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Fazaia Journal of Health Sciences

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EDITORIAL

Why This New Medical Journal

The launch of the Fazaia Journal of Health Sciences (FJHS) in collaboration with Air university marks a significant milestone in our institution's journey toward academic excellence and the advancement of health sciences. In an era of rapidly evolving medical knowledge and interdisciplinary collaboration, there is a need for credible, accessible, and regionally relevant platforms to share research, clinical experiences, and relevant educational advancements.

The vision behind this journal is to provide an authentic plateform for faculty members, researchers, clinicians, and students to share their findings, ideas, and innovations with the wider academic and professional community. While the world is enriched with countless medical journals, we believe there remains a crucial space for a publication that reflects the unique healthcare challenges, opportunities, and perspectives of Pakistan and similar contexts while maintaining international standards of scientific writing and publishing as defined by ICJME.

We remain committed to foster a culture of scientific inquiry and critical thinking, bridging the gap between research and practice. By encouraging contributions from diverse disciplines of medicine, dentistry, nursing, public health, allied health sciences, biomedical sciences, bioinformatics and medical education-we aim to inspire multidisciplinary collaboration and innovation. Each article we publish will undergo a standard peer-review process, ensuring the quality, relevance, and ethical integrity of scientific content.

The Fazaia Journal of Health Sciences is not merely a repository of articles; it is a platform for dialogue, mentorship, and inspiration. We hope it will encourage young researchers to take their first confident steps into scientific writing, while providing seasoned academics with a respected forum to disseminate impactful work.

This inaugural issue is the first chapter of a long journey. We invite our readers, authors, and reviewers to join us in building a journal that is both locally relevant and globally recognized. Together, we can contribute to a healthier society through the advancement of knowledge.

Editor-in-Chief

Major General Professor
Muhammad Tahir Khadim Hl(M), Retd
Dean Faculty of Health Sciences
Principal Fazaia Medical College

ORIGINAL ARTICLE

Comparison Between Tragal Cartilage With Perichondrium and Temporalis Fascia Graft in Type 1 Tympanoplasty

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ABSTRACT

Objective: To compare the efficacy of Tragal Cartilage Tympanoplasty (TC) and conventional Temporalis Fascia (TF) Tympanoplasty in terms of graft uptake and hearing outcomes.
Methodology: This cross-sectional study was conducted in the Department of Otorhinolaryngology at Fazaia Medical College (FMC), PAF Hospital, Islamabad, from December 2020 to January 2025. A total of 90 patients with mucosal-type chronic suppurative otitis media (CSOM) were enrolled and categorized into two groups: Group A (46 patients undergoing Tympanoplasty with TF graft) and Group B (44 patients undergoing tympanoplasty with TC and perichondrium graft). All patients of CSOM who met the inclusion criteria underwent comprehensive preoperative assessments, including otoscopy, tuning fork tests, Valsalva maneuver, fistula test, and facial nerve integrity. Pure tone audiometry (PTA) was performed to measure hearing levels. Type I tympanoplasty, using TF for Group A and TC with perichondrium for Group B. Postoperative outcomes were evaluated, with hearing thresholds via PTA at 3 and 6 months. Data were analyzed using SPSS version 22, with statistical significance defined as a p-value <0.05.
Results: We evaluated 90 patients; 46 in Group A and 44 in Group B. Preoperative mean hearing loss was approximately 30 dB in Group A and 35 dB in Group B. Type I Tympanoplasty was performed either microscopically or endoscopically. Success rates of graft uptake was 95.65% for Group A and 95.45% for Group B, indicating no statistical significance. However, hearing improvement, was greater in Group B (20 dB) compared to Group A. Statistically significant difference was observed (P<0.05).
Conclusion: TC with perichondrium is more effective in achieving 2:20 dB air-bone gap (AB gap) closure compared to TF.
Keywords: Cartilage, Temporalis fascia, Tympanoplasty

INTRODUCTION

Tympanic membrane (TM) perforations have a definite risk to the heath of the patients.[1] The common causes of perforations are acute otitis media[2] and chronic otitis media with or without cholesteatoma. Less commonly it can be a complication of grommet insertion (in approximately 3-5% of cases) or barotrauma.[3] Long standing perforations can lead to conductive hearing impairment primarily but potentially sensorineural in some instances.[1]

Zollner and Wullstein are pioneered tympanoplasty surgeons, they used temporalis fascia and since then, it has become the traditional graft material of choice.[2,4] For chronic otitis media tympanoplasty, a surgical procedure that repairs the tympanic membrane and middle ear ossicles, is a well-established treatment.[1,5]

Although vanous graft materials like

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perichondrium, periosteum, vein, cartilage, and other fasciae, have been used, but temporalis fascia has been a popular choice due to its easy accessibility, low metabolic rate and plenty of availability. However, shrinking and medialization leading to retraction pockets and failure are not very uncommon.[2,6] Utech, first introduced cartilage in 1959, now becoming popular with the advent of endoscopic Tympanoplasty. Its advantages are rigidity, easy handling, late resorption and avoiding post-auricular scars and pain, becoming the preferred graft material for endoscopic surgeons.[1,2,7]

Studies have statistically proved that cartilage, particularly sliced cartilage, yields similar outcomes to temporalis fascia regarding hearing improvement and graft uptake.[3,8] This study aims to compare the efficacy of sliced cartilage and temporalis fascia in Tympanoplasty in terms of graft uptake and hearing outcomes, by compairing with previous research using cartilage and temporalis fascia in tympanoplasty.

MATERIALS AND METHODS

This retrospective cross-sectional study was conducted in the Department of Otorhinolaryngology at Fazaia Medical College, PAF Hospital, Islamabad, from December 2020 to January 2025. Total ninety patients with mucosal-type chronic suppurative otitis media (CSOM) were included and divided into two groups: Group A (46 patients undergoing Tympanoplasty with temporalis fascia graft) and Group B (44 patients undergoing Tympanoplasty with tragal cartilage and perichondrium graft).

All the patients presenting to the ENT outpatient department with mucosal-type CSOM, who fulfilled the inclusion criteria were included. Inclusion criteria were: mucosal-type CSOM with small or medium central perforation, conductive hearing loss :S40 dB, patent Eustachian tube, no nasal or nasopharyngeal pathology, and a minimum follow-up of 6 months and also without preoperative comorbidities such as diabetes. Exclusion criteria included pre-existing comorbidities, large or total perforations, conductive hearing loss >40 dB, blocked Eustachian tube, or follow-up of less than 6 months.

Complete preoperative assessments were done, including otoscopy to evaluate the tympanic membrane, middle ear mucosa, and ossicles. Additional tests included tuning fork tests, Valsalva maneuver, fistula test, and facial nerve assessments. Pure tone audiometry (PTA) with masking was used to measure hearing levels, and X-rays of the mastoid and paranasal sinuses were performed to exclude nasal pathology and mastoiditis.

Type I Tympanoplasty was performed either endoscopically or microscopically, usmg temporalis fascia grafts for Group A and tragal cartilage with perichondrium grafts for Group B. In cases of dry perforations, type I Tympanoplasty alone was performed; for wet ears, cortical mastoidectomy was preferred alongside type I Tympanoplasty. Postoperative outcomes were assessed for graft uptake and hearing improvement, with hearing thresholds measured on PTA at frequencies 250, 500, 1000, and 2000 Hz at 3- and 6-months periods of follow up. Data were analyzed using SPSS version 22, with statistical significance defined as a p-value <0.05.

RESULTS

In this study 90 patients were included (41 were males and 49 females), with 46 patients

in Group A (Tympanoplasty with temporalis fascia graft) and 44 in Group B (Tympanoplasty with tragal cartilage and perichondrium graft). Preoperative mean hearing loss was approximately 30 dB in Group A and 35 dB in Group B. Type I Tympanoplasty, with or without cortical mastoidectomy, was performed either microscopically or endoscopically.

Success of the surgery was assessed on the

basis of graft uptake and hearing improvement. Graft uptake results are presented in Table I, and hearing improvement results in Table II. Graft uptake rates were comparable between temporalis fascia and tragal cartilage grafts. Success rates (95.65% for Group A vs. 95.45% for Group B) showed a 0.20% difference. Fisher's Exact Test yields a p-value > 0.05, indicating no statistical significance.

However, hearing improvement, measured as mean air-bone gap closure, was greater in Group B (20 dB) compared to Group A. Statistical analysis using Fisher's Exact Test confirmed significant difference ($p<0.05$). Indicating tragal cartilage with perichondrium (Group B) is more effective in achieving 2:20 dB AB gap closure compared to temporalis fascia (Group A).

DISCUSSION

Temporalis fascia (TF) graft failures often result from retraction pockets due to lack of rigidity, infection, and technical errors.[9,10] Moreover, TF grafts can shrink, atrophy, or undergo unpredictable changes due to poor stability, increasing the risk of failure.[2,3,9] In contrast, cartilage grafts are more rigid to retraction and take more time for resorption, making them a popular choice for tympanic membrane reconstruction.[11,12,13] However, there is no clear consensus on audiological outcomes due to thickness and rigidity of cartilage grafts.[1,10,14]

Our study evaluated graft success based on uptake and hearing improvement. Although both graft materials showed similar perforation closure rates, but TC demonstrated significantly better audiological outcomes. These findings compared with previous research, including a meta-analysis by Kai Chen and Rui Zhao in 2022, which found that TC compared with TF grafts were better in both graft uptake and postoperative hearing improvement. However, some studies have reported mixed results, with significant differences only in hearing improvement, not graft uptake.[1,11,15]

Another study published in the Pak Armed Forces Med Jin 2021, found that both TC with perichondrium andTF grafts achieved comparable success rates in endoscopic Tympanoplasty.[3,9,16] Similarly, research by Raghav Mehta et al. in Jaipur, India, concluded that TC and TF grafting have similar audiological outcomes.[8,17] However, TC grafts demonstrated a higher successful uptake rate due to their elasticity and resistance to resorption and retraction under negative middle ear pressure.

CONCLUSION

In conclusion, our study found that cartilage with

Table I: Graft Uptake in TF and TC

Sr.No.	Total Number of Patients	Type of Graft	Graft Uptake	Hearing Improvement
Group A	46	Ternporalis Fascia	44	95.65%
Group B	44	Tragal Cartilage and Perichondrium Graft	42	95.45%

Table II: Hearing Improvement with TF and TC

Sr. No.	Total Number of Patients	Type of Graft	Average Preop Hearing Loss	Patients with 20dB Hearing Improvement	Hearing Improvement
Group A	46	Temporalis Fascia	30dB	38	82.5%
Group B	44	Tragal Cartilage and Perichondriurn Graft	35dB	42	95.45%

perichondrium yields better functional outcomes, while both cartilage and temporalis fascia grafts have similar success rates in closing perforations but TC is better in achieving improved audiological results.

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ORIGINAL ARTICLE

Frequency of Anxiety and Depression in Patients undergoing Hemodialysis in Tertiary Care Hospitals of Rawalpindi

Syed Fawad Mashhadi, Muhammad Parhan Butt, Asma Farooq, Asma Ziad, Mateen Tahir, Muhammad Rizwan, Muhammad Arsalan
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ABSTRACT

Objectives: a. To determine the frequency of anxiety and depression among patients undergoing hemodialysis. b. To provide an association between anxiety and depression in dialysis patients and the socio-demographic factors.

Materials and Methods: A cross sectional study was conducted over a period of 6 months at tertiary care hospitals of Rawalpindi. Data was collected using purposive sampling technique from 358 patients on hemodialysis. The data collection tool, "Hospital Anxiety and Depression scale", comprised of 14 questions; seven each for assessing depression and anxiety. The collected data was analysed through SPSS version 26.0.

Results: Anxiety and depression was common in hemodialysis patients in proportion of 34.3% and 38.7% respectively. Significant association was found between anxiety and gender (p=0.038). Educational level was also significantly associated with both depression (p=0.016) and anxiety (p=0.018). No significant results was found with other sociodemographic factors, i.e age, marital status, type of family, occupation, and monthly income.

Conclusion: Anxiety and depression are prevalent in hemodialysis patients. These mental disorders need to be addressed by the physicians to promote treatment adherence, to improve quality of life of patients and disease prognosis.

Key words: Anxiety, Chronic kidney Disease, Depression, Renal Dialysis, Mental Health, Prevalence, Mental Disorders, Tertiary Healthcare.

INTRODUCTION

Hemodialysis serves as a vital lifeline for millions, with over two million patients worldwide relying on this life-sustaining treatment each year. In Pakistan, the situation is particularly critical, as the prevalence of Chronic Kidney Disease (CKD) is alarmingly high. Recent studies indicate that between 12.5% to 29.9% of the population is affected by CKD, while it reaches up to 43.6% among older adults.[1] This significant prevalence highlights the urgent need for hemodialysis, solidifying its status as an essential medical service in the country.

The hemodialysis process involves effectively rerouting blood through an external machine, where it is meticulously filtered before being returned to the body. This procedure typically lasts three to four hours and is generally required three times a week in developed nations, while in developing countries, it may be conducted twice a week.[2] While hemodialysis is crucial in maintaining and prolonging life, it undeniably impacts the quality of life for many patients.[3,4] Patients often confront repeated punctures and must adhere to strict fluid and dietary restrictions, all while managing potential complications arising from regular treatments.[5,6] This rigorous routine can take a toll on mental well-being, leading to increased feelings of anxiety and depression among those undergoing hemodialysis.[7,8]

Anxiety is marked by intense feelings of uncertainty, dread, and fear.[9] Research indicates

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that approximately 50% of individuals undergoing hemodialysis experience symptoms of both anxiety and depression.[10] Notably, the incidence of depression among these patients is about three times higher than that in the general population. This surge in anxiety and depression can significantly impact treatment outcomes, potentially resulting in poor adherence to dialysis protocols. This may manifest as missed hemodialysis appointments and shorter treatment durations, ultimately compromising patient health.[11]

The financial strain associated with weekly dialysis, ongoing medication, and necessary laboratory tests places considerable economic pressure on families. This situation may lead to feelings of guilt and intensify the psychological burdens faced by patients. Additionally, these mental health challenges are correlated with an increased incidence of social isolation, hospitalization, and mortality.[12,13]

In a country like Pakistan, the burden of patients grappling with neuropsychiatric symptoms is significant, yet these crucial aspects often go unaddressed by healthcare providers. This oversight can have a detrimental impact on both disease prognosis and treatment adherence.[14,15] To improve patient outcomes, it is essential to incorporate the assessment of anxiety and depression into routine care evaluations. By doing so, healthcare professionals can tailor the most effective treatment plans for each individual, ensuring a more holistic approach to their care.[16]

Even though several studies on anxiety anddepression have been undertaken, most have been conducted in Western countries. Findings on these issues in relation to haemodialysis populations in Pakistan are very scarce. Thus, the aims of the current study were to asses the frequency of these psychiatric disorders in patients undergoing hemodialysis and to determine their relationship with sociodemographic factors.

METHODOLOGY

The study utilized a cross-sectional analytical study design. The study population consisted of patients undergoing hemodialysis. Data collection took place in tertiary care hospitals in Rawalpindi over a period of six months. A sample size of 358 patients was determined for the study. The sampling strategy employed was non-probability purposive sampling.

To be eligible for participation in the study, participants were required to be undergoing maintenance hemodialysis for a minimum duration of three months, to provide informed consent, and to be at least 15 years of age. Patients were excluded if they had been diagnosed with pre-existing psychiatric disorders, had severe physical or cognitive limitations, or were critically ill.

Anxiety and depression were assessed using the Hospital Anxiety and Depression Scale (HADS) questionnaire. The questionnaire was translated into the local language for participants. The HADS questionnaire contained seven items for assessing depression and seven items for assessing anxiety. Out of the 14 questions, 8 were forward-scored and 6 were reverse-scored. The scoring system for HADS was as follows: a total score of O to 7 was considered normal, a score of 8 to 10 indicated borderline anxiety or depression, and a score of 11 to 21 indicated abnormal anxiety or depression (classified as a case). Each question had a maximum score of 3 and a minimum score of 0.

For statistical analysis, the collected data were entered into SPSS version 26.0. Both descriptive and inferential stat1st1cs were computed. Descriptive analysis included measuring mean and standard deviation for continuous variables, while frequency and percentage were reported for categorical variables. For inferential analysis, chi-square test was applied, with a p-value of :S0.05 considered statistically significant. Ethical considerations for the research included obtaining voluntary informed consent, ensuring anonymity and receiving approval from Ethical Review Committee of Army Medical College, Rawalpindi.

RESULTS

A total of 358 patients undergoing hemodialysis participated in the study. The mean age was 47.67 years(± 15.23), with the largest age group being 46-60 years. The majority of participants were male (66.8%) and married (81.8%). Most patients belonged to joint families (53.6%) and had varying educational levels, with the highest proportion (27.1%) completed matriculation. In terms of monthly income, 43.0% were earning below 40,000 PKR. Occupations ranged from unskilled labor to professional roles, with clerical workers comprising the largest subgroup (23.5%). The proportions of depressive disorder was 39.7% (n=142), while anxiety disorder affected 34.3% (n=123) of the patients.

Analysis of associations between socio-demographic variables and psychological outcomes revealed that gender was significantly associated withanxiety, with females experiencing higher rates than males (p = 0.038). Although females also showed a higher ooccurrence of depression, this difference was not statistically significant (p = 0.151).

Educational level was significantly associated with both depression (p= 0.016) and anxiety (p = 0.018). Higher educational attainment was generally associated with lower levels of abnormal depression and anxiety scores. Other socio-demographic variables including age group, marital status, type of family, occupational level, and monthly income showed no statistically significant association with either depression or anxiety (all $p > 0.05$), as detailed in Tables I and II.

Table I: Association between Socio-demographic Variables and Depression

Socio-demographic variables	Category	Normal n (%)	Borderline n (%)	Abnormal n (%)	p-value
Age in years	15 - 30	16 (31.4%)	15 (29.4%)	20 (39.2%)	0.568
	31 - 45	25 (23.8%)	42 (40.0%)	38 (36.2%)	
	46 - 60	38 (29.0%)	40 (30.5%)	53 (40.5%)	
	61 - 75	20 (32.3%)	15 (24.2%)	27 (43.5%)	
	76+	1 (11.1%)	4 (44.4%)	4 (44.4%)	
Gender	Male	73 (30.5%)	79(33.1%)	87 (36.4%)	0.151
	Female	27 (22.7%)	37(31.1%)	55 (46.2%)	
Marital status	Married	81 (27.6%)	95 (32.4%)	117 (39.9%)	0.962
	Unmarried	19 (29.2%)	21 (32.3%)	25 (38.5%)	
Educational level	Illiterate	10 (16.7%)	16 (26.7%)	34 (56.7%)	**0.016***
	Primary	10 (15.9%)	22 (34.9%)	31 (49.2%)	
	Matric	28 (28.9%)	33 (34.0%)	36 (37.1%)	
	Intermediate	24 (36.9%)	21 (32.3%)	20 (30.8%)	
	Graduate	14(34.1%)	14(34.1%)	13 (31.7%)	
	Postgraduate	14 (43.8%)	10 (31.3%)	8 (25.0%)	
Type of family	Nuclear	45 (27.1%)	62 (37.3%)	59 (35.5%)	0.154
	Joint	55 (28.6%)	54 (28.1%)	83 (43.2%)	
Occupational level	Unskilled	17(21.5%)	27 (34.2%)	35 (44.3%)	0.117
	Semi-skilled	21 (24.7%)	23 (27.1%)	41 (48.2%)	
	Clerical	27 (27.8%)	40 (41.2%)	30 (30.9%)	
	Semi-professional	17 (32.1%)	15 (28.3%)	21 (39.6%)	
	Professional	18 (40.9%)	11 (25.0%)	15 (34.1%)	
Monthly income in thousands (k)	Below 40k	40 (26.0%)	48 (31.2%)	66 (42.9%)	0.675
	40k-75k	30 (29.1%)	35 (34.0%)	38 (36.9%)	
	75k-150k	15(23.1%)	23 (35.4%)	27 (41.5%)	
	150k-300k	10 (43.5%)	7 (30.4%)	6 (26.1%)	
	Above 300k	5 (38.5%)	3 (23.1%)	5 (38.5%)	

*Statistically significant ($p < 0.05$)

Table II : Association between Socio-demographic Variables and Anxiety

Socio-demographic variable	Category	Normal n (%)	Borderlinen (%)	Abnormal (case) n (%)	p-value
Age in years	15 - 30	21 (41.2%)	12 (23.5%)	18 (35.3%)	0.792
	31 - 45	37 (35.2%)	30 (28.6%)	38 (36.2%)	
	46 - 60	45 (34.4%)	47 (35.9%)	39 (29.8%)	
	61 - 75	20 (32.3%)	17 (27.4%)	25 (40.3%)	
	76+	3 (33.3%)	3 (33.3%)	3 (33.3%)	
Gender	Male	94 (39.3%)	72 (30.1%)	73 (30.5%)	**0.038***
	Female	32 (26.9%)	37(31.1%)	50 (42.0%)	
Marital status	Married	105 (35.8%)	88 (30.0%)	100 (34.1%)	0.859
	Unmarried	21 (32.3%)	21 (32.3%)	23 (35.4%)	
Educational level	Illiterate	12 (20.0%)	22 (36.7%)	26 (43.3%)	**0.018***
	Primary	16 (25.4%)	24(38.1%)	23 (36.5%)	
	Matric	40 (41.2%)	29 (29.9%)	28 (28.9%)	
	Intermediate	30 (46.2%)	10 (15.4%)	25 (38.5%)	
	Graduate	18 (43.9%)	14 (34.1%)	9 (22.0%)	
	Postgraduate	10 (31.3%)	10 (31.3%)	12 (37.5%)	
Type of family	Nuclear	61 (36.7%)	52 (31.3%)	53 (31.9%)	0.663
	Joint	65 (33.9%)	57 (29.7%)	70 (36.5%)	
Occupational level	Unskilled	18 (22.8%)	25 (31.6%)	36 (45.6%)	0.097
	Semi-skilled	33 (38.8%)	25 (29.4%)	27 (31.8%)	
	Clerical	35 (36.1%)	29 (29.9%)	33 (34.0%)	
	semi-professional	17 (32.1%)	19 (35.8%)	17 (32.1%)	
	professional	23 (52.3%)	11 (25.0%)	10 (22.7%)	
Monthly income in thousands (k)	Below 40k	55 (35.7%)	39 (25.3%)	60 (39.0%)	0.187
	40k-75k	37 (35.9%)	29 (28.2%)	37 (35.9%)	
	75k-150k	19 (29.2%)	29 (44.6%)	17 (26.2%)	
	150k-300k	11 (47.8%)	7 (30.4%)	5 (21.7%)	
	above-300k	4 (30.8%)	5 (38.5%)	4 (30.8%)	

*Statistically significant ($p < 0.05$)

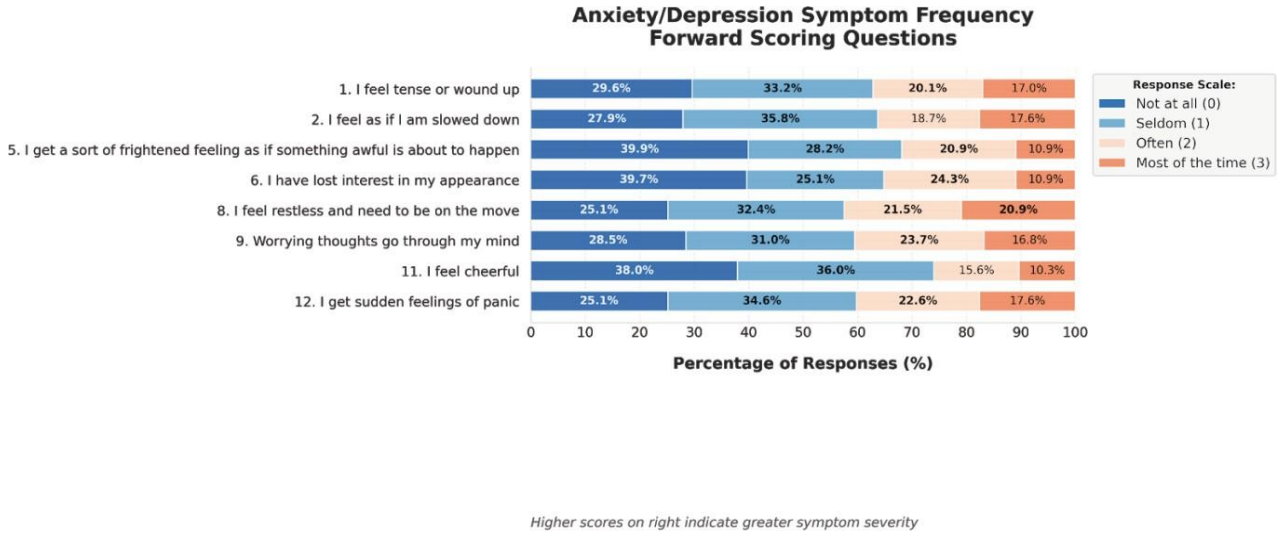

Figure 1: Frequency of Anxiety/Depression Symptoms - Forward Scoring Questions

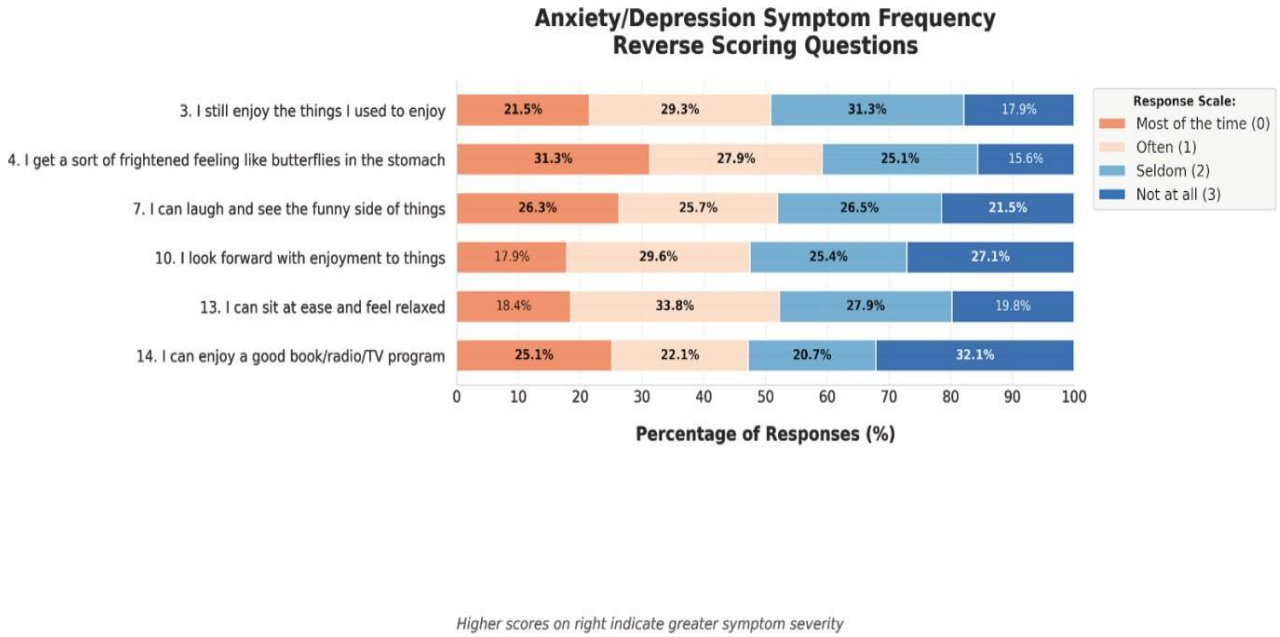

Figure 2: Frequency of Anxiety/Depression Symptoms - Reverse Scoring Questions

DISCUSSION

The findings reveal that the prevalence rates are 39.7% for depression and 34.3% for anxiety, figures that are comparable to a similar study conducted in China.[17] In contrast, research from Egypt reported significantly higher prevalence rates, with anxiety affecting 49.6% and depression affecting 55% of the participants. Both studies utilized the Hospital Anxiety and Depression Scale to evaluate symptoms of anxiety and depression. The discrepancies in prevalence rates may be attributable to geographic and socio-economic differences between the countries involved.[12]

Meng-Wei Ge et al. reported a prevalence of 24.4% and 23.7% for anxiety and depression respectively in cancer patients, which, although concerning, are lower than those found in dialysis patients.[18] A separate study examining the impact of the COVID-19 pandemic on the general population revealed a prevalence of 31.9% for anxiety and 33.7% for depression, emphasizing the significant challenges faced during this unprecedented time and the resilience required to navigate through adverse mental health symptoms. The results of the present study align closely with these statistics, illustrating the ongoing need for attention to mental health in these populations.[19]

In the present study, it was found that maJonty of the participants, specifically 39.7%, reported never experiencing a loss of interest in their personal appearance, as indicated by question 6 of the HADS questionnaire: "I have lost interest in my appearance." This positive response suggests that hemodialysis may not substantially impact an individual's physical appearance. In contrast, conditions like lupus nephritis and alopecia areata have been shown in various studies to significantly affect physical appearance, leading to higher levels of anxiety and depression among affected individuals. The presence of alopecia in these conditions can contribute to a negative self-perception, which is not as prevalent in those undergoing hemodialysis.[20,21]

Additionally, the study revealed another encouraging finding, that is 39.9% ofrespondents answered "not at all" to the question, "I get a sort of frightened feeling as if something awful is about to happen," which is question 5 of the HADS. Furthermore, 34.6% of participants reported experiencing "sudden feelings of panic"

only "seldom". These results indicate that the above stated aspects didnot significantly affect the majority of patients undergoing hemodialysis.

Our study found no appreciable association between age and levels of anxiety and depression. This contrasts with the findings ofNirmalaAryal's research conducted in Nepal, which reported that 50% of patients aged 65 and older experienced anxiety and 60% exhibited signs of depression. [22] The literature suggests that advancing age is a predictive factor for lower mental component scores and heightened levels of both anxiety and depression. Additionally, older adults often face a higher incidence of comorbidities and reduced social engagement, which can further compromise mental health. Our study primarily involved younger patients having a mean age of 47 years which may have lower incidence of other chronic diseases and shorter duration of hemodialysis sessions.

In our study, females reported significantly higher levels of anxiety than males. The prevalence rate was also high in females but not statistically significant. It was aligned with the study conducted in Egypt which reported higher rates of anxiety in females.[11] Gonadal hormones may be a major factor given that women are more likely to experiences mood disturbances during hormonal flux, in contrast to testosterone which has protective anxiolytic effects.[23] In a country like Pakistan, women have limited access to education, health facilities and equal job opportunities which can further exacerbate these mental disorders in them.

The current study found no association between marital status and family type with the levels of anxiety and depression, contrasting with the findings from a study conducted in Poland. Leszek Sulkowski indicated that social support from family and friends played a significant role in reducing mental disorders by enhancing patient satisfaction, encouraging treatment-seeking behavior, and adherence to dietary restrictions. [24] This perspective is further supported by an American study, which demonstrated that social support markedly improved the quality of life of the patients undergoing dialysis thereby reducing anxiety and depression in them.[25]

A lack of statistically significant association of monthly income and occupational level with anxiety and depression levels was reported in the present study. This can be attributed to the fact that the majority of the patients had health insurance that fully covered their treatment costs, alleviating their financial concerns.

Education provides patients with the necessary skills to comprehend complex health information related to dialysis procedures, which facilitates better adherence to treatment protocols and encourages proactive health management, ultimately alleviating symptoms of anxiety and depression. Patients with higher educational attainment tend to be more receptive to the advice of healthcare professionals, allowing them to make healthier lifestyle choices and engage more actively in psychosocial interventions, which have shown promising effects on reducing anxiety and depression. Conversely, those with limited educational backgrounds often experience increased vulnerability to poor health decisions. The current study has several limitations that should be considered before implication of findings. Firstly, its cross-sectional design restricts the ability to establish a cause-and-effect relationship between the variables, as it lacks a temporality. Additionally, the generalizability of the findings is limited due to the focus on a small geographical area. Furthermore, anxiety and depression were evaluated based on self-reported measures rather than established clinical diagnoses, which may affect the accuracy of the findings. Lastly, selection bias is also a concern, as the study excluded patients who opted not to participate, potentially including those who may have experienced anxiety or depression.

CONCLUSION

Anxiety and depression are prevalent in patients undergoing hemodialysis. Factors like gender and educational levels are associated with increased levels of anxiety and depression. Other sociodemographic factors such as age, marital

status, type of family, monthly income and occupation are not related to the levels of anxiety and depression.

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ORIGINAL ARTICLE

Perceived Weight Stigma, Cognitive Sophistication andAttitudes Towards Self in Young Adult Fat Working and Non-Working Women

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ABSTRACT

Objective: This study examined the relationship between perceived weight stigma, cogmtive sophistication, and self-attitudes in fat young adult women, comparing working and non-working groups. The main hypothesis was that (a) there would be a significant relationship between perceived weight stigma and attitudes towards self, (b) cognitive sophistication would predict a weakening in the relationship between perceived weight stigma and attitudes towards self, (c) there is a difference in working and non-working women for perceived weight stigma, cognitive sophistication and attitudes towards self.

Methodology: A total of 200 women aged 18-30 completed the Weight Self-Stigma Questionnaire (WSSQ), Attitudes Toward Self Scale, and Actively Open-Minded Thinking Scale. Differences were assessed based on employment and marital status.

Results: Perceived weight stigma was positively related to negative self-attitude and increased with age. Single and unemployed women reported higher stigma and more negative self-views. Cognitive sophistication did not significantly moderate the stigma-self-attitude relationship.

Conclusion: The study highlights important implications for the mental health and psychological support needs of fat young adult women, particularly in the context of employment and marital status.

Keywords: Perceived Weight Stigma, Cognitive Sophistication, Attitudes Towards Self

INTRODUCTION

Obesity is a present global epidemic in all age groups and in both developed and developing countries. This increasing prevalence has led to several researches on the possible consequences on both the physical and mental health of the population, [1] Obesity is a condition in which there is an excess of fat which adds up in the adipose tissue due to which the health of the individual is at risk. Obesity is associated with a greater risk of disability or premature death and is also considered to carry serious implications for the psychosocial health of an individual. [2]

This directive is based on social discrimination against obesity. In more recent times, one of the most significant psychosocial concerns regarding obesity is **weight stigma.**[3] It is suggested that phobia (or weight stigma) gives rise to a person's mental health problems. Therefore with both sides in consideration, we can assume that increased perceived weight bias can predict an effect on an individual's attitudes towards self. However the question still remains 'will cognitive sophistication imply a weakening of this relationship?'.[4,5]

To study this concept we can deduce three variables from the arguments presented and analyze their relationship. This study uses the terminology "fat" to describe the sample population as terms including "obese" are a source of perpetuating stigma, alienating fat individuals and as an offensive term that harms the fat community.[6]

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Specifically, the main objectives of this paper are:

a) To examme the relationship between perceived weight stigma and attitudes towards self in young adult, fat, working and non-working women.
b) To investigate if cognitive sophistication moderates this relationship
c) To explore the differences in young adult, fat, working and non-working women for perceived weight stigma, attitudes towards self and cognitive sophistication.

Weight bias and weight stigma have a significant negative influence on mental health. Fat people who faced weight stigma showed an increasing vulnerability to stress, rates of depressor, and they had lower self-esteem relating to their poor body image and workout evading tendencies. [7]

Stanovich and Toplak conducted a research on fat individuals to find that they are at a significant risk for mental health complications due to weight related discrimination by others and how they respond to it. This weight stigma was most commonly related to depression in fat individuals. They found that more stigmatizing and marginalizing experiences and incidents were significantly related to depression. [8]

THE CONCEPTUAL FRAMEWORK: THE CONCEPTUAL MODEL AND HYPOTHESES

The Conceptual Model depecting the relationship between perceived weight stigma, attitudes towards self and cognitive sophistication has been shown in figure -1

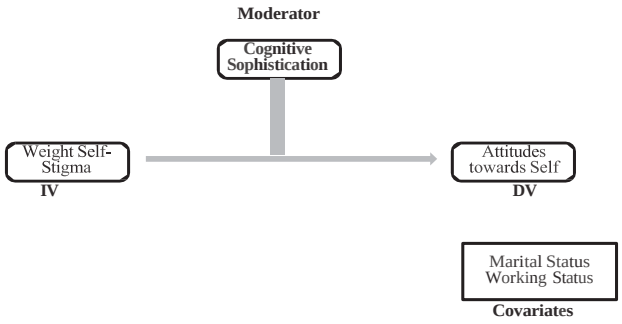

Figure 1. The Conceptual Model

PERCEIVED WEIGHT STIGMA

Weight stigma, also known as weight bias or weight-based discrimination, is discrimination or stereotyping based on a person's weight. Exposure to weight stigma has been associated with low self-esteem, depression and avoiding health promoting behavior.[9] Media Outlets often reinforce stereotypes, depicting fat individuals as undesirable or with low self-control Celebrities are often plastered on magazine covers, ridiculed for gaining weight.

Researchers have explored the theoretical models that lead to weight stigma practices and attitudes, the psychological impact and processes that run side by side with this concept and the history, origins and the social contexts for this discrimination.[10]

ATTITUDES TOWARDS SELF

Attitude towards self emphasizes how individuals evaluate themselves. An attitude towards self includes three self-regulatory vulnerabilities. They include holding of extremely high standards, the tendency to be self-critical at any failure to perform well and the tendency to generalize from a single failure to the broader sense of self-worth. [11] Attitudes towards self can take many forms. A positive attitude towards self can be depicted by self-acceptance, optimistic approach and encouraging outlook on others. It can lead to people developing good social skills and overall good social adjustment. However, when stigma is internalized, it may distort these attitudes leading people to devalue themselves. [12]

COGNITIVE SOPHISTICATION

It refers to the depth and complexity of thought processes that individuals apply in understanding themselves and others. It includes elements such as systemic neglect, belief in anxiety, sensitivity to balance, resistance to desire, and the tendency to think of others.[13] Comprehensive comprehension can be measured in the following categories according to the psychological processes studied: cognitive abilities (intellectual and high performance) and thought processes (open cognitive thinking, deceptive thinking,

and the need for understanding). This study represents the element of complex understanding that furthers the cognitive processes required in the assessment of fat social phobia and the self-interpretation of open-minded thinking.[14]

HYPOTHESES

Therefore, the following main research hypotheses were investigated:

- Hl : There is likely to be a significant relftionship between perceived weight stigma and attitudes towards self in young adult, fat, working and non-working women.
- Hl : Cognitive sophistication is likely to predict a weakening in the relationship between perceived weight stigma and attitudes towards self in young adult, fat, working and non- working women.
- H1 : There will be a difference in young adt{lt, fat, working and non-working women for perceived weight stigma, cognitive sophistication and attitudes towards self

RESEARCH METHODOLOGY

This section highlights the research design and research sample.

RESEARCH DESIGN

The study was aimed at assessing the relationship between perceived weight stigma and attitudes towards self as well as the moderation of cognitive sophistication. Correlational research design was used to study the relationship between perceived weight stigma, cognitive sophistication and attitudes towards self in young adult fat working and non-working women.

RESEARCH SAMPLE

The study was a quantitative, cross-sectional research utilising non-probability convenient sampling technique. The sample consisted of 200 women, comprised of 128 working and 72 non-working females between the ages of 18-30. Firstly, permission from the authors of the relevant scales was taken, via email, to use their measures for research purpose. For the data collection, permission letter was taken from the Director of the Institute of the Applied Psychology, Punjab University and signed from the concerned authorities of the respective universities from which the sample was taken. Consent forms were provided to the willing participants and they were assured that their participation was completely voluntary and their confidentiality was maintained. They were clarified about purpose and nature of the research study.

INDEPENDENT AND DEPENDENT CONSTRUCTS' MEASUREMENT: VALIDITY AND RELIABILITY TEST

Present research aimed to investigate the relationship between perceived weight stigma, cognitive sophistication and attitudes towards self in young adult working and non-working women. In this research, the results are based on total scores of each scale. The data analytical strategy included performing (i) Descriptive Statistics and Reliability Analysis of the Scales used (ii) Pearson product moment correlation (iii) Hierarchical regression analysis (iv) t-test based on marital status and t-test based on employment status.

Cronbach's alpha levels of the instruments used in the current study have good reliability. Open Minded Thinking Scale (a=.99) has the strongest reliability, followed by the scales for Perceived Weight Stigma (a=.96) and Attitudes Towards Self (a=.91) that also show excellent reliability. The subscales of Attitudes Towards Self also had moderately good reliability with the Self-Criticism Scale holding the highest reliability (a=.88), followed by High-Standards Subscale (a=.69) and Generalization Subscale (a=.63).

ANALYSIS AND RESULTS CORRELATION ANALYSES

It was hypothesized that there is likely to be a relationship between perceived weight stigma, cognitive sophistication and attitudes towards self in young adult working and non- working women. To assess this relationship, Pearson Product moment correlation was applied (Table I). Results showed that employment status has a significant negative correlation with

perceived weight stigma which suggests that employed women perceive more weight stigma. Employment status also has a strong negative correlation with all three subscales of attitudes towards self, suggesting that employed women have worse attitudes towards self in terms of holding high standards, being self-critical and generalization. It is also suggested from the correlation that employed women hold more open-minded thinking skills than those who are unemployed. Results in Table 1 also revealed that there is a significant positive relationship between perceived weight stigma and attitudes towards self. With increased weight stigma, there is an increase in all three aspects of attitudes towards self, most significantly in self-criticism, followed by high standards and then generalization. Thus proving that perceived weight stigma does correlate with negative attitudes towards self.

Then Independent Samples t-test was used to further analyze and determine the significance of the differences between married and single women in terms of perceived weight stigma, attitudes towards self and cognitive sophistication as shown in Table II.

Results show that there is a significant difference between single and married women in all three variables. Single women obtained higher scores in perceived weight stigma *(M=49.59)* than married women (M=34.71), and there was a significant difference between the two *(t= 63.71, p<.0I).* There was also a significant difference between the two groups of women in all three subscales of attitudes towards self. There was a significant difference in High Standards *(t= 19.48, p<.01)* with single women scoring higher *(M= 12.78)* than married women *(M= 8.23).* There was a significant difference in Self-Critical subscale of Attitudes Towards Self *(t= 39.40, p<.01)* with single women scoring higher *(M= 11.19)* than married women *(M= 8.00).* There was a significant difference in Generalization *(t= 15.03, p<.01)* with married women scoring higher *(M= 13.*77) than single women *(M=*

Table I: Pearson's Correlation among Variables and Collinearity Statistics

Variables	**1**	2	3	4	5	6	7	**8**	9
I.Age		-.13	.09	-.10	.12	.03	.09	.04	.03
2. Employment Status			.03	.78**	-.76**	-.64**	-.73**	-.56**	-.22**
3. Education				.04	.08	.03	-.03	-.28**	.26**
4. Marital Status					-.98**	-.81**	_94**	-.73**	-.34**
5. Perceived Weight Stigma						.82**	.97**	_75**	_37**
6. ATS- High Standards							.79**	.87**	.27**
7. ATS- Self-Criticism								.so**	_37**
8. ATS- Generalization									.28**
9. Open Minded-Thinking									

Table II: Independent Sample t-test showing differences in Study Variables on basis of Marital Status

	Single (n=114)		**Married** (n=86)				95%CI		
Variables	*M*	*SD*	*M*	*SD*	*t*	*p*	*LL*	*UL*	*Cohens d*
Perceived Weight Stigma	49.59	1.50	34.71	1.79	63.71	.00	14.42	15.34	.24
Attitudes Towards Self	37.7	3.70	27.23	1.32	25.19	.00	9.69	11.34	
High Standards	12.78	1.84	8.23	1.32	19.48	.00	4.09	5.01	.11
Self-Criticism	11.19	.75	8.00	.00	39.40	.00	3.03	3.35	.11
Generalization	13.77	1.71	11.00	.00	15.03	.00	2.41	3.14	.12
Open-Minded Thinking	70.98	6.49	67.01	4.00	4.99	.00	2.40	5.54	.05

Nate.CI=Confidence Interval; *LL*= Lower Limit; *UL*= Upper Limit.

11.00). Results also show that there is a significant difference between single and married women in Open-Minded Thinking *(t= 4.99, p<.01)* with single women scoring higher *(M= 70.98)* than married women *(M= 67.01).*

Then Independent Samples t-test was used to further analyze and determine the significance of the difference between employed and unemployed women in terms of perceived weight stigma, attitudes towards self and cognitive sophistication as shown in Table III.

Results show that there is a significant difference between employed and unemployed women in all three variables. Employed women obtained higher scores in perceived weight stigma *(M=47.47)* than unemployed women *(M=35.57),* and there was a significant difference between the two *(t= 16.34, p<.05).* There was also a significant difference between the two groups of women in all three subscales of attitudes towards self. There was a significant difference in High Standards *(t= 11.58, p<.01)* with employed women scoring higher *(M= 12.15)* than unemployed women *(M= 8.47).* There was a significant difference in Self-Critical subscale of Attitudes Towards Self *(t= 14.87, p<.01)* with employed women scoring higher *(M= 10.73)* than unemployed women *(M= 8.19).* There was a significant difference in Generalization *(t= 9.61, p<.01)* with unemployed women scoring higher *(M= 13.38)* than employed women *(M= 11.17).*

Results also show that there is a significant difference between employed and unemployed women in Open-Minded Thinking *(t= 3.22, p<.01)* with employed women scoring higher *(M=* 70.26)thanunemployedwomen(M= *67.53).* Finally Regression Analysis was conducted to examine whether cognitive sophistication is a moderator variable for the perceived weight stigma and attitudes towards self of the women under study. The results are shown in table IV.

Table IV: Regression Analysis for moderation effect of cognitive sophistication on perceived weight stigma and attitudes towards self

Predictor	**Attitudes Towards Self**	
Variables	B	R square
Step I		.76***
Marital Status	-.88***	
Employment Status	.01	
Step II		.00
Cognitive Sophistication	.03	
Step III		.03***
Perceived Weight Stigma	.12***	
Step IV		.00
PWSxCS	.01	
Total R square	.21	

Note. *Control variables included marital status and employment status
p<.05.p<.01.***p<.001.*

Table III: Independent Sample t-test showing differences in Study Variables on basis of Employment Status

	Employed (n=114)		**Unemployed** (n=86)				95% CI		
Variables	*M*	*SD*	*M*	*SD*	*t*	*f!_*	*LL*	*UL*	*Cohens d*
Perceived Weight Stigma	47.47	5.41	35.57	3.99	16.34	.02	10.47	13.34	.24
Attitudes Towards Self	36.26	5.00	27.83	3.05	12.99	.00	7.14	9.7	
High Standards	12.15	2.34	8.47	1.77	11.58	.00	3.05	4.30	.11
Self-Criticism	10.73	1.31	8.19	.82	14.87	.00	2.20	2.88	.11
Generalization	13.38	1.85	11.17	.82	9.61	.00	1.76	2.66	.12
Open-Minded Thinking	70.26	6.87	67.53	2.81	3.22	.00	1.06	4.40	.05

Nate.CI=Confidence Interval; *LL*= Lower Limit; *UL*= Upper Limit.

Table IV showed that the results for regression analysis for attitudes towards self as criterion variable. Overall, the model explained 21% variance in attitudes towards self. Marital status and employment status of block **1** explained 76% variance in attitudes towards self, $F(2,197)= 315.62$, $p<.01$.

In block 2, when cognitive sophistication was added to the model, regression explained 0.1% variance in attitudes towards self, F change $(1,196)= .69$, $p>.05$). When perceived weight stigma was added to the model in block 3, regression explained variance of 1% in attitudes towards self, F change $(1,112)= 2.7$, $p<.05$). When interaction terms perceived weight stigma and cognitive sophistication was added in the block 4, regression explained 3.1% variance in attitudes towards self, F change $(1,195) = 29.76$, $p<.01$. The interaction between perceived weight stigma and cognitive sophistication was non-significant. Thus, the results indicated that cognitive sophistication did not moderate the relationship between perceived weight stigma and attitudes towards self unlike stated in the hypothesis.

DISCUSSION

The first hypothesis-that perceived weight stigma would significantly relate to attitudes toward the self-was supported. Higher stigma was associated with increased self-criticism, high personal standards, and overgeneralization, with self-criticism being the most prominent. These results are consistent with existing literature showing that fat individuals often face psychological harm due to societal discrimination and internalized stigma.[15] [16] .[17]. [18] Negative stereotypes, such as being seen as lazy or unhealthy, contribute to self-blame and reinforce harmful behaviors like extreme dieting.[19].[20] Such stigma, when experienced across personal and professional environments, often leads individuals to adopt the same negative views others hold about them, deepening self-critical attitudes.[21]

Fat individuals also endure traumatic experiences, such as systemic barriers and overt discrimination, which contribute to the belief that their bodies are the root cause of these challenges, rather than recognizing societal fatphobia as the true issue.[22].[23]

The second hypothesis proposed that cognitive sophistication would weaken the link between weight stigma and self-attitudes. However, results showed no significant moderating effect. Although cognitive sophistication reflects an ability to think flexibly and challenge biased thinking, it did not protect participants from the negative effects of stigma. This supports critical perspectives which argue that addressing societal fatphobia is essential for meaningful therapeutic progress-individual cognitive skills alone are insufficient.[24].[25]

The third hypothesis-that working and non-working women differ in perceived stigma, cognitive sophistication, and self-attitudes-was also supported. Working women experienced greater weight stigma and more negative attitudes toward the self, likely due to higher exposure to societal appearance standards and workplace discrimination.[26].[27] Fat individuals are often seen as less competent and less employable, which increases their vulnerability to stigma. Interestingly, working women scored higher in cognitive sophistication, possibly due to education or work experience.

Further, single women reported higher stigma and more negative self-attitudes compared to married women. In a culture that idealizes thinness, single fat women may feel greater pressure to conform to beauty norms.[28].[29] Stigma women also reported more perceived stigma, often compounded by ageism and weight-based discrimination in healthcare settings, where fat individuals are more likely to be denied basic medical care.[30].[31]

CONCLUSION

The findings indicate that perceived weight stigma is positively associated with adverse self-attitudes and that this association intensifies with advancing age. Moreover, single and unemployed women demonstrated higher levels of perceived stigma and more negative self-perceptions. In contrast, cognitive sophistication did not emerge

as a significant moderator in the relationship between stigma and self-attitude.

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ORIGINAL ARTICLE

Parental Knowledge, Attitude And Perceived Barriers To Infant Immunization: An EPI Center Based Cross-Sectional Survey

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ABSTRACT

Objectives: This study aimed to assess parental knowledge and attitudes regarding infant immunization, identify barriers to timely vaccination, and their influence on parental perspectives at EPI centers of THQ and HIT Hospitals, Taxila.

Methodology: A cross-sectional survey of 292 parents, attending EPI centers at HIT and THQ Hospital, Taxila (March to October 2024) was conducted using convenience sampling. Data was collected via face-to-face interviews using a structured questionnaire covering demographics, knowledge, attitudes, and immunization barriers. Chi-square test was employed to determine the associations between knowledge, attitude and identified barriers to timely immunization using SPSS version 26.0.

Results: Majority of participants were mothers 204 (69.9%), out of which 135 (46.2%) aged between 25-30 years and 132 (45.2%) had 2-3 children. Total 229 participants (78.4%) had completed the recommended age-specific immunizations for their children. Equal proportions of participants 111 (38%) demonstrated good knowledge and a statistics of those having positive attitude toward immunization. Lack of awareness 181 (53%) and vaccine misconceptions 137 (46.9%) were reported as common barriers. Level of knowledge was found to be significantly associated with misconceptions (p=0.02), as well as with long waiting time at EPI centers and long clinic queues (p=0.03). Similarly, parental attitude was significantly linked to misconceptions (p=0.006) and clinic wait times (p=0.01).

Conclusion: Misconceptions about vaccines and logistical issues, such as prolong waiting times, significantly affect parental knowledge and attitudes, potentially leading to delays in infant immunization. Targeted education and training of healthcare professionals to communicate immunization benefits are essential to improve perceptions and increase coverage of immunization.

Keywords: Parent's Knowledge, Attitude, Barriers, EPI Centers, Immunization,

INTRODUCTION

Immunization is a preventive process that makes an individual resistant to a disease through vaccination.[1] Childhood immunization, being one of the most affordable life-saving interventions, has significantly improved healthcare.[1,2] It is estimated to reduce 2-3 million deaths yearly and thwart diseases.[3] Despite its proven benefits, children in low-income countries like Pakistan remam vulnerable to vaccine-preventable illnesses due to numerous multidimensional barriers.[1,4] These barriers include limited education, religious beliefs, vaccine supply disruptions, concerns about safety and efficacy, logistical challenges, large family size, and financial constraints.[5]

The WHO estimates that vaccination prevents between 3.5 and 5 million deaths annually.[6] In 2018, the global immunization rate was 85%, though substantial disparities persisted across WHO regions.[2] For example, Bangladesh reported 86% immunization coverage rate in 2018, India 76% in 2019-2020, and Pakistan

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only 66% in 2017.[3,7,8,9] Among these children, an estimated 5.3 million died in 2018 from all causes, with an estimated 700,000 attributed to vaccine- preventable diseases; 99 per cent of these deaths occurred in low- and middle-income countries. Unfortunately, the rate of child vaccination coverage fell to 81% globally in 2021.[10,11] South Asia accounts for world's one third under-immunized children, with some countries achieving vaccination coverage up-to 90%. Pakistan, however, has yet to meet the WHO's 95% immunization target.[12,13]

According to National Demographic and Health Survey (2017-2018), only 66% of children aged 12 to 23 months had received all of the basic Expanded Programme on Immunization (EPI vaccines.[13,14] This figure rose to 74% by 2020 but declined to 64% in 2022, largely due to flood-related disruptions.[15,16] Provincial disparities were notable: Punjab had the highest coverage at 88.5%, followed by Sindh (68%), Khyber Pakhtunkhwa (60.5%), and Balochistan with the lowest at 37.9%. [15] The reason for this suboptimal coverage rate and immunization denial in Pakistan is linked to different multifactorial **barriers like geographical, socioeconomic** status, social, cultural, and religious variables, misunderstandings about vaccinations negative consequences, that contribute to Pakistan's vaccination hurdles.[14,17,18]

Timely infant immunization remains a cornerstone of public health, crucial for preventing vaccine-preventable diseases and reducing child morbidity and mortality. However, uptake is often compromised by these perceived challenges. To date, no research has systematically examined parental knowledge, attitudes, and perceived barriers in this community. This study aims to fill that gap by assessing these factors through an EPI center-based cross-sectional design, the findings will help devising targeted interventions to improve perception and enhance immunization coverage.

METHODOLOGY

A Descriptive Cross-sectional survey was conducted on a sample of 292 parents or guardians of the children reporting to the EPI centers of THQ and HIT Hospitals Taxila-Pakistan, over a period of 8 months, from March to October 2024. Ethical approval was taken from healthcare institution administration, institutional review board of Hitec-IMS and from each participant as individual before data collection. A sample size of 217 was initially calculated using Open Epi calculator based on 83% prevalence[19], 95% confidence interval and 5% margin of error. However, data were collected from 292 participants using a convenience sampling technique to enhance data robustness. Participants whose youngest child was more than 1 year were included in the study and those who were linked to healthcare profession were excluded.

A self-structured proforma was developed following a thorough review of the relevant literature. It was subsequently evaluated by consultant pediatricians, and revisions were made based on their expert suggestions. Data was collected through face-to-face interviews method by the researches themselves. Parents and guardian visiting EPI center provided information regarding their children's immunization schedule. We approached 300 participants, out of which 292 participants provided complete responses and were included in the final analysis, out of which 8 of the parents with incomplete information were not included in the study. Data was collected over a span of two months on specified EPI days of healthcare facilities.

The questionnaire consisted of three sections: Section one covered socio-demographic characteristics; Section two assessed parents' knowledge and attitudes; and Section three explored perceived challenges toward infant immunization.

Knowledge was measured using eight questions with responses of "Yes," "No," or "I don't know." Correct answers were scored as 1, while incorrect or "I don't know" responses scored 0. Knowledge scores were categorized as satisfactory (2:4 points) or unsatisfactory (<4 points).

Parental attitude was evaluated using nine statements on a three-point Likert scale ("Agree," "Disagree," and "Neutral"). An "Agree" response was scored as 1, whereas "Disagree" and "Neutral" responses were scored as 0. Based on the cumulative score, attitude scores were then categorized as favourable (2:5 points) or unfavourable (<5 points).

Attitudes were classified as favorable or unfavorable, with part1c1pants scoring at or above the median considered to have a "favorable attitude" and those below the median as "unfavorable." Pretesting of questionnaire was done.

Data analysis was performed using SPSS version 26.0. Descriptive statistics, including frequencies and percentages, were calculated for variables such as gender, age, education, residence, number of children, and monthly income. Chi-square test was applied to examine associations between knowledge, attitude, and perceived challenges to timely infant immunization.

RESULTS

Out of 292 participants, majority were mothers 204 (69.9%), followed by fathers 87 (29.8%), with a minimal representation of other caregivers 1 (0.3%) and 212 (72.6%) were urban residents. Majority were housewives 177 (60.6%) and 135 (46.2%) lie between 25-30 years of age and only 4 (1.4%) were above the age of 40 years. Approximately 132 (45.2%) had 2-3 children and 204 (69.9%) reported a monthly income between 30,000 to 65,000 PKR and only 7 (2.4%) had income more than 1 lac. (Table I).

Table I: Socio-Demographic characteristics of the participants

		Frequency(n)	Percentages (%)
Educational background	Illiterate	17	5.8
	Primary	35	12.0
	Matric	72	24.7
	Intermediate	78	26.7
	Graduate	69	23.6
	Postgraduate	21	7.2
Sex of the children born	Boy	152	52.1
	Girl	138	47.3
	Twins	2	0.7
Age of the last-born child	<3months	96	32.9
	3-6months	86	29.5
	7-9months	56	19.2
	> 9months	54	18.5
Age-specific immunization status of the child	complete	229	78.4
	incomplete	63	21.6

Less than half of the participants **111** (38%) had good knowledge about immunization. Similarly, the proportion of parents with favorable attitudes towards immunization was comparatively lower than the parents with unfavorable attitudes (Figure **1).**

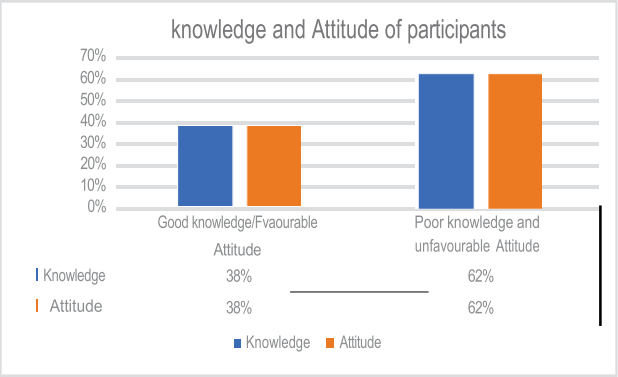

Figure 1: Responses of Participants Knowledge and Attitude about Immunization

There was a significant association **(p<0.001)** of knowledge with attitude, indicating that parents with poor knowledge were more likely to have an unfavorable attitude towards immunization (Table II).

Table II: Association between Participant Knowledge with attitude about Immunization

Knowledge of the participants about Immunization	The attitude of the participants toward Immunization		p-value
	favorable attitude	unfavorable attitude	
Good knowledge	102	9	**0.000****
Poor knowledge	9	172	

A major barrier to immunization identified by a large proportion of the parents 181 (62.30%) was lack of awareness. Misconceptions about vaccines and fear of side effects 136 (46.90%) were identified as the second most common challenge reported by the parents (Fig 2).

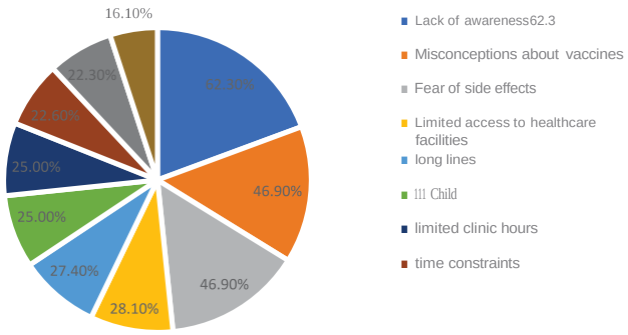

Figure 2: Key Barriers to Child Immunization Uptake

Chi-square analysis revealed a significant association between parental knowledge and misconceptions about vaccines (p=0.02) as shown in Table III. Long waiting time was also linked to poor knowledge (p=0.03). Other challenges, such as lack of awareness (p=0.7), limited access (p=0.4), and fear of side effects (p=0.08), showed no statistically significant association. Parental attitude was significantly influenced by vaccine misconceptions (p=0.006) and long waiting time (*p=O.O*1), highlighting their role in fostering unfavorable views and potential delays. Time constraints (p=0.5) and limited clinic hours (p=0.4) had no significant effect on attitude towards immunization.

DISCUSSION

The purpose of the current study was to evaluate the knowledge and attitude of the parents about timely infant immunization and to identify the barriers to immunization. Further emphasis was made on determining the association of knowledge, attitude with the barriers.

Only 38% of parents had adequate knowledge and a positive attitude toward immunization. This contrasts with a study by Asim et al. (2012)21, which reported higher awareness and favorable attitudes, possibly due to different sampling methods, as we used non-probability sampling, which may have influenced the results. A significant association between knowledge and attitude was observed, consistent with findings from a study in India by A. et al. (2017).[22]

According to our study, 46.9% of participants showed fear as a barrier to infant immunization. These findings are in line with the results of a study in New Zealand, conducted by Petousis-Harris et al.[23] Where a survey of healthcare providers showed that 53% of them believed that parental fear was the greatest barrier to children's immunization. Misconceptions about immunization are one of the major barriers to

Table III: Association of Participants knowledge and Attitude with key Barriers towards Immunization

	Barriers to Immunization						
	Bad behaviour of healthcare staff	Fear of vaccme side effects	Long waiting time	Misconception about vaccine	Lack of awareness	Limited access to healthcare	Ill child
Knowledge	p-value	p-value	p-value	p-value	p-value	p-value	p-value
	0.702	0.082	0.03*	0.020*	0.722	0.423	0.100
Attitude	0.990	0.088	0.01*	0.006*	0.644	0.688	0.092

immunization of infants. Our study showed similar :findings about misconceptions and myths to a study conducted by Etokidem, A.let al.[24] Addressing these fears requires a multifaceted approach involving healthcare providers, community leaders, and credible information sources. This finding suggests that even among parents with adequate knowledge, concerns about vaccine safety, remain a critical issue. Good communication about vaccine safety and monitoring of vaccine efficacy could alleviate these fears. Education about vaccine safety and efficacy, and personalized communication can help build trust and alleviate concerns, ultimately increasing immunization rates and protecting infants from vaccine-preventable diseases.

Parental knowledge and attitudes toward infant immunization in our study were lower than those reported in Saudi Arabia (Alshammari et al.,)25, largely due to limited awareness. This aligns with :findings by Paterson et al. (2016)[26], which highlight how misconceptions such as the belief that vaccines are harmful, contribute to vaccine hesitancy. Parents with less knowledge were more likely to hold such views, increasing the risk of refusal and undermining herd immunity. Addressing these misconceptions with accurate information and education is crucial in promoting immunization and protecting public health. This disparity is attributed to inadequate counselling by our healthcare professionals and shortcomings in the educational system. To tackle these challenges, workshops and training programs should be implemented to better educate healthcare professionals while fostering community engagement to enhance public awareness.

Long waiting times at clinics were also associated with unfavourable attitudes. This may reflect frustration or inconvenience experienced by parents, leading to a negative perception of the immunization process.[27] Female participants were significantly more likely to report "bad behaviour of health workers" and "fear of side effects" as barriers to immunization. This gender-based disparity might be due to differences in healthcare interactions or varying levels of trust in healthcare providers, as supported by previous studies that found women are often more cautious about potential risks associated with medical interventions.[28]

LIMITATIONS

First, the use of non-probability sampling may limit the generalizability of the :findings as it may not fully represent the broader population. Secondly, self-reported data has potential of recall bias and there is also chances that participants may have provided socially desirable responses, which could affect the accuracy of the :findings. Third, participants were recruited from EPI centers, where they already had some knowledge and positive attitude towards childhood immunization, thereby limiting the ability to capture the perspective ofless informed population who were not approaching to EPI center.

FUTURE RECOMMENDATIONS

There is need for targeted awareness campaigns to enhance parental understanding of vaccine benefits and safety.

Healthcare providers should be trained with effective communication strategies to address concerns and dispel myths about immunization.

Community Engagement is crucial to promote vaccine literacy and build trust in immunization programs.

Policymakers should expand immunization services especially in communities with low literacy or limited healthcare access and also integrate immunization awareness into maternal and child health programs

CONCLUSION

According to our study, the challenges affecting the knowledge and attitude of parents towards immunization of infants were lack of awareness and misconception about immunization. The study highlights the need for targeted educational initiatives to improve parental knowledge and attitudes towards immunization, especially in urban areas. Healthcare professionals should be trained to communicate the benefits and safety of immunizations effectively. Staff on the immunization should be trained to address the resource-related challenges to immunization.

CONFLICT OF INTEREST: None

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ORIGINAL ARTICLE

The Association between Sleep Quality and Neek Pain among General Population of Rawalpindi: An Analytical Cross-Sectional Study

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ABSTRACT

Objective: To assess proportion and relationship of neck pain associated disability and poor quality of sleep in general population of Rawalpindi.

Methodology: An analytical cross-sectional study was carried out online over a period of six months in Rawalpindi employing non-probability consecutive sampling technique.

Any individual between the age of 16-60 years and willing to fill the questionnaire was enrolled. The "Pittsburgh Sleep Quality Index (PSQI)" and "The Northwick Park Neck Pain Questionnaire (NPQ)" were utilized to analyse sleep disturbances and neck pain associated disability respectively. The link to questionnaire was shared on WhatsApp. Scores were calculated for each participant. Then, the scores were categorized in four levels of neck pain associated disabilities and two categories of sleep as good vs poor sleep. SPSS 24.0 was used for data analysis at 5% alpha.

Results: A total 383 valid responses were analysed. Mean age of participants was 30.29±13.82 years. An extremely significant association of poor sleep quality and prevalence of neck pain associated disability was observed ($p<0.001$).

Conclusion: It was concluded that participants with poor sleep experienced moderate to complete neck pain associated disabilities more as compared to participants with good sleep, who predominantly reported no or mild disability. This suggests that poor sleep quality is strongly linked with increased severity of neck pain and functional impairment. Improving sleep quality in persons with neck pain can enhance the prognosis of neck pain-associated impairments in medical settings.

Keywords: Neck Pain Questionnaire, Pittsburgh Sleep Quality Index, Quality of Sleep

INTRODUCTION

Neck pain is a widespread musculoskeletal issue of public health importance, ranking as the fourth leading cause of years lived with disability (YLDs) globally, following lower back pain, depression, and osteoarthritis.[1] Affecting up to 70% of people during their lifetime, it is especially common in adults aged 30-50 years and more prevalent among women.[2] In urbanized areas like Rawalpindi, lifestyle factors such as prolonged sitting, excessive screen time, poor posture, and stress significantly contribute to the rise in neck pain cases.[3] These behaviours strain cervical muscles and lead to chronic discomfort, exacerbated by poor ergonomic practices and muscle imbalances.[4]

Crucially, poor sleep quality has emerged as an important determinant for neck pain. Inadequate or disturbed sleep impairs musculoskeletal recovery, heightens pain perception, and is linked to the onset and persistence of neck pain.[5] A study of over 1,000 chronic pain patients revealed that 42.22% experienced sleep deprivation despite medication, illustrating a bidirectional relationship where pain disrupts sleep and insomnia causes neck pain.[6] Additionally, poor sleep increases inflammatory markers like IL-6 and CRP, further aggravating pain sensitivity.[7,8] The operational definition of sleep quality is the total amount of time spent asleep during a

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designated sleep period, typically 7-9 hours and neck pain associated disability is a self-reported discomfort, soreness, or pain experienced in the cervical region (the neck area) where participants rate their pain intensity through "Northwick Park Neck Pain Questionnaire".

There is paucity of published studies assessing the association between neck pain associated disability and quality of sleep in Pakistan, and a few which have assessed the frequency of neck pain and sleep quality did not have any statistically significant results. Moreover, existing literature does not reflect these regional differences, creating a gap in understanding the local burden and its specific risk patterns. There is limited local data evaluating the link between quality of sleep and neck pain which hinders the relevant insights that can form public health policies and clinical practice. The present study was conducted to explore the association between quality of sleep and neck pain associated disabilities in Rawalpindi using the PSQI and NPQ tool respectively.

METHODOLOGY

An analytical cross sectional study was carried out in the general population resided in Rawalpindi, from March to August 2025. The Ethical consent was taken from the Institutional Review Board of Army Medical College, National University of Medical Sciences (ERC ID No: 03/2025/465).

Adults aged 18-60 years, experiencing sleep disturbances including insomnia or sleep apnea, reporting moderate neck pain (as assessed by the Neck Pain Questionnaire), otherwise healthy participants without significant comorbidities such as spinal deformities, advanced neurological or orthopaedic disorders that could independently cause neck pain and were willing to participate and able to provide informed consent, were included in the study.

Individuals with spinal mJunes due to recent trauma or those who have undergone spinal surgeries, with severe psychiatric illness or cognitive impairments that hinder comprehension or voluntary participation, pregnant women or those who have given birth within last 06 months (due to physiological changes affecting both sleep and musculoskeletal pain), and individuals with a BMI >40 (as extreme obesity can be independent contributor to both poor sleep and neck pain) were excluded.

After calculating thorough Raosoft calculator, total 383 citizens of Rawalpindi were recruited in the study. This sample size was calculated with 95% confidence level and 5% margin of error at 50% prevalence to get largest sample size. Participants were recruited through consecutive sampling, a non-probability technique, after obtaining written informed consent.

The data was collected using two questionnaires i.e. "The Pittsburgh Sleep Quality Index (PSQI)" with sensitivity of 89%, specificity of 86.5% and Cronbach's alpha of 0.77, to analyse sleep disturbances. In PSQI, scores of seven component were calculated separately, with "0" represented no difficulty to "3" as severe difficulty. The score of seven components were then summed up to produce a global score (ranged from "0 to 21"). A Cut-off value of 2:5 represented poor sleep, whereas a score of <5 indicates good sleep. The higher the score, the worse the sleep quality.[7]

"The Northwick Park Neck Pain Questionnaire (NPQ)" was used to measure neck pain associated disability consisting of 09 questions related to pain intensity, duration of symptoms, nocturnal numbness, sleep affected by pain, effect on social life, carrying, reading/watching television, working/housework, and driving. There were five possible reply for each item, representing the various level of neck pain associated disability (0 representing no while 4 representing severe difficulty). It has maximum score 36 and minimum 0, with highest score directly proportional to neck pain associated disability. Neck pain associated disability was further divided into categories which are similar to neck disability index, (0-4%=no neck pain associated disability, 5-14%=Mild neck pain associated disability, 15-24%=Moderate neck

pain associated disability, 25-34%= Severe neck pain associated disability, >35%= Complete neck pain associated disability).[9] Qualitative data was presented in the form of frequencies and percentages. While mean and standard deviation (SD) were computed for continuous data. The chi-square test was used to assess the association of sleep disturbances with neck pain associated disability on SPSS version 24.0. The p-value <0.05 was considered statistically significant.

RESULTS

The mean age of participants was 30.29±13.82 years.Among 383 participants, 194 (50.7%) were males and 189 (49.3%) were females. A total of 127 (33.2%) were postgraduates, 218 (56.9%) were undergraduate, 29 (7.6%) had completed intermediate and only 9 (2.3%) completed their matriculation. Out of total participants, 158 (41.3%) were employed, 170 (44.4%) were unemployed and 55 (14.4%) belonged to other categories.

It was observed that majority of participants (55.1%) had no neck pain associated disabilities while 32.4% had mild disability as shown in Figure 1.

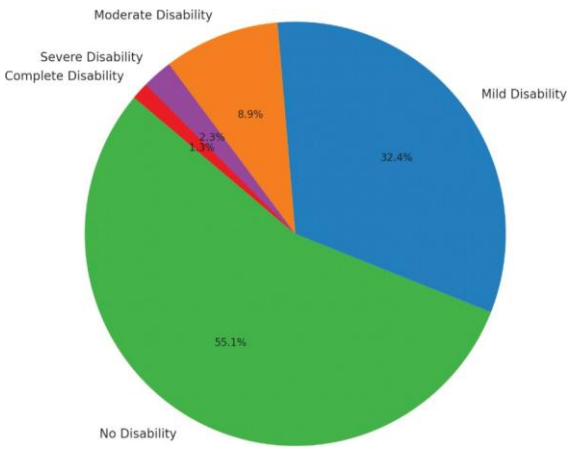

Figure 1: Distribution of Neek Pain Associated Disabilities

Among the respondents, Out of 211 (55%) with no neck pain associated disability, 203 (53%) had good quality sleep. While those 9 (2.3%) with severe disability, 7 (1.8%) had poor quality sleep. Among those with complete disability 5 (1.3%), 3 (0.8%) participants had poor sleep as shown in Figure 2.

There was an extremely significant association found between poor sleep quality and neck pain associated disability (p<0.001) as shown in Table 1.

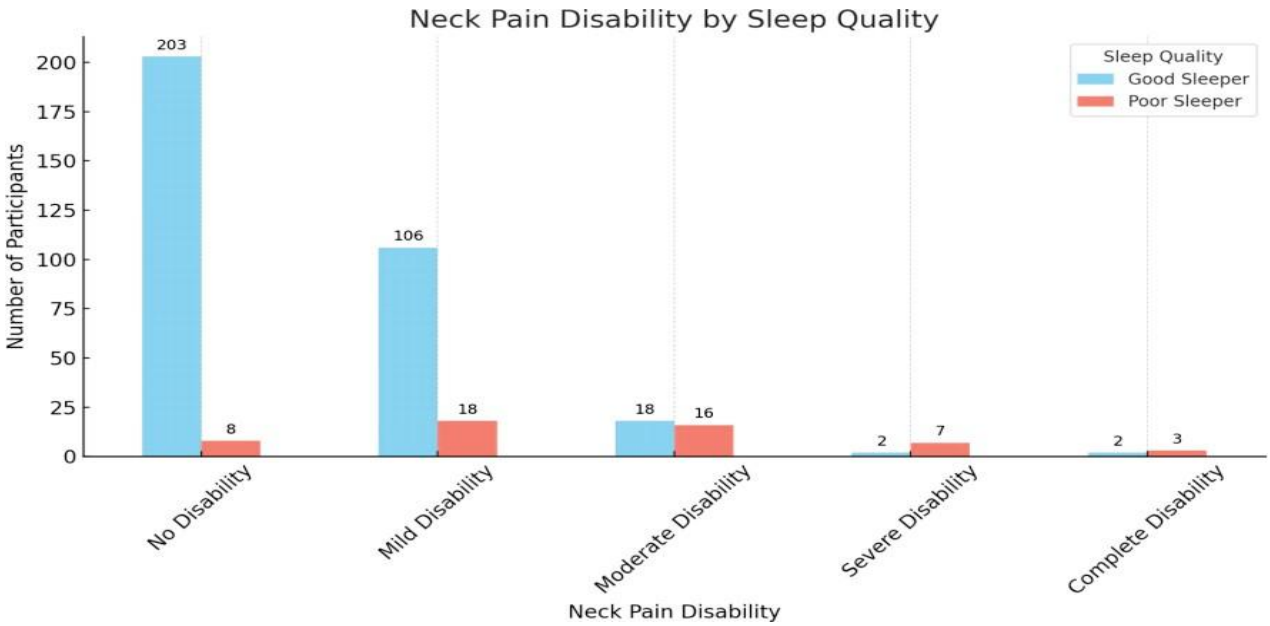

Figure 2: The cross tabulation between Sleep Quality and Neck Pain associated Disability

Table I. Association between Global PSQI score and Neck Pain associated Disability

Global PSQI Score	No Neck Pain associated Disability	Mild Neck Pain associated Disability	Moderate Neek Pain associated Disability	Severe Neck Pain associated Disability	Complete Neck Pain associated Disability	p-value
Good Sleeper	203(53%)	106(27.7%)	18(4.69%)	2(0.52%)	2(0.52%)	<0.001***
Poor Sleeper	8(2.08%)	18(4.69%)	16(4.17%)	7(1.82%)	3(0.78%)	

***p-value extremely significant

DISCUSSION

We observed the association between quality of sleep and neck pain-associated disability in a sample of 383 individuals. Utilizing the "Pittsburgh Sleep Quality Index and The Northwick Park Neck Pain Questionnaire", the study found an extremely significant relationship between poor sleep quality and greater levels of neck pain associated disability (Pearson Chi-Square = 90.594, $p < 0.001$). Our study found that adults who had inadequate sleep reported with high levels of neck pain associated disability compared to participants with good sleep, hence defining a strong association between the two. Notably, the proportion of individuals with no disability was substantially greater in the good sleep category (203 out of 331), whereas the participants with poor sleep exhibited elevated frequencies in the moderate (16), severe (7), and complete (3) disability levels.

These results suggest that sleep quality may play a crucial role in the experience and severity of neck pain associated disability. Findings are consistent with previous research conducted in Tohoku region, Japan which represented a similar link between poor sleep quality and neck pain disability, however it was from disaster affected regions after Great East Japan Earthquake.[10]

Another research conducted at John Hopkins University School of Medicine, highlighted that poor sleep is a robust risk factor of future pain than pain is for poor sleep, especially in chronic conditions.[11] Moreover, research in Ireland found that poor sleep quality particularly disruptions in REM sleep, was associated with increased sensitivity to pain and heightened muscle tension which may exacerbate conditions such as neck disability.[12]

Results of study supported this by showing that participants who had poor sleep quality experienced higher levels of neck disability. A study conducted in Pakistan reported that there is no association occurring in persons who were having cervical pain with daily physical activities and sleep pattern disturbances which was dissimilar with present research[13].

Despite significant association, the study had limitations. The data was cross-sectional, limiting ability to conclude causality and was collected in a short span of 2-3 months. It remains unclear whether poor sleep leads to increased neck disability or whether chronic neck pain disrupts sleep or if a third factor contributes to both. Variables such as age, gender, occupation, comorbidities or psychological stress were not included in this analysis which could act as confounding variables. Both PSQI and NDI are validated instruments, but they do not replace objective measures such as actigraphy or clinical diagnosis. Cultural, environmental and lifestyle factors that influence both sleep and physical health were not accounted for in this dataset, which could impact generalizability of findings across different populations or regions. The data was collected by google forms which were filled on self-reported measures and can be subjected to bias.

CONCLUSION

It was concluded that participants with poor sleep experienced moderate to complete neck pain associated disabilities more as compared to the participants with good sleep, who predominantly reported no or mild disability. This suggests that poor sleep quality is strongly linked with increased severity of neck pain and functional impairment. Improving sleep quality in persons with neck pain can enhance the prognosis of neck pain-related impairments in medical settings.

Conflict of Interest: None

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PERSPECTIVE

Artificial Intelligence for Supply Chain and Survival in Biological and Climatic Health Emergencies

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ABSTRACT

Low- and middle-income countries continue to grapple with the challenges of demand forecasting, managing stock, and providing access to essential commodities on a timely basis. Our engagement in Pakistan has been active since 2009, when we started developing country's health supply chain infrastructure with the design and implementation of the Vaccine Logistics Management Information System (VLMIS) for national and provincial entities of Expanded Programme on Immunization (EPI). We have systematically incorporated Artificial Intelligence (Al), business intelligence and machine learning (ML) into vaccine preventable infectious diseases (VPID) and supply chain processes over the past eleven years. This vision paper delineates how we aim to incorporate AI into the science of implementation, with a keen eye on integrating AI into the real world, stakeholder co-design, and continuous performance optimization. Using examples of case studies, such as supply chain and logistics for the sciences of preventing Measles and Polio re-emergence of 2012-13, and loss of $3.4 million pentavalent vaccine in 2015, forecasting and quantification of PPE (personal protective equipment) and vaccines in 2022, design and deployment of Pakistan's first Travelers Surveillance Information System. We contributed to strengthening the backbone of health systems notably international standards of supply chain strategic planning, procurement and forecasting and supply planning (FASP), commodity security, workforce management, warehousing, storage and distribution planning and execution. The latest Al-based contraceptive forecasting in Balochistan, Gilgit-Baltistan, AJ&K and Islamabad and vaccine demand forecasting in Pakistan, we can illustrate how practical AI can enhance global health security, pandemic preparedness, and health response to emergencies. In parallel, academic collaborations, especially through the Applied AI in Healthcare course (BMES-826) at National University of Science and Technology (NUST), have involved graduate students in forecasting models, optimization models, and early-warning systems based on real-time data. Such scholarly training has been used to inform operational planning and built local technical capacity on AI in health supply chains. This framework places AI not as an independent innovation but a ubiquitous system-wide enabler, aligning data science with operational conditions to produce resilient, proactive, and equitable health systems.

BACKGROUND

We started our supply chain system journey in 2009, and the national turnaround of VLMIS- a digital platform that revolutionized the transparency of vaccine stock and informed evidence-based procurement. With this digital base established, we have increasingly employed AI-powered forecasting and analytics in public health initiatives, directly linking machine learning results with policy and practice. Such development has been informed by the pillars of implementation science, to make technological innovation based on viability, acceptability, and

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scalability.

AI FOR PREVENTIVE HEALTH INTERVENTIONS

Preventive health thrives on anticipation: predicting needs, preempting shortages, and mobilizing resources before service disruptions occur. Using AI-driven FASP analysis, we have been able to identify supply bottlenecks, optimize resource allocation, and align commodity distribution with service delivery demand. In Balochistan, predictive modelling for the self-injection rollout of DMPA-SC (subcutaneous depot medroxyprogesterone acetate) ensured uninterrupted contraceptive availability, reduced wastage, and expanded access to modem family planning methods. These models provided actionable intelligence for procurement planning, inventory control, and last-mile delivery.

APPLIED AI IN ACADEMIC AND OPERATIONAL ECOSYSTEMS

Students have implemented AI algorithms into EPI datasets under the supervision of a Professor of Data Sciences and Practices at School of Mechanical and Manufacturing Engineering (SMME), NUST, leading to five-year vaccine demand projections used to guide procurement, cold chain expansion, and budgeting activities. Such blending of operational realities and academic innovation enhances technical capacity and evidence-based decision-making in the field of public health. Within this framework, projects have addressed diverse vaccine supply chain challenges nationwide: optimizing bOPV (bivalent oral polio vaccine) consumption to reduce district-wise disparities in Karachi; developing GaviOptima, an AI-powered forecasting and distribution tool; creating an early-warning system for Measles-2 coverage decline; and conducting AI-driven analyses of polio and TB (tuberculosis) vaccine consumption to uncover inefficiencies. Other initiatives have mapped Hepatitis-B vaccine outreach gaps in Punjab, refined provincial planning using population growth and wastage data, and produced multi-year forecasts for PCV13 (13-valent pneumococcal conjugate vaccine) and Pentavalent-1 in Punjab and Sindh. Policy-focused forecasts have guided provincial leadership, while optimization models have improved Hepatitis-B vaccine allocation in Sindh. Collectively, these initiatives show how FASP analysis, predictive modelling, and optimization algorithms developed in academic settings can be embedded into real-world decision-making, ensuring AI solutions are both technically robust and programmatically relevant.

RELEVANT ACHIEVEMENTS SUPPORTING AI INTEGRATION

The initiatives encompassed diverse health system strengthening measures, including the development of COVID-19 digital platforms for traveler surveillance, inventory management, and PPE forecasting calculators; commodity and cold chain support through the deployment of mobile biosafety laboratories, refrigerated transport, and oxygen commodity tracking with data-enabled monitoring; health data digitization efforts such as LMIS contraceptive analysis from 2011-2021, the DRAP (Drug Regulatory Authority of Pakistan) import/export licensing system, and integration of infectious disease platforms; and the application of AI-enhanced forecasting models to improve vaccine demand projections, procurement efficiency, and stock availability.

IMPLEMENTATION SCIENCE AND APPLIED AI FRAMEWORK

Our implementation science-based AI adoption framework emphasizes stakeholder co-design through the active inclusion of policymakers, logisticians, and health workers to promote contextual applicability. It uses iterative validation, comparing the outputs of predictive efforts in both historical and live data sets to ensure accuracy and alignment of policies. Capability development is pivotal, and training would focus on addressing mutual competencies between public health professionals and AI experts for sustained use. Embedded feedback loops are also part of the framework, where the operational outcomes are used to optimize

algorithms and make them more adaptable over time. This approach ensures AI is not an isolated pilot but a sustainable, embedded function within national health systems.

CONCLUSION

Our vision is a preventive health and supply chain ecosystem driven by AI that facilitates real-time detection of demand changes, supply bottlenecks, and preliminary signs of outbreaks, using predictive allocation to avoid shortages and surpluses. Our efforts build on World Health Organization (WHO) three pillars of prevention, detection and response and contributes locally as well as globally towards survival in biological and climatic health emergencies and pathogens ofhigh concerns while supporting WHO, Preparedness and Resilience for Emerging Threats (PRET), Global Outbreak Alert and Response Network (GOARN), Pandemic Influenza Preparedness (PIP), International Pathogen Surveillance Network (IPSN). These efforts are to further the integration of National Institutes of Health (NIH), Global Fund for AIDS, TB and Malaria (GFATM), Gavi Vaccine Alliance, FCDO (Foreign, Commonwealth & Development Office), Gates and USAID (U.S. Agency for International Development) funded information systems to achieve resilience, preparedness and Service Delivery Network Optimization for priority health areas like Family Planning (FP), Maternal, Neonatal and Child Health (MNCH), Nutrition, Infectious Diseases (IDs) and Immunization programs. This system will enhance resilience to pandemic, climate-related disruptions, and other emergencies through integrated platforms that combine procurement, warehousing, distribution, and service delivery data. This approach integrates expertise in deep supply chains with applied artificial intelligence and implementation science, enabling health systems to move beyond simply responding to crises to being proactive, using data and delivering public health in a sustainable way.

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