigrade (4°c) before analysis.

Methods

Screening for malaria infection

Principle: The individuals were screened for Malaria infection using Giemsa staining technique. The ingredients in Giemsa solution include eosin and methylene blue (azure). The parasite nucleus is stained red by the eosin component and blue by the methylene blue component. Methanol is used to fix the thin film. The thick film's dehaemoglobination and staining happen simultaneously

Measurement of blood pressure

Blood pressure was measured using the mercuric sphygmomanometer. The individual was made sure not to have any trauma in that arm. The individual ensured to be relaxed and seated comfortably with their back supported and foot uncrossed and flat on the floor. The BP curf was ensured to be the correct size for the arm and ensured to be in correct level with the persons heart (midsternal level), while being positioned at 2-3cm above the brachial artery. The radial pulse was located and the BP curf inflated. The BP curf was deflated for about 15-30 seconds. The measurement was retaken at 20-30mmhg to estimate the systolic BP and the curf deflated at the rate of 2 mmhg.

Determination of uPA

Principle: An invitro technique for the quantitative measurement of Human urokinase plasminogen activator in plasma, serums, cell lysates, tissue homogenate was determined using ELISA as was described by Smith et al. [17]. This assay employs an antibody specific for Human suPAR coated on a 96 well plate. Standards or samples are added to the micro ELISA plate wells and combined with specific antibody. Then a biotinylated detection antibody specific for Human suPAR Avidin – Horseradish Peroxidase (HRP) conjugate are added successively to each micro plate well and incubated. Free components are washed away. The substrate solution is added to each well. Only those wells that contain Human suPAR, biotinylated detection antibody and Avidin-HRP conjugate will appear blue in color. The enzyme - subsrate reaction is terminated by the addition of stop solution and the color turns yellow. The optical density (OD) is measured spectrophotometrically at a wavelength of 450 nm ± 2 nm. The OD value is proportional to the concentration of Human suPAR.

Determination of pro-adrenomedullin

Principle: The pro-adrenomedullin kit is based on sandwich enzyme-linked immune-sorbent assay technology as was described by [18]. An antibody is pre-coated onto a 96 well plate. Standards, test samples and bio conjugated reagents are added to the wells and incubated. The HRP- conjugated reagent is then added, and the whole plate is incubated, unbound conjugates are removed using wash buffer at each stage. TMB substrate is used to quantify the HRP enzymatic reaction. After TMB subsrate is added, only wells that contain sufficient pro-adrenomedullin will produce a blue colored product, which then changes to yellow after adding the acidic stop solution. The intensity of the yellow color is proportional to the pro-ADM amount bound on the plate. The optical density (OD) is measured spectrophotometrically at 450nm in a micro plate reader, from which the concentration of pro-adrenomedullin can be calculated.

Statistical analysis

Data generated from the study was analyzed using SPSS version 25. Qualitative / categorical variables was analyzed using descriptive statistics and values presented as frequency and percentages, quantitative variables were presented as mean ± standard deviation, comparative analysis was carried out using one way ANOVA, post hoc LSD was used to carry out multiple comparison within the groups, test for relationship was carried out using Pearson correlation and values are considered significant at $p< 0.05$.

Results

Anthropometric and blood pressure variables in hypertensive individuals with/without malaria and apparently healthy controls

The mean value of age, systolic and diastolic blood pressure were significantly higher in hypertensive individuals with malaria (63.93±9.21, 138.87±28.99, 90.60±15.56) and hypertensive individuals without malaria (58.47±10.72, 135.10±18.75, 89.03±10.54) when compared with apparently healthy controls (33.23±9.66, 112.27±4.21, 68.27±6.14) (p = 0.000 respectively) (table 1).

Table 1: Anthropometric and blood pressure variables in hypertensive individuals with/without malaria and apparently healthy controls

Group	Age (Yrs)	BMI (Kg/m2)	SBP (mmhg)	DBP(mmhg)
Hypertensive with malaria (A) N=30	63.93±9.21	28.08±4.35	138.87±28.99	90.60±15.56
Hypertensive without malaria (B) N=30	58.47±10.72	28.11±5.73	135.10±18.75	89.03±10.54
Control (C) N=30	33.23±9.66	29.16±17.02	112.27±4.21	68.27±6.14
F-value	82.322	0.100	14.919	10.378
P-value	0.000	0.905	0.000	0.002
A vs B	0.105	0.470	1.000	1.000
A vs C	0.000	1.000	0.000	0.000
B vs C	0.000	1.000	0.000	0.001

BMI = Body mass index, SBP = systolic blood pressure,
DBP = Diastolic blood pressure, p0.05 = significant.

Gender comparison of anthropometeric and blood pressure variables in hypertensive individuals with/ without malaria and apparently healthy controls

The mean values of age and systolic blood pressure was significantly higher in females hypertensive with malaria (62.00±9.42, 139.50±30.13) when compared with apparently healthy female controls (33.56±11.62, 114.31±3.86), also in males hypertensive with malaria (65.63±8.97, 138.31±28.95) when compared with apparently healthy female controls (33.56±11.62, 114.31±3.86) and apparently healthy male controls (32.86±7.22, 110.79±3.90) (p = 0.000 respectively). Similarly, there was significantly higher mean values of age in female hypertensive without malaria (55.84±10.41) when compared with apparently healthy female controls (33.56±11.62) and apparently healthy male controls (32.86±7.22), also in males hypertensive without malaria (63.00±10.13) when compared with females (33.56±11.62) and apparently healthy male controls (32.86±7.22) (p = 0.000 respectively) (table 2).

Table 2: Gender comparison of Anthropometric and blood pressure variables in hypertensive individuals with/without malaria and apparently healthy controls

Group	Age (Yrs)	BMI(Kg/m^2)	SBP(mmhg)	DBP(mmhg)
Female hypertensive with malaria (N=14) (A)	62.00±9.42	28.18±4.14	139.50±30.13	81.86±13.83
Male hypertensive with malaria (N=16) (B)	65.63±8.97	27.98±4.65	138.31±28.95	79.50±17.30
Female hypertensive without malaria (N=19) (C)	55.84±10.41	28.65±6.45	135.32±17.77	80.11±10.44
Male hypertensive without malaria (N=11) (D)	63.00±10.13	27.16±4.32	134.72±21.24	77.18±10.95
Female control (N=16) (E)	33.56±11.62	31.93±23.11	114.31±3.86	69.50±5.78

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Male control (N=14) (F)	32.86±7.22	26.00±3.09	110.79±3.90	66.86±6.44
F value	34.565	.526	5.830	4.293
P value	0.000	.756	0.000	0.002
A vs B	1.000	1.000	1.000	1.000
A vs C	1.000	1.000	1.000	1.000
A vs D	1.000	1.000	1.000	1.000
A vs E	0.000	1.000	0.017	0.066
B vsC	0.062	1.000	1.000	1.000
B vs D	1.000	1.000	1.000	1.000
B vs E	0.000	1.000	0.002	0.151
B vs F	0.000	1.000	0.006	0.054
C vs D	0.391	1.000	1.000	1.000
C vs E	0.000	1.000	1.000	0.123
C vs F	0.000	1.000	0.981	0.123
D vs E	0.000	0.865	0.121	1.000
D vs F	0.000	1.000	0.051	0.066
E vs F	1.000	1.000	1.000	1.000

P0.05 = Significant, SBP =systolic blood pressure, BMI =Body mass index, DBP = Diastolic blood pressure

Levels of plasma uPA and Pro-ADM in hypertensive individuals with and without malaria and controls

The mean levels of plasma urokinase plasminogen activator (UPA) and Pro-adrenomullin were significantly higher in hypertensive individuals with malaria infection (7.02±3.57, 52.02±27.23) when compared with their counterpart without malaria infection (2.14±0.52, 20.39±2.34) and apparently healthy controls (2.39±2.48, 21.23±2.51) (p = 0.000 respectively) (table 3)

Table 3: Levels of plasma uPA and Pro-ADM in hypertensive with/without malaria and control

Groups	Human UPA(ng/ml)	PRO-ADM (ng/l)
Hypertensive individuals with malaria (A) (N=30)	7.02±3.57	52.02±27.23
Hypertensive without malaria (B) (N=30)	2.14±0.52	20.39±2.34
Apparently healthy controls (C) (N=30)	2.39±2.48	21.23±2.51
F-value	35.333	38.813
P-value	0.000	0.000
A vs B	0.000	0.000
A vs C	0.000	0.000
B vs C	1.000	1.000

UPA = Urokinase plasminogen activator, Pro-ADM = pro-adrenomedullin

Gender comparison between plasma levels of uPA and Pro- ADM in hypertensive individuals with and without malaria and controls.

The mean levels of human UPA and PRO-adrenomedullin were significantly higher in females hypertensive individuals with malaria (8.85±3.67, 61.92±26.51) and males hypertensive individuals with malaria (5.48±2.66, 43.36±25.54) when compared with females hypertensive without malaria (2.12±0.50, 20.48±2.80), males hypertensive without malaria (2.17±.58, 20.22±1.30) and apparently healthy female controls (2.79±3.38, 21.23±2.79). Similarly, there was significantly higher levels of human UPA in males hypertensive with malaria (5.48±2.66) when compared with apparently healthy male control (1.92±0.30). (p = 0.000 respectively) (table 4)

Table 4: Gender comparison of plasma levels of uPA and Pro-ADM in hypertensive with/without malaria infection

Group	UPA(ng/ml)	PRO-ADM (ng/l)
Female hypertensive with malaria (N=14) (A)	8.85±3.67	61.92±26.51
Male hypertensive with malaria (N=16) (B)	5.48±2.66	43.36±25.54
Female hypertensive without malaria (N=19) (C)	2.12±0.50	20.48±2.80
Males hypertensive without malaria (N=11) (D)	2.17±.58	20.22±1.30
Female healthy control (N=16)(E)	2.79±3.38	21.23±2.79
Male healthy control (N=14) (F)	1.92±0.30	21.23±2.24
F value	19.794	19.236
P value	0.000	0.000
A vs B	0.002	0.018
A vs C	0.000	0.000
A vs D	0.000	0.000
A vs E	0.000	0.000
B vsC	0.000	0.000
B vs D	0.001	0.001
B vs E	0.003	0.001
B vs F	0.000	0.002
C vs D	0.949	1.000
C vs E	1.000	1.000
C vs F	1.000	1.000
D vs E	1.000	0.865
D vs F	0.000	0.869
E vs F	0.312	1.000

Human UPA = Human Urokinase plasminogen activator, Pro-ADM = pro-Adrenomedullin

Correlation between the levels of uPA and Pro-ADM with malaria severity in hypertensive individuals.

There was a significant strong positive correlation between human uPA and Pro-ADM (r=0.640, p = 0.000) in hypertensive individuals with malaria infection. (see table 5)

Table 5: Correlation between the levels of Human UPA, pro-ADM and malaria severity in hypertensive individuals.

Correlation	R	P-value
Huma n UPA(ng/ml) vs PRO-ADM(ng/l)	0.640**	0.000
Human UPA (ng/ml) vs Malaria severity	-.101	0.595
Malaria severity vs PRO-ADM(ng/l)	0.172	0.364

uPA = Urokinase plasminogen activator, Pro-ADM = pro-adrenomedullin

Discussion

This study demonstrates a significant elevation in blood pressure parameters among hypertensive individuals co-infected with *Plasmodium falciparum*, suggesting that malaria may worsen the cardiovascular burden in such individuals. The interplay between infectious and chronic non-communicable diseases, especially in low-resource, malaria-endemic settings like Nigeria, underscores the need to understand shared pathophysiological mechanisms.

A notable finding was the significantly higher mean age among both male and female hypertensive individuals with malaria compared to healthy controls. This aligns with the understanding that aging is associated with increased susceptibility to both hypertension and malaria-related complications. Age-related changes such as immune dysregulation,

arterial stiffness, metabolic dysregulation, and cumulative exposure to environmental risk factors may contribute to this pattern[19]. The result also supports previous findings by Eze et al.[20], who reported an age-related relationship between malaria infection and hypertension. Gender differences in biomarker expression may also reflect hormonal influences particularly the protective vascular effects of estrogen and differences in immune response patterns between men and women[21].

The mean systolic and diastolic blood pressures were significantly higher in hypertensive individuals with malaria compared to those without infection. This implies that malaria may exacerbate hypertensive states, potentially through a combination of systemic inflammation, oxidative stress, and endothelial dysfunction[3, 22] . Pro-inflammatory cytokines such as TNF-α and IL-6, commonly elevated in malaria, can impair endothelial nitric oxide production, increasing vascular tone and resistance[23, 24]. Dehydration due to malaria-induced fever and sweating may further raise blood viscosity and vascular load[25]. Sympathetic nervous system activation[26] and malaria-associated renal impairment[27] may also contribute to fluid retention and elevated blood pressure.

In this study, plasma levels of urokinase plasminogen activator (uPA) were significantly elevated in hypertensive individuals with malaria. uPA is a key enzyme in fibrinolysis and extracellular matrix remodeling and may reflect heightened endothelial activation and a pro-thrombotic state[28]. Its increase suggests not only an attempt to prevent clot formation but also an amplified inflammatory response[29]. Similarly, Pro-adrenomedullin (Pro-ADM), a precursor of the vasodilator adrenomedullin, was significantly elevated in the malaria-hypertension group. Pro-ADM is widely recognized as a biomarker of endothelial dysfunction, vasodilation, and systemic stress. Its elevation in malaria-infected hypertensive individuals likely reflects a compensatory response to vascular inflammation and increased arterial stiffness[30, 31]. Elevated Pro-ADM has been associated with severe infections and poor cardiovascular outcomes, further emphasizing its clinical relevance[16, 32, 33].

Both uPA and Pro-ADM were elevated across sexes in the hypertensive-malaria group, indicating a systemic response not limited by hormonal differences. In females, the increased levels may be partially driven by estrogen-modulated immune responses[34], while in males, the findings likely reflect direct effects of systemic inflammation and vascular injury[35]. The observed strong positive correlation between uPA and Pro-ADM supports a synergistic endothelial and inflammatory response. This is consistent with findings by Eze et al.[20] and suggests that these biomarkers may act in concert as part of the host's response to combined vascular and infectious stress.

These results suggest that malaria co-infection may intensify the vascular injury associated with hypertension, potentially accelerating the onset of complications such as stroke, heart failure, or kidney damage[36]. As such, these biomarkers could serve not only as mechanistic indicators but also as prognostic tools in hypertensive patients with malaria in endemic regions.

Conclusion

This study highlights the potential of *Plasmodium falciparum* malaria to aggravate hypertension through systemic inflammation and endothelial dysfunction, evidenced by elevated levels of uPA and Pro-ADM. The positive correlation between these biomarkers suggests a coordinated pathophysiological response to combined cardiovascular and infectious stress. These findings reinforce the need for integrated clinical management strategies that consider the role of infections like malaria in worsening chronic conditions such as hypertension. Further longitudinal research is recommended to clarify causality and validate the prognostic utility of uPA and Pro-ADM in malaria-hypertension comorbidity.

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Original Article

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Extent and Factors Affecting Male Partner Involvement in Maternal Healthcare in Rural Area of District Amritsar, Punjab, India: A Cross-sectional Study

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Abstract

Background: Reproductive, maternal, and child health are essential components of public health, with significant implications for the overall well-being of individuals and communities. The aim of this study was to assess the extent and factors affecting male partner involvement in maternal healthcare in rural Punjab, India.

Materials and Methods: A cross-sectional study was done on 400 male partners in the rural field practice area in Amritsar who were selected by probability proportional to size sampling technique. A predesigned, pretested, structured questionnaire was used to assess the male partner involvement in maternal health. The analysis of data was performed using SPSS version 23.

Conclusions: The study underscores the varying levels of male involvement in maternal healthcare, with higher participation during the antenatal period compared to the postnatal period. Significant association (p value = 0.001) was seen between maternal period and level of involvement in maternal care.

Key words: Male Partner, Male involvement, Reproductive, Maternal care.

Introduction

The maternal health has been one of the most important components of a nation's health.[1] Maternal healthcare service comprises services provided for women during pregnancy, delivery, and postnatal.[2]

Maternal health is essential component of public health, with significant implications for the overall well-being of individuals and communities. In India, where maternal indicators have historically been a cause for concern, efforts have been made to improve access to healthcare services and enhance health outcomes for women and children.

Male Partner involvement in maternal and child health is a practice which results in accessing better

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health services. Many studies in recent times have demonstrated that involving males in antenatal care has resulted in better outcomes for mother and child.[3] Research into the influence of husbands and fathers on health-related behaviours suggest that building men's knowledge regarding maternal health may be beneficial in terms of care-seeking for pregnancy and birth.[4] Male partner influences on women's reproductive health in the areas of contraception, pregnancy and childbirth, infertility, and foetal harm has a positive impact[5]

Material and methods: The cross-sectional study was conducted in the rural field practice area (including 11 villages with the total population of 31568) attached to department of Community Medicine, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar from1st August 2023 to 31st December 2024, after taking ethical clearance from Institutional ethical committee vide letter no.(Ref. No. SGRDU/CONT/THESIS/24-558).A predesigned, pretested, structured questionnaire was used to assess the male partner involvement in maternal health. Consent was taken and confidentiality of information from study subjects was assured.

Operational Definitions:

Male Partner: A male partner is defined as a man who marries a woman and is responsible for the pregnancy of that women.

Male Partner Involvement: A man is involved if he is "present, accessible, available, understanding, willing to learn about the pregnancy process and provides emotional, physical and financial support to the woman carrying the child".[6]

Inclusion Criteria: All the male partners of couples having at least one child below 5 years of age were included.

Exclusion Criteria: Couples not cohabiting during the pregnancy and postnatal period were excluded.

Sample size was calculated by using the formula:

$$n = \frac{z^2 Pq}{(e)^2}$$

Where,

n = sample size

z = (1.96) at 95% Confidence Interval

p = Presumed prevalence of male involvement in maternal health care (0.5)

q = 1-p (0.5)

e = absolute margin of error (0.05)

$$n = \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.05)^2}$$

$$\frac{0.96}{(0.05)^2} = 384 \text{ (which is rounded off to 400)}$$

Sampling Technique: The study subjects were selected by Probability Proportional to Size (PPS) sampling technique from 11 villages, 31, 31, 70, 38, 32, 34, 31, 33,33,33,34 and participants were drawn from each village to reach the requisite sample size (400). The analysis of data was performed using SPSS version 23. The associations were deemed significant at p value less than 0.05.

Results

Table 1. Distribution of the study subjects according to Sociodemographic variables.

S. No	Sociodemographic variables		n (%)
1	Age (years)	20-30	135 (33.8%)
		31-40	261 (65.3%)
		41-50	4 (1.0%)
2	Religion	Hindu	10 (2.5%)
		Sikh	387 (96.8%)
		Christian	3 (0.8%)
		Muslim	0 (0%)
3	Caste	General	140 (35.0%)
		SC/ST	238 (59.5%)
		OBC	22 (5.5%)
4	Type of Family	Nuclear	344 (86.0%)
		Joint	56 (14.0%)
5	Socio Economic status *	Upper	4 (1.0%)
		Upper-Middle	24 (6.0%.)
		Lower-Middle	171 (42.8%)
		Upper-Lower	179 (44.8%)
		Lower	22 (5.5%)

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6	Level of Education	Illiterate	11 (2.8%)
		Till Higher secondary	363 (90.7%)
		Graduate	19 (4.7%)
		Post graduate	7 (1.8%)
7	Primary occupation	Unemployed	11 (2.8%)
		Employed	55 (13.8%)
		Self Employed	334 (83.5%)

*ModifiedKuppuswamy Scale

Table 1. Illustrates the distribution of study subjects according to their sociodemographic variables. Among 400 study subjects,261(65.3%) belonged to the age group of 31-40 years. Mean age of the study subjects is 31.6 ± 3.6 years.Out of 400 study subjects, majority 387(96.8%) were Sikh by religion. 238(59%) belonged to scheduled caste.344 (86.0%) lived in nuclear family. According to Modified Kuppuswamy Scale maximum study subjects 179 (44.8%) belonged to upper lowersocio-economic class followed by 171(42.8%) lower middle class. Majority 363(90.7%) of male subjects were educated till higher secondary and 19 (4.7%) were graduates. 334 (83.5%) males were self-employed.

Table 2. Distribution of study subjects according to their involvement in maternal care during antenatal and postnatal period.

S. No.	Involvement of male partner in maternal care	Antenatal care n (%)	Postnatal care n (%)
1	Accompanying the wife to the health care facility for health checkup.	330 (82.5%)	221 (55.2%)
2	Assisted wife in household chores	41 (10.3%)	39 (9.7%)
3	Taking care of extra dietary needs of wife.	157 (39.3%)	150 (37.5%)
4	Interaction with community health care provider at home.	49 (12.3%)	9 (2.2%)
5	Interaction with health care provider at healthcare facility	11 (3.3%) *	37(16.8%) **

*n= 330, **n = 220

Table 2. shows that during the antenatal period out of the 400 study subjects, 330 (82.5%) accompanied their wives to the healthcare facility for health check-up, 41(10.3%) males assisted their wives in house hold chores,157 (39.3%) males said that they took care of extra dietary needs of their wives. During antenatal period interaction with community health provider who visited home was done by 49 (12.3%) males, while during the visit to the health care facility for antenatal check-up 11 (3.3%) males interacted with the health care provider. During postnatal period, out of the 400 study subjects,221 (55.2%) accompanied their wives to the healthcare facility for health check-up, 39 (9.7 %) males assisted their wives in house hold chores,150 (37.5%) males took care of extra dietary needs of their wives. Interaction with community health provider who visited home was done by 9 (2.2%) males. Out of 221 (55.2%) study subjects who accompanied their wives to healthcare facility, 37 (16.8%) interacted with the health care provider.

Table 3. Association between socio demographic variables and level of involvement of male partner in maternal health care during the antenatal period.

S.No.	Socio Demographic Variables		Good Involvement (n = 39)	Poor Involvement (n = 361)	χ^2	p-value	df
1	Literacy Status	Up to Matric (n = 336)	27 (8.0%)	309 (92.0%)	7.01	0.008	1
		Above matric (n = 64)	12 (18.8%)	52 (81.2%)			

Continue.....

2	Type Of Family	Nuclear (n = 344)	32 (9.3%)	312 (90.7%)	0.56	0.45	1
		Joint (n = 56)	7 (12.5%)	49 (87.5%)			
3	Socio Economic status	Upper class (n = 4)	1 (25.0%)	3 (75.0%)	11.74	0.019	4
		Upper-Middle (n = 24)	2 (8.3%)	22 (91.7%)			
		Lower-Middle (n = 171)	22 (12.9%)	149 (87.1%)			
		Upper-Lower (n = 179)	9 (5.0%)	170 (95.0%)			
		Lower (n = 22)	5 (22.8%)	17 (77.2%)			

Table 3. shows the association between socio demographic variables with the level of male involvement in antenatal care. The following criteria were considered to measure the level of involvement of male partner in antenatal and postnatal care: Accompanying the wife to the health care facility for health checkup, assisting wife in household chores, taking care of extra dietary needs of the partner, interaction with community health care provider at home and interaction with health care provider at healthcare facility. Every criterion was given a score of 1 and the scores were added. Score of 1 to 3 was considered as poor involvement while score of 4 and 5 considered as good involvement.

Out of 400 study subjects, 336(84%)who studied up to matric,27 (8.0%) showed good involvement, while poor involvement was seen in 309 (92.0%). In 64 (16%) subjects who were educated above matric, good involvement was seen in 12 (18.8%).Involvement in antenatal care in joint family was better,7 (12.5%) as compared to nuclear family 32 (9.3%). According to the modified Kuppuswamy scale, males belonging to upper socio-economic class had good involvement,1 (25.0%)and poor involvement was seen in3 (75.0%). In lower socio-economic class, out of 22(5.5%), 5 (22.8%) showed good involvement while 17 (77.2%) showed poor involvement in antenatal care.

The association of male involvement in antenatal care with literacy status was found to be significant ($\chi^2 = 7.01$, df = 1, p value = 0.008). Association of male involvement in antenatal care and socio-economic status was also found to be statistically significant ($\chi^2 = 11.74$, df = 4, p value = 0.019) but association with type of family was found to be statistically insignificant.

Table 4. Association between socio demographic variables and level of involvement of male partner in maternal health care during the postnatal period.

S. No.	Socio Demographic Variables		Good Involvement n = 7	Poor Involvement n = 393	χ^2	p-value	df
1	Literacy	Up to Matric n = 336	4 (1.1%)	332(98.9%)	3.82	0.05	1
		Above matric n = 64	3 (4.7%)	61 (95.3%)			
2	Type of family	Nuclear n = 344	5 (1.4%)	339 (98.6%)	1.25	0.26	1
		Joint n = 56	2 (3.6%)	54 (96.4%)			

Continue.....

3	Socio economic status	Upper class n = 4	1 (25%)	3 (75%)	0.58*	0.007	
		Upper-Middle n = 24	0 (0%)	24 (100%)			
		Lower-Middle n = 171	4 (2.3%)	167 97.7%)			
		Upper-Lower n = 179	2 (1.1%)	177 (98.9%)			
		Lower n = 22	0 (0%)	22 (100%)			

*Fisher Exact Test

Table 5. Association of level of male involvement in maternal care with maternal period.

Maternal period	Good involvement	Poor involvement	χ^2	p - value	df
Antenatal period	39 (9.75%)	361 (90.25%)	23.61	< 0.001	1
Postnatal period	7 (1.75%)	393 (98.25%)			

Table 4. shows the association between socio demographic variables with the level of male involvement in postnatal care. Out of 400 study subjects, 336(84%) who studied up to matric, 4 (1.1%) showed good involvement. Out of 64 (16%) who studied above matric, good involvement was seen in 3 (4.7%). Good involvement 2(3.6%) was seen in joint family as compared to nuclear family 5 (1.4%). According to the Modified Kuppuswamy Scale, male belonging to upper socio-economic class,1 (25.0%) had good involvement and 3 (75.0%) had poor involvement. Out of the 22 (5.5%)study subjects belonging to lowersocio-economicclass, none of them showed good involvement.

The association of level of male involvement in postnatal care with socio-economic status was found to be statistically significant (fisher exact = 0.58 p value = 0.007).While the literacy status and type of family were not significantly associated.

Table 5. shows that good involvement was shown by 39 (9.75%) of male partners in antenatal period and by 7 (1.75%) in postnatal period. The association between the maternal period and the level of male involvement in maternal care was found to be highly significant (χ^2 = 23.61, df = 1, p value = 0.001).

Discussion

Among 400 study subjects, 261(65.3%) belonged to the age group of 31-40 years. Mean age of the study subjects is 31.6 ± 3.6 years. Similar age group of the participants was seen in the study conducted in rural India of Chhattisgarh.[7].In the present study out of 400 study subjects,the majority 387(96.8%) were Sikh by religion, 238(59%) belonged to scheduled caste. This is in consonance with the data from NFHS- 5 that states that 44% to 50% of the household in Punjab belongs to scheduled caste/scheduled tribes/other backward classes.[8]The present study shows that majority 363(90.7%) of male subjects were educated till higher secondary and 19 (4.7%) were graduates. NFHS-5 report indicates that a significant proportion of Indian males have completed higher secondary education, with a smaller percentage achieving graduate-level education. In the present study, 334 (83.5%) males were self-employed. Similar findings were reported by the Periodic Labour Force Survey (2020-2021), revealing that a substantial portion of the male workforce in India is self-employed, particularly in rural areas.[9]

The present study shows that during the antenatal period, out of the 400 study subjects, 330 (82.5%) accompanied their wives to the healthcare facility for health check-up. The

results were similar to the study done by Paul and Pandey, which showed that in Punjab 89.7% men accompanied their wives to health care facility.[10]The male who accompanied their wives to healthcare facility during antenatal period were more (82.5 %), as compared to study done in Uganda and Nigeria, which reported that 65.4% and 63.0 % males respectively, accompanied their partners to antenatal clinic.[11,12] During the postnatal period, in the present study 55.2 % of males accompanied their partner to the healthcare facility as compared to 68 % in a study done in Karnataka.[13]

Association of male involvement in antenatal care with literacy (p= 0.008) and socio-economic status (p=0.019) was found to be significant in present study. Study done by Paul and Pandey showed that the household wealth index was positively associated with male involvement in antenatal care.[10] Study in Kenya established that male partners level of education has significant effect (p = 0.00) on male partner involvement in antenatal care.[14]

In the present study, socioeconomic status is significantly associated with male partner involvement in postnatal care (fisher exact = 0.58 and p=0.007) this is in contrast with the study done in Ethiopia.[15] Literacy status was not associated with the level of male involvement in postnatal care in the present study. Similar association between male involvement in postnatal care and literacy status was seen in the study done in Nepal.[16] However, in contrast with the study done in Northern Ethiopia which found that level of male involvement increases with education status.[15]

The present study indicates 39 (9.75%) males had good involvement in antenatal period. Similar finding was reported in study done in Kenya where 34.1% male involvement was found in antenatal care.[17]During the postnatal period, the present study indicates that male partner involvement was 7 (1.75%), which is notably lower compared to a study conducted in Ethiopia, where male involvement during the postnatal period was reported at 23.7%.[15] **The association between the maternal period and the level of male involvement in maternal care was found to be highly significant (p value = 0.001) in the present study.**

Conclusion

The study was done on 400 male participants. Mean age of the study subjects was 31.6 ± 3.6 years.Out of 400 study subjects, majority 387 (96.8%) were Sikh by religion. According to Modified Kuppuswamy Scale maximum study subjects 179 (44.8%) belonged to upper lower socio-economic class followed by 171(42.8%) lower middle class.344 (86.0%) belonged to nuclear family. Majority 363(90.7%) of male subjects were educated till higher secondary.330 (82.5%) and 221 (55.2%) accompanied their wives to the healthcare facility for health check-up during antenatal and postnatal period respectively. **The association of male involvement in antenatal care with literacy status (p value = 0.008) and socio-economic status was found to be statistically significant (p value = 0.019). Highly significant association was seen between male partner involvement in postnatal care and socio-economic status (p value = 0.007).** The association between the maternal period and the level of male involvement in maternal care was found to be highly significant (p value = 0.001).

Future research should integrate qualitative methods to better understand the cultural, social, and psychological factors that hinder male participation in maternal healthcare, especially during the postnatal phase. Additionally, comparative studies across various districts or states in India could uncover region-specific influences and highlight effective approaches that encourage male involvement in maternal health.

Limitations: The study relied on self-reported data from male partners, where participants might have overstated their involvement to appear more supportive or engaged.

Conflict of Interest: There are no conflicts of interest

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Original Article

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Uses of Local Plant Biodiversity among the Tribal Communities of Jhargram for Treating Fever and other Microbial Infections

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Abstract

Background: Forest and its products have played a very significant role in the culture, religion as well as economy of the tribal population throughout the world since time immemorial. Natural flora of a region largely impacts the life of the indigenous people as they depend on forest products in many ways. The traditional knowledge of medical practices of the tribal people is related with the forest ecology as they prepare medicines for different ailments by using medicinal herbs. The present study has been carried out in the Jhargram region to enlist the medicinal plants used by the tribal population for the prevention and treatment of microbial infections and fever.

Methods: The study surveyed knowledgeable informants from different parts of Jhargram district through a semi-structured questionnaire and found 49 plants belonging to 32 families that are used for the treatment of microbial infections and fever.

Conclusion: Decoction of different parts of plants like leaves, stem bark, roots, flowers and fruits are used for the prevention and treatment of fever and microbial infections. Traditional healers like Ojha, Vaidya prescribe them for the treatment of seasonal infections and nutrient deficiencies. This survey illuminates that the tribal people still actively use and believe in medicinal plants for their treatment.

Key word: Ayurveda, Herbalist, Kaadha, Therapeutics, Tribal

Introduction

Plants are one of the most important resources for medicines. The application of plants as medicines is as ancient as prehistoric period. Ayurveda is considered as one of the oldest systems of medical sciences in the world, which has details of what may be called religious or priestly medicine similar to early Egyptian medicine[1]. An important aspect of Ayurvedic medicine has been the use of certain plants as medicine in the form of decoction, powder,

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or fumigant, or even as amulets. Ayurveda deals with both preventive and curative aspects of life in a comprehensive way considering man to be born in a state of humoral balance that is gradually lost through changes in diet, lifestyle and environment. In India, the curative properties of some herbs in the Rig-veda seem to be the earliest records of use of plants in medicines. The medicinal plants are widely utilized across the world in two different areas of health management; traditional system of medicine and modern system of medicine[2,3]. According to the WHO, over 80% of the world's population relies on traditional forms of medicine, largely plant based to meet primary health care needs[4,5].

Drug discovery has achieved lots of success via traditional routes. Historically, the majority of new drugs have been generated from natural products[6]. Natural products, especially those from terrestrial plants and microbes, have long been a traditional source of drug molecules. Morphine, artemisinin, aspirin, quinine, digoxin, curcumin, reserpine and taxol are the 'poster children' for the power and promise that bioactive molecules can proffer. Plant based natural products subservient to such roles are not sparse in the recorded history of human endeavor [7,8]. Exploitation of natural sources for the development of traditional medicinal preparations, and also of bioactive molecules, leads and therapeutic agents has acquired a time-tested reputation[8,9]. Out of an estimated 250,000 − 350,000 plant species identified so far, about 35,000 are used worldwide for medicinal purposes. Of the various natural sources examined, plants proved to have high potential and yielded maximum number of commercially viable therapeutic agents[7,10].

Ethnomedicine deals with the study of traditional medicinal treatment practiced by different ethnic groups or indigenous people for curing diseases and illness and also address the healing practices[11]. According to WHO" traditional medicine is the sum total of the knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness" [12]. In India there are large numbers of tribal communities living in forested areas whose members lead a primitive life without modern amenities and are entirely dependent upon plants and plant products for their livelihoods. India has the world's largest tribal population (8.6%), also known as Adivasi (original inhabitants) and are major lyreside in the states of Jharkhand, Odisha, West Bengal in northeast India, each with its own customs and cultures[13,14]. From the past century due to its rapid extension the allopathic medicine system becomes principal medicine system in modern society in India. But till now there are many ethnic groups like Santal, Munda, Bhumij, Lodha, who are very close to nature, use large number of local plants for treating different types of diseases[15]. In different tribal communities the great wealth of traditional knowledge regarding the medicinal as well as therapeutic value of plants transmitted orally from generation to generation. Most tribal families sip kaadha like tea, whose preparation is similar to the process followed elsewhere in India's heartland. But the composition of the tribal kaadha is more enriched and also provides superior immunity and within two or three days, it works in the body as preventive and curative medicine[16].

However, due to industrialization, traditional knowledge and folklore are degenerating day by day. Therefore, it has become emergent to document the information available for scientific investigation and future application before they disappear from the society as the present generation of this population are not much interested in carrying forward the traditional knowledge. Herbal medicines are a great source of immunity for the tribes, as Vaidya prescribes them to combat seasonal viral, bacterial, fungal infections and nutrient deficiencies. The present study only focuses on the age-old remedies for fever and few microbial infections but no other diseases. Though there are other common ailments the tribes frequently suffer from but those are not considered in this study.

The aim of this ethnobotanical survey is to document the medicinal plants commonly used by the tribal population of Jhargram district for the prevention and treatment of flu and fever. Another purpose of this survey is to study existing literature to understand the role of traditional use of medicinal plants in improving immunity and the treatment of

flu and fever by the different tribal communities such as Santals, Sabar, Mundas in the Jhargram subdivision of Paschim Midnapur district of West Bengal.

Materials and Method

Source of Data

During field survey information regarding the plant usages have been collected from the traditional healers (Ojha, Vaidya, Kaviraj), local tribal medicine men and women served as the informants, and in some cases aged persons and the forest dwellers those have profound knowledge about plants are also used as informants. The informants were selected based on ethnicity, age and knowledge about the medicinal plants. All the information collected was cross checked with the information provided by other informants of the same tribal group. The questions mainly focus on the locally available medicinal plants used for the treatment of fever and different microbial infections. Information about the data collected from different tribal communities are enumerated by the vernacular name followed by scientific names of the plants, family name, useful parts and specific usages. The data was collected during the months of June to December in the year 2023. Informants were assured that the data collected from this study would only be used for research purposes. Reported plants were recognized on account of literature and taxonomic workout [17].

Area of Study

The survey area selected for the study is the western part of Paschim Medinipur. It consists of Jhargram municipality and eight community development blocks like Binpur-I, Binpur-II, Jamboni, Jhargram, Gopiballavpur-I, Gopiballavpur-II, Nayagram and Sankrail. The general ground configuration is having gentle slope towards east. Hilly terrain occurs in the north-western portion of the Division. The rainy season spreads over June to September due to south-west monsoon and highest rainfall occurs in July and August. The maximum temperature during project was 43˚C and minimum was 19˚C. The soil is red, laterite, shallow depth gravels, low in organic matter, nitrogen and high in phosphorus and potassium. The climate in this region is sub-humid and dry[18]. Extensive field survey is based on the dry deciduous forest areas in the Jhargram subdivision for gathering ethnomedicinal value of different plants used by the different ethnic tribes' like- Santals, Lodhas, Mundas etc. for treating gastro-intestinal disorders.

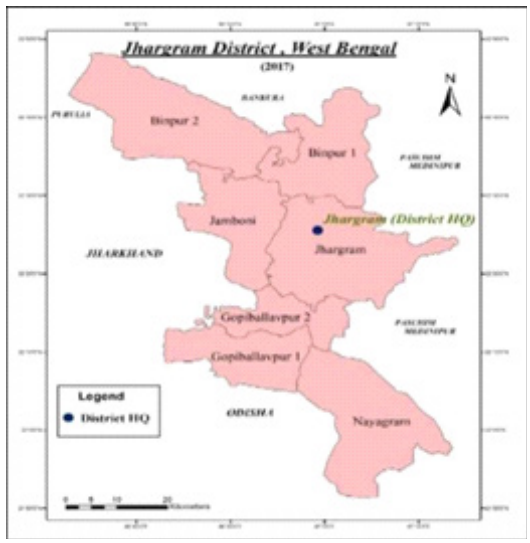


Figure 1: Map of Jhargram District

Results and Discussion

In the present study, the medicinal plants used for the prevention and treatment of microbial infections and fever of Jhargram district are enumerated in Table 1, in which local names are arranged followed by scientific name, family, habit, parts of the plant used and their uses along with medicinal properties. A variety of medicinal plants are used by the tribal population for the treatment of different ailments, among which 49 plants belonging to 32 families are documented based on their uses in the treatment of fever and other infections. The uses column represents the response of the interviewees. The documented plants are extensively used by the tribal population of West Bengal for the prevention and treatment of different physiological disorders. There are many evidence-based literatures are available on the uses and medicinal properties of the enlisted plants [19,20,21]. Images of respective plants are attached for better understanding.

Sl No	Local Name	Scientific Name	Family	Habit	Parts	Uses
1	Basak	*Adhatodavasica* Nees.	Acanthaceae	S	Leaf	Leaf extract mixed with honey has great medicinal value against bronchitis and asthma and fever
2	Chhatim	*Alstoniascholaris* R. Br.	Apocynaceae	T	Stem Bark	Bark is used in malarial fever
3	Kalmegh	*Andrographis paniculata* Nees	Acanthaceae	H	Leaf	Fresh leaf extracts in empty stomach for curing fever
4	Ishermul, Iswarmul, Bhedi janetet (Santali)	*Aristolochia indica* Linn	Aristolochiacea	C	Root Leaf Whole Plant	Root is used for fever, Asthma Fresh leaf extract is used for Cold and cough
5	Nim	*Azadirachta indica* A. Juss.	Meliaceae	T	Leaf	Extract of leaves are used for fever
6	Rosun	*Allium sativum* L.	Amarylidiaceae	H	Bulb	Garlic preparations play a great role to treat cold and cough
7	Khair	Acacia catechu	Mimosaceae	T	Stem bark	Stem bark is used as anantipyretic
8	**Bans**	*Bambusa arundinaceae* willd (Retz)	Poaceae	T	Stem bark	A siliceous secretion is used in asthma, cough and debilitating diseases
9	Kanchan katmauli	Bauhinia racemosa	Caesalpineaceae	T	Leaf	It is highly effective against fever and cough
10	Akanada	*Calotropis procera* R.Br	Asclepiadaceae	S	Leaf	Leaves paste is useful for to cure intermittent Fever
11	Bandarlathi	Cassia fistula	Caesalpineaceae	T	Root	Root is useful for fever and common cold
12	Aporajita	Clitoriaternatea	Fabaceae	C	Root	Root extract mixed with honey is active against bronchitis, asthma and fever
13	**Ghentu**	*Clerodendrum visosum* Vent	Verbenaceae	S	Leaf	Leaves are used for malaria fever
14	Telakucha	*Coccinia grandis* (Linn.) Voigt	Cucurbitaceae	H	Fruits	Fruits are useful for fever, bronchitis and asthma
15	Kansira	Commelina benghalensis L.	Commelinaceae	H	Whole part	Useful in treatment of fever

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16	Haldi	*Curcuma longa* L.	Zingiberaceae	H	Rhizome	Rhizome is used to treat cough and fever
17	Sissoo	*Dalbergia sissoo* Roxb.	Fabaceae	T	Leaf	Leaves are used to cure and fever
18	Kendu tree	*Diospyros melanoxylon* Roxb	Ebenaceae	T	Bark	Bark is effectively used against Is Malaria fever
19	Gurri Mokka	*Euphorbia hirta*L.	Euphorbiaceae	H	Aerial parts	The plant extract is used to treat bronchitis, asthma and cough. The plant plays a significant role against dengue fever
20	Manasa	*Euphorbia neriifolia* L	Euphorbiceae	S	Leaf	The leaf extract plays a great role, cold and cough
21	Dumur	Ficus hispida	Moraceae	T	Fruit	Used to treat tofever
22	Gamar	Gmelina arborea Roxb.	Verbenaceae	T	Root Stem Bark	The root and bark are effective against piles, urinary discharge and fever
23	Kurchi tree	*Holarrhenaantidysenterica* (L.) Wall	Apocynaceae	T	Leaf	Leaf of kurchi and Cyperus rotundus are paste to treat Malaria fever
24	Kolmisak	*Ipomoea aquatica* Forssk.	Convolvulaceae	H	Whole plant	The whole plant extract is used to treat jaundice, biliousness, bronchitis, and liver problem and fever
25	Bagbherenda	*Jatropha curcas*L.	Euphorbiaceae	S	Leaf	The latex plays a great role in fever
26	Swetadrona	Leucas aspera(willd) Link.	Lamiaceae	H	Whole plant	The whole plant is used as antipyretic
27	Leda, Kukurchita, Garur	*Litseaglutinosa* (Lour.) C.B. Robins. Syn. *L. sebifera* Pers.	Lauraceae	T	Roots Stem bark	Roots are used in Bronchitis. Stem bark is used in fever
28	**Swarnachampa**	*Michelia champaca* Linn.	Magnoliaceae	T	Stem	The bark of stem is used to treat fever
29	Lajjabatilata	Mimosa pudica L	Fabaceae	H	Roots	Roots are used in fever
30	Alkushi shrub	*Mucuna pruriens* (L.) Dc.	Fabaceae	C	Roots	The root is used against fever
31	Pudina	*Metha arvensis* L.	Lamiaceae	H	Leaf	Leaves are used in fever

Continue.....

32	Bakul	*Mimusopselengi* Linn	Sapotaceae	T	Flower	Dried flowers are used to reduce strong fever
33	Ghikalla	*Momordica dioica* Roxb	Cucurbitaceae	C	Root	The root is used to treat high fever
34	Shiuli	*Nyctanthes arbor-tristis* L	Oleaceae	S	Stem Bark	Bark is used in malaria fever and rheumatic joint pain
35	Tulsi	*Ocimum sanctum* L	Lamiaceae	H	Leaf	Leaves are useful against cold and cough. Bronchitis
36	Amrul	*Oxalis corniculata*L	Oxalidaceae	H	Leaf	Leaves use for curing cold, cough, influenza, fever
37	Nasabhaga	*Peristrophebicalyculata* Nees.	Acanthaceae	S	Leaf	The leaves are used in fever
38	Khajuur	*Phoenix sylvestris* Roxb.	Arecaceae	T	Fruit	Fruits are used to cure fever
39	Kalomorich	*Piper nigrum* L.	Piperaceae	C	Seed	Seeds are used to treat cold, cough and fever
40	**Madhabilata Madhumanjari**	*Quinqualis indica* Linn	Combretaceae	C	Fruit	It is effective against Fever
41	Sarpagandha	*Rauvolfia serpentina* Benth. ex Kurz	Apocynaceae	S	Root	The root is used against Malaria fever
42	Ritha	*Sapindusmukorossi* Gaertn	Sapindaceae	T	Leaf	Young leaves are used in fever
43	Kakmachi	Solanum nigrum L.	Solanaceae	H	Root	Root is effective against asthma and whooping cough
44	Kantikari	*Solanum surattense* Burm. f.	Solanaceae	H	Leaf	Leaves juice is highly used for cough and cold
45	Haritaki	*Terminalia chebula* Retz	Combretaceae	T	Fruits	Fruits are used to cure cough
46	Gulan-cha	*Tinospora cordifolia* (Willd) miers ex Hook f Thoms	Menispermaceae	C	Leaf	Leaf juice is used in fever
47	Choto Kuksima	*Vernonia cinerea* Less.	Asteraceae	H	Whole plant	The whole plant is used in the treatment of fever
48	Nishinda	*Vitex negundo* Linn.	Verbenaceae	T	Leaf	Leaves are used in and fever
49	Ada	Zingiber officinalis	Zingiberaceae	H	Rhizome	Rhizomes are used for cold and cough

A statistical analysis about the medicinal plants of the Jhargram district belonging to different habits and parts of plants used are presented in Figure 2 and 3. From Figure 2 it can be concluded that trees (18)are predominant in this region followed by herbs (16), shrubs (8) and climbers (7). One can depict from Figure 3 that leaves are majorly used plant part for the treatment of microbial infection and fever followed by root, stem bark, fruit etc.

Table 1: Enumeration of different medicinal plants used for microbial infection and fever of Jhargram district

Medicinal plants as mentioned in Table 1:


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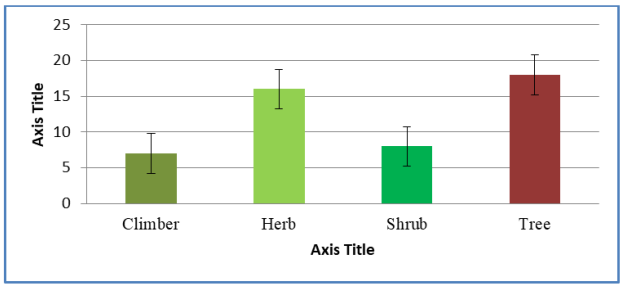


Figure 2: Analysis of Different habits of Plant Species

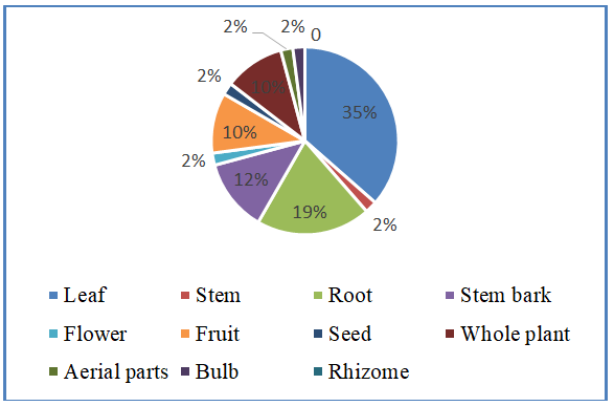


Figure 3: Different Parts of Plant Species Used for Medicine

Conclusion

The present study deals with 49 plant species belonging to 32 different families used by the tribal population of Jhargram district for the prevention and treatment of microbial infection and fever. It includes trees, shrubs, herbs, climbers etc. The knowledge about the use of plants by the tribes appears to be unknown or little known outside their community. The rural area of this district which was our study area is an important source of traditional medicines. More information may be explored from the people residing in the remote villages in this district. The traditional healers are the main source of knowledge on medicinal plants. This knowledge has been transmitted orally from generation to generation; however, it seems that it is disappearing from the modern society since younger people are not interested to carry on this tradition. It is also observed that some traditional plants in that area are fast eroding. The conservation efforts are needed by plantation and protection of these plants with maximum participation of local people. Medicinal plants play an important role in providing knowledge to the researchers in the field of ethnobotany and ethnopharmacology. There is a wide use of ethnobotanical science for understanding how indigenous knowledge can be used on the utilization of natural resources. The acceptance of plant-based remedies is increasing day by day. So, this research article will attract the attention of ethnobotanists, Phyto chemists and pharmacologists for further critical investigation of medicinal plants present in the districts of West Bengal, India.

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Original Article

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A Cross-sectional Study on Risk Perception of COVID-19 and its Determinants among the Residents in Mangalore

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Abstract

Background: The success of battle against COVID-19 was depended on public adherence towards infection control measures, which is greatly affected by risk perception of COVID-19. Assessing risk perception can provide valuable insights into their awareness, beliefs, and attitudes toward the pandemic; and assessing the determining factors that influence risk perception is crucial for designing effective public health interventions for future public health emergencies as well.

Objectives: The study intended to assess risk perception of COVID-19 and factors influencing it.

Methodology: A community based cross sectional study, by house-to-house visit was conducted among 323 participants during period of 2020-2022. Multistage sampling was adopted. Adults more than 18 years of age, who head their families were included.A pre-tested semi-structured validated questionnaire was used for data collection by interview method. Chi-square was used to test association.

Results: Among 323 participants, 96% had low risk perception of COVID-19.Most of the participants had good knowledge, positive attitude and good practice of preventive measures of COVID-19. Mass media was the most common source of COVID-19 related information. There was significant association between attitude towards preventive measures of COVID-19 and risk perception (p value 0.02).

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Conclusion: Majority of the participants had low risk perception of COVID-19;good knowledge, positive attitude and good practice of preventive measures of COVID-19. This finding indicates that public health interventions probably were effective, fostering a balanced and informed understanding of the risks.

Keywords: COVID-19; risk-perception; rural; pandemic

Introduction

The WHO declared the SARS-CoV-2 outbreak as a pandemic on March 11, 2020, due to its alarming levels of spread across the globe.[1]The coronavirus disease (COVID-19) had an enormous impact on all aspect of human life including health, the economy, and politics. [2]

Compared to developed countries, low and middle-income countries (LMICs) were hit the hardest by the pandemic because of their already overburdened health systems, special challenges related to scarce resources, unsatisfactory infrastructure, competing health priorities and lack of access to reliable information for households in resource-poor settings.[3]

The first case in India, was detected on 27th January, 2020, in Trissur. A 20-year-old female presented with history of dry cough and sore throat to the Emergency Department of General Hospital, Trissur, Kerala. There was travel history from Wuhan city, China to India, on January 23, 2020 owing to COVID-19 outbreak situation there.[4]

During the first wave a prompt nationwide lockdown was imposed in March, 2020, which helped in containing the pandemic, rather flattening the epidemic curve.[5] However, a country like India, which is densely populated and which has a high internal migration, will always be at risk of multiple waves of infection during such pandemics. The situation can worsen with adverse impacts, such as large number of fatalities and long-term complications as seen during COVID-19 pandemic.[3]

WHO endorsed infection prevention and control (IPC) measures to alleviate COVID-19 spread.[6] The lessons learned from the past still underscore the importance of IPC measures to prevent future outbreaks. The success of battle against COVID-19 was depended on public adherence towards IPC measures, which is greatly affected by their knowledge and attitudes towards preventive measures of COVID-19. [7] In addition to the physical threat, the outbreak also causes psychological distress, depression, and stigmatization.[8] Social stigma can prevent people from seeking health care immediately, which can lead to disease spread among the population.[9]

Assessing risk perception can provide valuable insights into their awareness, beliefs, and attitudes toward the pandemic. Determining the factors that influence risk perception is crucial for designing effective public health interventions. In view of the above, this study was planned to assess risk perceptionof COVID-19 and factors influencing it.

Aims and objectives:

1. To assess risk perception of COVID-19 among the residents in the rural field practice area of a teaching hospital in Mangalore
2. To assess and factors influencing risk perception of COVID-19 among the residents in the rural field practice area of a teaching hospital in Mangalore

Methodology

A community based cross sectional study was conducted by house-to-house visit among residents of rural field practice area of a teaching hospital in Mangalore. Adults above 18 years of age, who are the heads of their families were included. In case of their absence during two consecutive visits, an adult in the family who is also involved in the decision making, was interviewed. Any house found locked during the second visit which was done 5 days after the first visit was excluded and the next house was visited.

Referring to an earlier similar study, the risk perception was found to be 57.6 %.[7] Sample size was calculated by using the formula $4pq/L^2$. Considering p = 57.6, and allowable error (L) =10% of p, with a confidence interval of 95%, a sample size of 294 was obtained. Further, a non-response rate of 10% was added. Finally, the sample size was estimated to be 323. Study was conducted from October 1st 2020 to September 31st 2022.

Multistage sampling was adopted to select the houses. There are 16 areas under the rural field practice area. To decide the number of houses to be selected from each area, Probability Proportional to Size (PPS) was adopted. To select the house from each area, a list of houses maintained in the record of rural health training centre was used as sampling frame and houses were selected using Simple Random Sampling till a total sample size of 323 was achieved.

A pre-tested semi-structured validated questionnaire was used for collection of data by interview method. The questionnaire contained 3 parts, which was elicited and analysed using Likert scale. The part 1 was used to obtain the socio-demographic information of the respondent like age, sex, education, occupation, etc. Part 2 included questions on risk perception of COVID-19. Part 3 included questions on knowledge, attitude and practice of preventive measures of COVID-19.The content of the tool was validated by four expert professionals from the field of Community Medicine. Data was collected using interview technique from the selected individuals.

Statistical analysis:

The data was entered in Microsoft excel and analyzed using IBM SPSS trial version 28. All categorical data are presented in proportions. Continuous data was grouped and presented in proportion. Chi-square test was used to test the association between risk perception and selected variables. A p value of less than 0.05 was considered as statistically significant.

Operational definition:

Risk perception: people's beliefs and feelings about the possibility of COVID-19 infection**.** It was measured by five-point Likert scale and its score. The overall scores were categorized into two group as high-risk perception and low risk perception based on the score obtained.

Ethical Clearance: Ethical clearance was obtained from Institutional Ethics Committee (AJEC/REV/57/2021 dated 18/02/2021). For conducting the study, the purpose and the procedure was briefed to the respondents in the local language. Informed consent was obtained from each participant.

Results

Table 1: Distribution of the participants according to age (n=323)

Variables	Categories	Frequency	Percentage (%))
Age	25-45	131	40.6
	46-60	103	31.9
	60 and above	89	27.6
Gender	Male	196	60.7
	Female	127	39.3
Religion	Hindu	159	49
	Muslim	152	47.1
	Christian	12	3.7
Education	Pre primary	55	17
	Primary	88	27.2
	Upper primary	72	22.3
	Secondary	64	19.8
	Senior Secondary	17	5.3
	Graduation and above	27	8.4
Occupation (modified Kuppuswamy scale)	Professional	2	0.6
	semi professional	18	5.6
	clerical, shop owner, farmer	20	6.2
	skilled worker	22	6.8
	semi-skilled	127	39.3
	Unskilled	27	8.4
	Unemployed	107	33.1

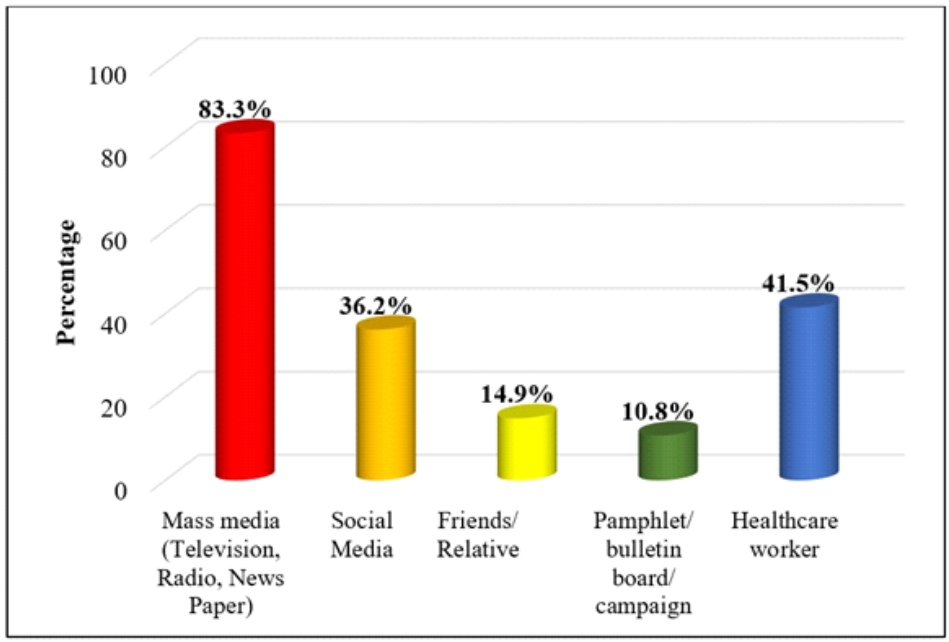
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Type of family	Nuclear family	198	61
	Joint family	74	23
	Three generation family	51	16
APL/ BPL card *	APL	105	32
	BPL	212	66
	Antyodaya card	6	2

*APL- Above Poverty Line, BPL- Below Poverty Line (based on the type of ration card they hold)

A total of 297 individuals participated in the study. Their demographics are as given in table 1.Mean age of the participants was 51.11 ± 12.462 years. More than half of the study participants were male. The semi-professional category in occupations includes teachers

Majority, 276 (85%) respondents didn't have any healthcare worker in their family, 47 (15%) had healthcare worker in family. Only 12 (3.7%) had history of COVID-19 infection in the house. Also 9 (2.7%) respondents gave history of COVID-19 infection in themselves



* *includes multiple response*

Figure 1: Distribution of participants according to source of COVID-19 related information*

In the present study most common source of information was mass media, followed by healthcare workers and social media. (figure 1)

Table 2: Distribution of study population according to risk perception of COVID-19 (n=323)

Question	Not At All n (%)	Slightly Likely n (%)	Not Sure n (%)	Very Likely n (%)	Extremely Likely n (%)
Do you think that you are likely to become infected with COVID-19	186 (57.6)	63 (19.5)	65 (20.1)	8 (2.5)	1 (0.3)

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Are you worried that your family member/friend might be infected with COVID-19	197 (61.0)	54 (16.7)	52 (16.1)	18 (5.6)	2 (0.6)
Even if person is in good health, chance of getting infected with COVID-19 is high	67 (20.7)	87 (26.9)	92 (28.5)	76 (23.5)	1 (0.3)
Compared to most people of your age, your risk of getting COVID-19 is high	205 (63.5)	23 (7.1)	79 (24.5)	16 (5)	0
Do you think that people in your present location are likely to contract COVID-19	173 (53.6)	42 (13)	96 (29.7)	11 (3.4)	1 (0.3)
Do you fear that in spite of taking proper precautions, you could get infected with COVID-19	118 (36.5)	99 (30.7)	71 (22)	35 (10.8)	0
People with comorbidities are at higher risk of getting infected with COVID-19	105 (32.5)	43 (13.3)	78 (24.1)	93 (28.8)	4 (1.2)
Vaccinated people are at lower risk of getting infection	103 (31.9)	144 (44.6)	43 (13.3)	33 (10.2)	0

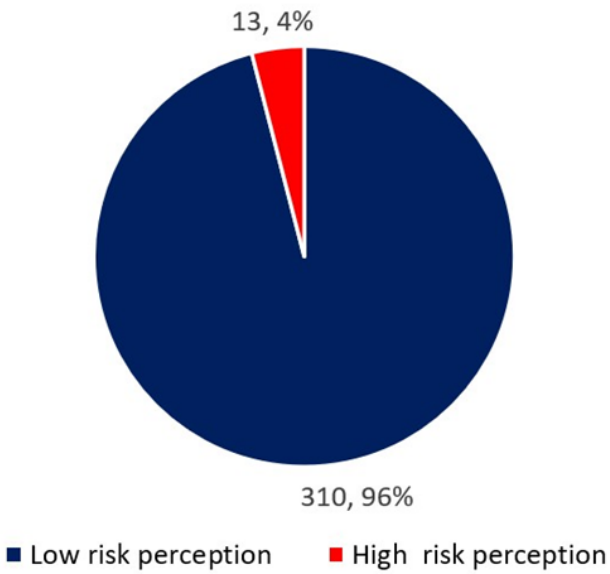


Figure 2: Distribution of study population according to risk perception of COVID-19 (n=323)

Risk perception was measured by five-point Likert scale and its score. Majority i.e. 310 (96%) had low risk perception and 13 (4%) had high risk perception of COVID-19 (figure 2).

Similarly, knowledge, attitude and practice were accessed. It was found that, Knowledge of preventive measures of COVID-19 was good in 315(97.5%) participants and average in 8 (2.5%) participants. None of the participants had poor knowledge. 317 (98.1%) participants had positive attitude towards preventive measures and whereas negative attitude was seen in only 6 (1.9%) participants. practice of preventive measures was good in 205 (63.5%) participants, average in 116 (35.9%) participants and poor in 2 (0.6%) participants. Majority,270 (83.6%) had low stigma and 53 (16.4%) had high stigma towards COVID-19.

Table 3: Distribution of study participants according to risk perception of COVID-19 and socio-demographic factors (n= 323)

Socio demographic characteristics	Frequency	Low Risk perception (n=310)	High Risk perception (n=13)	Test statistic value	p value
Age					
Less than 60	234	225 (96.2 %)	9 (3.8 %)	0.070#	0.758
60 and above	89	85 (95.5 %)	4 (4.5 %)		
Gender					
Male	196	186 (94.9 %)	10 (5.1 %)	1.498*	0.221
Female	127	124 (97.6 %)	3 (2.4 %)		
Type of family					
Nuclear family	195	187 (95.9 %)	8 (4.1 %)	0.008*	0.930
Joint family	128	123 (96.1 %)	5 (3.9 %)		
APL/ BPL card					
APL	105	103 (98.1 %)	2 (1.9 %)	1.810#	0.235
BPL	218	207 (95.0 %)	11 (5.0 %)		
Occupation					
employed	216	207 (95.8 %)	9 (4.2 %)	0.034#	0.9
Unemployed	107	103 (96.3 %)	4 (3.7 %)		
Education					
Illiterate	55	54 (98.2 %)	1 (1.8 %)	0.836#	0.704
Literate	268	256 (95.5 %)	12 (4.5 %)		

** Obtained by Chi-square test, # Obtained by Fisher's Exact test*

Categories were combined during analysis to align with the requirements of statistical testing.

Chi square test was done to find association between socio-demographic characteristics and risk perception (table 3). However, on statistical analysis, there is no significant association between risk perception and socio-demographic characteristics

Table 4: Distribution of study participants according to risk perception of COVID-19 and other factors (n= 323)

	Frequency	Low Risk perception (n=310)	High Risk perception (n=13)	Test statistic value#	p value
Presence of healthcare worker in family					
Yes	47	45 (95.7 %)	2 (4.3 %)	0.008	0.9
No	276	265 (96.0 %)	11 (4.0 %)		
History of COVID-19 infection for any member in the house					
Yes	12	12 (100 %)	0	0.523	0.9
No	311	298 (95.8 %)	13 (4.2 %)		

 # Obtained by Fisher's Exact test

Association between risk perception and source of information like mass media, friends/relatives, Pamphlet/bulletin board/campaign and healthcare worker was not found statistically significant.

Irrespective of the presence of healthcare worker in family and History of COVID-19 infection for any member in the house, majority of the participants had low risk perception of COVID-19. However, out of 12 respondents those who gave history of COVID-19 infection in the family, all the participants (100%) had low risk perception regarding COVID-19 (Table 4). However, on statistical analysis, there is no significant association between risk perception regarding COVID-19 and history of COVID-19 infection.

Table 5: Association of risk perception of COVID-19 with knowledge, attitudes and practice towards preventive measures of COVID-19 (n= 323)

	Frequency	Low Risk perception (n=310)	High Risk perception (n=13)	Test statistic value#	p value
Knowledge					
Average	8	8 (100 %)	0	0.344	0.9
Good	315	302 (95.9 %)	13 (4.0 %)		
Attitude					
Negative	6	4 (66.7 %)	2 (33.3 %)	13.595	0.021
Positive	317	306 (96.5 %)	11 (3.5 %)		
Practice					
Poor	118	114 (96.6 %)	4 (3.4 %)	0.194	0.775
Good	205	196 (95.6 %)	9 (4.4 %)		

 # Obtained by Fisher's Exact test

Irrespective of the knowledge of preventive measures, all participants had low risk perception of COVID-19. However, it was not found to be statistically significant. Among participants who had positive attitude, 96.5% had low risk perception, whereas only 3.5% had high risk perception. On statistical analysis, there was significant association between attitude towards preventive measures of COVID-19 and risk perception. (p value 0.02) (table 5). Temporality of the association between practice of COVID-appropriate behavior and the risk perception isn't possible with the cross-sectional study. One way of representing would be that: 3.4% of people with poor practice and 4.4% people with good practice had perceived themselves to be at high risk. These proportions were not significantly different from each other (Table 5).

Discussion

Risk perception of COVID-19

Risk perceptions refer to people's beliefs and feelings about the possibility of disease or other harms to health. Perceived risk is a key predictor of both motivation to take protective action, and subsequent performance of health behaviors geared at alleviating the threat.[10]Risk perception is a feature of protection-motivation theory.[11] It is a response to a threat, which can predict perceived risk influencing protective behaviors.

In the present study 96% of the participants had low risk perception of COVID-19 and majority were not worried about the COVID-19 issue. Similar results were also reported in a study conducted by Kokane N et al in Maharashtra during September 2020.[10]

A study conducted by He Shan et al in China in 2020 stated that people are worried about getting infected by COVID-19.[12] Whereas in the present study, majority were not worried about the COVID-19 issue and most of the participants were not worried forthemselves or for their family members. This difference could be because of the reason that the study was conducted after two waves of COVID-19 and as a result, perceived risk was lesser compared to the studies conducted during first wave of COVID-19.

A study conducted in Tamil Nadu assessed risk perception and behavioral changes during the first wave of COVID-19. It found that approximately two-thirds of participants perceived a risk of contracting COVID-19, particularly among younger adults (ages 20-39) and urban residents.[13] In contrast, the present

study indicated that 96% of participants in Mangalore had low risk perception despite demonstrating good knowledge and positive attitudes towards preventive measures. This difference may also be due to the difference in timeline during which the study was conducted. The public health interventions may have been effective, fostering a balanced and informed understanding of the risks.

Factors associated with risk perception of COVID-19

Studies conducted across different parts of India indicate that risk perception is greatly influenced by demographic factors, including place of residence (rural vs. urban), level of education etc. A similar study carried out in Tamil Nadu revealed that people who were less educated and who resided in rural areas often perceive risk at lower levels.[13]

In the present study factors like age, gender, education, occupation etc. were not found to be significantly associated with risk perception. However, in a study conducted by Kokane N et al in Maharashtra there is statistical significance in perceived risk and age, history of COVID-19 infection; and no statistical significance was seen in gender and education with total perceived risk.[10] In the present study positive attitude was significantly associated with low-risk perception.

The study was conducted during a specific period of the pandemic, which may have influenced participants' perceptions based on the prevailing situation at that time. As the global situation transitions to a post-pandemic phase, public perceptions and behaviors may have evolved, highlighting the need for ongoing research to understand these changes and inform future public health strategies.

Conclusion

Only 4% of residents in the rural field practice area of a teaching hospital in Mangalore perceived a high risk of encountering COVID-19. Factors associated with this high-risk perception of COVID-19 was negative attitude, as per statistical significance. Other factors which leaned towards having higher risk-perception were: elderlies, males, nuclear families, employed individuals, literates, BPL card holders, positive history of a family member developing a disease and good knowledge. Overall, the study showed that majority of the rural residents had good knowledge, positive attitudes, good practice, low stigma in conjunction with low-risk perception, with most common source of information regarding all of the above being mass media. This in turn represents the effective IEC effort by different authorities in reaching rural India. So, at times of pandemics, the utility of mass media, social media etc. should be given as much importance as the information being passed on by the healthcare workers.

The study has certain limitations. Social desirability bias could not be addressed, as participants may have provided responses that they perceived to be socially acceptable rather than entirely truthful. This is shown in the difference between proportion of individuals with positive attitudes and good practice. The strengths of the study were that it adopted a community-based approach, gathering information directly from community. Now that the study shows overall positive long-term impact of multi-sectoral involvement, future research could adopt a longitudinal design throughout the outbreaks to assess changes in KAP over time and to understand the rapidity and changing impacts of interventions.

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Original Article

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Toxidromes and Their Public Health Impacts: A Cross-Sectional Analysis From a South Indian Tertiary Care Hospital

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Abstract

Objective: This study aimed to assess the prevalence, clinical features, and public health impact of various toxidromes, focusing on their demographic associations and healthcare implications in a tertiary care hospital setting.

Methods: A hospital-based cross-sectional study was conducted over a period of one year (January 2021 - December 2021), involving patients who presented with signs of toxic exposure or poisoning. A total of 120 cases were analyzed using detailed questionnaires and clinical examinations.

Results: The study identified that organophosphate poisoning was the most common toxidrome, accounting for 35% of the cases. Toxidromes were more prevalent in individuals aged 20-40, with a higher incidence in males. A significant correlation was found between socioeconomic factors, such as low income and education level, and the incidence of poisoning.

Conclusion: The study underscores the significant public health burden of toxidromes, particularly in low-income areas. Early detection, public awareness campaigns, and preventive measures such as poisoning education are essential to reducing the burden of toxicological diseases.

Key-words: Toxidromes, Public Health, Organophosphate Poisoning, Substance Abuse

Introduction

Toxidromes, or syndromes resulting from toxic exposure to various chemicals, drugs, or environmental hazards, pose a significant public health concern globally. These conditions vary widely in clinical presentation and severity, depending on the type of toxic agent involved.[1] According to the World Health Organization (WHO) data from 2021, exposure to toxic substances led to 2 million deaths and 53 million disability-adjusted life-years (DALYs) lost in 2019, underscoring the need for a

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better understanding of the patterns and outcomes of acute poisoning to improve planning, prevention, and management strategies.[2] Organophosphate (OPC) poisoning, sedative-hypnotic overdose, and opioid intoxication are among the most commonly encountered toxidromes in clinical practice.[3] The increasing rates of substance abuse, pesticide use, and environmental hazards have made the recognition and management of toxidromes critical for clinicians.[4]

In India, the burden of poisoning cases is disproportionately high, contributing to a substantial public health crisis.[5] Given the rise in accidental, intentional, and industrial exposure, understanding the clinical and epidemiological profiles of these conditions is crucial. While numerous studies have investigated the incidence and management of individual toxidromes, there remains a paucity of data addressing the comprehensive impact of these conditions on public health, particularly in developing regions.[6]

Therefore, the aim of this study was to fill this gap by examining the prevalence, risk factors, and healthcare impacts of various toxidromes in a tertiary hospital setting in Tamilnadu.

Material and Methods

Study Design and Setting

This hospital-based cross-sectional study was conducted at a tertiary care center over the course of one year from January 2021 to December 2021. A total of 500 patients were screened to detect patients with clinical signs indicative of poisoning or toxic exposure. Inclusion criteria included patients of any age or sex, who showed symptoms of poisoning due to environmental, industrial, or accidental exposure to toxic agents. Exclusion criteria included individuals with a history of chronic illness not related to toxic exposure.

Sample Selection

Patients who were admitted to the emergency department or referred from other hospitals with suspected toxidromes were screened. The demographic data, medical history, and symptom onset were documented. Diagnostic criteria for each toxidrome, such as cholinergic effects for organophosphates and central nervous system depression for sedative-hypnotics, were utilized.

Sample Size Calculation

The sample size for this study was calculated using the formula for estimating proportions. Assuming a prevalence of toxidromes of 50% (p = 0.5) for the primary toxidrome (as there are no previousstudies in our target patient population), a confidence level of 95%, and a margin of error of 5% (d = 0.05), and using the formula: $N = Z^2_{1-al^2} * p * (1 - p) / d^2$, the required sample size was determined to be approximately 384 participants.[7] To account for potential dropouts and incomplete data, the sample size was increased by 20%, resulting in a final sample size of 500 patients.

Data Collection and Analysis

Clinical examinations were conducted following standard toxicology protocols. Demographic and clinical data were entered into Microsoft Excel for preliminary analysis, followed by statistical analysis using SPSS version 25. Descriptive statistics were applied to summarize the sample characteristics.

Results

Demographic Distribution

A total of 500 patients were screened in this study, of whom 120 patients were found to present with clinical signs indicative of poisoning or toxic exposure. The mean age of the patients was 30.5 years, with the majority of patients (55%) being less than 30 years in age (**Figure 1**). The study population consisted predominantly of males, who represented 60% of the total participants. The geographic distribution of patients revealed that the majority were from rural areas (71.7%), whereas 34 patients were from urban areas, representing 28.3% of the cases. In terms of socioeconomic status, 70% of the cases came from economically disadvantaged and undereducated backgrounds, with low-income individuals showing a higher susceptibility to toxic exposures as shown in **Figures 2** and **3**.[8] Notably, agriculture-related jobs were noted to be the most common occupation in this cohort, highlighting the occupation-related risks associated with pesticide exposure (**Figure 4**).

Most Common Toxidromes Amongst Patients

All patients in the study intentionally ingested substances orally, with 120 patients (100.0%)

reporting this route of ingestion. The most prevalent toxidromes were organophosphate poisoning, rat killer paste, and ant killer powder toxicity. The distribution of ingested compounds among patients revealed that the OPC cypermethrin was the most frequently ingested compound, affecting 28 patients (23.3%). This was followed by rat killer paste, which was ingested by 18 patients (15.0%), and chlorpyrifos, affecting 10 patients (8.3%). Bromodialone and paraquat were each ingested by 9 patients (7.5%), while kerosene was also reported in 9 patients (7.5%). Dimethoate and oleander were ingested by 6 patients each (5.0%), while monochrotophos was ingested by 5 patients (4.2%).Glyphosate 41%, phenol, paracetamol 500 mg, and herbicides were ingested by 2 patients each (1.7%). A wide range of other compounds, including atenolol 50 mg, abrusprecatorius, alprazolam, amlodipine 5 mg, carbamazepine 200 mg, clonazepam, diazepam 5 mg, isopropyl alcohol, karthikaikilangu (glory lily), lorazepam 2 mg, metformin 500 mg, plant oil, profenofos 40%, rat killer powder, thyroxine (8 tablets), and zinc phosphide 80%, were each ingested by only 1 patient (0.8%). In addition, unknown substances were involved in 2 cases (1.7%) as shown in **Figure 5.**

Co-morbidities Amongst Patients

The distribution of comorbidities among the patients showed that the majority (93 patients, 77.5%) had no reported comorbidities. Among those with comorbidities, Type 2 Diabetes Mellitus (T2DM) was the most common, affecting 9 patients (7.5%), followed by systemic hypertension (SHTN) in 7 patients (5.8%). Psychiatric disorders were present in 3 patients (2.5%). Bronchial asthma (BA) and coronary artery disease (CAD) were each reported in 2 patients (1.7%). Other comorbidities, including chronic kidney disease (CKD), hypothyroidism, obesity, past tuberculosis (PTB-old), seizure disorder and old cerebrovascular accident (CVA)were reported in 1 patient each, representing 0.8%of the total cases (**Table 1**). Additionally, 45 patients (37.5%) reported alcohol use. In comparison, 75 patients (62.5%) reported no alcohol abuse.

The distribution of psychiatric diagnoses among the patients showed that impulsive disorder was the most common, affecting 42 patients (35.0%). Adjustment disorder was also prevalent, with 39 patients (32.5%) diagnosed. Major depressive disorder was reported in 5 patients (4.2%). Less common diagnoses included psychosis and schizophrenia, each affecting 1 patient (0.8%). Bipolar disorder was also in frequent, affecting 1 patient (0.8%). Not ably, psychiatric evaluations were not performed for 31 patients (25.8%) due to death prior to assessment (**Figure 6**).

Antidotes, Complications and Outcomes

Among these patients, 29(24.2%) received at ropineasanantidote. Flumazenil was administered to 4 patients (3.3%), and vitamin K was given to 8 patients (6.7%). N-acetylcysteine (NAC) was administered to 2 patients (1.7%). One patient (0.8%) received calcium gluconate. The majority, 84 patients (70.0%), received only supportive therapy without specific antidotes (**Figures 7** and **8**).

The distribution of complications among patients showed that 55 (45.8%) experienced no complications. Among those with complications, cholinergic crisis was the most common, affecting 23 patients (19.2%). Toxic hepatitis was reported in 19 patients (15.8%), and respiratory failure occurred in 15 patients (12.5%). Pulmonary fibrosis and acute kidney injury (AKI) were each observed in 8 patients (6.7%). Coagulopathy affected 6 patients (5.0%). Less frequent complications included multiple organ dysfunction syndrome (MODS) in 10 patients (8.3%), cardiogenic shock in 4 patients (3.3%), hepatic encephalopathy, intermediate syndrome, chemical pneumonitis, and toxic myocarditis, each affecting 3 patients (2.5%). Bradyarrhythmia was noted in 2 patients (1.7%), while aspiration and shock were reported in1 patient each (0.8%) as shown in **Table 2**.

Table 1: Distribution of Co-Morbidities Among Patients

Co-Morbidity	No of patients	Percentage
Bronchial Asthma	2	1.7%
Coronary Artery disease	2	1.7%
Chronic Kidney Disease	1	0.8%
Hypothyroidism	1	0.8%
Obesity	1	0.8%

Continue.....

Psychiatric Disorder	3	2.5%
Pulmonary Tuberculosis	1	0.8%
Rural residence	1	0.8%
Seizure Disorder	1	0.8%
Systemic Hypertension	7	5.8%
Type 2DM	9	7.5%
Old Cerebrovascular Incident	1	0.8%
No co-morbidities	93	77.5%

Table 2: Complications Among Patients.

Complications	No of patients	Percentage
Cardiogenic Shock	4	3.33%
Coagulopathy	6	5.00%
Hepatic Encephalopathy	3	2.50%
Toxic Hepatitis	19	15.83%
Intermediate Syndrome	3	2.50%
Pulmonary Fibrosis	8	6.67%
Acute Kidney Injury	8	6.67%
Aspiration	1	0.83%
Bradyarrythmia	2	1.67%
Chemical Pneumonitis	3	2.50%
Cholinergic Crisis	23	19.17%
Multi-Organ Dysfunction Syndrome	10	8.33%
Respiratory Failure	15	12.50%
Shock	1	0.83%
Toxic Myocarditis	3	2.50%
None	55	45.83%

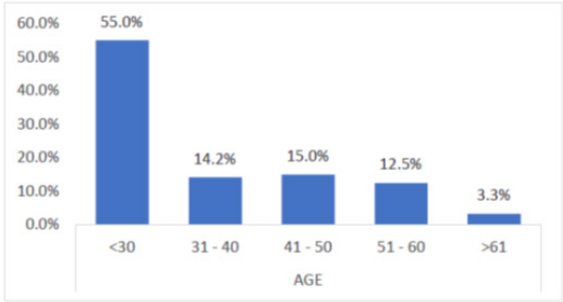


Figure 1: Age distribution of patients

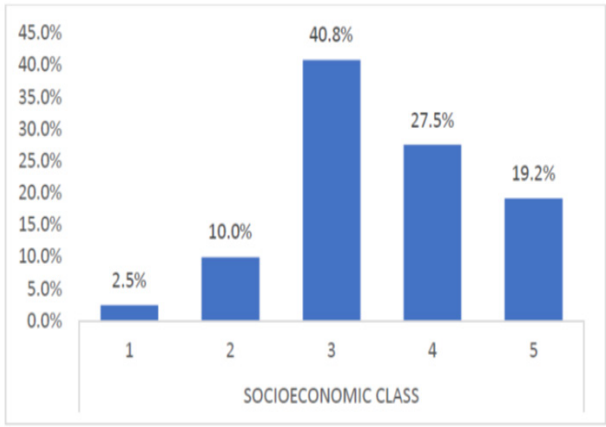


Figure 2: Socioeconomic Class Distribution of Patients

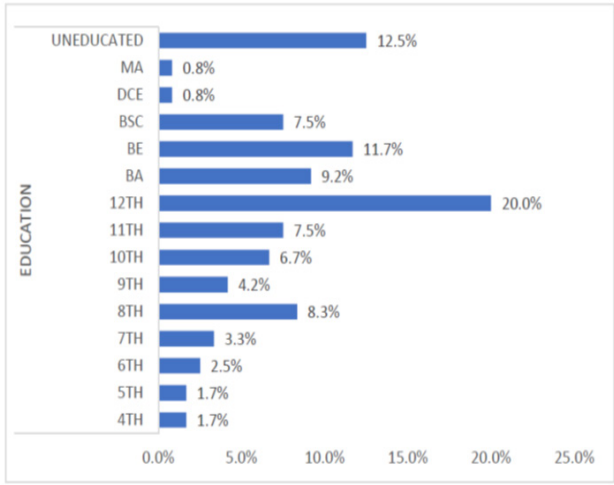


Figure 3: Educational Level of Patients

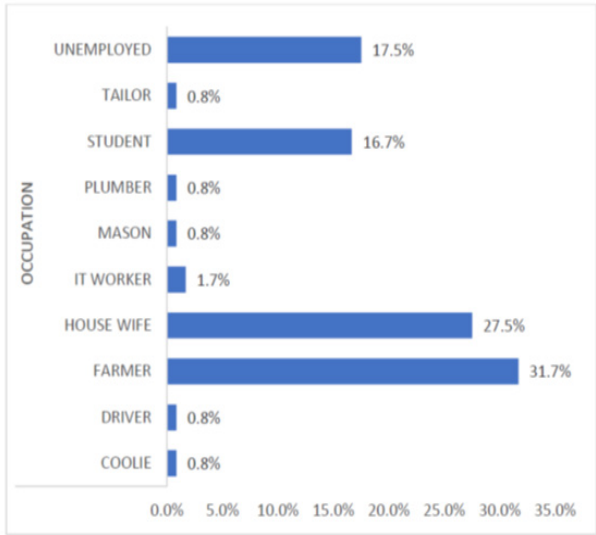


Figure 4: Occupational Distribution of Patients

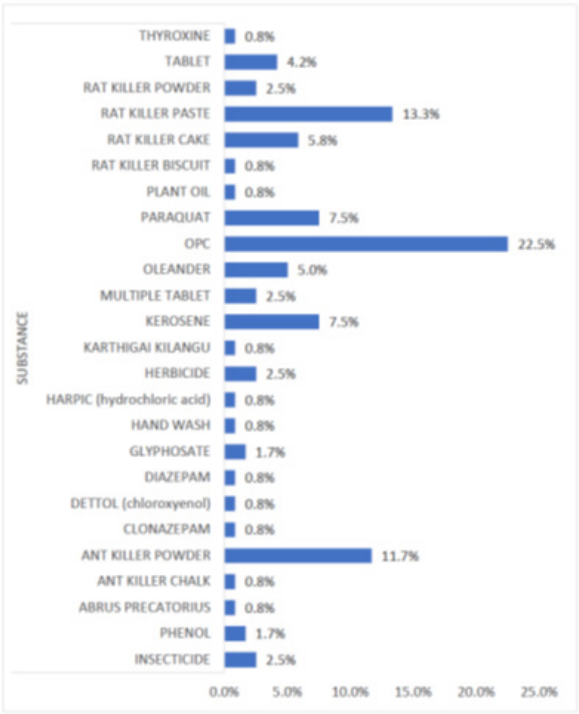


Figure 5: Distribution of Substances Ingested by Patients

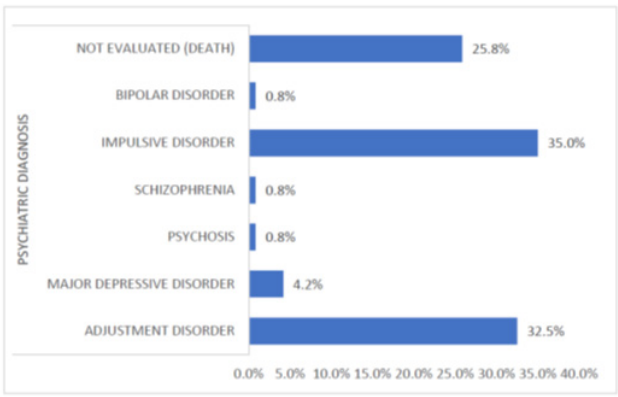


Figure 6: Psychiatric Diagnoses Among Patients

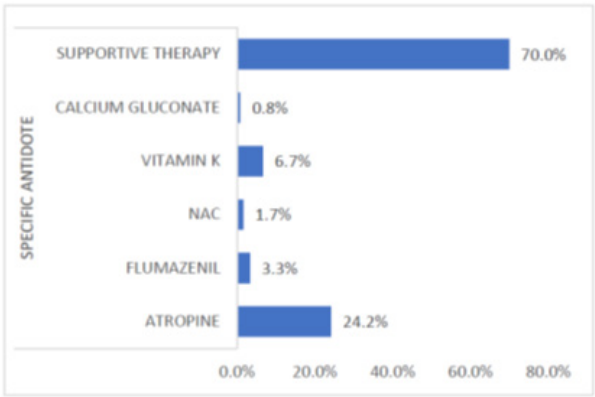


Figure 7: Administration of Antidotes

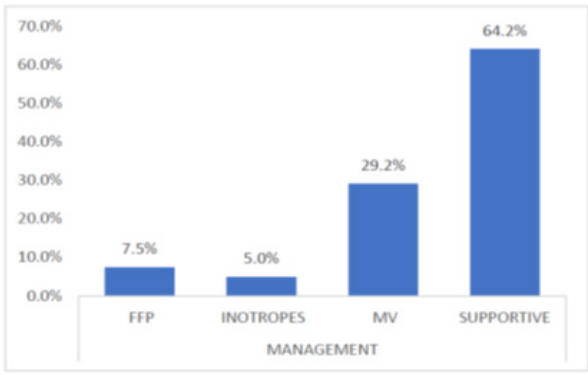


Figure 8: Management Strategies for Patients

Discussion

Our study revealed that poisoning is predominantly noted in younger patients, with more than half (55%) of the cases being individuals under the age of 30. This is consistent with prior research indicating that younger populations are particularly susceptible to acute toxic exposures, often driven by behavioral and lifestyle factors.[9] A previous study similarly found that the majority of poisoning cases occurred in individuals under 30 years of age, supporting the finding that younger adults are at a higher risk due to factors such as experimentation with substances or workplace exposures.[10] Similarly, gender analysis demonstrated that male patients accounted for 60% of the cases, a trend also noted in a previous study which reported a male predominance (50.7%), with a significant proportion of cases (47.8%) being in the 21-30 age group.[11] This aligns with the observation in our study that males are more likely to engage in risky behaviors, including alcohol consumption, pesticide exposure, and substance abuse.

The urban-rural divide is another important aspect highlighted in our results, with 71.7% of patients coming from rural areas. This finding emphasizes the disparities in healthcare access and environmental factors between urban and rural populations. Rural areas, in particular, are often at higher risk due to occupational hazards in agriculture or local industries, where exposure to chemicals such as pesticides is common. Our study's socioeconomic data show that a significant portion of patients belonged to middle to lower socioeconomic classes and had low educational attainment. These findings

are consistent with the idea that individuals from lower socioeconomic backgrounds face increased vulnerability to toxic exposure, often due to occupational hazards or limited access to preventive healthcare services. Poorer access to healthcare infrastructure and education in these populations likely exacerbates the risk of delayed diagnosis and treatment of poisoning cases.A similar study noted that among 278 patients, 36% were illiterate, indicating that low educational attainment could correlate with a higher risk of poisoning, as individuals may not fully comprehend the risks associated with certain substances or toxic exposures.[12]

Factors contributing to higher poisoning rates in this population include workplace stress, peer pressure, and limited access to adequate healthcare. People in lower socioeconomic strata are more likely to face challenges such as poor mental health, limited career opportunities, and exposure to toxic environments. Addressing these underlying social determinants of health could reduce the incidence of poisoning, particularly in vulnerable groups. Occupational risk factors were also significant in this study, with a high proportion of patients being farmers, followed by housewives and the unemployed. Farmers, in particular, face a higher risk of toxic exposure due to agricultural practices involving pesticides and herbicides. This aligns with findings from other studies, where farmers accounted for a substantial proportion of poisoning cases due to pesticide exposure.[13] This group also faces challenges related to the lack of proper safety measures in agriculture, further exacerbating the risk.

Substance abuse was another critical factor in our study. Alcohol consumption was present in 37.5% of the cases, highlighting its role in poisoning incidents, often in combination with other toxic substances. A previous study similarly reported that benzodiazepines, alcohol, and opioids were common toxic agents in their study, with poly-drug use being a frequent cause of poisoning.[9] Substance abuse not only increases the risk of intentional poisoning (e.g., suicides) but also contributes to accidental toxic exposures due to impaired judgment or recklessness.

Regarding the management of poisoning, our study found that treatment with atropine, a standard antidote for organophosphate poisoning, was the most commonly used measure while other antidotes like flumazenil and vitamin K were also used, but more sparingly. Our finding that the majority of patients only received supportive care and the mortality rate in our cohort was 26% emphasizes the need for better-equipped healthcare facilities capable of providing timely interventions such as antidotes, mechanical ventilation, and intensive care. This mortality rate also highlights the severe nature of toxic exposure and the limitations of current treatment protocols, especially in settings where resources may be scarce. Previous studies have reported similar mortality rates which are largely attributed to organophosphate poisoning.[14] The findings of our study call for a re-examination of treatment protocols, especially for patients with severe poisoning, to improve survival outcomes. Moreover, psychiatric evaluations conducted on patients revealed that impulsive disorder and adjustment disorder were very common diagnoses amongst our patients. This finding underscores the critical need for integrating mental health assessments into poisoning management, particularly given the high incidence of poisoning related to suicidal intent.

The primary limitation of this study lies in its cross-sectional design, which restricts the ability to draw causal inferences or evaluate long-term outcomes. Additionally, reliance on patient self-reports and medical records may introduce bias, particularly regarding substance use or the circumstances surrounding poisoning. Another limitation is the relatively small sample size for specific variables, such as rare toxins or complications, which may limit the generalizability of our findings.

Conclusion

This study underscores the significant public health burden posed by toxidromes, particularly in vulnerable populations. The findings call for urgent public health interventions targeting high-risk occupational groups, such as agricultural workers, and individuals with substance abuse problems. Educational campaigns that raise awareness about the risks of toxic exposures, along with better safety regulations and healthcare services, are crucial steps in mitigating the burden of toxidromes.

Further research is needed to explore the long-term effects of toxic exposure and to assess the effectiveness of preventive measures. Additionally, longitudinal studies examining the relationship between toxidromes, socioeconomic status, and chronic health outcomes are essential in shaping future public health policy.

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Ethical clearance: Provided by the Institutional Ethics Committee, Thanjavur Medical College (dated 20/7/2022, certificate no 999/2002).

Informed Consent: All patients in this study were enrolled after their full and informed consent which was provided by them after a study information sheet was read by/read to them.

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Original Article

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Readiness of Primary Health Care System to combat Non-Communicable Diseases at Coastal District of Andhra Pradesh

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Abstract

Background: Non-Communicable Diseases (NCD'S) kill 41 million people each year, which is 74% of all deaths globally. NCDs are estimated for 63% of all deaths in country, of which the cardiovascular diseases (27%) followed by chronic respiratory diseases (11%), cancers (9%), diabetes (3%) and others (13%). WHO offers guidance and aid to Member States to enhance NCD outcomes, advocating cost-effective measures for NCD prevention and management. It developed Package of essential non-communicable (PEN) disease interventions for primary health care in low-resource settings. These are cost-effective and can be delivered to an acceptable quality in resource-poor settings. GOI has launched National Program for Prevention and Control of Cancer Diabetes Cardiovascular Diseases and Stroke (NPCDCS) in the year 2010.

Objective: To Assess the accessibility of cardiovascular care infrastructure in primary level health care facilities.

Methodology: A cross-sectional study has been conducted among 38 Primary Health Centres (PHC) to assess their preparedness to handle NCD's using WHO - PEN criteria as standards, questionnaire was self-administered to Medical Officers (MO) at the facilities of district. Facilities were assessed for items and domains (equipment, drug supplies and laboratory services) with a main focus on management of hypertension and diabetes mellitus. Responses were collected from MO s and compared availability of an items across levels of primary care facilities.

Results: Only 62.5% of PHCs have a separate NCD clinic. Essential drugs dominate in all domains, with better availability in newly sanctioned PHCs, followed by equipment.

Conclusion: Primary health care facilities should gear up for comprehensive NCD prevention, early diagnosis, treatment, and management.

Keywords: Non communicable diseases, primary care, WHO-PEN.

Introduction

Non-Communicable Diseases (NCD'S) kill 41 million people each year, which is 74% of all deaths globally. NCDs pose a significant health challenge in country like India, and are contributing to a substantial portion of the country's disease burden.

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Cardiovascular diseases (CVD's), Hypertension, diabetes, cancer, chronic respiratory diseases account for over 80% of all premature NCD deaths**.** Lifestyle factors such as unhealthy diets, tobacco use, lack of physical activity play a pivotal role in the rise of NCDs. Of all NCD deaths, 77 % are in low- and middle-income countries[1]. In India Cardio-vascular diseases make up 29.6 % of male deaths and 25.8 % of female deaths, ranking among the top ten causes of mortality[2].

Among the age groups 30-69 Cardio Vascular Diseases constitute 36.3 % of cause of death in India[2]. India is facing the dual challenge of addressing infectious diseases while grappling with the increasing prevalence of NCDs, emphasizing the need for comprehensive public health strategies tailored to these diverse health concerns. To this as a response Government of India (GOI) has launched National Program for Prevention and Control of Cancer Diabetes Cardiovascular Diseases and Stroke (NPCDCS) in the year 2010, with focus on strengthening infrastructure, human resource development, health promotion, early diagnosis, management and referral[3]. This was renamed in 2023 as National programme for prevention and control of non-communicable diseases (NP-NCD)[4].

On the other hand, World Health organisation (WHO) offers guidance and aid to Member States to enhance NCD outcomes, advocating cost-effective measures for NCD prevention and management has designed a WHO Package of Essential Non-Communicable Disease (PEN) interventions to improve the coverage of appropriate services for people with NCDs services in primary care settings especially for low to middle income countries[5].

Table 1: Checklist for quick assessment of the facility[5]

Domain	**Observation points**
How are NCD's managed now?	Flow of patients in the facility, Where is BP taken How are NCD's managed?
What NCD's are covered? Patient care services	Is there a separate NCD clinic? NCD treatment guidelines available?
Staff	Dedicated staff for NCDs? Staff trained in NCD diagnosis and treatment?
Equipment	BP apparatus, Glucometer, weighing machine, height measuring tape
Laboratory services	Urine for albumin, sugar, ketones, blood sugar, cholesterol.
Medicines	Are essential NCD drugs available? (metformin, amlodipine, etc.)
Records and reports	Unique ID Number for patients separate NCD register? Computerized records?
Referral system	Nearest referral centers.

Table 2 WHO essential technologies and tools for implementing essential NCD interventions in primary care

Technologies	Tools:
Thermometer	WHO/IHD risk prediction chart
Stethoscope	Evidence based clinical protocols
Blood pressure measurement device	Flow charts with referral criteria
Measurement tape	Patient clinical record
Weighing machine	Medical information register
Peak flow meter	Audit tools
Spacers for inhalers	
Glucometer	
Blood glucose test strips	
Urine protein test strips	
Urine ketones test strips	
And when resources permit	
Nebulizer	
Pulse oximeter	
Blood cholesterol assay	
Lipid profile	
Serum creatinine assay	
Troponin test strips	
Urine microalbuminuria test strips	
Tuning fork	
Electrocardiograph (if training to read and interpret electrocar diograms is available)	
Defibrillator	

Health care delivery system in India is provided by both public and private sector system, public sector health services in India are organized as a three-tier hierarchical system, comprising primary (subcentres and PHCs), secondary (CHCs, taluka and district hospitals) and tertiary (medical colleges and teaching hospitals). At the primary level, a sub-centre (SCs) established to serve a population of 3000 – 5000, primary health centre (PHCs) for a population of 20 000 – 30 000, community health centre (CHCs) for a population of 80 000 – 120 000, CHC's acts as First Referral Units (FRUs)[6].

Research Gap: Non-communicable diseases (NCDs) are a major public health concern in India, yet there is limited region-specific evidence on the readiness of primary healthcare (PHC) systems in Andhra Pradesh to manage them. Most existing studies focus on tertiary care, disease prevalence, or specific interventions rather than a comprehensive assessment of PHC preparedness, highlighting the need for research to inform evidence-based strengthening of the system.

Need of the study: Given India's resource constraints, periodic assessments of the healthcare system are essential**,** the study aimed to evaluate cardiovascular care accessibility in primary healthcare facilities, focusing on NCDs like Hypertension and Diabetes, using the Package of Essential Noncommunicable Disease (PEN) Interventions criteria. This assessment emphasized understanding the facility's capacity and resources for managing NCDs.

Materials and Methods

Study setting:

Andhra Pradesh is an 8th largest state in India with 26 districts[7], holding a population of 8.64 crores, (as per 2011 census)[8]. Nellore District situated in the South Eastern portion of the state with a coastal length of 163 Km bounded by Bay of Bengal on the East with 10 CHC's, 2 area Hospitals and 54 PHCs.

The World Health Organization's Package of Essential NCD Interventions (WHO PEN)[5] outlines vital technologies necessary for low-resource settings. It includes a list of essential technologies and drugs crucial for primary care, prioritizing simpler tools that must be available and allowing for additional resources to expand capabilities. However, the WHO-PEN doesn't specify human resource needs or differentiate between levels of primary care facilities, focusing primarily on the necessary medical tools and medications.

The questionnaire has been categorized into five domains: Human resources, equipment, point-of-care supplies, laboratory-based tests, and drugs, focusing on hypertension and diabetes. The questionnaire

included four essential drugs for hypertension (ACEI/ ARB, Beta blockers, CCB, and Thiazide diuretics) and four commonly used drugs for diabetes (Metformin, Glibenclamide, Glimepiride, and Insulin). Responses were expected as Yes, no, or available in working condition not available. We grouped key facilities necessary for managing these conditions, aiming to assess the public health system's readiness. To ensure accurate reporting and protect participants from potential administrative consequences related to system deficiencies, we opted not to collect any personal identifiers (such as respondent names or facility names) for this study. Institutional ethics clearance was secured.

A cross-sectional study has been conducted among 38 primary health Centres (PHCs) in the district to assess their preparedness to handle NCD's using WHO – PEN[6] criteria as standards, questionnaire was self-administered to Medical Officers (MO) at the facilities of district. Facilities were assessed for items and domains (equipment, drug supplies and laboratory services) with a main focus on management of hypertension and diabetes mellitus. Responses were collected from MO s and compared availability of the items across levels of primary care facilities. The data was processed and analysed using Microsoft Excel to derive percentages and proportions.

Results

The facility-based assessment of PHC's is categorized into two main groups. The one category assesses readiness for handling diabetes, while the other evaluates hypertension management capabilities. Among the 38 PHC's surveyed, about 23 (60.5%) had NCD clinic separately. Twenty-eight (73.7%) PHC 's has computerised records of NCD patients. In equipment domain, sphygmomanometer is present in working condition in almost all PHC's. Minimum laboratory services for diagnosing diabetes i.e., glucometer is present in 76.3% of PHC's. 18.4% i.e., 7 PHC's reported that it is in not working condition (fig 2). and urine tests for sugar and ketone bodies are present in only 34 (89.5%) and 13 (34.2%) respectively (table 3).

Table 3: showing availability of laboratory services domain

Domain	Variable			Primary health centre
		Total (n=38)	Available (n)	Percentage (%)
Point of care testing supplies	Urinary protein	38	37	97.4 %
Laboratory tests	Urine ketone bodies	38	13	34.2%
	Plasma Glucose estimation	38	38	100 %
	Serum cholesterol/ lipid profile	38	0	0 %

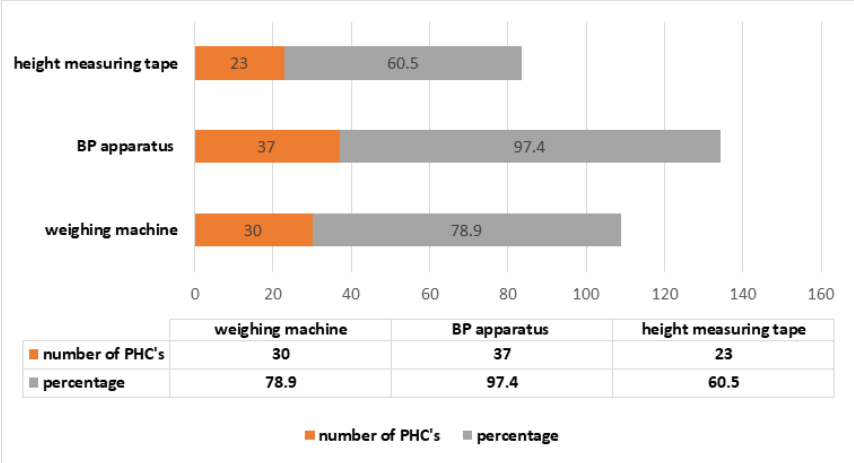


Fig 1 showing availability of basic equipment measuring BMI and BP

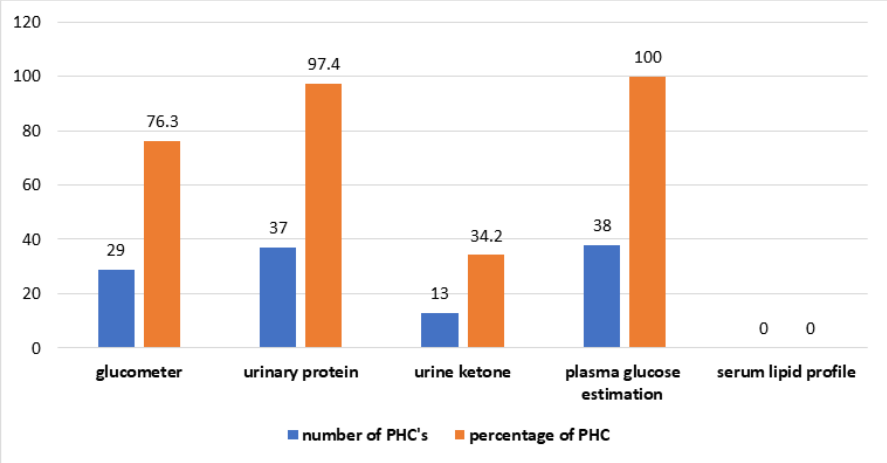


Fig 2: showing availability of laboratory services to diagnose any complications.

Table 4: showing the availability of drugs for HTN and DM in PHC

Domain	Variable	Total (n=38)	Primary health centre	
			Available(n)	Percentage (%)
Drugs for Hypertension	Beta blocker (atenolol)	38	38	100 %
	CCB (amlodipine)	38	38	100 %
	ARB's telmisartan	38	37	97.4 %
	ACEI enalapril	38	35	92.1 %
	Thiazide diuretics	38	29	76.3 %
	Furosemide	38	35	92 %

Domain	Variable			Primary health centre
Drugs for Diabetes mellitus		Total (n=38)	Available (n)	Percentage (%)
	Metformin	38	38	100 %
	Glibenclamide	38	22	57.9 %
	Glimepiride	38	38	100 %
	Insulin	38	26	68.4 %
	Any statin (Atorvastatin)	38	35	92.1 %

All facilities have drugs for both conditions, with metformin and glimepiride dominating the anti-diabetic medications (Table 4). Medications such as telmisartan, amlodipine, and atorvastatin instead of simvastatin (which is a core list medicine in statins as per WHO-PEN standards) are predominant across all forms, while thiazide drugs are less commonly present (Table 4).

This current study on facility assessment reveals strength in medicine availability and human resources but challenges exist with insufficient laboratory services. The study indicated that patients are frequently referred to larger facilities for basic lab services such as cholesterol and ketone bodies testing, putting strain on both tertiary care facilities and patients.

Limitations: This study is limited by potential response bias from medical officers and a sample size that may not be representative of the entire healthcare system.

Discussion

In order to achieve universal health coverage primary health care is the most cost-effective way

that every country can afford[9]. Long-term investment in evidence-based NCD prevention and control can enhance health system strength[10]. A systematic review on public sector capacity for Noncommunicable Disease prevention and control in twelve low- and middle-income countries, based on WHO-PEN standards, revealed readiness index scores ranging from 13.5% to 51% among countries[11]. The present facility assessment highlights significant deficiencies in essential components crucial for managing NCDs at the primary care level. Similar study done in Uganda found resource gaps in all facilities in screening and management of NCD services[12]. Primary health care centres exhibited greater deficiencies compared to CHCs in a similar study conducted in Madhya Pradesh[13].While human resources meet requirements in our study, laboratory services are insufficient to diagnose NCDs effectively, sustaining their adequacy and availability remains essential, and availability of necessary drug classes, equipment, supplies, and enhancing point-of-care testing capabilities needed. There is significant variability in in rural to urban facilities in a survey done by Krishnan et al[14] which raises concerns about quality of health services and health outcomes in rural areas, also raises questions about equity in health care access, our study was limited to only public facilities.

Conclusion

In conclusion, this assessment serves as a vital step in recognizing the existing gaps and provides a roadmap for targeted interventions and policy enhancements to strengthen the primary healthcare system's capacity in managing NCDs effectively. This study's findings should guide strategic planning and resource allocation to improve the readiness of primary health centres in combating the increasing burden of Non-Communicable Diseases. Regular evaluations of primary health centers are crucial to ensure they meet minimum standards in serving rural populations. Additionally, providing basic lab services at the primary health level can help reduce the burden of non-communicable diseases (NCDs). Changes are necessary to enhance adequacy and expand lab services appropriately to effectively address NCD's.

Consent to participate: Before conducting the facility assessment verbal informed consent was taken from the medical officers assuring them that their identity will be kept confidential. Necessary permission was taken from district administration.

Ethical approval: The research protocol for the study was reviewed and approved by the institutional ethical committee at Dr. Pinnamaneni Siddhartha Institute of Medical Sciences and Research foundation Gannavaram, Andhra Pradesh, India. With approval Number: PG/1057/24 .The ethical guidelines of our university were strictly followed

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Conflict of interests: None

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Original Article

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Reliability of Sofa (Sequential Organ Failure Assessment) Score for Predicting Morbidity and Mortality in Acute Pancreatitis in a Tertiary Care Center

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Abstract

Introduction: Severe pancreatitis can cause high mortality, and scorings are essential in assessing and managing it. We used serial Sequential Organ Failure Assessment (SOFA) scores in assessing patients with acute severe pancreatitis to predict severity, intensive care unit admission, and mortality.

Materials and Methods: Our study was a prospective, single-institutional review of 150 consecutive acute severe pancreatitis patients admitted to Coimbatore Medical College and Hospital from May 2019 to April 2020. Serial SOFA scores were calculated on admission, on days 2, 7, 14, and 21 of these patients.

Results: The serial SOFA scores correlated significantly with mortality. Highest SOFA score of 11 and mean SOFA score of more than 8 correlated to mortality of more than 80%. Analyzing the trends in the SOFA score, the mortality rate was around 50% when the score increased, 30% when it remained unchanged, and less than 25 % when it showed a decreasing trend. Mortality differences were better predicted by the first 48 hours SOFA score than in the subsequent 48 hours value. Prolonged hospital stay was associated with late mortality when compared with groups. When comparing other variables, the majority of pancreatitis was caused by alcohol consumption with high mortality observed in patients requiring organ support systems.

Conclusion: Changes in SOFA scores over time predicted the progression of organ failure, and escalating changes in SOFA score on hospital day 1 were subsequently associated with higher mortality rates. In our study, serial assessment of SOFA scores was found to be a cost-effective and easy method for predicting morbidity and mortality in acute pancreatitis patients.

Keywords: Sequential organ failure assessment, pancreatitis, mortality.

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Introduction

One of the most prevalent gastrointestinal disorders worldwide is acute pancreatitis. It is the most prevalent pancreatic disease in India and necessitates hospitalization. Pancreatitis is becoming more common worldwide[1].

Rapidly developing and exhibiting a wide range of clinical manifestations and severity, acute pancreatitis is an inflammatory condition. Worldwide, the incidence ranges from 4.9 to 73.4 cases per 100,000 people[1]. The symptoms of acute mild pancreatitis go away in about 79% of cases in a week. On the other hand, about 21% of patients experience necrotizing pancreatitis and severe pancreatitis with organ failure. Multiple organ failure and prolonged systemic inflammatory response syndrome are more likely to occur in these patients.

Three to four weeks after the start of the disease process, 30% of these patients experience increased morbidity and death as a result of secondary infections of necrosis[2]. Compared to moderate pancreatitis, the overall mortality rate for severe pancreatitis might reach 15% to 30%. Alcohol use is the primary cause of most cases of acute pancreatitis, but biliary aetiology accounts for the remaining occurrences of pancreatitis[3]. Acute exacerbations of chronic calcific pancreatitis are another reason that is specific to the Tropics.

Many grading systems have been created in recent years to help clinicians determine the degree of sickness in patients who have been admitted with acute pancreatitis. Clinical and biochemical characteristics served as the foundation for these rating schemes. Each of these rating schemes has advantages and disadvantages of its own.

It was determined that the scoring systems accurately measured the dynamic fluctuations in critical disease. APACHE (Acute Physiology and Chronic Health Assessment) II & III, Atlanta, Glasgow-Imrie, Ranson, BISAP (Bedside Index for Severity in Acute Pancreatitis), and SOFA (Sequential Organ Failure Assessment) score[5] are a few of these. The SOFA score was created in 1994 during a consensus meeting with the goal of developing a score that would quantitatively and objectively describe the extent of organ failure or malfunction over time in patient groups or even in individual individuals. The score was created to forecast results and characterize a series of consequences associated with critical illness.

The score was once known as the Sepsis-related OrganFailureAssessment[6], but its early recognition of its use in assessing acute morbidity in a variety of severe illnesses led to a modification in its name. It has been demonstrated that the SOFA scoring system performs better and was simpler to use. The respiratory (ABG / SPO_2), cardiovascular (mean arterial pressure), hepatic (bilirubin level), coagulation (platelet count), renal (serum creatinine), and neurological (Glasgow Coma Scale score) systems were evaluated using six distinct parameters that made up the SOFA score. Each parameter had a score between 0 and 4, with a higher score denoting worsening organ dysfunction. In resource-starved environments, the SOFA scoring system directs the effective use of resources[7]. The aim behind this approach is to determine the patient's fate based on the course of the disease and the use of the resources that are available.

This keeps all forms of care from being thrown on a patient who might not make it. In order to predict morbidity and mortality as well as the reliability of the SOFA score in patients with acute pancreatitis who were admitted to our Coimbatore Medical College and Hospital, this study was conducted.

Though there were studies on prognostic value of SOFA score in acute pancreatitis, there were very few studies measuring the utility of serial SOFA scores in predicting morbidity and mortality.

Sofa Score

Based on the level of malfunction in six organ systems, the Sequential Organ Failure Assessment (SOFA) Score predicts death. Using the worst metrics recorded over the previous 24 hours, the score is determined at admission and then every 24 hours until release.

Aims & Objectives

Aim:

To evaluate the efficacy and reliability of serial SOFA scores for predicting morbidity and mortality

of patients presenting with acute pancreatitis in Coimbatore Medical College and Hospital.

Objectives:

1. To assess the serial SOFA score.
2. To predict their correlations and their outcome in patients with acute pancreatitis.
3. To study the usefulness of SOFA score assessment in predicting mortality in acute pancreatitis patients.
4. To study mortality among mechanically ventilated patients and ICU admitted patients and its correlation with SOFA score.

Materials and Methods

This prospective study, which took place between May 2019 and April 2020, focused on patients who were admitted to Coimbatore Medical College and Hospital in Coimbatore, Tamilnadu (convenience sampling). 150 patients with acute bouts of acute pancreatitis were included in the study. Sample size calculated with 95% confidence interval and 5% margin of error. Acute pancreatitis was diagnosed using radiologic evidence (ultrasonography or computed tomographic scan imaging), clinical presentation, and laboratory test results. SOFA score calculated by 6 parameters as described.

Inclusion criteria:

All patients more than 18 years of age with acute pancreatitis.

Exclusion criteria:

Chronic pancreatitis

Pancreatitis from surgical complications

Traumatic pancreatitis

Pancreatitis due to surgical complications

Known CKD patients, COPD patients

Known liver disease patients

On admission, a detailed clinical history was obtained and a thorough physical examination was conducted. Prognostic stratification and classification was done based on the SOFA score. Information on clinical status, investigations, length of hospitalstay and intensive care unit stay, the kind of feeding, ventilator requirement and need for ionotropic support were gathered. A severity prediction based on the SOFA score was created and patients followed up. During follow-up, SOFA scores were calculated on day 2 and day 7. Day14 or 21 SOFA score added as available. Following discharge, patients with mild illness were monitored on an OPD basis for two weeks and three months. Serious cases were investigated based on their merits. When necessary, laparoscopic or open cholecystectomy was done for patients with biliary pancreatitis. Patients with alcoholic pancreatitis were advised to abstain from alcohol, and in certain situations, a psychiatrist assisted in the de-addiction process.

The characteristics of the patients, the cause of the pancreatitis, the organ support system that was utilized, and the ICU hospitalization were among the demographic data that was documented.

Observation and Results

IBM was used to examine the gathered data. Version 23.0 of the SPSS statistical software. For categorical variables, descriptive statistics such as frequency and percentage analysis were employed, whereas for continuous variables, the mean and standard deviation were employed. The unpaired sample t-test was used to determine whether there was a significant difference between the bivariate samples in the independent groups. The probability value of.05 is regarded as a significant level in the statistical instrument mentioned above.

Table 1: Age distribution

Age Distribution	Frequency	Percentage
21-30	58	38.7
31-40	73	48.7
41-50	17	11.3
51-60	2	1.3
Total	150	100

Mean ± SD = 34 ± 7 years

Table 2: Gender distribution

Gender distribution	Frequency	Percentage
Female	4	2.7
Male	146	97.3
Total	150	100

As seen in general population, there was male predominance in our series too.

Table 3: Etiology distribution

Etiology	Frequency	Percentage
Alcoholic	127	86.7
Biliary	8	5.3
Others	15	10
Total	150	100

The above table shows the Etiology distribution were 86.7% is Alcoholic, 5.3% is Biliary, 10.0%

Table 4: Use of Ventilator support distribution

Ventilator support	Frequency	Percentage
Absent	136	90.7
Present	14	9.3
Total	150	100

The above table shows the Use of Ventilator support distribution were 90.7% is Absent, 9.3%

Table 5: Ionotropic requirement distribution

Ionotropic support	Frequency	Percentage
Absent	123	82
Present	27	18
Total	150	100

The above table shows the Ionotropic requirement distribution were 82.0% is Absent, 18.0%

Table 6: Renal replacement therapy distribution

Renal replacement therapy	Frequency	Percentage
Absent	140	93.3
Present	10	6.7
Total	150	100

Table 7: ICU admission distribution

ICU admission	Frequency	Percent
No	121	80.7
Yes	29	19.3
Total	150	100

Table 8: Outcome distribution

Outcome	Frequency	Percent
Alive	141	94
Dead	9	6
Total	150	100

Table 9: Comparison of Average SOFA with Groups by Unpaired t-test

Group	N	Mean SOFA	SD
Dead	9	15	1
Alive	141	2	2

** Highly Statistical Significance at p-value-0.0005

Table 10: Comparison of SOFA with Groups by Unpaired t-test

Assessment day	Mmean SOFA, Dead	SD	Mean SOFA, Alive	SD	t-value	p-value
Day-1	15.2	1.1	5.1	2.5	11.983	0.0005
Day-2	14.1	1.3	2.1	2.1	16.873	0.0005
Day-7	14.2	1.4	0.7	1.1	33.893	0.0005
Day-14/21	14.2	1.4	0.3	0.6	29.745	0.0005

** Highly Statistical Significance at p < 0.01 level

A comparison of SOFA and groups using the unpaired t-test is displayed in the above table. The difference between SOFA at admission and Groups was extremely statistically significant, as evidenced by the t-value of 11.983 and p-value of 0.0005<0.01 in the comparison. The difference between SOFA at Day 2 and Groups was highly statistically significant, as evidenced by the t-value of 16.873 and p-value of 0.0005<0.01 in the comparison. The difference between SOFA at Day 7 and Groups was highly statistically significant, as evidenced by the t-value of 33.893 and p-value of 0.0005<0.01 in the comparison. 't' value=33.893, p=0.0005<0.01 in a comparison of SOFA at Day 7 with Groups indicates a very statistically significant difference between

SOFA at Day 7 and Groups. In a comparison of SOFA at Day 14/21 with Groups were 't' value=29.745, p=0.0005<0.01 which shows a highly statistically significant difference between SOFA at Day 14/21 and Groups respectively.

Discussion

Due to changes in guidelines and advancements in diagnostic and therapeutic approaches, particularly for patients with severe disease, the outcomes of patients with acute pancreatitis have improved over the past 20 years. Nonetheless, a 30% fatality rate is still linked to severe acute pancreatitis[8,9]. Timing determines the cause of death in individuals with acute pancreatitis: sepsis and its consequences cause late mortality, while SIRS leading to MODS typically causes early death[10]. Significant resources are needed for imaging, endoscopy, surgery, and intensive care unit treatment for patients with severe acute pancreatitis. The Coimbatore Medical College and Hospital served as the study's site. According to this study, men were more likely than women to have acute pancreatitis.

Our study's median age group was 35 years old, suggesting that younger people were more impacted. In our study with alcoholic preponderance, gallstones and alcohol were responsible for 93.2% of the cases of acute pancreatitis, which is comparable to Western developed nations. Etiology, however, had little effect on outcome[11]. This could suggest that the course and outcome of acute pancreatitis are unaffected by the pathogenic process. Patients with severe acute pancreatitis were included in this investigation. Our study's overall mortality rate was 11%, with the intensive care unit accounting for the majority of deaths (19%). Nine (6%) of these patients passed away in less than two weeks.

This could suggest that improvements in medical management have led to more successful treatment of early problems, which has decreased the rate of early mortality. Still, almost half of the patients experienced late mortality. More work should therefore be done to enhance the techniques for forecasting late death in patients suffering from acute pancreatitis. Physicians must have the ability to incorporate data into clinical decision-making because the grading systems are not always 100% accurate. Instead of dehumanizing the decision-making process, these scoring human systems let doctors stop depending on subjective, emotionally charged, and inaccurately calculated estimates. Like any other study, ours has certain limitations. Due to the small size of the research population, more extensive multicentric investigations involving a greater number of patients are required. Additionally, different scoring methods should be evaluated. In contrast to other scoring systems like APACHE, MODS, Glasgow, etc., the SOFA scores were determined at the time of admission and 48 hours later, on the 7th and 21st days. Ideally, they should have been tested every 24 hours to track the disease's progression.

Conclusion

In a concise, our study demonstrated a strong association between the use of SOFA score and mortality. Our study also demonstrated morbidity in association with prolonged hospital stay and use of organ support systems in severe acute pancreatitis patients. Our study divulged acute pancreatitis to be more common in middle-aged young men with alcohol predominance. The overall mortality rate was 11% in our study, with death occurring in the early week of admission. Thus, serial SOFA scores were shown to be reliable for guiding clinical decisions and 1 week is a reasonable time for SOFA score reassessment to predict late mortality in acute pancreatitis.

Although other scoring systems were available for predicting mortality in acute severe pancreatitis, the SOFA score was found to be cost-effective and an easier tool to apply with bedside clinical and easily available laboratory methods.

This study demonstrates that in patients with acute pancreatitis and SOFA score greater than 8 indicators of organ failure correlated with the development of systemic complications and mortality. Independent of the initial score, an increase in SOFA score during the first 48 hours predicted a mortality rate of at least 50%.

The SOFA score can be used as an important tool in defining both the clinical condition of the individual patient and the response to therapies in the context of clinical trials. This study conducted in Coimbatore Medical College and Hospitals showed the serial assessment of SOFA score is very useful in predicting morbidity and mortality in acute pancreatitis patients, since there is a significant correlation between the rise in the SOFA score and mortality in all stages of the disease.

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Original Article

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A Study of the Pattern of Ocular Morbidity Among the Elderly Residing in Old Age Homes in Sub-urban Areas of Ramanagara

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Abstract

Background: Ocular morbidity is a significant health issue affecting the elderly, impacting their quality of life, independence, and overall well-being. This study aims to assess the prevalence of ocular morbidity among 122 elderly living in four old age homes in suburban areas around Ramanagara, Karnataka, India.

Methods: A cross-sectional study design was employed, and detailed ophthalmic examinations were conducted using standard diagnostic tools. The results reveal a high prevalence of ocular diseases, with cataracts (52.5%) being the most common, followed by uncorrected refractive errors and presbyopia (35.2%), age-related macular degeneration (ARMD-12.3%), and glaucoma (9%).

Conclusion: The findings highlight the need for regular eye care services and comprehensive health programs to address the ocular health needs of the elderly in these communities.

Keywords: old-age, ageing, ocular diseases, morbidity, old age homes.

Introduction

The global population of elderly individuals is rapidly increasing, and with it, the prevalence of age-related ocular morbidities. According to the World Health Organization (WHO) the global population includes slightly over one billion older persons, making up approximately 13.5%, as of 2021. By 2030, it is projected that one in six individuals will be 60 years old or more.[1] In India, this demographic shift is especially notable, with the proportion of people aged 60 and above expected to double from 10.5% in 2022 to 20.8% by 2050.[2] Ocular morbidity in the elderly encompasses a range of conditions, including cataract, refractive errors, age-related macular degeneration (ARMD), glaucoma, and diabetic retinopathy. These

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conditions not only affect vision but also contribute to falls, fractures, decreased mobility, social isolation and cognitive decline in mental health and frailty (vision-cognitive impairment).[3,4]

In the past, elderly care facilities were primarily managed by nonprofit organizations and were intended for the impoverished and underprivileged. The middle- and upper-middle-class elderly who can afford to pay for care in old age have also been served by paid institutions in recent years.[5] In India, as the elderly population is growing, the sub-urban areas, particularly those around major cities, are witnessing a significant influx of older adults. Sub-urban areas often have limited access to healthcare services, including ophthalmic care, which can exacerbate ocular morbidity. Old age homes are increasingly becoming a common living arrangement for the elderly, especially those economically disadvantaged or lacking family support.[6] These institutions provide a unique setting to study the ocular health status and patterns of morbidity among the elderly.

Ramanagara, a district in Karnataka, India, has a few old age homes that cater to the elderly population. The present study aims to assess the pattern of ocular morbidity among elderly residents in four old age homes located in sub-urban areas of Ramanagara. The findings of this study can contribute to the development of targeted interventions and health policies to improve the ocular health of the elderly in these settings.

Materials and methods

A cross-sectional study was conducted to assess the pattern of ocular morbidity among 122 elderly residents of four old age homes in sub-urban areas around Ramanagara. The study was approved by the Institutional Ethical Committee (IEC) and informed consent was obtained from all participants.

Study population:

The study population consisted of 122 elderly residents (aged 60 years and older) from all four old age homes in sub-urban areas of Ramanagara.

Sample size:

There are four old age homes in the district. The elderly residing in all old age homes formed the sample size which is 122. Purposive sampling technique was employed.

Data Collection

Data collection was carried out over a period of six months from January 2024 to June 2024. Detailed ophthalmic examinations were conducted by a team of ophthalmologists. The examination included visual acuity testing, torch light examination of the anterior segment, intraocular pressure (IOP) measurement by digital tonometry, and dilated fundus examination. A semi-structured questionnaire was administered to gather demographic information, medical history, and lifestyle factors.

Statistical Analysis

Data were analysed using SPSS software version 20. Descriptive statistics were used to summarize the demographic and ocular morbidity data. Chi-square tests were employed to identify significant associations between demographic factors and ocular morbidities. A p-value of less than 0.05 was considered statistically significant.

Results:

Demographic Characteristics:

The study included 122 elderly residents from all the four old age homes with a mean age of 72.5 years (range: 60-91 years). The majority of the participants (76.2%) were female, and 65.6% were aged 70 years and older. The educational level of the participants was good, with 68.7% having attended school. Most of the residents (83.6%) had a sedentary lifestyle, and 52.5% had a history of chronic diseases, including hypertension and diabetes mellitus.

Ocular Morbidity

The most common ocular morbidity identified in the study was cataract, affecting 52.5% of the participants. Uncorrected Refractive errors and presbyopia were the second most prevalent condition, affecting 35.2% of the residents. Other common ocular morbidities included Age-related macular degeneration (ARMD) (12.3%), glaucoma (9.0%), and diabetic retinopathy (5.7%).

The visual acuity of the participants was categorized as follows: 45.9% had normal visual acuity

(6/9 or better), 11.5% had mild visual impairment (6/9 to 6/18), 38.5% had moderate visual impairment (6/18 to 6/60), and 4.1% were legally blind (worse than 6/60).

Association Between Demographic Factors and Ocular Morbidity:

The study found significant associations between certain demographic factors and specific ocular morbidities. Age was significantly associated with the prevalence of cataract (p = 0.029), uncorrected refractive errors and presbyopia (p = 0.0011), ARMD (p= 0.0003) and Glaucoma (p= 0.0004). Gender was not significantly associated with any ocular morbidity. However, educational level was significantly associated with uncorrected refractive errors (p = 0.0001) and glaucoma (p = 0.0004). Table 1 summarizes the significant associations.

Table 1: Significant Associations Between Demographic Factors and Ocular Morbidities:

Parameter	Category	Age in years				Gender			Literacy status		
		60-69	70-79	≥ 80	Total	Male	Female	Total	Literate	Not literate	Total
Cataract	Yes	11	43	9	64	18	46	64	42	22	64
	No	04	40	15	58	11	47	58	42	16	58
	Total	15	83	24	122	29	93	122	84	38	122
	P value	0.029				0.2353			0.4187		
URE[1]	Yes	06	22	15	43	11	32	43	11	32	43
	No	09	61	09	79	18	61	79	73	05	79
	Total	15	83	24	122	29	93	122	84	38	122
	P value	0.0011				0.7288			0.0001		
AMRD[2]	Yes	02	05	08	15	4	11	15	12	03	15
	No	13	78	16	107	25	82	107	72	35	107
	Total	15	83	24	122	29	93	122	84	38	122
	P value	0.0003				0.7528			0.3872		
Glaucoma	Yes	05	04	02	11	3	8	11	02	09	11
	No	10	79	22	111	26	85	111	82	29	111
	Total	15	83	24	122	29	93	122	84	38	122
	P value	0.0004				0.7217			0.0004		
DR[3]	Yes	02	03	02	07	2	5	07	05	02	07
	No	13	80	22	115	27	88	115	79	36	115
	Total	15	83	24	122	29	93	122	84	38	122
	P value	0.1075.				0.67			1.0000		

URE[1:] Uncorrected refractive errors and presbyopia

AMRD[2:] Age related macular degeneration

DR[3:] Diabetic Retinopathy

Discussion

The results of this study highlight the high prevalence of ocular morbidity among elderly residents in old age homes in sub-urban areas around Ramanagara.

Cataract was the most common ocular morbidity, affecting more than half of the participants. This finding is consistent with previous studies that have reported cataract as the leading cause of visual impairment and blindness in the elderly.[7] The prevalence of cataract was highest among those aged 70-80 years, which aligns with the natural progression of cataract formation with age.[8] It is observed that most of the patients had cataract in one eye and pseudophakia in the other eye. Patients were reluctant for cataract surgery on the second eye

in our study population if the Best Corrected Visual Acuity was better than 6/18 in the pseudophakic eye. Another study on the rural Chinese population made similar observations.[9]

Visual impairment (less than 6/18) was present in 42.6% of the total eyes in our cohort. One of the major studies in South India on the institutionalised elderly population in a rural area reported that visual impairment (VI) was present in 56.9% of the individuals. Over 80% of the VI was due to avoidable causes including cataract (57.1%) and uncorrected refractive errors (26.4%).[10] The same group conducted the study in an urban locality and reported that 52% of the elderly residents residing in old age homes had bilateral presenting Visual Acuity of 6/12 or worse, and nearly one-third had bilateral presenting vision worse than 6/18.[11] The prevalence of VI among senior citizens receiving residential care in Singapore and Australia, according to the <6/12 criterion, was 46.4% and 41.5%, respectively.[12, 13]

In India, the prevalence of refractive errors such as myopia and hypermetropia is 53.1%. Among individuals aged above 50 years, 10.2% experience visual impairment and blindness due to refractive errors, a figure significantly higher than the global estimate of 5.7%. Additionally, the study found that nearly one-third of adults in the country suffer from uncorrected presbyopia.[14] In our study, refractive errors and uncorrected presbyopia were the second most common ocular morbidity, together affecting one-third of our study participants.

This is a concerning finding, as uncorrected refractive errors can significantly impact the quality of life of the elderly. They spend their leisure time in near-work activities and it also results in lost productivity.[15] The higher prevalence of refractive errors among those with no formal education seen in our study suggests that educational level may influence access to and awareness of corrective lenses and glasses.

Older age is an independent risk factor for age-related macular degeneration (ARMD). ARMD is estimated to affect 1.4–3.1% of people living in India, and its prevalence is expected to increase in the years to come. [16, 17] 12.3% of our study population had ARMD changes. Out of fifteen individuals, ten of them had early ARMD and three elderly individuals who were suspected to have wet ARMD were referred to the base hospital, evaluated by a retina specialist, and the diagnosis was confirmed. A large population, hospital-based study in Maharashtra noted the overall proportion of ARMD to be 1.38%. (ARMD - 1.34% and late ARMD - 0.37%).[17] They evaluated individuals aged above 50 years, whereas we studied elderly more than 60 years. We also observed that age was significantly associated with the prevalence of cataract ($p < 0.001$) and ARMD ($p = 0.012$).

Glaucoma is the third most common cause of blindness in India but a leading cause of irreversible blindness. Nine percent of our participants had glaucoma, which varied from chronic simple glaucoma to neo-vascular glaucoma. The diagnosis was made at the base hospital after a complete evaluation. The previous research showed the prevalence of glaucoma in people forty years of age to be from 6.9% to 8.1%. Furthermore, as glaucoma and aging are closely related, the number of glaucoma patients would rise over time, especially given India's rapid demographic change. The National Program for Control of Blindness and Visual Impairment has up till now prioritized cataract blindness prevention. Effective measures must be taken to control glaucoma-related blindness in conjunction with the cataract-driven approach.[18]

Diabetic retinopathy (DR) affected 5.7% of our participants. A major study - SMART India population-based cross-sectional screening study estimated that national prevalence was 12.5% for diabetic retinopathy and four percent for Vision threatening DR, with no significant differences between urban and rural population.[19] Diabetic retinopathy is a serious complication of diabetes, and regular ophthalmic examinations are essential for early detection and management to prevent vision loss.

Educational level was significantly associated with uncorrected refractive errors and glaucoma, suggesting that educational interventions and health literacy programs may help in reducing the burden of these conditions

Chronic diseases, particularly hypertension and diabetes mellitus, were associated with a higher

prevalence of ocular morbidities. This underscores the importance of integrated health care services that address both systemic and ocular health issues. Regular monitoring and management of chronic diseases can help in reducing the risk of ocular complications.[20]

The high prevalence of ocular morbidity among the elderly in old age homes highlights the need for regular eye care services and comprehensive health programs.

Access to ophthalmic care is often limited in sub-urban areas, and the elderly in these settings may face additional barriers such as transportation, financial constraints, and lack of awareness. Mobile eye care units and community-based screening programs can play a crucial role in addressing these barriers and improving access to eye care services. Old age homes in Karnataka face a mix of financial challenges and support.Many facilities depend on government programs to help its elderly residents financially, such as the Indira Gandhi National Old Age Pension Scheme (IGNOAPS) and the state's Sandhya Suraksha Yojane (SSY). These programs seek to provide impoverished and destitute elderly people with a basic level of financial assistance.We also observed that organisations which depended on government aids had a higher magnitude of ocular morbidity than the private institutions.

Conclusions

There is a noticeable gap in data concerning the healthcare of elderly individuals residing in old age homes nationwide. Ocular morbidity is a significant health issue among the elderly, and the findings of this study emphasize the need for customary eye care services in old age homes in sub-urban areas. Cataract, refractive errors, ARMD, glaucoma, and diabetic retinopathy are common ocular morbidities affecting the elderly in these settings. Age, educational level, lifestyle, and chronic diseases are important factors influencing the prevalence of these conditions.The study has a few limitations. The study was conducted in a limited geographic area, which may affect the generalizability of the findings. Despite thelimitations, the study provides valuable insights into the ocular health status of the elderly in old age homes in sub-urban areas. The use of detailed ophthalmic examinations and a semistructured questionnaire ensures the reliability and validity of the findings.

Enhancing access to comprehensive eye care services, including corrective measures such as spectacles, surgical interventions for cataracts, and treatments for other ocular conditions, is essential to improve the visual health of elderly residents. Health policies and interventions should focus on improving access to eye care services, promoting health literacy, and encouraging physical activity among the elderly to reduce the burden of ocular morbidity.

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Ethical Clearance: The study is approved by the INSTITUTION ETHICS COMMITTEE (CDSIMER-IEC, Regn. ECR/1628/INST/KA/2021)

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Conflicts of interest: NA

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Original Article

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Cross Sectional Study on Association of Physical Activity with Nutritional Status and Quality of Life of Geriatric Population of Anand, Gujarat

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Abstract

Background: The elderly population experiences significant physiological changes. A reduction in the body's capacity to detect essential senses like hunger and thirst is a problem that people may encounter as they age. Being physically fit helps person to conquer many health-related problems, so finding association between them would help in future to guide and educate them about importance of Physical activity and nutritional status. This study aimed to find the correlation of physical activity with nutritional status and quality of life in geriatric population.

Methodology: This is a cross-sectional study including 200 people from Anand, Gujarat, India.

Result: The present study found statistically significant positive correlation in between Physical Activity Scale for Elderly (PASE) and Mini Nutritional Assessment scale (MNA) suggesting higher physical activity is associated with better nutritional status. The present study found statically significant positive correlation between PASE and WHO- Quality of life (WHO-QOL) Brief total score. Suggesting a higher physical activity is associated with better quality of life status in elderly.

Discussion and Conclusion: Geriatric people having high levels of physical activity and nutritional status show improved quality of life. Furthermore, this research emphasizes regular physical activity along with a balanced nutritional status should be inculcated in geriatrics for them to maintain good health.

Keywords: Geriatrics, Physical Activity, Nutrition, Quality of life, Physiotherapy.

Introduction

According to the United Nations (UN), a geriatric is defined as a person 60 years or older (UN, 2001). Engaging in regular physical activities helps maintain mobility and independence in old age; improves physical and mental functions; and reverses some effects of chronic conditions or diseases [1]. Simple

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exercises like walking can help to strengthen bones and muscles, manage weight, lower risk of diseases, and improve one's ability to do daily activities. [2]

Geriatric populations change significantly as they age. Physical activity is safe for both healthy older adults and those who are frail, with consistent participation in activities such as walking at low intensities to more high-intensity sports or resistance exercise reducing the risk of major cardiovascular disease, metabolic disorders, obesity, falls cognitive impairments osteoporosis, muscular weakness among others [3]. Clinicians, family members, friends can impact on older persons by encouraging them to increase their activities while minimizing costs but increasing enjoyment facilitating group-based exercises or enhancing self-efficacy towards exercise. A review found that the Physical Activity Scale for the Elderly is a widely used PA measure among community-dwelling older adults. [4]

Regular exercise has advantages that go beyond calorie balance and weight maintenance. Research conducted on ambulatory older adults revealed a positive correlation between poor nutritional condition and physical performance. [5]

One of the challenges of aging is a reduced calorie requirement. Unfortunately, this poses a problem for nutrition. The number of calories a person needs daily is contingent upon many factors: height, weight, muscle mass, activity level, and so on. While taking in fewer calories, the elderly have to get as much if not more of some specific nutrients. Fortunately, this can be achieved by eating whole foods and supplementing. A decline in the body's capacity to detect essential senses like hunger and thirst is another problem that people may encounter as they age. Your risk of dehydration and unintentional weight loss may increase as a result. And these consequences might be more severe with increasing age.[6]

Older adults consume fewer calories than younger people due to the tendency of older adults to move and exercise less and their lower muscle mass, therefore they require nutrient dense foods to maintain their daily allowance. The importance of eating a variety of whole foods, including fruits, vegetables, fish, and lean meats, for older people is heightened as a result.

Progressive physiological decline may impair one's capacity for doing an array of tasks, which can have a negative effect on one's quality of life. Studies in the past have clearly shown how the respiratory system's capacity decreases with age and the effect that regular physical activity has on this reduction. [7]

Over the past few years, policymakers and healthcare professionals have become more aware of the need to increase the physical activity of older adults. The data indicates that enhancing older patients' physical capabilities, lifestyle choices, and quality of life may support resilience-building and healthy aging. In epidemiologic studies, a practical and popular method for assessing physical activity is the use of a physical activity questionnaire. PASE was first created in the early 1990s as a tool for investigating primarily older individuals through an age-specific physical activity questionnaire. [8]

WHO defines Quality of Life as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns [9].

Aims:

To find the correlation of physical activity with nutritional status and quality of life of geriatric population.

Objectives:

Primary objective

To correlate physical activity with quality of life and nutritional status in geriatric populations

Secondary objective

To find the association between physical activity with gender, number of meals/ day, and presence and absence of Hypertension, Diabetes Mellitus and Osteoarthritis of knee.

Need of the Study

Physical activity, quality of life and nutritional level are one of the important aspects of life. Being physically fit helps person to conquer many health-related problems. Geriatric is vast field and there still is lack of data available especially when talking about Indian context. So, this study intends to provide the

data regarding Physical activity and its correlation with quality of life in addition with nutritional status. This would help in the future to guide and educate elderly about importance of Physical activity and nutritional status.

Methods:

Study Design: Cross-sectional Observational study

Sample Size: The sample size was calculated using the formula for estimating proportions in a population, considering a 10% prevalence of the geriatric population in Anand, a 95% confidence level (Z = 1.96), and a 5% margin of error, resulting in an initial sample size of 138. After applying the finite population correction, the adjusted sample size was 137, which was further increased to account for a 10% non-response rate. To enhance the study's power a final sample size of 200 was considered appropriate.

Sampling Method: Convenient sampling

Study Setting: Department of Physiotherapy, Shree B.G. Patel College of Physiotherapy, Anand and Anand District.

Study Duration: 3 months

Eligibility Criteria

Inclusion criteria:

- Geriatric population in the age group of >60 years with/without comorbidities like osteoarthritis, diabetes mellitus and hypertension, and those having stable vital parameters
- Geo graphically- Anand district.

Exclusion criteria:

- Inability to provide consent form
- History of recent fracture (last 6 months)
- History of any recent cardiac or pulmonary surgery (last 6 months).
- History of any recent surgery (last 2 months).
- Known case of psychiatrist disorder
- Lower limb amputation at any level
- Known case of neurological complications.

Outcome measures:

Pase (Physical Activity Scale for Elderly)

The Physical Activity Scale for the Elderly (PASE) is a short and easy to score (5 minutes) instrument made specifically for measuring physical activity in epidemiologic research among individuals aged 65 years and over. [4]

World Health Organaization Quality of Life Scale (WHO-QOL)

A 26-item WHOQOL-BREF questionnaire with four groups, namely physical health (7 items), psychological health (6 items), social relationships (3 items) and environmental health (8 items) and also includes some QoL and general health questions. [10]

MNA (Mini Nutritional Scale)

The total score of the MNA differentiates between old people consisting of: 1) adequate nutritional status (MNA > or = 24); 2) protein-calorie malnutrition, (MNA < 17); 3) at risk of malnutrition (MNA between 17 and 23.5). [6]

Procedure:

Subject were taken from Shree B. G. Patel College of physiotherapy, and from the community setting in Anand District. 249 people were assessed out of which 200 met eligibility criteria. The purpose and procedure of the study was explained to each patient. Written consent was taken prior to the study from each patient. Finally, data processing and analysis was carried out to create an inference.

Statistical Analysis

All the statistical analysis were performed in IBM SPSS statistic v-26. Shapiro-Wilk test was used to assess normality of data. Data are represented in the form of mean and standard deviation for parametric data and median and IQR for non-parametric data. Spearman Ranked test was used to find correlation between variables. Independent sample Mann-Whitney U Test was used for analysis of categories of Gender, presence or absence of Hypertension, Diabetes mellitus and osteoarthritis.

Result

Observation of 200 patients were taken. All the observation were taken by a qualified and experienced physiotherapist.

Table 1: Demographic data

Number [b]		200
Age [c]		68 (64-72)
Gender (Male) [b]		97
Hypertensive [b]		122
Diabetic [b]		67
Osteoarthritis [b]		109
Meals/day [c]		2 (1-2)
MNA [c]		24 (22-26)
WHO-QOL Brief [c]	Physical Health	60 (53-71)
	Psychological Health	62 (54-70)
	Social Health	75 (66-83)
	Environmental health	68 (59-75)
	Overall health score	75 (62-75)
PASE		257 (250-265)

(MNA- Mini Nutrition Assessment Scale, WHO-QOL Brief- WHO Quality of Life Questioner brief, PASE- Physical Activity Assessment Scale for Elderly)

[a]- Normally distributed Data, [b]- Data expressed as (number), [c]- D Data expressed as (Median and IQR_{1-3})

The data did not adhere to a normal distribution, as found using Shapiro-Wilk test. Our data consisted of 200 individuals with mean age of 68.4, amongst them 97 were males. As can be seen in Table 1, amongst 200 people, 122 had hypertension, 67 had diabetes mellitus and 109 had osteoarthritis. And on average they had 2 meal per day. Their average Mini Nutrition Assessment Score was 23.86, overall average WHO-QOL was 71, and average PASE sore was 262.

Table 2: Association of PASE with different variables

Variables		**Correlation coefficient**	**P-value**
Age [s]		0.074	
Gender [u]			0.635
Meals/day [s]		0.092	
Hypertensive [i]			0.122
Diabetic [u]			0.006*
Osteoarthritis [u]			0.001*
WHO-QOL Brief [s]	Physical Health	0.235**	
	Psychological Health	0.410**	
	Social Health	0.254**	
	Environmental health	0.456**	
	Overall health score	0.250**	
MNA [s]		0.222**	

[u] - Independent sample Mann-Whitney U Test;

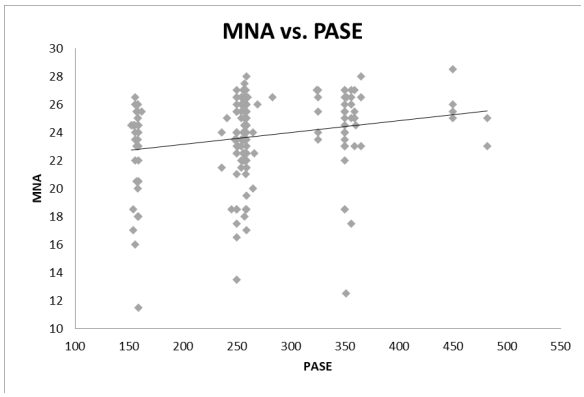
[i] -Independent sample Kruskal-Wallis test;

[s] - spearman's ranked test; MNA- Mini Nutrition Assessment Scale, WHO-QOL Brief- WHO Quality of Life Questioner brief, PASE- Physical Activity Assessment Scale for Elderly.

#-Significant association,

*- significant correlation at α value 0.05,

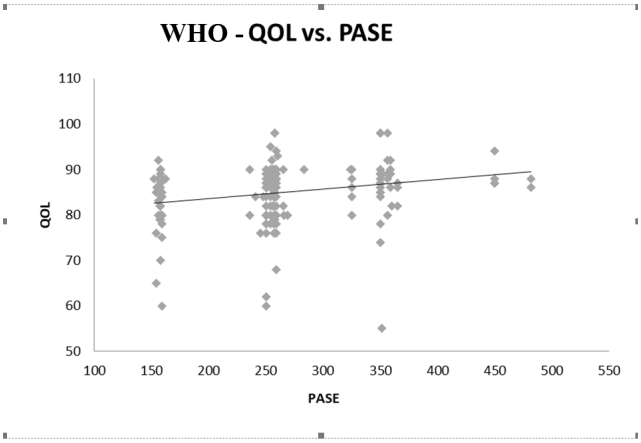
**- significant correlation at α value 0.01.



MNA – Mini nutrition assessment scale; PASE - Physical Activity Assessment Scale for Elderly

Figure 1: Scatter plot graph of PASE vs. MNA

The present study found statistically significant positive correlation in between PASE and MNA with correlation coefficient value of 0.222, as can be seen in Table - 2. Suggesting a higher physical activity is associated with better nutritional status which is depicted in scatter plot diagram in Figure 1.



WHO - QOL - WHO Quality of Life Questioner brief - PASE - Physical Activity Assessment Scale for Elderly

Figure 2: Scatter plot graph of PASE vs. WHO - QOL

The present study found statically significant positive correlation (Correlation coefficient=0.250) between PASE and WHO-QOL Brief total score as can be seen in Table - 2. Suggesting a higher physical activity is associated with better quality of life status in elderly which is depicted in scatter plot diagram in Figure 2.

The present study also found that non diabetic and elderly without osteoarthritis had better physical activity compared to elderly with diabetic; and osteoarthritis with p value of 0.006 and 0.001 respectively.

Discussion

A study shows that the Japanese population with mean age of 73 had mean PASE value of 155 and the Canadian population with mean age of 75 had mean PASE value of 174 which is much lesser compare to the present study population with mean age of 68.4 and mean PASE value 257. [11]

Many of the age-related health issues can be avoided or delayed by exercising regularly. Additionally, regular exercise supports muscular growth so that you may continue carrying out daily tasks independently. Physical activity may strengthen the bones and muscles, help to maintain a healthy weight, increase the ability to carry out daily tasks, and improve cognitive health. [11]

Yves Guigoz et al. (2011) in their study on nutrition, health, and ageing, reported that the mean score for the nutritional assessment was 24, which is almost similar to the mean score for this study, which was 23.67. Age-related bodily changes increase vulnerability to nutritional deficiencies, which can negatively impact all facets of health, including physical, mental, and social wellbeing. As age increases, maintaining a healthy weight and giving body the correct nutrition can help to stay independent and active. Additionally, it can aid in reducing or even preventing the symptoms of long-term illnesses like diabetes or heart disease. [12]

In study conducted by Venu R. Shah, et al (2017) a mean WHO-Quality-of-Life score of physical health, psychological health, social relationships, and environmental health was found 64.9, 66.2, 69.4 and 57.6 respectively, which is similar to our study. Quality of life is crucial to elderly because it gives a reason to keep going rather than just giving up and accepting their fate. [13]

This study showed positive correlation (r = 0.250) between physical activity and QOL. According to the study, Lakshmi Prasad, Et. Al. (2021), in India the correlation between physical activity level and WHO-QOL total score was (r = 0.315) which is similar our study. [14] Showing was a positive correlation of QOL with physical function and physical activity level. Older adults prefer QOL compared to longevity. Rétsági *et al*. [15] and Puciato *et al*. [16] in their study among older adults reported a positive relationship between physical activity level and QOL. The common side effects of aging can be reduced by increasing physical activity which would reduces risk factors and also delays the onset or decreases the side effects of aging and improves QOL. [17]

This study showed positive correlation (r = 0.222) between nutritional status and physical activity. Aging is a complex process of physiological and social changes that leads to disease, disability, and the lower experience of happiness. Positive correlation was also found between MNA and PASE

score (r=0.31, p<0.01) in one study. [18] In a simple term, malnutrition is associated with a poor diet or deficiency of micronutrient which results in reduced levels of physical activity. Physical activity increases the need for some vitamins and minerals. A well-balanced diet will supply enough vitamins and minerals to cover any increased need due to activity.

Our study found that individuals without osteoarthritis and/or diabetes mellitus exhibited higher levels of physical activity compared to those with these conditions. The reduced physical activity in individuals with osteoarthritis can be attributed to pain during weight-bearing movements, leading to decreased mobility. Similarly, diabetes mellitus is associated with various complications which may further limit physical activity. These findings highlight the significant impact of musculoskeletal and metabolic disorders on physical activity levels in the geriatric population, underscoring the need for targeted interventions to promote mobility and overall well-being in affected individuals.

Conclusion

The findings of this study show a positive correlation between physical activity and the quality of life as well as nutritional state for geriatrics. Also, older adults have an improved overall quality of life when they have high levels of physical activities and nutritional status. Furthermore, these research results emphasize on making a habit where old people should exercise regularly to maintain good health.

Given the growing evidence of the benefits of physical activity for older individuals, there is need for future research to explore the mechanisms behind this relationship, and examine how different types and intensities of physical activity impacts various aspects of health in elderly population. In addition, if put into practice; this information will help in designing interventions which can be used in order to enhance the wellbeing among old people through promotion of exercising.

Limitation of the Study

- The data was only taken from Anand / Gujarat/India.
- Due to lack of resources only 200 peoples were included in study.
- Co-morbidities can be individually analysed amongst varies groups which would show detailed correlation.
- Nutritional status using biological markers could not be assessed.
- All the data taken are based on subjective memory, and are at risk of biases.

Future recommendation:

- Future study should include various geographical areas of India.
- Larger sample size must be taken.
- Individual variables that can affect nutritional status must be kept under consideration.
- Biological markers for nutritional status should be used for actual nutritional status.

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Original Article

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Exploration of Factors Affecting Quality of Life among Frontline Health Workersin a Federal Government Hospital in Nepal

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Abstract

Background: Quality of life is a vital component of human well-being, especially for frontline health workers who serve as the primary point of contact for healthcare delivery. Understanding their job satisfaction and its influence on their quality of life is crucial for effective health system functioning.

Methods: This exploratory qualitative study assessed the quality of life of frontline health workers in a federal-level government hospital in Nepal. Twenty participants were purposively selected, with the sample size determined by information saturation. Face-to-face key informant interviews were conducted, audio-recorded with informed consent, and analyzed using thematic analysis with the RQDA package in R. Ethical approval was obtained from the Nepal Health Research Council, and administrative approval from the Ministry of Health and Population.

Results: The study identified poor quality of life among frontline health workers across four domains. In the physical domain, issues such as chronic back pain, varicose veins, and gastritis were linked to long-standing duties and demanding schedules. Psychological challenges included poor mental health and stress. Social and environmental issues highlighted group conflicts, workplace political influence, lack of motivation, and a growing trend of brain drain among health workers.

Conclusion: The findings advocate for strengthened workplace policies, including reasonable working hours, adequate staffing, attractive pay scales, and supportive work environments, to improve the quality of life of frontline health workers. Addressing these issues is critical for fostering job satisfaction and ensuring a resilient healthcare workforce.

Keywords: Frontline health workers, Quality of life, Factors

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Introduction

Quality of life is an individual's perception of their position in life in the context of the culture and value systems in which they live.[1] Quality of life consists of different dimensions including work environment, organizational culture and climate, relationships and cooperation, training, compensation rewards, facilities, job satisfaction, job security, the autonomy of work, and resources which can affect the effectiveness and performance of the organization. Well-satisfied employees with high quality of life can make their organization successful.[1] Frontline health workers are the point of contact, the main components of WHO building block of health system and deliver a range of life saving interventions to prevent illness, death and disability.[2,3] One of the study done in Nepal revealed 48% of nurses reporting low quality of life. [4] Addressing the challenges faced by frontline health worker is essential for improving health outcomes. A high quality of work life (QWL) is crucial for an organization's ability to attract and retain employees. Numerous studies have shown that quality of life has a positive effect on various organizational and personal components, such as employee commitment and organizational effectiveness. On the other hand, quality of work life has a negative correlation with turnover, absenteeism, resignation, and work-life conflict. These insights emphasize the critical role of QWL in shaping organizational dynamics and individual experiences within the workplace.[5]

Thus, the current study aimed to explore the factors affecting physical, psychological, social and environmental) domain of quality of life among the frontline health workers working in the selected government hospital of federal level.

Material and Methods

Study Design and Settings

This is a qualitative study performed among the frontline health workers working in the selected government hospital of federal level in Nepal using inductive approach.[6] This study is a part of mixed method study conducted in federal level hospital in Nepal. Twenty respondents based on the theory of data saturation were chosen purposively from the 440 sample size of quantitative study.[7] Repeated information was received after the fifteen interviews and no new information was generated when reaching twenty interviews and this point of information saturation was decided as total sample size for the study. The study covered the frontline health workers of selected federal-level hospitals under the Ministry of Health and Population of Nepal. The duration of data collection was4 months commenced from 2024/5/1st -2024/8/30th

Ethics

Approval of the study was taken from the Institutional Review Committee of Nepal i.e., Nepal health research council ref no: 13X9. Approval for conducting the study was taken from MoHP in accessing federal level hospitals. Written Informed consent was obtained from all participants before proceeding to data collection. Principal investigator conducted all interviews and one co-investigator took a field notes of the interviews.

Inclusion and Exclusion Criteria

Front line health workers of federal level hospital under MOHP, were included in the study. Front line health workers in the given study are those who are directly involved in patient care. Those are Doctors, Nurses and Health Assistant, pharmacist and lab technician. Those participants who were in long term leave were excluded from the study. Those residents' students and other medical student working as frontline workers were also excluded from the study.

Data Collection and Analysis

Data was collected through face-to-face interview techniques using semi structured interview guide. Member checking was done with two respondents after the interview The audio recording was transcribed in Nepali language and then translated to English in a text file. Thematic analysis was done using the RQDA package of R-software, enabling a detailed exploration of key codes and themes.[8]Coding was done by two independent coders and intercoder percentage agreement was computed which was 79%. The detail explanation of codes and themes along with verbatim were presented in word file after coding was done in RQDA software.

Results

The findings were summarized in four themes as per the objectives of the study. The four themes include the domains of Quality of life according to WHO.[4]

A. Physical domain

B. Psychological domain

C. Social relationships, and

D. Environmental domain

A. Factors affecting physical domain of quality of life

The findings showed different factors affected the physical domain of quality of life. The following codes highlights the findings:

Workplace Hazards

The study revealed that workplace hazards, such as poor ergonomics, biosafety risks, and waste management issues, significantly impact the physical health of frontline health workers, leading to strain, increased risk of infection, and hesitancy in performing high-risk procedures.

Respondents revealed that *KII 5–''Many patients, including those infected with various diseases and geriatric patients in the final stages of life, come to us, bringing a range of illnesses, and in such situations, we also feel fearful of visitors.''*

Respondents were concerned about the risk of bio hazards causing different physical disease. *KII 20 – ''Positive samples do possess some occupational hazards.''*

Physical Problems in Health

Respondents working in the frontline highlighted about the increase in threats of physical challenges, including back pain, varicose veins, fatigue, leg pain and gastric issues are common due to long shifts, standing for extended periods, and high patient volumes. *KII 22 – ''standing for long periods often lead to back pain. Headaches caused by the chaos are also common''*

KII 11 –''We often don't have time to eat, and we experience pain in our legs, back, and particularly gastric issues. Leg pain has become a major physical health problem, causing significant challenges''

Nature of Job

Long standing duty hours in both day and night shift contribute to physical exhaustion and irritability, which negatively affect the physical health leading to different somatic symptoms in frontline health workers and ultimately affecting physical quality of life.

One of the respondents revealed that KII 14 –''We can't differentiate between night and day and must be on call at all times. We neither get to sleep nor eat as humans are meant to, and this affects not only our physical health but also our mental well-being''

B. Factors affecting psychological domain of quality of life

Psychological domain is very crucial and an important aspect of mental health. To improve the quality of life for frontline health workers, it is essential to address factors such as insufficient salaries, lack of allowances, and inadequate motivational support. This study shed a light on different factors affecting the psychological health of frontline health workers.

Insufficient Salary

One of the respondents stated that; *KII 6 - "Although the salary is provided by the Nepal government, it seems insufficient considering the rising cost of living. It feels like it's not enough to keep up with inflation''.*

Supportive work environment, fair compensation, recognition, and adequate facilities play a significant role in enhancing mental well-being and job satisfaction. But the study revealed dissatisfaction on the wages, allowances provided to them

Lack of Rewards and Appreciation
Good incentives, recognition for the work, and praise for staff can serve as motivating factors which is lacking in the health care services as revealed by the study.

Work Pressure

One of the respondents revealed that *''Heavy workloads, such as one staff member managing an entire ward, create immense pressure. Long duty hours and the inability to take holidays due to staff shortages leave no time for refreshment''*

Stress

Stress in the workplace is driven by insufficient staffing, long hours, and high-pressure conditions which directly affects the psychological domain of quality of life.

Intimidating Situation

The finding revealed that frontline health workers face intimidating situations such as workplace violence, high-stakes decision-making, resource constraints, and ethical dilemmas, which can severely impact their mental health.

KII 8 – ''*We often feel unsafe in our workplace, approximately 50% of the time. At times, patients misbehave with us, threaten us, or even cause physical harm. The uncertainty of what might happen during a shift is genuinely frightening''*

C. Factors affecting social relationship domain of quality of life

Frontline health workers focused the importance of a healthy work environment related to social relationship to maintain their well-being and uphold their job responsibilities.

Administrative Issues

Respondents pointed out that administrative issues often lead to mental stress, underlining the need for fair treatment from hospital management. When the administration treats its workers equitably, it has a positive effect on social relationship, directly enhancing their quality of life.

KII 19 – ''Issues with administration can also cause mental stress. For instance, if there's a technical error in the attendance system and an employee is marked absent, the administration often refuses to understand the issue. Sometimes, even the smallest matters are blown out of proportion by the administration''.

Senior Superiority Complex

The study highlighted about the behavior of senior staff, showing that excessive pressure or negative behavior from senior staff can lead to poor mental and social health outcomes for juniors, a problem that worsens when supervisors fail to collaborate with subordinates in creating duty schedules, further contributing to workplace stress.

The interplay between administrative fairness, supportive leadership, and cooperation among staff members is essential to maintain social relationship thus safeguarding the mental health and overall quality of life of frontline healthcare workers.one of the respondents revealed that; *KII 9* **– ''***Another factor is the behavior of the in-charge or supervisor. When we are not treated appropriately, we feel stressed. When we need leave and it is denied, it severely impacts mental health. Therefore, supervisor plays a very important role in this situation as well''.*

D. Factors affecting environmental domain of quality of life

Environmental health plays a crucial role in maintaining and promoting quality of life of frontline health worker by addressing various factors that directly impact their well-being.

Limited Resources

The study revealed that limited resources often hinders efforts to improve healthcare infrastructure and access, leading to disparities in quality care. A lack of training among healthcare workers has exacerbated this issue, leading to inadequate knowledge and skills and compromising workplace safety and the effectiveness of care as reveled by the study.

KII 5 – ''This is concerning because we are dealing directly with patients' lives, and such gaps in training should not exist. The lack of training is one issue''.

Lack of Job Security

The findings revealed inconsistency in tenure among healthcare staff resulting in a lack of continuity, affecting patient outcomes. Due to the lack of job security, there is high turnover among health workers ultimately increasing work load and diminishing the environmental quality of life.

One of the respondents revealed that; *KII 11 – ''Taking leave is difficult, and when we face problems, it's hard to get time off when needed due to the staff shortage. Additionally, we are required to work 6 to 7 hours straight, handling over 500 patients a day''*

Political Influence

Political influence and instability add another layer of complexity, as decisions driven by political

agendas can create delays in implementing essential policies are main contributing factors for quality of life as revealed by the study. Respondent revealed that; *KII 13 – ''The hospital environment is highly politicized, with people often claiming connections to higher-ups and demanding priority. Having to focus solely on such individuals affects us significantly''* The participants highlighted the importance of workplace safety, recognizing its impact on job stability, professional satisfaction, and overall quality of life.

KII 3 – ''The challenges we face are primarily related to training opportunities and promotions. These issues, like many others, are heavily influenced by the political scenario. Achieving improvements across all sectors requires political stability''.

Unsafe Work Environment

The respondents in the study raised concerns about the unsafe work environment, struggling to adapt to a negative atmosphere, and fearing the potential effects of physical assault occurring in work place with fear and distress.

KII 14 -"Some individuals seem to take pleasure in others' misery, and incidents of physical assault or threats by visitors occur frequently".

Respondents also identified several issues in their workplace, such as unequal opportunities, gender-based violence, long working hours, and job insecurity, all of which negatively affected their mental well-being. *KII 22 – ''Poorly managed duty hours, the lack of adequate resting stations, high patient loads, and the stress of handling large numbers of patients further exacerbate these challenges''.*

Discussion

The current findings regarding factors affecting physical domain of quality of life revealed that workplace hazards, long shifts, and the demanding nature of frontline healthcare jobs contribute to physical health issues such as back pain, varicose veins, fatigue, and gastric problems, significantly impacting the quality of life of health workers. This finding aligned with other study stated that Healthcare personnel experienced seven times the national rate of musculoskeletal disorders compared with all other sector workers. It can directly affect the Quality Work Life of health professionals at and outside their workplace. The major influencing factors of Quality Work Life were unsuitable working hours, a lack of facilities for nurses and poor staffing.[9]

The study provided insight that insufficient salaries, lack of rewards, heavy workloads, workplace violence, and high-pressure conditions severely impact the psychological well-being of frontline health workers, highlighting the need for better compensation, recognition, and a supportive work environment to enhance their quality of life. The findings from another study align with this study, highlighting the workplace violence in healthcare systems. Healthcare personnel are 16 times more likely to experience violence than employees in other sectors. With nearly 25% of violent incidents, including physical violence, verbal abuse, and sexual harassment, occurring within healthcare settings. [10] This study further emphasized the multifaceted consequences that nurses face when subjected to workplace violence. The impact on their physical, mental, social, and professional well-being is profound, affecting not only their personal lives but also their work performance. These serious consequences affect both the safety of healthcare workers and the quality of care provided to patients, underlining the critical need for effective measures to address and prevent violence in healthcare environments. Similar study stated that, the health workers are exposed with various risky environment such as dealing with pandemic situation, contact with communicable disease, crisis of human resources, unsafe working environment while being encountered in conflict situation in day-to-day life while performing at the utmost role in workplace affecting quality life especially with psychological health.[11]The another study also revealed that poor psychological health in work place can lead the health workers working in the frontline to low self-esteem and depressive symptoms.[12]

The current finding explored that administrative issues, senior staff superiority, and lack of supportive leadership negatively impact the social relationships of frontline health workers, emphasizing the importance of fair treatment, collaborative management, and equitable workplace practices to safeguard their

mental health and quality of life. Similar finding with other study revealed that perceived workplace culture and supports contributed to symptom severity.[13] The above findings also aligned with the finding of Ethiopia which revealed the poor management and supervision practice among health workers. Management problems like inappropriate working conditions, job insecurity, and inadequate professional development are highlighted similar to the current study.[9]

The current study revealed that environmental factors such as limited resources, lack of job security, political influence, and unsafe work conditions significantly affect the quality of life of frontline health workers by creating barriers to training, increasing workloads, and fostering dissatisfaction with workplace policies, highlighting the urgent need for stable, supportive, and well-resourced healthcare environments. These findings aligned with other study stating that healthcare personnel experienced lack of professional development opportunities, and an inappropriate working environment in terms of the level of security, patient care supplies and equipment. It can directly affect the Quality Work Life (QWL) of health professionals (HPs).[9] By addressing key determinants such as access to adequate resources, workplace safety measures, including exposure to infectious diseases, physical hazards, and violence, and professional development opportunities, healthcare institutions can foster a supportive environment conducive to employee satisfaction and well-being.[14]

There are some limitations in the study. The sampling was done purposively from the list of health workers of federal hospitals, so the findings cannot be generalized to all health workers. The study do not provide a casual inference as it was intended to explore the descriptive phenomena regarding quality of life of health workers in the current situation.

Conclusion

Frontline health workers face significant challenges to their quality of life, including high stress, long hours, inadequate budgets, poor leadership, excessive workloads, and lack of recognition. Key issues such as unsuitable working hours, insufficient facilities, poor staffing, limited professional development, and unsafe work environments highlight the need for targeted interventions to address mental health concerns, enhance their quality of life, and curb migration for better opportunities.

Recommendation:

The study urged to provide insightful recommendation to implement targeted policies to improve working conditions, provide adequate resources, and support professional development to enhance the quality of life and retention of frontline health workers.

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Original Article

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Medical Students' Awareness of Third- And Fourth-Hand Smoking and its Implications: A Cross-Sectional Study

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Abstract

Context: Third-hand smoke (THS) is defined as a persistent smoke residue that sticks to dust and surfaces indoors and is then released back into the atmosphere, endangering public health. About two thirds of cigarette butts end up in the environment, which is known as fourth-hand smoke (FHS).

The purpose of this study is to gauge medical students' knowledge of the implications of third- and fourth-hand smoking.

Settings and Design: South Indian Medical College medical students

Methods and Materials: In the months of April through June of 2023, a cross-sectional study was carried out among medical students at a medical college in South India. The study covered all medical students who provided their consent. As it is Undergraduate college with 100 students each year, we decided universal sampling. The study participants completed a pre-made, semi-structured questionnaire via Google Forms, and their informed consent was obtained. Beliefs regarding THS were assessed using the Beliefs About Third Hand (BATHS) Scale.

Utilised statistical analysis: Frequency, percentage, mean, standard deviation, median, and interquartile range were computed using descriptive statistics.

Findings: Of the 360 individuals involved, only 35.6% (128) were aware of third-hand smoke, and only 23.3% (84) were aware of fourth-hand smoke. Of the individuals who were aware of THS, about 78 (60.9%) thought that children exposed to thirdhand smoke would first experience an acute respiratory tract illness, then asthma or wheeze. Out of 128 participants, 123 (96.1%) and 125 (97.7%) felt that smoking should be prohibited in homes and public areas, respectively.

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Conclusions: Since third-hand smoke has a negative impact on human health and was not well-known to medical students, efforts must be made to raise awareness among them. It is advisable to include instructional messages on third- and fourth-hand smoking in the medical curriculum.

Key words: Medical students, awareness, implications, third- and fourth-hand smoking

Introduction

Third-hand smoke (THS) is defined as a persistent smoke residue that sticks to dust and surfaces indoors and is then released back into the atmosphere, endangering public health.[1]

Although the term "third hand smoke" (THS) was first used in print in 2006, it wasn't until 2009 that it gained widespread recognition thanks to an article published in Paediatrics by Harvard Medical School associate professor of paediatrics Jonathan Winickoff and colleagues. In that study, the researchers found that perceptions about THS harming children were held by 65.2% of non-smokers and 43.3% of smokers, and that these beliefs were independently linked to the implementation of house smoking prohibitions.[2.]

Third-hand smoke is made up of the leftover pollutants from tobacco smoke that are either re-emitted into the gas phase after tobacco has been smoked, stay on surfaces and in dust after tobacco has been smoked, or react with oxidants and other substances in the environment to produce secondary pollutants. When tobacco is burned, improperly vented gas stoves produce nitrous acid, which reacts with the nicotine adsorbed onto surfaces to form tobacco-specific nitrosamines (TSNAs), such as 1-(N-methyl-N-nitrosamino)-1- (3-pyridinyl)-4-butanal (NNA), 4-(N nitrosomethylamino)-1-(3-pyridinyl) -1- -butanone (NNK), and N-nitrosonornicotine (NNN). There is some proof that NNA causes mutagenesis. The National Toxicology Program lists NNK and NNN as reasonably expected human carcinogens, while the International Agency for Research on Cancer lists them as human carcinogens. [2].

THS can infiltrate surfaces like furniture, drapes, walls, clothes, hair, and automobile upholstery in the form of ashes and dust.[2.] Up to two thirds of cigarette butts end in the environment, contributing to fourth-hand smoke.[3.] But the hazardous substances they contain are just as much of a problem as the waste's volume. Our streets, sewers, water, and sea are all ultimately contaminated by this hazardous waste,[4,5] leading to widespread contamination. Raising society's awareness of the issue could be the most significant response.

THS education initiatives for communities are expected to enhance the prevalence of smoke-free surroundings and hence reduce the possible negative health effects associated with THS exposure, according to a study that looked at THS knowledge levels. According to a study by Darlow et al., health professionals believed that smoking impacted the quality of parenting and stated that they did not smoke at home.[6] Their knowledge levels must also be greater than those of the general public. However, nearly two out of three participating health professionals in a worldwide study examining health professionals' understanding of THS were unaware of its existence, leading the authors to conclude that education should be made available. [7] Therefore, it is crucial to research our medical students' understanding of second- and third-hand smoking and its effects.

Aim & Objective(s) To estimate awareness of third- and fourth-hand smoking and its implications among our medical students

Materials and Methods

Study design and population

Between April and June of 2023, a cross-sectional survey of medical students at Government Theni Medical College in Tamil Nadu, South India, was carried out. Using the universal sample method, all medical students who gave consent were included in the study. As it is undergraduate college with 100 students each year, all were included in the study. Prior to the study commencing, clearance from the Institutional Ethical Committee was secured. The study participants completed a pre-designed, semi-structured questionnaire via Google Forms; informed consent was obtained from them prior to beginning the questionnaire, and participant anonymity was preserved.

Study questionnaire

Questionnaire was prepared to assess participants knowledge of third- and fourth-hand smoking. The Beliefs About Third Hand (BATHS) Scale was developed by Haardörfer et al.[9] to determine beliefs about THS. The survey consisted of two parts: evaluation of health effects (items 1,2,3,7,8); and permanence in the environment (items 4,5,6,9). Each item has a 5-point Likert-type response:1) Strongly disagree;2) Disagree;3) Not sure;4) Agree;5) Strongly agree.

Statistical analysis

The data was initially entered to Microsoft Excel 2010 and later the spreadsheets were used for analysis. Statistical analysis was done using statistical package of social science (SPSS trial version 20.0).

Descriptive statistics was calculated as frequency, percentage, mean and standard deviation, median and inter-quartile range. Descriptive data has been represented using various tables, graphs, diagrams etc.,

Results

The following findings were attained from the 360 students who provided consent for the current survey. Data were gathered using Google Forms. Merely 128 (35.6%) and 84 (23.3%) of the 360 participants were cognisant of third- and fourth-hand smoking, respectively. About 67 (52.3%) of the students who were aware of THS believed that exposure to THS would cause lung cancer, followed by chronic obstructive pulmonary disease, recurrent respiratory infections, and adult asthma. Approximately 78 (60.9%) individuals believed that children exposed to third-hand smoking would first experience an acute respiratory tract illness, then asthma or wheeze. Of the 128 participants that were aware of THS, 123 (96.1%) and 125 (97.7%) felt that smoking should be banned in home environment and public places respectively as shown in table 1 and 2.

The responses of the 128 participants are displayed in Figure 1, of which 69 (53.9%) strongly agreed and 27 (21.1%) agreed that breathing in a room where someone smoked the day before can be harmful to a child's or infant's health. It reveals that 66 (51.6%) individuals agreed and 9 (7%) strongly agreed that inhaling in a room where someone smoked the day before can be harmful to an adult's health. Additionally, it shows that 9 individuals (7%) highly agreed, 46 participants (35.9%) agreed, and 56 participants (43.8%) said they were not confident that particles in a room where someone smoked the day before might cause cancer. It shows that 71 people (55.5%) agreed that smoke particles can linger in a room for days, while 15 participants (11.7%) strongly agreed.

It was found that 12 (9.4%) people strongly agreed, 43 (33.6%) agreed, and 54 (42.2%) participants said they were not sure that the smoke particles can linger in a room for weeks. The results indicate that 18 (14.1%) people strongly agreed, 47 (36.7%) individuals agreed, and 49 (38.3%) participants said they were not sure that smoke particles could absorb into walls and furniture.

There were 48 (37.5%) participants who said they were unsure, 42 (32.8%) who agreed, and 8 (6.3%) who strongly agreed that smoke particles on skin, hair, and clothing can be transferred to others through touch. Additionally, 50 (39.1%) participants said they were unsure, 37 (28.9%) agreed, and 7 (5.5%) strongly agreed that smoke can enter the body through the skin. It also reveals that not all smoking particles are eliminated by opening windows or turning on air conditioning; 37 (28.9%) individuals said they were not sure, 61 (47.7%) agreed, and 19 (14.8%) strongly agreed.

There was no significant difference in the awareness level across the year of study of medical students. The mean score of third hand smoking impact on health is 3.4± 0.6088. The mean score of third hand smoking persistence in environment is 3.56 ± 0.6768.

Figure two shows about various solutions to overcome third- and fourth-hand smoke in which majority 66 (51.6%) participants suggested to avoid smoking in closed environment, followed by wet mopping of rooms used for smoking, adequate cross ventilation must be maintained and to quit smoking hence to increase the awareness about third- and fourth-hand smoke.

Table 1: Awareness levels of participants about

Third-hand and Fourth-hand smoking (n=360)

S.No	Content	Awareness level n(%)
1	Third -hand smoking	128 (35.6)
2	Fourth-hand smoking	84 (23.3)

Table 2: Awareness of Implications of Third-hand and Fourth-hand smoking (n=128)

S.No	Awareness/Opinion of Medical Students regarding Implications of THS and FHS	Awareness level n(%)
1	Effect on organs	102 (79.7)
2	Effect of tobacco residual smoke in lungs	112 (87.5)
3	Effect of inhaling residual smoke in lungs	127 (99.2)
4	Effect of inhaling residual smoke in heart	111 (86.7)
5	Knowledge of THS and FHS motivate people to be smoke free	117 (91.4)
6	THS and FHS is equally harmful like first-hand and second-hand smoking	88 (68.8)
7	Ban smoking in home environment	123 (96.1)
8	Ban smoking in public places	125 (97.7)
9	Disease caused by THS in Adults	
	Lung cancer	67 (52)
	Chronic Obstructive Pulmonary Disease	26 (20.1)
	Asthma	14 (10.9)
	Recurrent Respiratory Tract infection	18 (14)
	Others	4 (3)
10	Disease caused by THS in Children	
	Asthma, Wheeze	50 (39.1)
	Acute respiratory tract infection	78 (60.9)

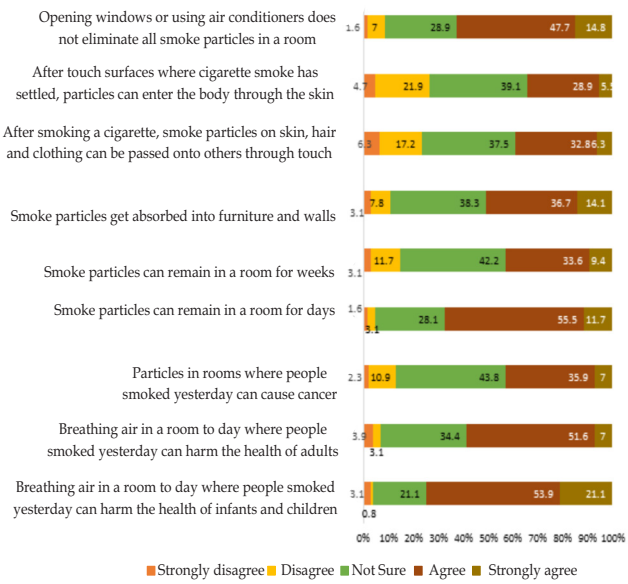


Figure 1: Medical students response to each of the 9-items assessed in beliefs about third hand smoke (baths) scale (n=128)

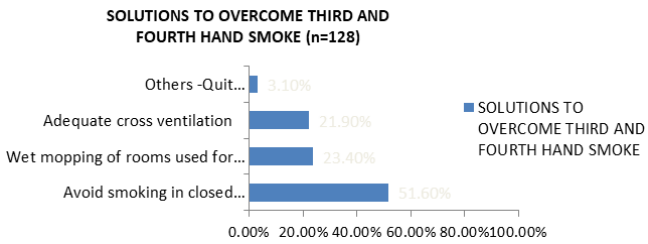


Figure 2: Solutions to overcome third- and fourth-hand smoke (n=128)

Discussion

The government has implemented a number of public awareness campaigns regarding first- and second-hand smoking, as well as the health risks associated with it. However, the public is largely unaware of the long-term effects of smoking as a pollutant, which is causing serious health problems. As a result, there needs to be a greater focus on third-hand smoking. In order to ascertain medical students' awareness of THS, Google Forms interviews with medical students in South India produced the surprising finding that, in contrast to a study conducted in Turkey, only 36.5% of medical students knew about third-hand smoke.[10] This indicates that the issue needs to be taken seriously since, as someone working in a field that involves educating the public about the effects of THS.

According to a study by Diez Izquierdo et al., just 27% of parents of young children know what thirdhand smoke.[11] Among those who knew about THS, 102 (79.7) percent of respondents agreed that organs are being affected, with the lungs being the major organ in their opinion. However, studies have shown that other organs, such as the heart and eyes, are also affected by THS, which further supports the idea that even medical professionals need to be briefed about THS. The majority of those affected are children, as they are the ones who are in direct contact with pollutants most of the time, whether they are crawling or walking.[12-14]

Conclusion

We were able to determine from this study that medical students in south India had a relatively low awareness of third- and fourth-hand smoke and its effects on human health. As a result, steps need to be taken to raise medical students' awareness of third- and fourth-hand smoke, such as role-playing and small-group discussions.

Recommendation

It is advisable to include health educational messages on third- and fourth-hand smoking in the medical curriculum.

Strength of the study strength of my study was using Google forms as source for collection of data, direct interview might have yield more reliable data and advantage of using Google forms are quicker collection of data and enables easier interpretation.

Relevance of the study

No studies with respect to awareness of third- and fourth-hand smoking and its implications among medical students have been found in literature in our study settings. This study will aid as one of the significant references which can enhance more researchers in future to conduct advance projects in similar area.

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Prevalence and Practice of Self-Medication: A Community based Cross-Sectional Study

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Abstract

Background: According to WHO, self-Medication is defined as "the selection and use of medicines by individuals to treat self-recognized illnesses or symptoms". Lack of knowledge about self-medication can result in the illogical use of pharmaceuticals, which can have major detrimental effects on health and increase the financial burden. This study will assess the prevalence and determinants of self-medication in community and will help us in educating and creating awareness to decrease the self-medication and its related adverse effect.

Objectives: 1. To assess the prevalence, knowledge and practice of self-medication.2.To study the association of sociodemographic variables and self-medication

Methodology: The community based descriptive cross-sectional study was conducted in urban field practice area of tertiary health care center. Participants above 18 years of age were interviewed by predesigned and pretested questionnaire using sociodemographic variables, knowledge and practice of self-medication. Total 130 participants were enrolled in the study using 60% prevalence in previous study.

Results: The prevalence of self-medication in the study was 55.4%. Female participants were practicing more self-medication than males and found to be statistically significant. Commonest reasons for self-medication were minor aliments (56.9%) followed by ease and convenience etc. The commonest illness for self-medication were pain (66.6%) followed by fever (55.6%) etc. The most widely used drug for self-medication were analgesics and anti-inflammatory (66.6%), and antipyretics (63.8%).

Keywords: Self-medication, Prevalence, Community based, urban area, tertiary care centre

Introduction

According to WHO, Self-Medication is defined as "the selection and use of medicines by individuals to treat self-recognized illnesses or symptoms". [(1)] Self-medication is the treatment of common health problems with medicines specially designed and

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labelled for use without medical supervision and approved as safe and effective for such use. The World Health Organization's Expert Committee on National Drug Policies declared in 1995 that self-medication is a common practice in both developed and developing nations.[2] Medications for self-administration are commonly referred to as "nonprescription" or "over the counter" (OTC) and can be obtained through pharmacies without a prescription from a physician. [2]

Self-medication is the practice of using prescription drugs to cure individuals own symptoms that oneself has identified, as well as the intermittent or continuous use of a doctor's prescription for a chronic or recurrent illness or symptom, with the doctor serving as an advisor. [2] Purchasing medications without a prescription, utilizing leftover medications kept at home, sharing medications with family or friends, or repurchasing previous prescriptions are all examples of self-medication.[3] Typically, these medications were used to treat or prevent mild illnesses or symptoms that don't require a trip to the doctor. Self-medication has the potential to be both beneficial and harmful.[4]

When drugs are used inappropriately and without first speaking to a registered practitioner, it can lead to major issues such as drug interactions, addiction, microorganism resistance, organ damage, etc.[5] Self-medication had influenced by a variety of factors, including medicine availability, ease of access to pharmacies, lifestyle choices, and socioeconomic status. [6] Lack of knowledge about self-medication can result in the illogical use of pharmaceuticals, which can have major detrimental effects on health and increase the financial burden.[7] Therefore, if left unchecked, the growing antibiotic resistance crisis could have an impact on a nation's economic growth in addition to the healthcare sector. [8] When symptoms start to fade and when feel better, people often forget to take their medications as prescribed. Because of this poor treatment both in terms of dosage and duration the bacteria have grown more resistance. [9,10] A number of reasons, including the need for self-care, empathy for ailing family members, limited access to healthcare and medicine availability, and time and financial restraints, had contributed to the rising trend of self-medication.[9]

Purchasing drugs through a pharmacist's recommendation was the most common way thus it is important to give pharmacist education and training in order to deter the public from self-medication practice and to encourage more responsible and knowledgeable pharmaceutical procurement practices.[10] Numerous risk factors exist at the individual and community levels that demand careful investigation.[11]To stop the harmful effects of self-medication, health care providers must run awareness campaigns to educate the public about this issue. People who self-medicated were not aware of the dangers of self-medication. [12] Self-medication using over-the-counter (OTC) pharmaceuticals is allowed in India under drug legislation, however there isn't a list of approved OTC drugs.[13] There is urgent need of developing heath education program for the mass regarding usage of antimicrobials. All over the world self-medication with antibiotics is a major public health problem with ever increasing antibiotic resistance. Hence, the study was conducted to assess the prevalence and determinants of self-medication in community. It will help in educating and creating awareness about antibiotic resistance among people to decrease the self-medication and its related adverse effects.

Aim and Objectives

1. To assess the prevalence, knowledge and practice of self-medication.
2. To study the association of sociodemographic variables with self-medication.

Material and Methods

A cross-sectional study was conducted in urban field practice area of a tertiary care center in Western Maharashtra. The study was conducted from June 2024 to December 2024. Considering prevalence of self-medication practices to be 60% [12] in previous study with a desired confidence limit of 95% and relative precision of 15% and considering loss of 10%, sample size of 130 using formula Sample size= $4pq/d^2$ was included in the study. Institutional Ethical permission was taken prior to the study.

The data collection tool was a predesigned, pretested questionnaire. Systematic random sampling was used for data collection. Total families surveyed in urban field practice area under

Department of Community Medicine of a Medical College were 1595. Among these families, every 12th family was taken into account and one member age ≥18 years preferably the head of the family residing more than 6 months was taken to complete a total sample size of 130. Health care professionals were excluded from the study. Information about purpose of study was provided to individuals. After taking written informed consent data was collected by face-to-face interview using pretested questionnaire by maintaining the confidentiality.

Part A of the questionnaire comprises questions seeking information on participants sociodemographic characteristics like age, gender, residence, religion, marital status, occupation, education, type of family. Part B of the questionnaire comprised questions dealing with self-medication in last one year like reasons for self-medications, illnesses for which self-medication taken, drugs used for self-medications, sources of information for self-medication, reason for not taking self-medications, knowledge about adverse reaction among individuals using self-medication. The data was entered in the Microsoft excel sheet, tabulated and analysed for frequencies and percentage and Chi square test used to test the association at $p< 0.05$. Jamovi 2.3.28 software was used for data analysis.

Results

A total of 130 participants were included in the study. Male participants were 70 (53.8%) whereas 60 (46.2%) were female participants.

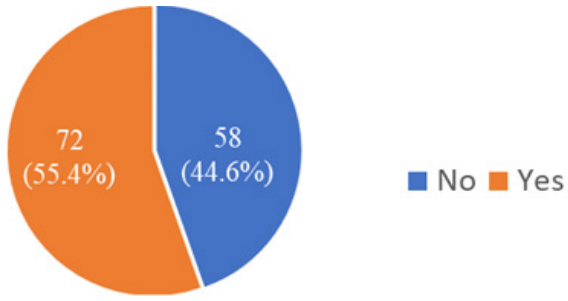
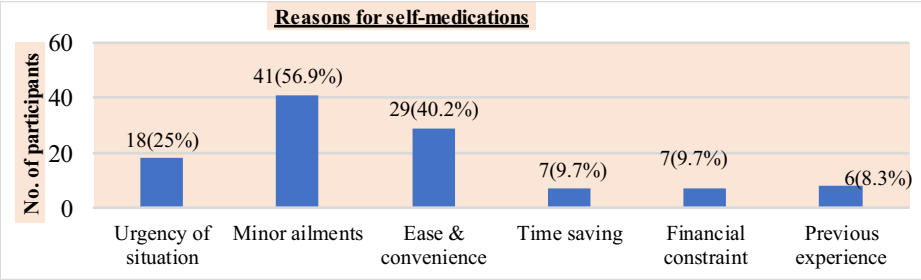


Figure 1: Number of Participants taking Self-medication

Among 130 participants, 72 (55.4%) practiced self-medication whereas 58 (44.6%) did not practice self-medication.



* Includes multiple responses

Figure 2: Reasons for self-medication

Majority of participants were taking self-medication for minor ailments 41(56.9%), followed by ease and convenience 29(40.2%), Urgency of situation 18(25%) and other miscellaneous reasons like time saving, financial constraints, previous experience etc.

Table 1: Illness and drug usage for Self-medication among participants

Illness for Self-medication		
Pain	48	66.6%
Fever	40	55.6%
Cough and cold	26	36.1%
Other (Constipation, gastric pain, fungal infection etc.)	5	6.9%
Drugs used for Self-medication		
Analgesics and anti-inflammatory	48	66.6%
Antipyretics	46	63.8%
Antibiotic	3	4.1%
Antacid	10	13.8%
Cough syrup	19	26.3%
Other (Nutritional supplement, topical applications etc.)	6	8.3%

*Multiple responses included

It was observed that pain was the most common illness for which self-medication was used in 48 (66.6%) participants, followed by fever in 40 (55.6%), cough and cold among 26 (36.1%) participants. The drugs used for self-medication were analgesic and anti-inflammatory in 48 (66.6%) participants followed by antipyretics in 46 (63.9%) and cough syrup in 19 (26.3%) participants. In the present study, sources of information for self-medication were pharmacist in 48 (66.7%) participants followed by friends and family in 23 (31.9%) participants.

Table 2: Sociodemographic information of participants

Variables	Category	Practicing Self-medication				N= 130	p value
		Yes (72)		No (58)			
		N	%	N	%		
Age	<20	1	1.3	2	3.4	3	0.416
	21-30	19	26.3	9	15.5	28	
	31-40	14	19.4	11	18.9	25	
	41-50	13	18	7	12.1	20	
	51-60	6	8.3	8	13.7	14	
	>60	19	26.3	21	36.2	40	
Gender	Male	30	41.6	40	68.9	70	0.002
	Female	42	58.4	18	31.1	60	
Education	Illiterate and primary education	29	40.3	20	34.5	49	0.209
	Middle and high school	27	37.5	17	29.3	44	
	Diploma and Graduate	16	22.2	21	36.2	37	
Type of Family	Nuclear	33	45.8	23	39.7	56	0.585
	Joint	20	27.8	21	36.2	41	
	Three generation	19	26.4	14	24.1	33	

There were 54 (41.6%) participants in age group above 50 years followed by 45 (34.6%) in age group between 31 to 50 years and 31 (23.8%) in age group below 30 years. Majority of the participants were studied up to primary education i.e. 49 (37.7%) followed by 44 (33.8%) educated up to higher education and 37 (28.5%) participants were graduates in this study. It was observed that prevalence of self-medication was 58.3% in female participants whereas 41.6% in male participants and it was statistically significant. ($p< 0.002$). In the present study no statistical association was observed between self-medication and age, education, occupation and type of family.

Table 3: Reasons for not taking self-medications

Reason	Number	Percentage
Risk of adverse reaction	19	32.7%
Risk of wrong diagnosis	22	37.9 %
Other reasons	31	53.4 %

*Multiple responses included

In the present study, 58(44.6%) participants were not taking self-medication. The reason for not taking self-medication was risk of wrong diagnosis in 22 i.e. 37.9% participants, risk of adverse reaction in 19 i.e. 32.7% participants whereas other reasons were family member is doctor, there was no need for self-medication since I wasn't unwell etc.

Table 4: Knowledge about Adverse Drug Reactions among participants (N=60)

Knowledge about Adverse Reaction among participants using self-medication		
Skin allergy	36	60%
Gastro intestinal symptoms	16	26.6%
Other	29	48.3%

*Multiple responses included

Among 130 participant's 60 (46.2%) had knowledge about Adverse Drug Reactions. It was observed that 36 (60%) of the participants in this study

were aware of the adverse drug reactions of skin allergies and edema. A few other adverse reactions were decrease in blood pressure, neurological issues, or drug-induced renal damage among 29 (48.3%) participants. Higher educated participants have a greater knowledge of adverse drug reactions than people who have only completed high school. ($p< 0.007$)

Discussion

Prevalence of self-medication found to be 55.4% in the present study while Sajith M et al study [1] had prevalence of 60% and Samuvel Babu P et al study showed prevalence of self-medication in urban population about 64% . [12] Another study conducted by Malli et al showed prevalence of 55.9% among the students in a study conducted in Saudi Arabia [14]. In our study total 58.5% female participants were taking self-medication as compared to male and these findings were similar to the study conducted by Sajith M et al i.e. 52.5% female participants used self-medication [1]

In our study there was no statistically significant association between age and self-medication same as that of study conducted by Rathod et al[7] In our study medication for illness like pain contributed around 66.6% and fever 55.6%. Another study by Kasulkar et al found that self-medication was used in 38% for minor illnesses like cough, cold, and fever [6] whereas Rathod et al found that 57.9% participants used self-medication for fever [7] and Samuvel Babu P et al [12] observed that about 64% participants use self-medication for body pain. Fever, headache, and abdominal pain are most common conditions for which people have used self-medications in a study conducted by Selvaraj et al at urban Puducherry [15]. Convenience (46%) and lack of time (35.3%) were commonly cited reasons for self-medication in a study carried out by Juneja et al [11] whereas the most common reasons cited by participants for self-medication in the present study were convenience and use for minor ailments.

In our study analgesics and anti-inflammatory were more commonly consumed drugs by people for the purpose of self-medication while in another study conducted by Rathod et al [7] most common drugs used for self-medication were analgesics in 66.2% participants and antipyretics in 59.1% participants. It was also observed in this study that 53.8% participants had inadequate knowledge of impact of adverse drug reactions due to self-medication and similar findings were observed by another study by Samuvel et al. [12]

Conclusion

Prevalence of self-medication was 55.4% in our study and compared to males, female participants (58.3%) were using more self-medication. Higher educated participants had a greater knowledge of adverse drug reactions compared with those studied till high school. The excessive use of medications causes side effects, disease resistance, harm to society, and wastage of resources.

Recommendations:

Health education awareness programs need to be conducted in community. Strict monitoring, regulations and auditing for sale of medication without prescription to be implemented

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Ethical Clearance/Statement of Ethics *{Instruction to authors: Explicitly state the name of the ethics committee clearing the study, along with the date and number):* EC/NEW/INST/MH/0225 Maharashtra Institute of Medical Education & Research, Talegaon **(D) No. IEC/MIMER/2024/INST/1017**

Declaration of conflicts of interest statement: Nil

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Original Article

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Prevalence and Risk Factors of Varicose Veins in a Tertiary Care Hospital in Pondicherry: A Cross-sectional Study

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Abstract

Background: Varicose veins, characterized by enlarged and distorted veins, can lead to considerable discomfort and diminish quality of life. Understanding the prevalence and associated risk factors across various occupational groups is crucial. This study aimed to assess the prevalence of varicose veins in a tertiary care hospital and identify demographic and occupational factors contributing to the condition.

Methods: This cross-sectional, hospital-based study was conducted at Sri Manakula Vinayagar Medical College and Hospital, Pondicherry, from August to November 2024. A total of 106 workers from various sectors participated. Data was gathered using structured questionnaires and physical examinations. Statistical analysis was performed using SPSS Version 21, descriptive statistics like proportions were used to describe the prevalence and analytical statistics like chi-square tests was used to determine the association between varicose vein and various factors. A p-value of <0.05 was taken as statistically significant.

Results: Of the 106 participants, 58 (54.7%) were diagnosed with varicose veins. The majority of affected individuals were in the 26-35 age group (55.2%), with skilled labourers (65.5%) being most affected. Males represented 60.3% of those diagnosed. Common symptoms included visible veins (32.7%), leg swelling (25.8%), and leg pain (8.6%). Significant associations were found with occupation and smoking.

Conclusion: The study highlights a high prevalence of varicose veins, particularly among skilled labourers. These findings emphasize the importance of targeted prevention strategies, including occupational adjustments and lifestyle modifications, to reduce the burden of varicose veins in the working population. Further research is needed to develop tailored interventions for at-risk groups.

Keywords: Varicose veins, Risk, Occupational

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Introduction

Varicose veins are a common but often overlooked health issue, particularly among workers whose jobs require prolonged standing, heavy lifting, or repetitive movements. Characterized by dilated, elongated, and tortuous veins, varicose veins primarily affect the lower limbs, causing significant physical and psychological distress. Common symptoms include leg pain, swelling, fatigue, and a sensation of heaviness, all of which can severely impair quality of life. Workers in occupations involving increased venous pressure in the legs are particularly susceptible to developing this condition. [1,2]

Understanding the prevalence and risk factors for varicose veins among the working population is critical for devising effective prevention and management strategies. In the United Kingdom, approximately 50,000 varicose vein surgeries are performed annually in NHS hospitals, with an additional 13,000 conducted in the private sector. However, these procedures are often carried out by junior or less experienced staff, leading to higher rates of complications and recurrence. Research indicates that around 20% of varicose vein surgeries address recurrent disease, resulting in increased healthcare costs and poorer patient outcomes. Despite the high frequency of this condition, large-scale studies on surgical complications and recurrence are limited.[3,4]

Symptoms of varicose veins range from mild to severe. Common signs include leg pain, swelling, cramps, and itching, often exacerbated by prolonged standing and alleviated with leg elevation. Severe complications, such as chronic venous insufficiency (CVI), can result in skin changes, leg ulcers, and deep vein thrombosis (DVT). Risk factors for varicose veins include a family history of venous disease, female gender, advanced age, obesity, pregnancy, chronic constipation, and occupations requiring prolonged standing. Women tend to report more severe symptoms, such as aching, leg cramps, and swelling, compared to men.[5] A study in Uttar Pradesh by Aggarwal V et al[6] reported prevalence of varicose vein as 46.7% among females and 27.8% among males. A study in Hyderabad by Mohammad A et al[7] reported among the patients with varicose vein, 92% were male.

The primary cause of varicose veins is venous disease, which results in valvular reflux and backward blood flow, leading to increased venous pressure. This process causes vein dilation, often involving the great and small saphenous veins in the legs. Contributing factors include genetic predisposition, loss of vein wall elasticity, obesity, pregnancy, and secondary venous insufficiency caused by DVT. Although the exact mechanisms behind varicose veins remain unclear, venous reflux and increased venous pressure are recognized as central to their development.[8,9]

Treatment options for varicose veins encompass both conservative and interventional approaches. Conservative methods include lifestyle changes such as avoiding prolonged standing, regular exercise, weight management, using compression stockings, and elevating the legs. However, evidence supporting compression stockings is limited unless the patient has active or healed venous ulcers. Interventional treatments, such as laser therapy, endovenous thermal ablation, and sclerotherapy, have largely replaced traditional surgical methods, offering improved outcomes and fewer complications.[9-11]

Despite the available treatments, research gaps persist, particularly regarding the influence of demographic factors like age, gender, and occupation on the prevalence of varicose veins. Workers in high-risk jobs are often underrepresented in research, resulting in generalized preventive strategies that lack effectiveness. This study aims to address these gaps by examining the prevalence of varicose veins among workers attending a tertiary care hospital, while identifying the demographic and occupational factors associated with the condition. The findings will contribute to developing targeted interventions and policies to improve the quality of life for affected workers and reduce the overall healthcare burden.

Materials and methods

This study was a hospital-based, observational, cross-sectional study conducted at Sri Manakula Vinayagar Medical College and Hospital, Pondicherry, from August to November 2024. The study was conducted as part of the Associate Fellow of Industrial Health (AFIH) course and as

per the Competency-Based Medical Education (CBME) guidelines of AFIH outlined by DGFASLI, a compulsory short project is mandated during the course. The primary researcher hails from Pondicherry and was feasible for him during this course, as it allowed easier access to the area and facilitated obtaining the necessary permissions efficiently. The study population comprises workers from various sectors who were seeking treatment at the surgery department of the hospital. The sample size was calculated using the formula: $n = [Z(1-\alpha/2)]^2 * P(1-P) / d^2$, with a 95% confidence interval and a margin of error of 10%. Based on an expected population proportion of 47%[6], the initial sample size was calculated to be 96, which was adjusted to 106 to account for a 10% nonresponse rate. A consecutive sampling method was used to select the participants. All those who were aged 18 years and above, employed in their current occupation for at least one year presenting with the symptoms of varicose vein in Department of Surgery or Emergency during the data collection period were included in the study. Exclusion criteria included workers with a history of previous venous surgery, chronic venous insufficiency, severe comorbid conditions affecting mobility, or those who did not provide consent to participate. Data collection involved a structured questionnaire and thorough physical examination. Operational definition of initial diagnosis of varicose vein was by clinical evaluation of swelling, dilated, convoluted veins located beneath the skin which can be observed or felt by a clinician while the patient is in an upright position.[13,14] Data collected was entered in Ms-Excel and was analysed using SPSS Vs 21. Descriptive statistics was expressed in percentages or proportions and analytical statistics like chi-square test was used to test the association. A p-value of <0.05% was taken as statistically significant.

Ethical approval for the study was obtained from the Institutional Ethics Committee of the All India Institute of Hygiene and Public Health (AIIH&PH), Kolkata, prior to its commencement IEC/2024(3)/116 dated 0.10.2024. Additionally, written informed consent was secured from both the hospital authority and the study participants before initiating the research.

Results

The study population primarily comprised individuals aged 26-35 years (54.7%), followed by 36-45 years (31.1%) and 18-25 years (14.2%). The majority were male (58.5%) and married (71.7%). Regarding education, most participants were diploma or graduate holders (54.7%), with others having higher secondary (30.2%) or secondary education (15.1%). Occupation-wise, skilled labour which refers to work that requires expertise and proficiency, developed through job experience or training dominated (55.7%) who were agricultural and fishery workers, construction workers, followed by professionals (24.5%) who were police, office workers, teachers, others included housewives (14.2%), and manual labour (5.7%). Smoking was reported by 42.5% of participants, while 49.1% consumed alcohol.(Table 1)

Table 1. Distribution of Study participants according to the Socio demographic details (N=106)

Variables	Categories	Frequency	Percent
Age	18-25	15	14.2%
	26-35	58	54.7%
	36-45	33	31.1%
Gender	Male	62	58.5%
	Female	44	41.5%
Marital Status	Single	30	28.3%
	Married	76	71.7%
Education	Secondary	16	15.1%
	Higher Secondary	32	30.2%
	Graduate	58	54.7%
Occupation	Manual labour	6	5.7%
	Professionals	26	24.5%
	Skilled labour	59	55.7%
	Other	15	14.2%
Smoking	Yes	45	42.5%
	No	61	57.5%
Alcohol consumption	Yes	52	49.1%
	No	54	50.9%
Family history of varicose vein	Yes	26	24.5%
	No	80	75.5%

The majority of participants had 1-5 years of work experience (60.4%), followed by 6-10 years (24.5%), 11-15 years (9.4%), and less than a year

(5.7%). Most worked six days a week (60.4%), with others working five days (30.2%) or daily (9.4%). A significant proportion worked 8-12 hours daily (69.8%), while 15.1% worked either 4-8 hours or more than 12 hours. Regarding work posture, dynamic work postures were the most prevalent, accounting for 64 individuals (60.4%). Sedentary postures were observed in 24.5%. Additionally, bending and twisting postures were noted in 28.3%. Long periods of standing (>8 hours) were common (59.4%), as were prolonged sitting (55.7%) and heavy lifting (45.3%). (Table 2)

Table 2. Distribution of Study participants according to Occupational characteristics (N=106)

Variables	Categories	Frequency	Percent
Work Experience	Less than 1 year	6	5.7%
	1-5 years	64	60.4%
	6-10 years	26	24.5%
	11-15 years	10	9.4%
No. of working days in a week	Weekly 5 days	32	30.2%
	Weekly 6 days	64	60.4%
	Everyday	10	9.4%
Working hours per day	4-8 hours	16	15.1%
	8-12 hours	74	69.8%
	More than 12 hours	16	15.1%
Work posture*	Dynamic	64	60.4%
	Sedentary	26	24.5%
	Bending and twisting	30	28.3%
Frequently stand for long periods (>8 hrs)	Yes	63	59.4%
	No	43	40.6%
Frequently sit for long periods (>8 hrs)	Yes	59	55.7%
	No	47	44.3%
Perform heavy lifting	Yes	48	45.3%
	No	58	54.7%

*Multiple response

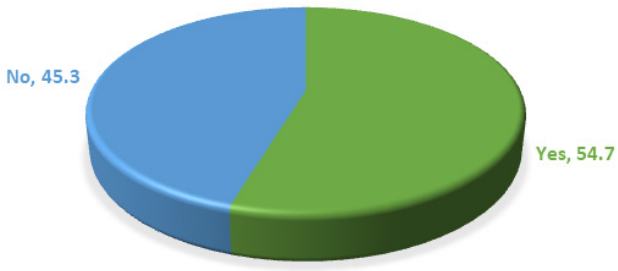


Figure 1. Prevalence of initial diagnosis of varicose vein among the study participants (N=106)

A total of 58 participants (54.7%) were diagnosed with varicose veins, consisting of 35 (60.3%) males and 23 (39.6%) females. (Figure 1) The majority of those affected were in the 26-35 age group, with 32 (55.2%) individuals. Among the affected, 38 (65.5%) were skilled labourers, 15 (25.8%) were professionals, and 5 (8.7%) were housewives. (Figure 1)

Table 3. Distribution of Study Participants with initial diagnosis of varicose vein according to clinical features and management (N=58)

Variables	Categories	Frequency	Percent
Limb	Right	16	27.7%
	Left	40	68.9%
	Both	2	3.4%

Continue.....

Symptoms*	Leg pain	5	8.6%
	Swelling in the legs	15	25.8%
	Visible veins on the skin	19	32.7%
	Skin discoloration	16	27.5%
	Itching around veins	14	24.1%
Type of treatment*	Medication	45	77.5%
	Compression stockings	5	8.6%
	Surgery	10	17.2%

*Multiple response

The distribution of limb involvement was as follows: 16 (27.7%) had varicose veins in the right limb, 40 (68.9%) in the left limb, and 2 (3.4%) in both limbs. The symptoms experienced included leg pain in 5 (8.6%), swelling in the legs in 15 (25.8%), visible veins on the skin in 19 (32.7%), skin discoloration in 16 (27.5%), and itching around the veins in 14 (24.1%). Regarding treatment, 43 (74.1%) used medication, 5 (8.6%) used compression stockings, and 10 (17.2%) underwent surgery. Among the 58 study participants with initial diagnosis of varicose vein, 12 (20.6%) of the study participants were in advanced stage as they presented with changes in skin or subcutaneous tissue with oedema, pigmentation, eczema or atrophie blanche whereas the rest 46 (79.4%) were in initial degree like palpable veins, visible varicose veins. (Table 3)

Table 4. Association between varicose veins and selected variables (N=106)

Variables	Categories	Varicose Vein		p-value
		Yes	No	
Age	18-25	5 (33.3%)	10 (66.7%)	.147
	26-35	32 (55.2%)	26 (44.8%)	
	36-45	21 (63.6%)	12 (36.4%)	
Gender	Male	35 (56.5%)	27 (43.5%)	.670
	Female	23 (52.3%)	21 (47.7%)	
Education Level	Secondary	11 (68.8%)	5 (31.2%)	.019
	Higher Secondary	11 (34.4%)	21 (65.6%)	
	Graduate	36 (62.1%)	22 (37.9%)	
Occupation type	Manual labour	0 (0%)	6 (100%)	.006
	Professionals	15 (57.7%)	11 (42.3%)	
	Skilled labour	38 (64.4%)	21 (35.6%)	
	Other	5 (33.3%)	10 (66.7%)	
Daily working hours	4-8 hours	11 (68.8%)	5 (31.2%)	.312
	8-12 hours	37 (50%)	37 (50%)	
	> 12 hours	10 (62.5%)	6 (37.5%)	
Smoke	Yes	30 (67.7%)	15 (33.3%)	.034
	No	28 (45.9%)	33 (54.1%)	
Family history of varicose vein	Yes	5 (19.2%)	21 (80.8%)	.001
	No	53 (66.2%)	27 (33.8%)	

Age, gender, and daily working hours were not significantly associated with varicose veins. The prevalence of varicose vein was significantly higher among those with secondary education level (p=0.019), occupational type among those with skilled labour (p=0.006), those with habits of smoking (p=0.034), and those without family history of varicose vein (p=0.001). (Table 4)

Discussion

Out of 108 study participants, 58 participants (54.7%) were diagnosed with varicose veins, consisting of 35 (60.3%) males and 23 (39.6%) females. Similar findings were reported in study by Mohammed et al[7], Samane DS et al[15]. This could be due to cultural factors and social constraints.

In this study majority of the study participants with varicose vein were belonging to the age group of 26-35 years. A study by Campbell et al[16] showed majority belonging to age group of 30-40 years. Study by Samane et al[15] also reported majority belong to age group of 31 to 50 years.

The present study showed that a significant proportion worked 8-12 hours daily (69.8%). Long periods of standing (>8 hours) were common (59.4%) and heavy lifting (45.3%). The present study also showed of the patients had occupation history of prolonged standing, which suggests that occupation has a definite role as a causative or a contributing factor. The occupation of these study participants studied with respect to the area of work showed that varicose veins were more common among skilled labourers comprising of agricultural, fishery works and construction workers, probably as a result of their habit of prolonged standing and pressure during work.[17]

In this study, 16 (27.7%) participants had varicose veins in the right leg and 40 (68.9%) in the left leg. This could be attributed to the anatomical configuration of the veins, where the left iliac vein joins the right iliac vein at a right angle and is often compressed by the colon. Additionally, the crossing of the right and left common iliac arteries over the left common iliac vein may contribute to this pattern. The study found a slightly higher proportion of varicose veins in the left leg, which is consistent with previous research by Dur AHM[18]et al, Kumar KS et al[19], Bashir et al[20]. An explanation of the increased prevalence in left is that the venous drainage of the left leg follows a more tortuous path through the pelvis, with the left common iliac vein being compressed by the right common iliac artery. Bilateral varicose veins were observed in 3.4% of participants.[21]

The most common symptoms experienced included visible veins on the skin in 19 (32.7%), skin discoloration in 16 (27.5%), swelling in the legs in 15 (25.8%), itching around the veins in 14 (24.1%) leg pain in 5 (8.6%). Similar findings reported by Mohammad A et al[7], Kumar KS et al[19] where majority reported with dilated veins and itching or pain.

Varicose vein was significantly higher among those with habits of smoking (p=0.034). Similar finding was reported by the study GourgouS et al[22].

In this study those without family history of varicose vein were significantly associated with varicose vein. This finding is in contrast to the study reported by Sharma S et al[23] where family history has a strong correlation with varicose vein. A plausible reason for this finding could be the study setting, as the population in a tertiary care hospital may differ significantly from the general population. Patients seeking care in such facilities might have more severe disease or occupational exposures that outweigh genetic predispositions, thereby showing an association independent of family history.

The limitations of the study include its cross-sectional design, which limits the ability to establish temporal associations. Since the study was conducted at a single tertiary care hospital, its findings may not be applicable to larger populations or different settings. Also, the study did not employ advanced diagnostic equipment, which could have affected the accuracy and sensitivity of varicose vein detection.

Conclusion

More than half of those reported were initially diagnosed with varicose vein. A significant association was observed between varicose veins and occupations requiring prolonged standing, extended working hours, as well as the habit of smoking. Promoting workplace ergonomics, reducing prolonged standing, and encouraging smoking cessation can help mitigate the risk of varicose veins.

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Original Article

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Assessment of Post-COVID-19 Manifestations in covid 19 recovered Patients in Dedicated Covid Hospital in Metropolitan City: Cohort Study

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Abstract

Introduction: This study aimed to assess and characterize post-COVID-19 manifestations in recovered patients. A mixed retrospective and prospective cohort study was conducted over 18 months at a dedicated COVID-19 hospital, involving 300 adult patients who had recovered from COVID-19.

Objectives: Primary Objectives: To study the manifestations (Health status) of covid-19 and post covid-19 infection. Secondary Objectives: a) To study the manifestation of post Covid-19 infection with comorbidity b) To study the exacerbation of co-morbidity in covid 19 infection. C) To study the demographic profile of Covid-19 infected patients.

Methods: The study included adults ≥18 years who had recovered from COVID-19. A sample size of 300 was recruited using convenient sampling. Data was collected via questionnaires and analyzed using SPSS software.

Results: The mean age of participants was 51.71 ± 14.22 years, with 68% males. Post-COVID-19 manifestations were observed in 92.3% of participants. The most common symptoms were fatigue (59%), muscle pain (52.3%), cough (19.3%), respiratory distress (17.7%), and joint pain (13.7%). Neuropsychiatric sequelae included headache (4.3%) and sleep disturbance (3%). Cardiovascular symptoms like chest pain and palpitations were reported by 2.3% of participants. An increase in hypertension (21%) and diabetes (17.33%) prevalence was observed post-recovery.

Significant associations were found between post-COVID-19 syndrome and gender, socioeconomic status, and comorbidities. Cough during acute infection was statistically associated with developing post-COVID-19 syndrome.

Conclusion & Recommendations: Patient care should continue even after recovery from COVID-19 infection. Strengthening of post- COVID-19 clinics and sensitization of healthcare staff are needed for proper identification

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and management of post-COVID manifestations. Long-term monitoring of recovered patients is recommended for evaluation and treatment of persistent or new symptoms. Recommendations include - 1) Early implementation of integrated rehabilitation services through both in-person and remote delivery models; 2) Establishment of multidisciplinary teams including physiotherapists, occupational therapists, nurses, psychologists, speech therapists, physicians, and social workers 3) Condition-specific interventions including energy conservation techniques, pain management, cognitive rehabilitation, and psychological support, with careful consideration of post-exertional symptom exacerbation (PESE) before implementing exercise-based interventions.

Keywords: COVID-19, post-COVID syndrome, long COVID, persistent symptoms.

Introduction

These outbreaks have not only strained medical and public health systems but also challenged economies and societies in addressing financial hardships, public anxieties, and the race for vaccine development.[1,2]

In late December 2019, Wuhan city in China encountered pneumonia cases of unknown etiology. The causative agent was later identified as a novel coronavirus, now referred to as SARS-CoV-2, with the disease it causes termed COVID-19[3]. The rapid spread of SARS-CoV-2 across international borders prompted swift multi-sectoral mitigation steps by governments worldwide, including India[4]. Acute respiratory tract infections (ARTIs) are among the most common communicable diseases, affecting individuals regardless of age and gender [5]. While various microorganisms can cause these diseases, respiratory syncytial virus (RSV), influenza A and B, and coronaviruses are considered to have the greatest contagious ability, with a history of causing multiple epidemics and pandemics[6]. COVID-19's high transmission rate has led to millions of infections and hundreds of thousands of deaths globally. Symptoms range from mild (fever, dry cough, fatigue) in about 80% of cases to severe respiratory distress requiring intensive care[7]. The disease severity is often related to age and comorbidities, with elderly patients more likely to require ICU care[8]. Symptom duration varies from 2 weeks for mild cases to 3-6 weeks for severe cases[9]. The primary mode of transmission is through direct contact with confirmed cases, as SARS-CoV-2 spreads via exhaled air and aerosols[10]. Diagnosis typically involves polymerase chain reaction (PCR) tests, computed tomography (CT) scans, and blood tests [11]. Treatment approaches vary based on disease severity. Mild cases receive supportive care, including antibiotics, vitamins, trace elements, and antipyretics. Severe cases may require oxygen therapy with or without mechanical ventilation [12]. While numerous medications have undergone clinical trials as potential antivirals, no clear results have confirmed the efficacy of any investigated treatments [13-15]. Corticosteroids may play a vital role in managing severe cases due to their anti-inflammatory properties [16]. Post-recovery manifestations have been observed in many COVID-19 patients, similar to those reported after the 2003 SARS outbreak [17,18]. These symptoms, which differ from acute COVID-19 manifestations, can persist for extended periods and may require long-term monitoring. This article aims to investigate post-COVID-19 manifestations, characterizing the various symptoms or signs that appear in recovered individuals. Additionally, it seeks to explore potential links between these symptoms and factors such as age, weight, disease severity, and comorbidities. The study addresses the critical gaps by comprehensively investigating post-COVID manifestations and their potential associations with patient-specific factors. The findings will contribute to patient care approaches and help shape effective public health strategies to address the pandemic's enduring consequences.

AIM: Assessment of post-COVID-19 manifestations in covid 19 recovered patient in dedicated Covid Hospital in metropolitan city

OBJECTIVES:

a) To study the manifestations (Health status) of covid-19 infection and post covid-19 infection.

b) To study the manifestation of post Covid-19 infection with comorbidity

c) To study the exacerbation of co-morbidity in covid 19.

d) To study the demographic profile of Covid-19 infected patient.

Methodology

This study employed a mixed retrospective and prospective cohort design conducted over 18 months at a Dedicated COVID-19 Hospital (DCH). The study population comprised adults aged 18 years and older who had recovered from COVID-19 infection. Using a formula $n= Z^2 \times p \times q / e^2$ Where, Z score (Z) = 1.96 for confidence interval at 95% p = prevalence 75%, q = 100-p i.e 25% %, e = margin of error 5% and an estimated prevalence of 75% reported as fever according to the Study of Mahmud R, et al. (2021)[23].

The minimum sample size was calculated to be 288. To account for potential loss to follow-up, 300 participants were recruited through convenient sampling using data from the DCH's Medical Records Department.

Data collection was performed using a validated questionnaire that covered demographic information, COVID-19 status and comorbidities, post-COVID-19 manifestations, and exacerbation of comorbidities during COVID-19. The study included both sexes aged 18 years and above who had recovered from COVID-19, while excluding non-consenting individuals and pregnant or lactating women. A pre-tested semi-structured case record form was used to collect information from participants. Retrospective data were obtained from hospital records, and prospective data were gathered during follow-up visits to the post-COVID outpatient department. All data were compiled using Microsoft Excel and subsequently analyzed using SPSS software-24.

Results

Demographic Characteristics

The study included 300 participants, comprising 204 males (68%) and 96 females (32%). The mean age was 51.71 ± 14.22 years, with the majority (52%) in the late adulthood category (above 60 years). Educational status varied among participants, with 60.30% having completed graduation and 12% having post-graduate degrees. Socioeconomically, most participants belonged to the upper lower (48.30%) and lower (41.30%) classes according to the Modified Kuppuswamy Scale 2021[24]. Occupational distribution showed 61.30% in various professions, 26.30% as frontline workers, and 12.30% as healthcare workers. Family structure was nearly evenly split between nuclear (52%) and joint (48%) families. Body Mass Index (BMI) analysis revealed 45.30% with normal BMI, 29.30% pre-obese, and 17.30% in obesity class 1.(Table 1)

Table 1: Demographic distribution of study participants

Age (Category)	Frequency	Percentage (%)
Early adulthood (18-40)	70	23.3
Middle adulthood(41-60)	74	24.7
Late adulthood (above 60)	156	52.0
Sex		
Male	204	68.0
Female	96	32.0
BMI		
low BMI	13	4.3
Normal	136	45.3
Pre obese	88	29.3
obesity class1	52	17.3
obesity class 2	6	2.0
obesity class 3	5	1.7
Total	300	100

COVID-19 Symptomatology

The most prevalent symptoms were fever (75%), respiratory distress (38%), fatigue (29.70%), and cough (26.30%). Only 7.70% of participants were asymptomatic. After recovery, the most common symptoms were fatigue (59%), muscle pain (52.30%), cough (19.30%), and respiratory distress (17.70%). Neuropsychiatric sequelae included headache (4.30%) and sleep disturbance (3%). Notably, 9.30% remained asymptomatic post-recovery. Approximately 80% of patients had no comorbidities before infection. Hypertension (19.66%) and diabetes (9.60%) were the most common pre-existing conditions. After recovery, there was a slight increase in hypertension (21%) and diabetes (17.33%) prevalence. However, 71.70% of patients developed no new comorbidities. The median discharge time was 14 days across all age groups. Interestingly, early adulthood patients tended to have longer recovery times (>14 days), while middle and late adulthood patients often recovered in less than 14 days. (Table 2)

Table 2: Symptoms of during and post COVID-19 infection

Symptom Category	Symptoms	During Infection		Post Infection	
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
General	Fever	225	75	24	8
	Fatigue	89	29.7	177	59
	Muscle pain	-	-	157	52.3
	Joint pain	-	-	41	13.7
Respiratory	Cough	79	26.3	58	19.3
	Respiratory distress	114	38	53	17.7
Cardiovascular	Chest pain	-	-	7	2.3
	Palpitation	-	-	7	2.3
Neuropsychiatric	Anxiety	-	-	2	0.7
	Sleep disturbance	-	-	9	3
	Loss of taste/smell	-	-	5	1.7
	Headache	-	-	13	4.3
Gastrointestinal	Diarrhea	-	-	6	2
Renal	Frequent urination	-	-	1	0.3
Other	Others	120	40	-	-
	Asymptomatic	23	7.7	28	9.3

Majority of the patients at least had one symptom whereas only 7.60% were asymptomatic. Cough was more common in males (17.66%) compared to females (8.66%), with a P-value of 0.04. Cough was more prevalent in the general public (14%) compared to healthcare workers (HCW) (5.66%) and frontline workers (FLW) (6.66%), with a P-value of 0.01, indicating significance. Fatigue was significantly more prevalent in the general public (20%) compared to HCWs (1.33%) and FLWs (8.33%), with a P-value of 0.02. Cough was more prevalent among the upper-lower class (IV) (12.33%) and lower class (V) (10.33%) compared to other socio-economic classes, with a highly significant P-value of 0.001. The findings suggest that middle adulthood (36–55 years) tends to have a higher prevalence of post-COVID symptoms like cough, fatigue, and respiratory distress compared to early or late adulthood. Cough was more prevalent in males (14.66%) compared to females (7.33%), with a significant P-value of 0.01.Cough and fatigue were more common in the general public (12% and 14.33%, respectively) compared to HCWs and FLWs. The differences were significant, especially for fatigue (P-value of 0.001)

Cough was more prevalent in the upper-lower class (IV) (9%) and lower class (V) (10.33%) compared to other classes, with a highly significant P-value of 0.001. The incidence rate is calculated based on the assumption of a one-year follow-up period. This rate is significantly higher than typical diabetes incidence rates in the general population (usually 3-7 cases per 1000 person-years), suggesting a potential increased risk of diabetes following COVID-19 infection. (Table 3)

Table 3: Diabetes Incidence Rate Post-COVID-19

Metric	Value
Total participants	300
Pre-COVID diabetes prevalence	9.6% (29 cases)
Post-COVID diabetes prevalence	17.33% (52 cases)
New diabetes cases	23
Follow-up period	1 year (assumed)
Person-years at risk	259.5
Incidence rate	88.63 cases per 1000 person-years

Relative risk

Patients with pre-existing hypertension have a 1.5 times higher risk of experiencing post-COVID

fatigue compared to those without hypertension .Individuals with pre-existing diabetes are 1.7 times more likely to suffer from post-COVID respiratory distress than those without diabetes . Obese patients (BMI > 30) have a 1.4 times increased risk of developing a prolonged cough (lasting >4 weeks) following COVID-19 recovery. Patients over 60 years of age are 1.6 times more likely to develop new-onset hypertension after COVID-19 infection compared to younger patients. Male patients have a 1.3 times higher risk of experiencing post-COVID palpitations compared to female patients. Female patients are 1.5 times more likely to experience post-COVID anxiety compared to male patients. Healthcare workers show a potentially reduced risk (RR = 0.8) of experiencing post-COVID joint pain compared to non-healthcare workers, but this finding is not statistically significant. Patients from lower socioeconomic backgrounds have a slightly elevated risk (RR = 1.2) of persistent fever following COVID-19 recovery, but this result is not statistically significant. (Table 4)

Table 4: Relative Risks for Post-COVID Symptoms and Comorbidities

Exposure	Outcome	Relative Risk (RR)	95% Confidence Interval	P-value
Pre-existing Hypertension	Post-COVID Fatigue	1.5	1.2 - 1.8	< 0.001
Pre-existing Diabetes	Post-COVID Respiratory Distress	1.7	1.3 - 2.2	< 0.001
Obesity (BMI > 30)	Prolonged Cough (>4 weeks)	1.4	1.1 - 1.7	0.005
Age > 60 years	New-onset Hypertension	1.6	1.3 - 2.0	< 0.001
Male Gender	Post-COVID Palpitations	1.3	1.1 - 1.6	0.012
Female Gender	Post-COVID Anxiety	1.5	1.2 - 1.9	0.001
Healthcare Worker	Post-COVID Joint Pain	0.8	0.6 - 1.1	0.18
Lower Socioeconomic Status	Persistent Fever	1.2	0.9 - 1.5	0.09

Discussion

Post-COVID-19 manifestations were observed in approximately 90% of recovered subjects, presenting a wide range of symptoms from mild headaches to more critical conditions such as stroke, renal failure, and pulmonary fibrosis. This finding is consistent with previous reports of post-viral infection syndrome following SARS [12, 13]. A four-year follow-up study of SARS survivors showed that chronic fatigue and psychiatric conditions remained clinically significant [14], emphasizing the need for long-term rehabilitation and a multidisciplinary approach to mental health management. In our study of 300 patients, most developed symptoms within 15 days of initial recovery. The most common post-COVID-19 manifestations were fatigue (59%), muscle pain (52.30%), cough (19.30%), and respiratory distress (17.70%). This aligns with findings from Carfì et al., who reported persistent fatigue (53.1%), dyspnea (43.40%), and joint pain (27.30%) in recovered patients[6]. The severity of COVID-19 and its post-recovery manifestations showed a strong link with age and comorbidities [15, 16]. Older age was associated with increased disease severity, and patients with pre-existing conditions were more likely to experience severe COVID-19 and subsequent complications. Neuropsychiatric symptoms were documented in a significant proportion of subjects, consistent with findings by Lara et al. in their study

of COVID-19's impact on Alzheimer's and mild cognitive impairment patients [18]. Our study found headache (4.30%) and sleep disturbance (3%) to be common neuropsychiatric sequelae. Notably, 58.33% of patients had at least one persistent symptom, while 34% experienced multiple symptoms. This is comparable to findings by Carfì et al., where 55% of patients exhibited three or more symptoms two months post-discharge [6].Our study identified several risk factors for post-COVID-19 syndrome, including female sex, respiratory distress, lethargy, and prolonged illness duration. Interestingly, all age groups showed similar susceptibility to developing post-COVID symptoms, contrasting with the age-related severity patterns observed during acute infection. Comparisons with other studies reveal both similarities and differences in symptom prevalence. Moradian et al. reported fatigue (19.50%) and dyspnea (18.50%) as the most frequent delayed symptoms six weeks post-discharge [20]. Our study found higher rates of fatigue (59%) and similar rates of respiratory distress (17.70%) at 15 days post-discharge. Eve Garrigues et al. observed persistent fatigue (55%), dyspnea (42%), and cognitive symptoms in patients over 100 days post-admission [18]. Our findings at 15 days post-discharge show comparable fatigue rates but lower rates of respiratory and cognitive symptoms, possibly due to the shorter follow-up period. Organ impairment was also observed in our study, primarily affecting the lungs (37%) and neuropsychiatric function (10%), with less frequent cardiac (4.6%) and renal (0.3%) involvement. This differs somewhat from Dennis et al., who reported more widespread mild organ impairment in their community-based study [21].Our findings underscore that negative PCR results do not signify the end of patient monitoring. Continuous and long-term follow-up is crucial for evaluating post-COVID-19 manifestations and enabling early intervention for critical signs. Ongoing counselling is vital not only for medication adherence but also for detecting early warning signs of serious manifestations [22].

Conclusion

This study highlights the critical need for continued patient care beyond the initial recovery from SARS-CoV-2 infection. Our findings demonstrate that a significant proportion of COVID-19 survivors experience post-COVID manifestations (PCMs), ranging from mild symptoms such as fatigue and headache to more severe conditions including pulmonary fibrosis, stroke, and myocarditis. While the acute phase of COVID-19 has been the primary focus of healthcare systems worldwide, this study emphasizes the importance of a long-term, comprehensive approach to patient care. The persistent and potentially severe nature of PCMs necessitates a shift in our healthcare strategies to encompass extended monitoring and support for COVID-19 survivors. Future research should focus on developing targeted interventions for PCMs and understanding the long-term implications of SARS-CoV-2 infection on overall health and quality of life.

Recommendations:

For specific conditions, targeted interventions are recommended: post-exertional symptoms should be managed with energy conservation and pacing techniques; arthralgia requires a combination of pain education, self-management strategies, anti-inflammatory drugs, and exercise (when PESE is absent); breathing impairments benefit from nasal breathing techniques and pacing approaches; cognitive issues should be addressed through education and cognitive exercises; fatigue management includes energy conservation and careful return to exercise; depression can be treated with psychological support, mindfulness, and peer support groups; and olfactory impairment requires specific training and education. All physical exercise recommendations are contingent upon the absence of post-exertional symptom exacerbation (PESE), emphasizing the need for individualized, cautious approaches to rehabilitation.

Limitations:

1. Those with more severe illness might have been less likely to respond and might have differed from survey respondents due to hospitalisation or severity of illness.
2. There was less awareness about post Covid-19 OPD in hospitals and hence, less number of patients turned up in the OPD after discharge.

Public Health Implications

The study's implications reveal critical insights for healthcare systems to plan comprehensive post-COVID care, establish screening protocols, and allocate resources effectively, while simultaneously informing public health policies, advancing research priorities, and anticipating economic impacts, ultimately contributing to better management of long-term COVID-19 manifestations and improved patient outcomes.

Known Learnings

- Post-COVID syndrome affects a substantial proportion of infected individuals across all severity levels.
- Symptoms cluster in recognizable patterns, with neurological, respiratory, and cardiovascular manifestations being most prevalent.
- Risk factors include advanced age, and pre-existing conditions.
- Multiple organ systems can be affected simultaneously, requiring coordinated care approaches.
- Recovery trajectories vary significantly between patients and symptom domains.

Unknown Learnings/New Findings

- Identification of demographic patterns in symptom presentation not previously reported.
- Novel insights into the interaction between pre-existing conditions and post-COVID manifestations.
- Effectiveness of certain intervention approaches requiring further validation.
- By addressing both the established knowledge base and newly emerging findings, healthcare systems can develop more targeted and effective strategies for managing the long-term consequences of COVID-19, ultimately improving patient outcomes and optimizing resource utilization.

Conflict of Interest: NIL

Financial support and sponsorship: NIL

Ethical approval: The study was approved by the Institutional Ethics Committee of Brihanimumbai Mahanagarpalika H.B.T Medical College and Dr R.N. Cooper Municipal Gen. Hospital,Juhu,Mumbai on 12/04/2021.

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Original Article

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Utilization of Maternal Health Services among the Rural Women and their Predictors: An Evidence from Auraiya District of Uttar Pradesh

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Abstract

Background: Maternal mortality is a great global health issue. Though in past decades there has been good progress in bringing down MMR but the progress occurred at slower pace. Many of these deaths can be avoided if there is increase in utilization of maternal health services by women.

Methods: A community based cross-sectional study was conducted to find out the pattern of utilization of maternal Health services and the predictors of it among women in the rural areas of Auraiya District.

Results: There was a high level of ANC service utilization, with most women adhering to recommended visit schedules, initiating care early, and receiving appropriate supplementation and immunizations. Women had strong preference for institutional deliveries, particularly at CHCs, and a high prevalence of skilled birth attendance. Women's education, Husband's education, Religion, Social class, husband's occupation, monthly income, age at marriage, interval between births, status of pregnancy, and history of still birth had significant association with antenatal services utilization. caste, occupation of the mother, age at first pregnancy showed a significant impact on the utilization of intranatal services. Women's education, social class, monthly family income, family structure, age at the time of marriage, birth order, status of pregnancy, and history of abortion was strongly associated with postnatal care utilization.

Conclusion: Overall, there was a high level of maternal health services utilization indicating that the government programmes are effective in increasing the utilization of Antenatal and intranatal services utilization.

Keywords: Maternal health services, utilization, CHC, UP.

Introduction/ Back ground

Since the establishment of the Sustainable Development Goals in 2015 globally there is slight decrease in maternal deaths from 309300 in 2016 to 287000 in 2020.[1] As per UN report 24000 deaths occurred in india. India is the major contributor of maternal deaths after Nigeria. India contributed for 8.36% of global maternal deaths (UN 2020)[2].

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Maternal Mortality Ratio (Maternal deaths per 100,000 live births) of India has dropped from 212 in 2007[3] to 97 in 2018-20[4]. Within India there is disparity in MMR across states, seven states Kerala, Tamilnadu, Telangana, Gujrat, Maharashtra, Andhra Pradesh and Karnataka have achieved the Sustainable Development Goal of MMR below 70[5,6,7]. But in some of the states like Assam, UP, and Madhya Pradesh MMR is very high. In Uttar Pradesh it is very high so it's very challenging to achieve the targets laid by SDG 3.1.Aim of the SDG 3.1 is to reduce the MMR less than 70 by 2030 and no country should have MMR more than 140.

In India 37 percent of mothers received minimum of 4 ANCs in 2005-06[8], compared to 58.4 percent in 2019-21 (NFHS-5)[9], leaving approximately half of pregnant mothers with inadequate antenatal care. According to HMIS 2017-2019 Maternal Mortality Ratio of Auraiya district is 344 per 100,000 live births that is one of the large contributors of maternal deaths in UP[10,11].

Mixed method study conducted by Bhushan H et al[12] reported that the rapid decline in MMR in India is associated with increase in coverage of maternal health services.

Material and Methods

A community based cross-sectional study was conducted to assess the utilization and the predictors of utilization of maternal health services.

Sampling methods, techniques and size:

Multistage sampling a combination of cluster sampling and random sampling was used. In the Auraiya district there are 7 Community Health Centres. In the first stage 5 villages within 5 km area served by the each CHC were selected by simple random sampling. Finally, List of women who gave birth within one year was collected from ASHA and then random sampling technique was undertaken. Sample size was calculated using the following formula:

$$n= Z_{1-\alpha/2^2}P\ (1-P)/d^2$$

Data was collected from 420 mothers using structured questionnaire after taking informed consent. Utilization of Antenatal services categorized into two. Women who had utilized minimum of four visits, minimum one TD injection, and 100 or more iron-folic acid tablets were defined as having utilized. For Intranatal services mothers who had institutional delivery in presence of skilled birth attendant was considered as having utilized intranatal services. For postnatal services mothers who had attended minimum one follow up visit in the health facility is defined as having utilized postnatal services.

Chi square test and binary Logistic regression was used to find out the predictors of the utilization at 0.05 level of significance.

Results

Table 1: Percentage and frequency distribution of Study Subjects by their ANC Services Utilization

N=420

ANC services utilization		Frequency (f)	Percentage (%)
Antenatal checkup	No	1	0.2
	Yes	419	99.8
Frequency of Antenatal visits	0	1	0.2
	1	2	0.5
	2	12	2.9
	3	111	26.4
	>= 4	294	70.0
First time visit (Trimester)	No visit	1	0.2
	3rd trimester	21	5.0
	2nd trimester	24	5.7
	1st trimester	374	89.0
Total no of iron and folic acid tablets taken	< 100	82	19.5
	≥100	338	80.5
TD injections	Taken	420	100
	Not Taken	0	0.0

Table 2: Percentage and frequency distribution of Study Subjects by their Intranatal Services Utilization

N=420

Delivery services utilization		**Frequency (f)**	**Percentage (%)**
Place of Delivery	PHC	1	0.2
	CHC	343	81.7
	District Hospital and other government hospitals	14	3.3
	Medical College	6	1.4
	Private	46	11
	Home delivery	9	2.1
	Ambulance delivery	1	0.2
Presence of skilled birth attendant during Intranatal period.	Yes	412	98.1

Table 3: Percentage and frequency distribution of Study Subjects by their PNC services utilization

N=420

PNC services utilization		**Frequency (f)**	**Percentage (%)**
Postnatal care visit to the health facility within 42 days after child birth.	No	193	46.0
	Yes	227	54.0
If yes, then Purpose of visit	Self	67	29.8
	Child	109	48.4
	Self & Child	49	21.8
Visited by nurse or health worker	Yes	419	99.8
	No	1	0.2
Frequency of visiting by ANM	No visit	1	0.2
	1 - 2 times	271	64.5
	≥3 times	148	35.2
Consumed IFA tablets by 42 days of delivery	No	25	6.0
	Yes	395	94.0

Table 4: Chi square showing Association between Antenatal services utilization and Reproductive and obstetric factors

N = 420

Obstetric Characteristics		**Antenatal**				**Significance**	
		Utilization		**Non-Utilization**		**chi sq**	**p-value**
		f	**%**	**f**	**%**		
Age at marriage (in years)	< 20 yr	17	4.04	19	4.52	3.98	0.045
	20 - 29 yr	246	58.57	138	32.85		
Age at first pregnancy	<19 yrs and ≥30 yrs	260	61.90	153	36.42	1.1877	0.275
	20 - 30 yrs	3	0.71	4	0.95		

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Birth order	One	107	25.95	74	17.7	1.3111	0.519
	Two	97	23.09	53	12.61		
	Three or more	59	14.04	30	7.14		
Interval between births	≤24 months	65	27.31	49	20.58	5.904	0.015
	> 24 months	88	36.97	34	14.28		
Status of pregnancy	Unwanted	252	60	144	34.28	0.87	0.002
	Wanted	11	2.61	13	3.09		
History of abortion	Yes	4	3.33	2	0.47	0.0425	0.8364
	No	259	61.66	155	36.90		
History of stillbirth	Yes	1	0.23	6	1.42	7.1045	0.0076
	No	262	62.61	151	35.95		
History of neonatal death	Yes	1	0.23	3	0.71	2.4416	0.118
	No	262	62.61	154	36.66		

Table 5: Chi square showing Association between Intranatal services utilization and obstetric factors

N = 420

Obstetric Characteristics		**Intranatal**				**Significance**	
		Utilization		**Non-Utilization**		**chi sq**	**p-value**
		f	**%**	**f**	**%**		
Age at marriage (in years)	< 20 yr	31	7.38	2	0.27	1.6632	0.1971
	20 - 29 yr	378	90	9	2.14		
Age at first pregnancy	<19 yrs and ≥30 yrs	4	0.95	1	0.23	5.9938	0.0143
	20 - 30 yrs	405	96.4	10	2.38		
Birth order	One	179	42.61	4	0.95	0.3519	0.8364
	Two	147	35	4	0.95		
	Three or more	85	20.23	3	0.71		
Interval between births	≤24 months	111	46.63	2	0.27	1.034	0.3092
	> 24 months	120	28.57	5	1.19		
Status of pregnancy	Unwanted	386	91.90	10	2.38	0.1988	0.6557
	Wanted	23	5.47	1	0.23		
History of abortion	Yes	6	1.42	0	0	0.163	0.6864
	No	403	0.95	11	2.61		
History of stillbirth	Yes	7	1.6	0	0	0.191	0.6621
	No	402	95.71	11	2.61		
History of neonatal death	Yes	4	0.95	0	0	0.109	0.7413
	Yes	405	96.42	11	2.61		

Table 6: Chi square showing Association between Postnatal services utilization and Reproductive and obstetric factors

N=420

Obstetric Characteristics		Postnatal				Significance	
		Utilization		Non- Utilization		chi sq	p-value
		f	%	f	%		
Age at marriage (in years)	< 20 yr	30	7.1	6	1.4	13.59	0.0002
	20 - 29 yr	197	46.90	187	44.52		
Age at first pregnancy	<20or>30yrs	3	0.71	3	0.71	0.0402	0.8411
	20 - 30 yrs	224	53.33	190	45.23		
Birth order	One	119	28.33	64	15.23	20.16	0.000045
	Two	76	18.09	74	17.61		
	Three or more	32	7.6	55	13.09		
Interval between births	≤24 months	53	22.22	61	14.52	3.5973	0.057873
	> 24 months	174	41.42	132	31.42		
Status of pregnancy	Unwanted	206	49.04	190	45.23	11.46	0.0007
	Wanted	21	5	3	0.71		
History of abortion	Yes	6	1.4	0	0	5.175	0.0229
	No	221	52.61	193	45.95		
History of stillbirth	Yes	4	0.95	3	0.71	0.027	0.8695
	No	223	54.76	190	45.23		
History of neonatal death	Yes	1	0.23	3	0.71	1.383	0.236
	No	226	53.80	190	45.23		

Table 7: Binary Logistic Regression Model Showing Relation of Utilization of ANC Services with Demographic Predictors

N=420

Dependent Variable: Utilization of ANC Services						
Predictors	**B**	**SE**	**p-value**	**OR**	**95% C.I. for OR**	
					Lower	**Upper**
Women's education			0.042			
High school and above	0.07	0.65	0.909	1.08	0.30	3.87
Middle	-0.05	0.67	0.942	0.95	0.26	3.52
Primary	-0.49	0.72	0.494	0.61	0.15	2.50
Literate but below primary	-1.50	0.73	0.040	0.22	0.05	0.93
Illiterate	**Ref. Group**					
Husband's education			0.807			
High school and above	0.60	0.71	0.396	1.82	0.46	7.31
Middle	0.31	0.74	0.673	1.37	0.32	5.85
Primary	0.66	0.81	0.414	1.93	0.40	9.36
Literate but below primary	0.00	0.95	0.997	1.00	0.16	6.44
Illiterate	**Ref. Group**					
Religion: Hindu wrt Muslim	-0.78	0.50	0.117	0.46	0.17	1.22

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Social class			0.010			
SC	1.20	0.36	0.001	3.31	1.62	6.77
ST	0.80	0.73	0.273	2.23	0.53	9.32
OBC	0.65	0.34	0.057	1.92	0.98	3.77
General	**Ref. Group**					
Occupation of mother			1.000			
Daily Wager	20.87	high	0.999	large	0.00	-
Govt Employee	19.34	high	0.999	large	0.00	-
Housewife	**Ref. Group**					
Occupation of husband			<0.001			
Unemployed	-0.57	1.15	0.619	0.56	0.06	5.39
Daily Wager	0.12	0.92	0.897	1.13	0.18	6.88
Farmer	-1.35	0.88	0.128	0.26	0.05	1.47
Private employee	-0.88	0.88	0.318	0.41	0.07	2.34
Self employed	0.24	1.17	0.839	1.27	0.13	12.71
Govt Employee	**Ref. Group**					
Monthly family income			0.126			
Rs 4000 or below	-0.70	0.32	0.031	0.50	0.26	0.94
Rs 4001-6000	-0.13	0.41	0.750	0.88	0.39	1.96
Rs 6001-8000	-0.33	0.53	0.537	0.72	0.26	2.04
Rs 8000 above	**Ref. Group**					
Family structure: Nuclear wrt Joint	0.00	0.26	0.993	1.00	0.60	1.67
Constant	1.41	1.12	0.207	4.10		

Table 8: Binary Logistic Regression Model Showing Relation of Utilization of Intranatal Services with Demographic Predictors

N = 420

Dependent Variable: Utilization of Intranatal Services						
Predictors	**B**	**SE**	**p-value**	**OR**	**95% C.I. for OR**	
					Lower	**Upper**
Women's education			0.270			
High school and above	2.87	1.64	0.081	17.64	0.70	442.44
Middle	2.01	1.63	0.217	7.46	0.31	181.78
Primary	0.63	1.72	0.712	1.89	0.07	54.55
Literate but below primary	1.82	1.81	0.313	6.19	0.18	214.12
Illiterate	**Ref. Group**					
Husband's education			0.530			
High school and above	-2.04	2.00	0.309	0.13	0.00	6.60
Middle	-1.66	2.19	0.448	0.19	0.00	13.88
Primary	-0.88	2.42	0.717	0.42	0.00	47.39
Literate but below primary	-3.22	2.11	0.126	0.04	0.00	2.48
Illiterate	**Ref. Group**					
Religion: Hindu wrt Muslim	-17.37	Large	0.998	0.00	0.00	

Continue.....

Social class			0.073			
SC	-0.86	1.24	0.490	0.42	0.04	4.84
ST	-2.29	1.48	0.122	0.10	0.01	1.84
OBC	1.37	1.48	0.356	3.93	0.21	71.89
General	**Ref. Group**					
Occupation of mother			0.053			
Daily Wager	-4.30	1.78	0.016	0.01	0.00	0.44
Govt Employee	-0.72	Large	1.000	0.49	0.00	
Housewife	**Ref. Group**					
Occupation of husband			0.703			
Unemployed	0.89	Large	1.000	2.43	0.00	
Daily Wager	-14.46	Large	0.999	0.00	0.00	
Farmer	-16.55	Large	0.999	0.00	0.00	
Private employee	-16.57	Large	0.999	0.00	0.00	
Self employed	-17.07	Large	0.999	0.00	0.00	
Govt Employee	**Ref. Group**					
Monthly family income			0.566			
Rs 4000 or below	-1.08	1.22	0.374	0.34	0.03	3.69
Rs 4001-6000	-0.22	1.68	0.898	0.81	0.03	21.57
Rs 6001-8000	-1.89	1.52	0.213	0.15	0.01	2.95
Rs 8000 above	**Ref Group**					
Family structure: Nuclear wrt Joint	-1.14	0.86	0.187	0.32	0.06	1.74
Constant	38.67	Large	0.998	Large		

Table 9: Binary Logistic Regression Model Showing Relation of Utilization of Postnatal Services with Demographic Predictors

N = 420

Dependent Variable: Utilization of Postnatal Services						
Predictors	**B**	**SE**	**p-value**	**OR**	**95% C.I. for OR**	
					Lower	**Upper**
Women's education			0.255			
High school and above	0.67	0.54	0.217	1.95	0.68	5.63
Middle	0.88	0.56	0.118	2.41	0.80	7.25
Primary	0.05	0.61	0.931	1.05	0.32	3.49
Literate but below primary	0.47	0.61	0.440	1.60	0.49	5.26
Illiterate	**Ref. Group**					
Husband's education			0.551			
High school and above	-0.26	0.59	0.654	0.77	0.24	2.44
Middle	-0.04	0.62	0.950	0.96	0.28	3.27
Primary	-0.26	0.70	0.713	0.77	0.20	3.04
Literate but below primary	1.22	0.95	0.199	3.40	0.53	21.90
Illiterate	**Ref. Group**					
Religion: Hindu wrt Muslim	0.28	0.39	0.474	1.32	0.62	2.82

Continue.....

Caste			0.018			
SC	-0.92	0.35	0.008	0.40	0.20	0.79
ST	-0.18	0.78	0.813	0.83	0.18	3.83
OBC	-0.32	0.34	0.343	0.73	0.37	1.41
General	**Ref. Group**					
Occupation of mother			0.748			
Daily Wager	0.98	1.28	0.446	2.65	0.22	32.63
Govt Employee	19.84	28166.17	0.999	415484739.51	0.00	
Housewife	**Ref. Group**					
Occupation of husband			0.884			
Unemployed	0.08	0.97	0.936	1.08	0.16	7.21
Daily Wager	-0.23	0.73	0.749	0.79	0.19	3.30
Farmer	-0.42	0.70	0.553	0.66	0.17	2.60
Private employee	-0.12	0.70	0.866	0.89	0.23	3.49
Self employed	0.00	0.87	0.999	1.00	0.18	5.45
Govt Employee	**Ref. Group**					
Monthly family income			0.444			
Rs 4000 or below	-0.07	0.30	0.806	0.93	0.51	1.68
Rs 4001-6000	0.41	0.40	0.296	1.51	0.70	3.30
Rs 6001-8000	0.35	0.46	0.440	1.42	0.58	3.49
Rs 8000 above	**Ref. Group**					
Family structure: Nuclear wrt Joint	1.03	0.25	<0.001	2.80	1.71	4.57
Constant	-0.03	0.93	0.977	0.97		

Note: The coefficients for other groups are interpreted relative to the reference group.

Results and Discussion

Predictors of the utilization of maternal health services:

Antenatal Services:

Women's Education

Compared to illiterate women, those who were literate but below primary education had significantly lower odds of utilizing ANC services

Social Class

Social class showed a significant association with ANC service utilization. Women from Scheduled Castes were more likely to utilize ANC services compared to the General category

Occupation of the Husband

Husband's occupation was significantly associated with ANC utilization. Wives of Farmers were 74% less likely and private employees 59% less likely to use ANC services compared to government employees.

Monthly Family Income

Families earning Rs. 4000 or below had significantly lower odds of utilizing ANC services compared to families earning above Rs. 8000

Intranatal:

- Daily wagers had significantly lower odds of utilization to use intranatal services compared to housewives. Daily wage mothers face extreme barriers to intranatal service utilization.

Postnatal:

- Women from nuclear families were almost three times more likely to utilize postnatal services compared to those from joint families.

- Scheduled Caste women were significantly less likely to utilize postnatal services compared to the general class

Discussion

The findings of the study revealed that, 99.8% of the women attended antenatal visits out of which 70% attended all the four recommended visits. 89.0% of women-initiated care in the 1st trimester which aligns with the global recommendations. These findings are higher than those reported by Singh et al., where 83% of the women accessed ANC services, and only 61% attended three or more visits. Similarly, **Roy S et al**.[13] found that only 38.3% of the mothers attended at least 4 ANC visits, highlighting the gap in ANC coverage in different settings. The higher ANC coverage in the current study could attributed to increased awareness, improved healthcare access, and strengthened maternal health programs.

The findings of the study align with the study by **Emelumadu et al.[14],** which reported high utilization of both antenatal and intranatal services. The positive association found between service satisfaction and utilization suggest that quality of care and patient experience plays a significant role in encouraging women to seek maternal health services. Similarly in current study, the strong preference for CHC based deliveries and skilled birth attendance may reflect confidence in the quality of care provided at these facilities.

The study revealed that within 42 days postpartum, 54.0% of the women visited health facility. This highlights an encouraging level of PNC utilization. Compared to **Singh et al**[15] and **Wu Y et** al[16] who reported lower PNC utilization rates of 26% and 28.42% respectively. The higher PNC attendance in this study could be attributed to increased accessibility, and enhanced health education efforts during ANC visits.

Additionally, this study found that woman's education, occupation, social class, husband's occupation, monthly family income, and family structure are significant predictors of maternal health services utilization. These findings are consistent with the **Iyaniwura and Yussuf[17],** who reported a positive association between education and ANC utilization. Educated women are more likely to be aware of the importance of maternal healthcare and seek timely services.

Conclusion

Overall, there was a high level of ANC service utilization, with most women adhering to recommended visit schedules, initiating care early, and receiving appropriate supplementation, immunizations, had strong preference for institutional deliveries, particularly at CHCs, and a high prevalence of skilled birth attendance, demonstrating adherence to safe delivery practices indicating that the government programmes are effective in increasing the utilization of Antenatal and intranatal services utilization.

Within 42 days postpartum, 54.0% of women visited a health facility.So, there is need to sensitize the mothers and their families regarding importance of the PNC services to increase utilization of PNC services.

Based on the findings of the study there are some recommendations to improve maternal care and align with SDG 3.1:

- Implementation of community outreach program to identify and support women who delay ANC and regarding risk of home deliveries.
- Flexible clinical hrs for ANC services for women who have daily responsibilities.
- Basic obstetrical and neonatal training of traditional birth attendants and ambulance staff.
- Digital tracking system to identify and follow up with women.

Ethical Clearance: IRB for protection of human subjects, IIHMR University JaipurIORG0007355 OMB No-0990-0279 IRB 00008833 Date: 28.07.23

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