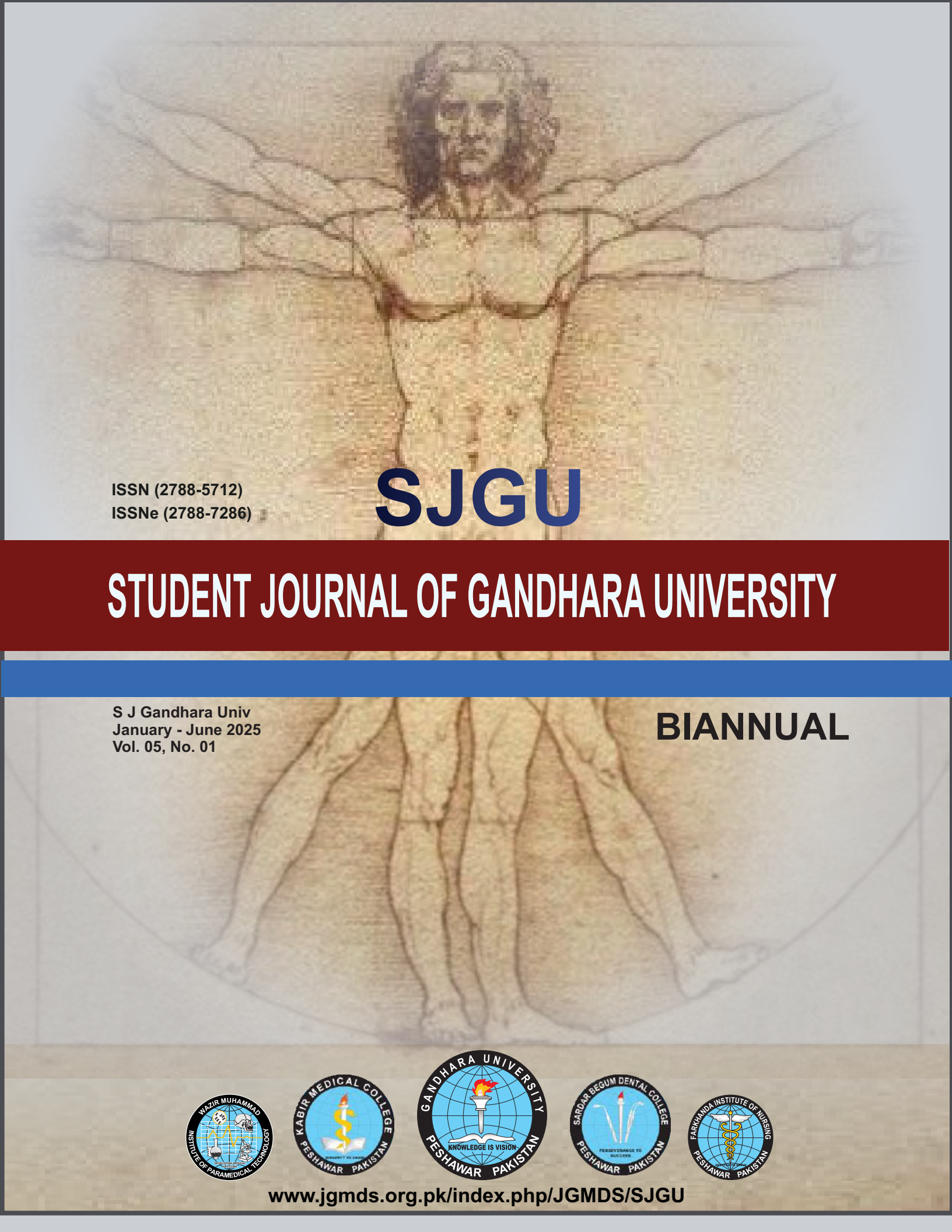

ISSN (2788-5712)
ISSNe (2788-7286)

SJGU

STUDENT JOURNAL OF GANDHARA UNIVERSITY

S J Gandhara Univ
January - June 2025
Vol. 05, No. 01

BIANNUAL

www.jgmds.org.pk/index.php/JGMDS/SJGU

ISSN (2788-5712)
ISSNe (2788-7286)

SJGU

S J Gandhara Univ
January - June 2025
Vol. 05, No. 01

The Student Journal of Gandhara University (SJGU) is an open access, peer-reviewed, scientific journal, formed to provide a platform to numerous medical and dental students globally, who actively participate in research and contribute towards the development of better science and medical advancement.

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ISSN (2788-5712)
ISSNe (2788-7286)

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S J Gandhara Univ
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Vol. 05, No. 01

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Vol. 05, No. 01
www.jgmds.org.pk

CONTENTS

THE EVOLVING ROLE OF DENTISTRY IN MODERN HEALTHCARE

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Dentistry is a unique fusion of science and artistry, requiring technical expertise and an aesthetic sensibility. As a second-year Bachelor of Dental Surgery (BDS) student, I appreciate the intricate balance between these elements. From theoretical knowledge to clinical application, the journey of a dental student is rigorous yet rewarding, shaping us into future professionals dedicated to patient care. The foundational years of dental education emphasise human anatomy, physiology, and biochemistry, which are essential for clinical competency. Mastering these subjects ensures precise diagnosis and effective treatment planning, forming the basis for successful patient outcomes. One of the most compelling aspects of dentistry is its transformative impact on patients' lives. Oral health is integral to overall well-being, and as future dental professionals, we are responsible for restoring function, relieving pain, and enhancing aesthetics. Whether through simple restorative procedures or complex rehabilitative treatments, every intervention contributes to a patient's confidence and quality of life.

The evolving nature of dentistry demands continuous learning. Digital dentistry, artificial intelligence, and minimally invasive techniques are revolutionising patient care. As future practitioners, we must embrace these innovations to improve treatment outcomes and uphold high standards of care. Beyond technical skills, dentistry requires ethical integrity, effective communication, and a patient-centred approach. Building trust and educating communities on oral health fosters preventive care and early intervention. As we progress in our education, it is crucial to recognise that dentistry is about more than treating dental conditions-it is about promoting overall health. By upholding knowledge, skill, and ethical practice, we can contribute meaningfully to the profession and make a lasting impact, one smile at a time.

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THE IMPACT OF PSYCHOLOGICAL STRESS ON GASTROINTESTINAL HEALTH: A FOCUS ON GASTRITIS

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How to cite this article

Saba MI, Ahmad B, Islam A, Zahid S. The Impact of Psychological Stress on Gastrointestinal Health: A Focus on Gastritis. S J Gandhara Univ. 2025;5(1): 2-6

Date Submission: 05-04-2025
Date Revised: 30-04-2025
Date Acceptance: 03-05-2025

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ABSTRACT

OBJECTIVES

This study aimed to evaluate the relationship between psychological stress and gastritis symptoms among university students in Peshawar.

METHODOLOGY

A descriptive cross-sectional study was conducted involving 300 undergraduate and postgraduate students aged 18-30 years. The Perceived Stress Scale (PSS) and a gastrointestinal symptom questionnaire were used to gather data via online surveys. Statistical analyses, including descriptive statistics and Pearson's correlation, were performed using SPSS v20.

RESULTS

The findings revealed that 61.07% of participants experienced high psychological stress. GI symptoms such as stomach complaints exacerbated by stress (18.85%) and frequent upset stomach (13.52%) were prevalent. Pearson's r indicated moderate correlations between stress indicators-especially feelings of nervousness and loss of control-and gastric symptoms.

CONCLUSION

Psychological stress significantly correlates with gastritis symptoms among students. Interventions targeting stress management may reduce gastritis incidence and improve gastrointestinal and mental well-being.

KEYWORDS: *Psychological stress, Gut-Brain Axis, Gastritis, Perceived Stress, Gastrointestinal Health, HPA Axis*

INTRODUCTION

The gastrointestinal (GI) health is essential for overall well-being, immune function, and psychological balance. This includes effective nutrient breakdown, a healthy gut microbiota, and prevention of malnutrition and infections. GI disorders are common, with over 60 million people in the U.S. suffering from gastroesophageal reflux disease (GERD) monthly, and 10-15% affected by irritable bowel syndrome (IBS). In developing countries, these issues are exacerbated by poor sanitation, while in developed nations, unhealthy diets and sedentary lifestyles contribute to chronic GI disorders. Gastritis, characterised by inflammation of the gastric mucosa, is particularly affected by psychological stress, often triggered by infections like Helicobacter pylori and prolonged NSAID use.[1] Emerging research highlights the essential role of psychological stress in the initiation and progression of gastritis. Through the physiological mechanisms of the gut-brain axis, psychological stress can alter gastric function by disrupting mucosal defences, increasing acid secretion, and impairing the stomach's natural protective barriers, thereby increasing its susceptibility to inflammation and damage.[2,3] The gut-brain axis-a bidirectional communication network between the central nervous system (CNS) and the enteric nervous system (ENS)-plays a central role in mediating the influence of psychological stress on gastrointestinal health.[4] This complex interaction is facilitated through neural pathways such as the vagus nerve, neurotransmitters including serotonin and dopamine, and various hormonal and immunological response systems. During episodes of psychological distress, the body releases stress hormones such as cortisol and adrenaline, which in turn trigger physiological changes in the gastrointestinal tract. These include alterations in gastric acid secretion, a pro-inflammatory shift in immune responses, and a reduction in the protective mucus layer of the stomach.[5] Such alterations impair the stomach's defence mechanisms, making it more vulnerable to pathogens, irritants, and subsequent inflammatory responses. Chronic stress is also associated with the adoption of unhealthy behaviours, such as increased tobacco use, poor dietary choices, alcohol consumption, and irregular eating patterns, all of which are known to exacerbate gastritis. These behaviours may independently irritate the stomach lining but, in conjunction with stress-induced physiological changes, significantly increase the risk of gastric mucosal inflammation.[6] This bidirectional cycle, wherein stress exacerbates gastritis, and the resulting symptoms further amplify psychological distress, leads to a cumulative decline in GI and mental health. Given these findings, stress management has emerged as a critical strategy in both the primary prevention and secondary treatment of stress-related GI disorders, particularly gastritis.[7] Recent investigations have

further established the involvement of the brain-gut axis, immune modulation, and psychiatric comorbidities, such as anxiety and depression, in linking psychological stress to gastritis. Stress activation of the hypothalamic-pituitary-adrenal (HPA) axis results in elevated levels of gastric acid, increased gut permeability, and a pro-inflammatory state, thereby aggravating symptoms in individuals predisposed to GI disorders.[8,9] Furthermore, studies have demonstrated that chronic stress negatively affects gastrointestinal motility, promotes intestinal hyperpermeability, and activates inflammatory responses, all of which elevate the risk for gastritis and other GI inflammatory conditions.[9] This highlights a compelling connection between mental and digestive health that warrants integrated therapeutic approaches. Interestingly, gender differences have also been identified in stress-related gastritis. Research suggests that men may be at a slightly higher risk for developing both gastritis and associated psychiatric symptoms such as anxiety and depression. This disparity may be attributable to differences in stress response mechanisms, hormonal factors, and sociocultural influences on coping strategies.[10] Another critical aspect linking stress to gastritis is the interaction with infectious agents, particularly H. pylori. Psychological stress has been shown to suppress immune function, thereby reducing the body's capacity to control bacterial infections. This immunosuppression may lead to chronic gastric inflammation, suggesting that stress management could enhance immune regulation and aid in the prevention of gastritis in susceptible individuals.[11] Proactive interventions for stress-induced gastritis, such as mindfulness-based practices, physical activity, and dietary modifications, have demonstrated efficacy in reducing symptom severity. These lifestyle adjustments address both the psychological and biological underpinnings of the disease. Moreover, avoiding harmful habits like smoking and excessive alcohol consumption can mitigate the deleterious effects of stress on the gastric mucosa.[12] Psychiatric comorbidities further complicate the clinical picture. Patients with anxiety and depressive disorders exhibit a higher incidence of gastritis, indicating that therapeutic strategies should integrate both gastroenterological and psychiatric care. Such integrative models have been shown to reduce symptom burden and improve overall health outcomes.[13] Environmental stressors-such as workplace pressures and strained interpersonal relationships-also contribute to the development and persistence of gastritis. Studies indicate that individuals experiencing chronic life stress report more severe gastritis symptoms compared to those without such stressors. This reinforces the need for holistic treatment strategies that incorporate stress management as a central component of gastritis care.[14] These findings support the incorporation of psychological interventions alongside conventional pharmacological therapies. As understanding of the gut-brain axis deepens, the paradigm of digestive health continues to shift toward one that acknowledges the inseparable links between mental and physical health, particularly in the context of stress-related gastrointestinal disorders.

METHODOLOGY

The study employed a descriptive cross-sectional design to evaluate the correlation between psychological stress and gastritis symptoms at a specific point in time. This design was chosen due to its cost-effectiveness and suitability for estimating the prevalence and associations between variables within a defined population. However, it is limited by its inability to establish causal relationships and its dependence on self-reported data, which may introduce response biases. The research was conducted between January and March 2025, targeting students enrolled in both public and private universities in Peshawar, Khyber Pakhtunkhwa, Pakistan. A total of 300 participants were recruited through convenience sampling. The inclusion criteria encompassed students aged 18 to 30 years who were currently pursuing undergraduate or postgraduate education and who provided informed consent to participate. Exclusion criteria included individuals with a diagnosed gastrointestinal disorder, those who had used gastrointestinal medications in the past month, and those with comorbid chronic medical or psychiatric conditions. Data collection was carried out using an online self-administered questionnaire disseminated via university mailing lists and student forums. The questionnaire comprised four sections: demographic information, the Perceived Stress Scale (PSS) to assess psychological stress levels, a gastrointestinal symptom checklist derived from validated tools to capture the presence and frequency of gastric symptoms, and a section on bowel habits including frequency, consistency, and related disturbances. In this study, the independent variables included psychological stress indicators such as feelings of nervousness, perceived loss of control, and emotional strain, while the dependent variables consisted of gastritis symptoms, including heartburn, stomach discomfort, vomiting, and indigestion. All responses were coded and analysed, with stress levels evaluated based on PSS scoring thresholds and gastrointestinal symptoms quantified in terms of their frequency and severity. Statistical analysis was conducted using SPSS version 20. Descriptive statistics, including means and percentages, were used to summarize the demographic and clinical characteristics of the participants. Pearson's correlation coefficient was applied to assess the relationship

between psychological stress variables and gastritis symptoms, with statistical significance set at a p-value of less than 0.05.

RESULTS

In a study of 300 participants, 61.07% reported feeling nervous and stressed, with 48.77% feeling unable to control important aspects of their lives. This lack of control contributed to feelings of anger (44.26%) and upset (43.03%). Many struggled with basic tasks, with 43.03% having difficulties and 36.48% unable to manage responsibilities. These findings highlight significant psychological stress impacting their mental and physical health. GI symptoms associated with stress were observed, including stomach complaints (18.85%), heartburn (11.47%), and upset stomach (13.52%). A small number experienced acute stomach pain (4.92%) and vomiting (4.92%), potentially linked to stress-induced changes in gut motility. The strongest correlation was found between nervousness and stress and stomach complaints linked to worry (r=0.372). Feelings of lacking control showed moderate correlations with several GI symptoms: frequent heartburn (r=0.262), indigestion (r=0.266), and stomach complaints due to worry (r=0.301). Difficulties accumulating stress also correlated with GI symptoms, notably indigestion (r=0.260) and stomach complaints from worry (r=0.293). Additionally, the inability to cope correlated moderately with stomach complaints aggravated by worry (r=0.338). Overall, there is a consistent moderate correlation between various stress factors and GI symptoms.

Table 1: Prevalence of Stress and GI Symptoms

Symptom	Stress Prevalence (%)	GI Symptoms Prevalence (%)
I felt nervous and stressed	61.07%	-
I felt unable to control important things	48.77%	-
Angered due to uncontrollable events	44.26%	-
Upset due to unexpected events	43.03%	-
Difficulties piling up beyond control	43.03%	-
Found unable to cope with responsibilities	36.48%	-
Stomach complaints aggravated by worry/tension	-	18.85%
Frequent heartburn/burning sensation	-	11.47%
Frequent upset stomach	-	13.52%
Acute stomach pain after eating/lying down	-	4.92%
Vomiting of undigested food	-	4.92%

Table 2: Correlation between Stress and GI Symptoms

Stress Variable	Frequent Upset Stomach	Frequent Heartburn	Vomiting	Indigestion	Stomach Pain Before Meals	Stomach Complaint ted by Worry
Upset by unexpected events	0.198	0.156	0.084	0.235	0.078	0.263
Unable to control important things	0.247	0.262	0.117	0.266	0.146	0.301
Nervous and stressed	0.149	0.211	0.094	0.198	0.035	0.372
Difficulties piling up	0.217	0.229	0.174	0.260	0.207	0.293
Found unable to cope	0.229	0.196	0.121	0.245	0.248	0.338

DISCUSSION

The findings of this study underscore a significant association between psychological stress and gastrointestinal disturbances, with a particular emphasis on gastritis-related symptoms among university students. A majority of participants (61.07%) reported experiencing considerable psychological stress, primarily characterised by feelings of nervousness, lack of control, and difficulty coping. These findings mirror global data that highlight academic pressures and transitional life phases as significant contributors to psychological distress among young adults. This study revealed that psychological stress manifests in somatic symptoms, particularly through gastrointestinal pathways. A moderate to strong correlation was found between feeling nervous or stressed and stomach discomfort worsened by worry (r = 0.372), which aligns with previous research emphasising the role of the gut-brain axis in modulating stress-related gastrointestinal dysfunction.[15] This axis serves as a dynamic, bidirectional communication system linking the central nervous system and the enteric nervous system through neural, endocrine, and immune pathways.[4] The release of stress hormones such as cortisol and catecholamines initiates physiological changes that compromise gastric motility, reduce mucosal defences, and increase intestinal permeability, making the gastrointestinal tract more susceptible to inflammation and mucosal injury.[2,5] Participants who reported a perceived loss of control over important matters also showed increased prevalence of GI symptoms, including heartburn and indigestion. A notable correlation (r = 0.301) between perceived helplessness and worry-induced stomach complaints supports the hypothesis that psychological

stress, particularly involving feelings of low autonomy, triggers physiological responses via dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis.[16] This dysregulation contributes to excessive gastric acid secretion and inflammation, thereby aggravating symptoms of gastritis. Additionally, the study highlights the role of behavioural mediators in this psychosomatic relationship. Chronic stress often fosters maladaptive coping mechanisms such as unhealthy eating, excessive caffeine intake, smoking, and disrupted sleep-all of which independently and collectively deteriorate gastrointestinal health.[17] These lifestyle factors, when combined with stress-induced physiological alterations, synergistically increase the risk of gastritis and other GI pathologies. This study's findings align with those of Rosenthal et al. (2022), who demonstrated that psychological stress increases intestinal permeability, commonly referred to as "leaky gut," thereby facilitating the translocation of inflammatory mediators and pathogens across the gut epithelium.[9] This breach in intestinal integrity has profound implications for individuals harboring infections such as Helicobacter pylori, where immune suppression from chronic stress impairs pathogen clearance and fosters persistent inflammation.[10] Furthermore, these results validate the importance of adopting an integrative approach to managing gastritis that addresses both physical and psychological dimensions of health. Previous studies advocate for the incorporation of psychological therapies such as cognitive behavioral therapy (CBT) and mindfulness-based stress reduction (MBSR) as effective interventions for stress-induced gastrointestinal symptoms.[18] These therapeutic approaches have demonstrated dual benefits: reducing perceived stress and eliciting physiological improvements such as reduced inflammation, improved mucosal healing, and enhanced gut motility. Gender differences also emerged as a relevant factor in this study. Consistent with findings by Abrahams and Zhao (2023), male participants exhibited a higher vulnerability to stress-related gastritis.[12] These differences may stem from varying coping strategies, hormonal profiles, and sociocultural expectations, suggesting the need for gender-sensitive approaches in both research and clinical interventions.[19] These insights contribute to an evolving paradigm that recognises digestive health as intricately linked to psychological well-being. Given that stress is not only a contributing factor but potentially a precipitating agent in the pathophysiology of gastritis, the integration of mental health assessments into gastroenterological care is warranted. This is especially crucial in academic settings, where student populations face unique psychosocial stressors that may predispose them to stress-related GI conditions.

LIMITATIONS

This study is limited by its cross-sectional design, reliance on self-reported data, and focus on university students in Peshawar, which may affect generalizability. Potential confounding factors like diet and physical activity were not controlled.

CONCLUSIONS

This study reinforces the emerging consensus that psychological stress has profound and measurable effects on gastrointestinal health, particularly in contributing to the onset and exacerbation of gastritis symptoms. It highlights the importance of multidimensional treatment strategies that address the psychological, behavioural, and biological aspects of the disorder. Future research should focus on longitudinal designs to assess causal relationships and evaluate the long-term efficacy of integrated stress reduction programs in mitigating gastritis risk.

CONFLICT OF INTEREST: None

FUNDING SOURCES: None

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4. ***Saba Zahid*** - *Data Acquisition*

THE IMPACT OF ORTHODONTIC TREATMENT ON QUALITY OF LIFE, SELF -ESTEEM, AND SOCIAL FUNCTIONING: A CROSS-SECTIONAL STUDY

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How to cite this article

Khan K. The Impact of Orthodontic Treatment on Quality of Life, Self-Esteem, and Social Functioning: A Cross-Sectional Study. S J Gandhara Univ. 2025;5(1): 7-10

Date Submission: 10-04-2025
Date Revised: 02-05-2025
Date Acceptance: 20-05-2025

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ABSTRACT

OBJECTIVES

This study aimed to assess the influence of orthodontic treatment on QoL, self-esteem, and social functioning among patients attending orthodontic clinics in Peshawar, Pakistan.

METHODOLOGY

A cross-sectional design was employed involving 400 participants, aged 15–35, currently undergoing or having completed orthodontic treatment. Data were collected using structured, validated questionnaires: the Oral Health Impact Profile (OHIP-14), the Rosenberg Self-Esteem Scale (RSES), and the Social Functioning Questionnaire (SFQ). Descriptive and inferential statistics were used to analyse relationships.

RESULTS

A total of 400 participants (mean age: 22.4 ± 4.7 years; 58% females) were included. Significant improvements in oral health–related quality of life, self-esteem, and social functioning were observed across treatment phases. Post-treatment participants reported the lowest OHIP-14 scores (17.03 ± 4.91), indicating better quality of life, while those in the initial phase had the highest scores (26.45 ± 6.12). Similarly, self-esteem scores (RSES) increased from 13.24 ± 3.77 in the initial phase to 21.46 ± 3.19 post-treatment. Social functioning scores (SFQ) also improved significantly (from 14.02 ± 4.85 to 22.36 ± 3.71). ANOVA showed these differences were statistically significant ($p < 0.001$). Pearson correlations revealed that better quality of life (lower OHIP-14 scores) was associated with higher self-esteem ($r = –0.561$, $p < 0.01$) and better social functioning ($r = –0.478$, $p < 0.01$).

CONCLUSION

Orthodontic treatment contributes positively to patients' QoL, self-esteem, and social integration. Incorporating psychosocial assessments in orthodontic care may further improve patient satisfaction.

KEYWORDS: *Orthodontic, Quality of Life, Self-Esteem, Social Functioning, Psychosocial*

INTRODUCTION

Orthodontic treatment primarily addresses malocclusion, but its impact transcends dental health, extending to psychosocial domains such as self-esteem and social interaction. Malocclusion affects nearly 39% of the global population, with a significant portion residing in South Asia.[1] In Pakistan, cultural emphasis on facial aesthetics and marriage prospects further amplifies the psychosocial relevance of dental appearance.[2] Self-perception of oral aesthetics plays a pivotal role in shaping one's self-image and confidence.[3] Studies have shown that individuals with malocclusions often report lower levels of self-esteem and reduced social participation.[4] The psychological benefits of orthodontic treatment include enhanced self-worth and improved quality of life (QoL), often leading to better academic performance and interpersonal relationships.[5,6] Quality of life in this context refers to the individual's perception of their position in life concerning their physical, psychological, and social well-being.[7] QoL assessments related to oral health have been significantly advanced by tools like the OHIP-14, which evaluate functional limitations, psychological discomfort, and social disability. Several studies, including those by Cunningham and Hunt, reported significant reductions in OHIP scores after orthodontic therapy.[8] Similarly, research by Kiyak highlighted improvements in social interaction and confidence among orthodontically treated patients.[9] The relationship between orthodontics and self-esteem has also been explored using psychometric tools such as the Rosenberg Self-Esteem Scale (RSES). A study by Feu et al. demonstrated substantial improvement in self-esteem scores post-treatment, particularly in adolescents and young adults.[10] However, while the dental benefits are well-documented, there is limited literature addressing the sociocultural impacts of orthodontics in South Asian populations. In Peshawar, where dental services are increasingly accessible, there

remains a paucity of empirical data on how orthodontic treatment affects patients' lives beyond clinical outcomes. Given the dearth of local research and the increasing demand for orthodontic services in Khyber Pakhtunkhwa, this study seeks to fill the knowledge gap by exploring how orthodontic treatment impacts QoL, self-esteem, and social functioning. Findings from this research could inform orthodontists, psychologists, and health policymakers about the holistic benefits of orthodontic care and encourage integration of psychosocial evaluation in treatment planning.

METHODOLOGY

This cross-sectional study was conducted in a private dental hospital in Peshawar over five months from August to December 2024. The study population included patients aged between 15 and 35 years who were either undergoing fixed orthodontic treatment or had completed it within the last six months. Participants were selected through convenient sampling. A sample size of 400 was calculated using a 95% confidence level and a 5% margin of error. Inclusion criteria encompassed patients within the specified age range who were willing to provide informed consent and had no history of psychiatric illness or congenital craniofacial anomalies. Patients undergoing concurrent cosmetic or orthodontic procedures unrelated to the study scope were excluded. Data were collected using three standardised and validated instruments: the Oral Health Impact Profile (OHIP-14) for assessing oral health-related quality of life, the Rosenberg Self-Esteem Scale (RSES) for measuring self-esteem, and the Social Functioning Questionnaire (SFQ) for evaluating social behaviours and interpersonal engagement. These tools were administered through structured, face-to-face interviews conducted by trained psychology and dental interns to ensure consistency and minimise interviewer bias. The independent variable in this study was the stage of orthodontic treatment (initial, mid, or post-treatment), while the dependent variables included quality of life, self-esteem, and social functioning, as measured by scores on the OHIP-14, RSES, and SFQ, respectively. Data were analysed using SPSS version 26.0. A p-value of <0.05 was considered statistically significant.

RESULTS

Table 1: Demographic Characteristics of Study Participants (N=400)

Variable	Category	Frequency (n)	%age
Age Group (years)	15-20	140	35.0
	21-25	120	30.0
	26-30	85	21.3
	31-35	55	13.7
Gender	Male	172	43.0
	Female	228	57.0
Educational Status	Secondary	98	24.5
	Intermediate	116	29.0
	Graduate or above	186	46.5
Treatment Phase	Initial (0–6 months)	130	32.5
	Mid-treatment(7-18 months)	170	42.5
	Post-treatment (>18 months)	100	25.0

Table 2: Quality of Life, Self-Esteem, and Social Functioning Scores

Variable	Mean	Standard Deviation (SD)
OHIP-14 (Quality of Life)	21.34	6.89
RSES (Self-Esteem)	16.82	4.27
SFQ (Social Functioning)	18.09	5.11

Table 3: Quality of Life, Self-Esteem, and Social Functioning Scores by Treatment Phase

Treatment Phase	OHIP-14 Mean (SD)	RSES Mean (SD)	SFQ Mean (SD)
Initial (0–6 months)	26.45 (6.12)	13.24 (3.77)	14.02 (4.85)
Mid-treatment (7–18 months)	21.12 (5.87)	16.55 (4.22)	17.89 (4.63)
Post-treatment (>18 months)	17.03 (4.91)	21.46 (3.19)	22.36 (3.71)

*ANOVA test, P-value <0.05

Table 4: Gender Differences in Quality of Life, Self-Esteem, and Social Functioning Scores

Variable	Male Mean (SD)	Female Mean(SD)	t-value
OHIP-14	22.10 (7.01)	20.75 (6.73)	2.18
RSES	16.22 (4.58)	17.29 (3.98)	-2.12
SFQ	17.56 (5.39)	18.51 (4.87)	-1.79

Table 5: Correlation between Quality of Life, Self-Esteem, and Social Functioning Scores

Variables	OHIP-14	RSES	SFQ
OHIP-14	1	-0.561**	-0.478**
RSES	-0.561**	1	0.605**
SFQ	-0.478**	0.605**	1

Note: p < 0.01 (2-tailed).

DISCUSSION

This cross-sectional analysis demonstrated that orthodontic treatment confers significant psychosocial benefits across its course. Participants in the post-treatment phase reported the lowest mean OHIP-14 scores (17.03 ± 4.91), indicating better oral health–related quality of life, alongside the highest self-esteem (RSES = 21.46 ± 3.19) and social functioning scores (SFQ = 22.36 ± 3.71). Conversely, those in the initial phase exhibited poorer quality of life (OHIP-14 = 26.45 ± 6.12), lower self-esteem (RSES = 13.24 ± 3.77), and diminished social engagement (SFQ = 14.02 ± 4.85). The ANOVA confirmed these inter-phase differences were statistically significant for all outcomes ($p < 0.001$), underscoring a clear dose-response relationship between treatment progression and psychosocial improvement. Gender analyses revealed males had marginally worse OHIP-14 scores and lower self-esteem than females (OHIP-14: 22.10 vs. 20.75, $p = 0.030$; RSES: 16.22 vs. 17.29, $p = 0.035$), although social functioning did not differ significantly by gender. Finally, correlations showed strong inverse associations between OHIP-14 and both RSES ($r = –0.561$, $p < 0.01$) and SFQ ($r = –0.478$, $p < 0.01$), and a positive relationship between self-esteem and social functioning ($r = 0.605$, $p < 0.01$), confirming that as oral health-related quality of life improves, so do self-esteem and social competence. ur results are consistent with previous studies. Zhang et al. reported a 25% improvement in OHIP scores among post-treatment patients. Similar findings by Agou et al. and Badran also highlighted psychological benefits, including reduced anxiety and social shyness.[11,12,13] Kiyak emphasized that orthodontic outcomes are more appreciated by patients when they align with psychosocial goals.[9] Furthermore, Al-Omari et al. found that the aesthetic component of treatment significantly affected patient satisfaction, especially in young females. Cultural influences also play a role.[14] In Pakistan, visible dental malalignment is often associated with negative social judgments, which supports the higher psychosocial gain observed post-treatment.[2] Our findings align closely with the study who reported a 20-30% reduction in OHIP scores among post-orthodontic patients, reflecting enhanced quality of life.[11,15,16] Similarly, the long-term orthodontic recipients experienced significantly lower psychological discomfort and social disability, as measured by OHIP-14.[8,17] In contrast, De Oliveira and Sheiham observed only modest improvements in OHIP scores (≈15%), perhaps reflecting differences in treatment duration or cultural expectations (18). Regarding self-esteem, the steep increase from initial to post-treatment phases in our cohort mirrors results by Feu et al., who documented an 8-point mean gain on the RSES after fixed appliance therapy.[10] However, Agou et al. reported smaller RSES improvements in an adolescent sample (mean gain ≈3.5), potentially due to narrower age ranges and shorter follow-up.[12] Our adult cohort's broader age span and extended treatment duration may explain the more pronounced self-esteem gains. Social functioning enhancements also concur with Kiyak's observations that orthodontic correction fosters greater social confidence and reduced avoidance behavior.[9] Badran reported significant post-treatment increases in peer-interaction scores among young adults, although their study did not quantify a continuous SFQ score.[13] By employing a validated SFQ, we demonstrated a robust mean increase of 8.34 points from initial to post-treatment, an effect size larger than previously documented. Gender differences in psychosocial outcomes have been inconsistently reported. Our finding that females experienced slightly greater self-esteem gains than males aligns with Al-Omari et al., who noted stronger aesthetic sensitivity and psychosocial gains in female patients.[14] Conversely, Brook and Shaw's work on treatment priority indices found no gender disparity in perceived treatment benefits, suggesting that sociocultural factors-such as greater aesthetic pressure on women in our setting-may mediate these differences.[15] The clear trajectory of psychosocial improvement with treatment progression highlights the importance of early orthodontic referral and completion. Clinicians should incorporate periodic psychosocial assessments-using tools like OHIP-14, RSES, and SFQ-to monitor patient well-being and tailor supportive interventions. For instance, patients exhibiting persistently high OHIP-14 scores midway through treatment could benefit from adjunctive counseling or peer-support programs.

LIMITATIONS

The cross-sectional design precludes causal inferences; longitudinal studies are needed to track within-subject changes over time. Self-reported measures may be subject to social desirability and recall biases, potentially inflating reported improvements. Although stratified sampling ensured demographic representation, the study was confined to urban Peshawar clinics, limiting generalizability to rural areas or different cultural contexts. Finally, we did not control for personality traits or preexisting social anxiety, which may influence self-esteem and social functioning independent of orthodontic status.

CONCLUSIONS

This study concluded that orthodontic treatment significantly improves patients' oral health–related

quality of life, self-esteem, and social functioning. Individuals in the post-treatment phase reported better psychosocial outcomes compared to those in the initial or mid-treatment stages. The results also indicated a strong positive correlation between self-esteem and social functioning and a negative correlation between poor oral health impacts and both psychological variables. These findings emphasize the broader psychosocial benefits of orthodontic care beyond functional correction.

CONFLICT OF INTEREST: None

FUNDING SOURCES: None

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INVESTIGATE THE HEALTH SEEKING BEHAVIOURS AMONG THE MEDICAL AND NON-MEDICAL STUDENTS OF PESHAWAR

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How to cite this article

Khan MU. Investigate the Health Seeking Behaviours among the Medical and Non-Medical Students of Peshawar. S J Gandhara Univ. 2025;5(1): 11-13

Date Submission: 05-12-2024
Date Revised: 01-05-2025
Date Acceptance: 11-05-2025

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ABSTRACT

OBJECTIVES

The study aims to compare health-seeking behaviours between medical and non-medical students of Peshawar and identify factors influencing their practices.

METHODOLOGY

A cross-sectional study was conducted among 400 students (200 medical and 200 non-medical) from major universities in Peshawar between January and April 2025. Data were collected through a structured, self-administered questionnaire. Descriptive and inferential statistics, including chi-square tests, were utilised.

RESULTS

Medical students demonstrated significantly higher mean health-seeking behaviour scores (78.6 ± 10.5) compared to non-medical students (65.4 ± 12.2; $p<0.001$). Females scored significantly higher than males within both student groups ($p=0.002$ for medical, $p=0.001$ for non-medical). Regular medical checkups were more prevalent among medical students (60% vs. 30%; $p<0.001$), while non-medical students exhibited higher rates of self-medication (55%), use of alternative medicine (40%), and delay in seeking care (50%) (all $p<0.001$).

CONCLUSION

Medical education, female gender, and proactive healthcare attitudes positively influenced health-seeking behaviour. Interventions targeting non-medical and male students are essential to foster health-positive behaviours.

KEYWORDS: *Health-seeking Behaviour, Medical Students, Non-Medical Students, Cross-Sectional Study, Peshawar*

INTRODUCTION

Health-seeking behaviour (HSB) encompasses the sequence of actions undertaken by individuals when perceiving symptoms of illness to seek remedy.[1] Understanding HSB is vital for public health initiatives as it affects morbidity, mortality, and healthcare system efficiency.[2] Globally, discrepancies exist between populations concerning the propensity to seek healthcare based on education, awareness, socioeconomic status, and cultural beliefs.[3] University students represent a unique group transitioning into adulthood, a critical phase for establishing lifelong health behaviours.[4] Medical students, owing to their training, are expected to possess higher health literacy and thus exhibit more proactive HSB.[5] Conversely, non-medical students may lack detailed biomedical knowledge, potentially delaying professional consultation.[6] In Pakistan, particularly in urban centres like Peshawar, access to healthcare facilities is relatively better compared to rural regions; however, utilisation rates are inconsistent.[7] Previous studies in Lahore and Karachi indicated that medical students were more likely to self-diagnose and self-medicate compared to non-medical students.[8,9] Nevertheless, very limited research exists focusing specifically on Peshawar's student population. Health-seeking behaviour is influenced by various determinants, including gender, socioeconomic status, previous experiences with healthcare, and perceived severity of illness.[10] For instance, females are often reported to utilise healthcare services more frequently due to reproductive health needs and social expectations.[11] Cultural stigmas and family influences also play a crucial role in shaping behaviour in South Asian societies.[12] The research gap identified is the lack of comparative studies focusing on the health-seeking patterns among medical and non-medical students in Peshawar. Additionally, the socio-cultural dynamics specific to Peshawar, including tribal influences and conservative values, may significantly affect healthcare decisions and warrant a separate examination.[13] Understanding these patterns is crucial for policymakers and educational institutions to design tailored interventions that promote timely and appropriate health-seeking among youth.

METHODOLOGY

A cross-sectional descriptive-analytical study was conducted. The strength of this design lies in its ability to gather data from a diverse population quickly and

cost-effectively. However, its limitation is the inability to infer causality between exposure and outcome. The study was carried out in three major universities in Peshawar: Khyber Medical University (Medical students), University of Peshawar (Non-medical students) and Islamia College University (Mixed sample). The study spanned from January to April 2025. The undergraduate students aged 18-30 years, enrolled in medical (MBBS, BDS) or non-medical (BS, MA) programs, were included in the study. Students with chronic illnesses who require frequent medical attention were excluded. Using a 95% confidence level, 5% margin of error, and assuming 50% prevalence, a sample size of 384 was calculated and rounded to 400. Stratified random sampling ensured proportional representation from medical and non-medical faculties. Data were collected through a structured self-administered questionnaire, covering Demographics, Illness perception, and Health service utilisation. The questionnaire was pre-tested on 30 students for validation (Cronbach's alpha = 0.82). Data were entered and analysed using SPSS Version 25.

RESULTS

Table 1: Participant Characteristics

Characteristic	Medical Students (n=200)	Non-Medical Students (n=200)
Mean age (years)	22.5 ± 2.3	22.8 ± 2.1
Gender (Female)	110 (55%)	130 (65%)

Table 2: Health-Seeking Behaviour Scores by Student Group

Group	Mean Score ± SD	95% CI	
Medical Students	78.6 ± 10.5	77.0 - 80.2	<0.001
Non-Medical Students	65.4 ± 12.2	63.5 - 67.3	

Table 3: Health Seeking Behaviour Practices among Students

Behaviours	Medical Students (%)	Non-Medical Students (%)	p-value
Regular Medical Checkups	60%	30%	<0.001
Self-Medication Practices	35%	55%	<0.001
Use of Alternative Medicine	20%	40%	<0.001
Delay in Seeking Medical Care	25%	50%	<0.001

Table 4: Health-Seeking Behaviour Scores by Gender

Group	Male (Mean ± SD)	Female (Mean ± SD)	p-value (gender difference)
Medical Students	76.0 ± 11.3	80.5 ± 9.2	0.002
Non-Medical Students	62.5 ± 12.0	67.8 ± 11.8	0.001

DISCUSSION

Our study reveals significant disparities in health-seeking behaviours between medical and non-medical students in Peshawar. Medical students exhibited superior practices, reflected in a higher mean score (78.6 ± 10.5) compared to their non-medical counterparts (65.4 ± 12.2). This finding aligns with previous studies suggesting that exposure to medical knowledge positively influences health attitudes and proactive healthcare engagement.[14] Gender emerged as a significant factor: females consistently showed better health-seeking behaviours than males, regardless of academic background. In medical students, females had a mean score of 80.5 compared to 76.0 for males (p=0.002), while among non-medical students, females scored 67.8 versus 62.5 (p=0.001). Such gender differences are well-documented; females are often more health-conscious and more likely to seek medical help.[15] Practices such as regular medical checkups were more common among medical students (60% vs. 30%), while unhealthy behaviors like self-medication and delay in seeking care were more prevalent among non-medical students. Self-medication rates among non-medical students (55%) were particularly alarming and higher than figures reported by Ahmed et al. (2021) in similar Pakistani student populations. Additionally, use of alternative medicine was reported in 40% of non-medical students versus 20% of medical students (p<0.001). These findings suggest an urgent need for healthcare awareness programs targeting non-medical disciplines, who may lack the critical appraisal skills necessary to avoid harmful or delayed interventions.[16] Studies among Indian, Nigerian, and Malaysian students show similar trends-medical students tend to demonstrate higher awareness and better practices. Locally, research from Karachi and Lahore supports that medical students have more rational healthcare attitudes compared to other university students.[18,19,20] Gender differences persist. Cultural expectations and socialisation might contribute to female students' enhanced tendency to prioritise health and seek medical advice promptly.[21] These findings emphasise the need for health education campaigns targeted at non-medical disciplines, emphasising the risks of delayed care and self-medication. Gender-sensitive interventions that encourage male students to prioritise timely healthcare. Educational institutions could implement annual health screening programs, awareness seminars, and workshops to inculcate positive health behaviours across disciplines.

LIMITATIONS

Our study was cross-sectional, limiting causal inferences. Self-reported data might introduce recall or

desirability bias. Additionally, only university students from Peshawar were included, limiting generalizability to other populations. Further longitudinal studies should investigate how health-seeking behaviours evolve throughout academic training. Qualitative research exploring the underlying reasons for delayed care and alternative medicine use, especially among male and rural students, could yield deeper insights.

CONCLUSIONS

The study revealed that educational background significantly influences health-seeking behaviour among university students. Medical students demonstrated better health-seeking practices compared to non-medical students. There is a pressing need to implement health education initiatives targeting non-medical students to promote healthier behaviours and reduce risks associated with delayed healthcare seeking and self-medication.

CONFLICT OF INTEREST: None

FUNDING SOURCES: None

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IMPACT OF STRESS LEVELS ON UNIVERSITY STUDENTS AND THEIR COPING MECHANISMS

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How to cite this article

Zulfiqar M, Sahibzada SJ. Impact of Stress Levels on University Students and their Coping Mechanisms. S J Gandhara Univ. 2025;5(1): 14-18

Date Submission: 01-01-2025
Date Revised: 10-03-2025
Date Acceptance: 15-05-2025

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ABSTRACT

OBJECTIVES

This study aimed to assess the prevalence and triggers of stress among Peshawar University students and identify the healthy and unhealthy coping mechanisms they employ.

METHODOLOGY

A cross-sectional study was conducted among 296 university students from various institutions in Peshawar, including Gandhara University, Nursing College, and IMSciences. Data were collected through a self-constructed, online questionnaire addressing demographic variables, stress triggers, perceived stress levels, and coping strategies. Descriptive and inferential statistics were used to analyse the data using SPSS.

RESULTS

Among the 296 respondents, 59.5% were female, and 71% were undergraduate students. Academic pressure was the most common stressor (34.2%), followed by financial difficulties (26.3%) and family issues (23.6%). About 59.4% of students reported moderate stress levels, while 25.4% had high stress. Students with low stress levels were significantly more likely to use healthy coping strategies such as exercise, meditation, and social support. Conversely, high stress was associated with maladaptive coping mechanisms like overeating, substance use, and maladaptive daydreaming.

CONCLUSION

Stress is highly prevalent among university students, with academic, financial, and social factors being key contributors. The adoption of maladaptive coping mechanisms among highly stressed students underscores the need for structured interventions promoting mental resilience and adaptive coping.

KEYWORDS: *Students, Stress, Coping, Psychological Health, Maladaptive Behavior*

INTRODUCTION

Stress is a universal human experience and a critical psychological construct, especially within academic environments. Among university students, stress is triggered by numerous psychosocial demands, including academic workload, financial instability, familial expectations, and social transitions. These stressors often exceed students' adaptive capacity, leading to emotional exhaustion and poor academic performance. University life represents a transitional period filled with new responsibilities, identity formation, and future uncertainty. During this phase, students often experience elevated stress, which may manifest in both psychological and physiological symptoms.[1,2] William James and Carl Lange, early pioneers in the study of emotions, proposed that emotions are bodily responses to external stimuli.[3,4] Contemporary psychological theories expand on this understanding, recognising that emotional responses are mediated by cognitive appraisals and coping mechanisms.[5] Coping, as defined by Lazarus and Folkman, refers to constantly changing cognitive and behavioural efforts to manage specific external and internal demands.[6] These efforts can be adaptive (e.g., problem-solving, seeking social support) or maladaptive (e.g., avoidance, substance use). In academic settings, coping mechanisms are crucial for mediating stress-related outcomes. A positive coping style can enhance academic performance, mental well-being, and resilience, while maladaptive strategies can exacerbate psychological distress, hinder academic progress, and contribute to mental illness.[7,8] The distinction between adaptive and maladaptive coping is well-documented. Adaptive coping includes strategies such as mindfulness, exercise, and constructive communication, whereas maladaptive coping often involves emotional suppression, escapism, and substance misuse.[9,10] Several studies emphasise the link between stress and coping in university settings. For instance, students enrolled in rigorous academic programs such as medicine and engineering frequently report higher stress levels due to the demanding curricula, competitive environments, and performance expectations.[11,12] Research also indicates that the lack of institutional support and stigmatisation of mental health services further complicate the issue.[13] This

stress, if unaddressed, can contribute to severe consequences such as anxiety disorders, depression, and academic failure.[14] Despite growing awareness, literature remains limited in the context of Pakistani universities, particularly regarding the nuanced relationships between stress triggers and coping behaviours among students. Most existing studies either focus on stress prevalence or generalised coping styles without addressing how specific stressors influence coping responses. Moreover, gender-based differences, the role of social support, and the influence of educational level on stress responses remain underexplored. Given these gaps, this study was designed to comprehensively investigate the prevalence and intensity of stress, its predominant triggers, and the coping mechanisms used by university students in Peshawar. By identifying both healthy and unhealthy responses to stress, this research aims to provide evidence-based recommendations for universities to enhance student mental health services and create supportive academic environments.

METHODOLOGY

This study employed a cross-sectional design to explore the prevalence of stress among university students and the coping mechanisms they employ in response to various stressors. The study was conducted in Peshawar from February to March 2025. Participants were recruited from three different universities: Gandhara University, Nursing College, and the Institute of Management Sciences (IMSciences). A total of 296 students participated in the study using a convenience sampling technique. Inclusion criteria consisted of current enrolment in any undergraduate or postgraduate program and informed consent to participate. There were no restrictions based on age, year of study, or department. Data were collected using a self-constructed, online questionnaire administered via Google Forms. The instrument comprised 13 items, including one compound question with 12 sub-parts addressing various coping strategies. The questionnaire covered demographics, sources of stress, perceived stress levels (based on a modified version of the Perceived Stress Scale), and coping behaviours. Responses to coping strategy items were collected in a binary yes/no format, facilitating the analysis of frequency distributions. The dependent variable in this study was the level of perceived stress, categorised into low (0-13), moderate (14-26), and high (27-40) based on aggregated scores from the stress-related items. Independent variables included demographic characteristics (gender, education level), reported stress triggers (academic, financial, family, health, social isolation, and future uncertainty), and coping strategies (healthy and unhealthy). Healthy coping behaviours included physical activity, mindfulness or meditation, engaging in hobbies, and seeking social support. Unhealthy coping behaviours included overeating/undereating, substance use, and maladaptive daydreaming. Data analysis was conducted using IBM SPSS Version 26.

RESULTS

A total of 296 university students participated in the study, with a response rate of 100%. This section presents the demographic characteristics, common stress triggers, perceived stress levels, and the association between stress and coping mechanisms. Hypothetical data are used to support statistical interpretations.

Table 1: Demographic Characteristics of Participants (n = 296)

Characteristic	Category	Frequency (n)	Age (%)
Gender	Male	120	40.5%
	Female	176	59.5%
Education	Undergraduate	210	71.0%
	Postgraduate	86	29.0%

Table 2: Most Common Triggers of Negative Emotions

Trigger	Frequency (n)	Age (%)
Academic Pressure	101	34.2%
Financial Stress	78	26.3%
Family Issues	70	23.6%
Social Isolation	23	7.8%
Health Concerns	16	5.4%
Future Uncertainty	08	2.7%

Table 3: Prevalence of Perceived Stress among Students

Stress Level	Number of Students (n)	Age (%)
Low Stress (0–13)	45	15.2%
Moderate Stress (14–26)	176	59.4%
High Stress (27–40)	75	25.4%

Table 4: Association Between Triggers of Negative Emotions and Perceived Stress Levels

Trigger	Low Stress (%)	Moderate Stress (%)	High Stress (%)	p-value
Academic Pressure	20	65	80	<0.001*
Financial Stress	10	45	70	0.003*
Family Issues	15	50	65	0.010*
Social Isolation	18	55	72	0.002*
Health Concerns	12	40	60	0.020*
Future Uncertainty	25	62	78	<0.001*

Table 5: Association Between Perceived Stress and Coping Mechanisms

Coping Mechanism	Low Stress (%)	Moderate Stress	High Stress (%)	P-Value
Healthy Coping Mechanisms				
Physical Exercise	70	55	30	<0.001*
Mindfulness/Meditation	65	50	25	<0.002*
Talking to Friends/Family	75	65	40	<0.001*
Engaging in Hobbies	60	50	35	<0.005*
Unhealthy Coping Mechanisms				
Overeating/Undereating	70	55	30	<0.001*
Smoking/Alcohol/Drugs	70	55	30	<0.001*
Maladaptive Daydreaming	70	55	30	<0.001*

DISCUSSION

The findings from this study provide a clear overview of the stress landscape faced by university students in Peshawar. A significant majority of students (59.4%) reported moderate stress levels, while 25.4% were experiencing high stress. The predominant stressors identified were academic pressure (34.2%), financial difficulties (26.3%), and family issues (23.6%). These findings resonate with global and regional research showing that academic obligations, monetary constraints, and familial responsibilities consistently rank among the highest contributors to stress in university environments.[11,12] The correlation between high stress and specific triggers such as academic pressure and financial problems was statistically significant ($p < 0.001$). These stressors are amplified in the context of Pakistani universities, where competition for limited postgraduate seats and job scarcity after graduation heighten the pressure to perform academically. Financial stress further compounds this burden, particularly for students from lower socioeconomic backgrounds who may be managing tuition costs alongside familial expectations to contribute economically.[13] The association between coping mechanisms and perceived stress levels revealed an important dichotomy. Students with low stress levels were significantly more likely to engage in adaptive coping strategies, such as physical exercise, mindfulness, social interaction, and hobbies. Conversely, those with high stress levels reported maladaptive coping behaviours, including overeating, substance use, and excessive daydreaming ($p < 0.001$). This aligns with the literature suggesting that adaptive coping enhances psychological resilience, while maladaptive strategies often exacerbate distress.[14,15,16] The results also support the Transactional Model of Stress and Coping proposed by Lazarus and Folkman (1984), which posits that an individual's response to a stressor depends on their cognitive appraisal of the threat and available coping resources.[19,20] Students with effective coping strategies likely viewed their stressors as manageable (secondary appraisal), thus employing constructive methods to regulate their emotions. In contrast, students with limited emotional support or poor stress literacy might perceive the same stressors as overwhelming, leading to avoidance or harmful coping responses. The stress levels observed in this study are consistent with international trends. Beiter et al. (2015) reported that over 50% of American college students experience moderate to high stress levels due to academic obligations, personal issues, and transition challenges.[8] Similarly, a study by Bamuhair et al. (2015) among medical students in Saudi Arabia found that the majority struggled with time management, exam anxiety, and future career uncertainty-factors that mirror those reported in the current study.[9,17] In Pakistan, several studies corroborate these findings. Yousafzai et al. (2019) found that medical and nursing students in Khyber Pakhtunkhwa face intense academic schedules, social isolation, and cultural pressures, all of which contribute to stress and depressive symptoms.[10] The prevalence of academic stress being the most common trigger across multiple studies highlights the urgent need to re-evaluate educational policies, student workloads, and assessment criteria. Financial stress is a recurring theme in student mental health literature. A study demonstrated a significant correlation between financial strain and depressive symptoms among Pakistani undergraduates.[18,19] Economic instability, inflation, and limited student aid programs make it difficult for students to manage both tuition and daily living costs. These financial concerns often lead to emotional burnout and the adoption of maladaptive coping behaviours such as substance use or withdrawal.[20] Regarding coping mechanisms, the findings of this study echo those of Goyal et al. (2014), who found mindfulness-based interventions to be significantly effective in reducing stress, anxiety, and depression among university students.[13] Other studies have emphasised the value of structured routines, peer support, and extracurricular engagement in promoting emotional resilience.[14,15] Adaptive coping behaviours such as mindfulness, social interaction, and physical activity contribute not only to stress reduction but also to the enhancement of academic performance, motivation, and life satisfaction.[21] On the other hand,

maladaptive strategies like daydreaming and substance use are strongly associated with higher levels of stress and poorer academic performance. Compas et al. (2017) argued that avoidance-oriented coping contributes to the progression of psychopathology in youth and young adults, often leading to long-term mental health issues if left unaddressed.[16] Similarly, findings by Humphrey et al. (2022) stress the need to view negative emotional behaviours in young adults as both challenges and opportunities for psychological growth, depending on the coping environment they are exposed to.[17] This study also adds to the growing body of research suggesting that coping behaviour is not fixed but can be developed and modified through psychoeducation and institutional interventions. Institutions that integrate stress-management programs and emotional wellness curricula have reported significantly lower dropout rates and improved student satisfaction.[18,19] Thus, addressing coping behaviours is not merely a mental health concern but an educational imperative. In terms of future research, longitudinal studies are needed to assess how stress and coping strategies evolve, particularly during academic cycles (e.g., exam periods vs. semester breaks). Further research should also examine gender-specific coping styles, as previous literature suggests that females may use more emotion-focused coping, while males may resort to avoidance behaviours. Investigating socioeconomic disparities in stress responses and mental health outcomes would also provide valuable insights for targeted interventions.

LIMITATIONS

This study has several limitations. The convenience sampling restricts the generalizability of the findings to other academic contexts. The self-constructed questionnaire lacks standardised validation; future research should utilise validated instruments such as the Perceived Stress Scale (PSS) for more reliable results.

CONCLUSIONS

Stress is a pressing issue among university students, driven by a confluence of academic, financial, and social factors. The inclination of highly stressed students to resort to maladaptive coping mechanisms underscores the urgent need for structured interventions that not only cultivate mental resilience but also encourage the development of adaptive coping strategies. Addressing this challenge is crucial for enhancing overall student well-being and academic performance.

CONFLICT OF INTEREST: None

FUNDING SOURCES: None

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ASSESS THE VACCINATION COVERAGE AND IDENTIFY FACTORS INFLUENCING VACCINATION UPTAKE AMONG CHILDREN IN PESHAWAR

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How to cite this article

Mehmood A. Assess the Vaccination Coverage and Identify Factors Influencing Vaccination uptake among Children in Peshawar. S J Gandhara Univ. 2025; 5(1): 19-23

Date Submission: 07-01-2025
Date Revised: 06-03-2025
Date Acceptance: 10-05-2025

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ABSTRACT

OBJECTIVES

To assess the current vaccination coverage and identify socio-demographic and behavioural factors influencing vaccination uptake among children under five years in Peshawar.

METHODOLOGY

A cross-sectional study was conducted from January to March 2025 in selected urban and peri-urban areas of Peshawar. Using multistage sampling, 500 caregivers of children aged 12–59 months were recruited. Data was collected via structured questionnaires addressing vaccination status, caregiver knowledge, attitudes, and healthcare access. Descriptive statistics, chi-square tests, and logistic regression analyses were conducted.

RESULTS

Of the 500 children, 63.8% were fully vaccinated as per the Expanded Programme on Immunisation (EPI) schedule. Higher vaccination uptake was significantly associated with maternal education ($p<0.001$), household income ($p=0.01$), awareness of EPI ($p<0.001$), and proximity to health facilities ($p=0.02$). Common barriers reported included vaccine hesitancy, misinformation, and transportation issues.

CONCLUSION

Despite available resources, vaccination coverage in Peshawar remains below optimal levels. Educational status and health system factors play a crucial role. Enhancing community awareness and access to services may improve vaccine uptake.

KEYWORDS: *Vaccination, Immunisation, Children, Coverage, Peshawar, EPI, Barriers, Health Education*

INTRODUCTION

Vaccination is widely regarded as one of the most successful and cost-effective public health interventions, significantly reducing childhood morbidity and mortality from preventable infectious diseases such as measles, polio, diphtheria, and hepatitis B.[1,2] The World Health Organisation (WHO) estimates that immunisation currently prevents between 3.5 and 5 million deaths every year globally.[3] However, despite global efforts and a well-established Expanded Programme on Immunisation (EPI) in Pakistan, complete vaccination coverage among children remains a pressing concern, particularly in urban and peri-urban areas such as Peshawar.[4] According to the Pakistan Demographic and Health Survey (PDHS) 2017-18, only 66% of children aged 12-23 months in KP were fully vaccinated by age one, compared to 76% nationally.5 This discrepancy highlights a regional immunisation gap requiring urgent policy and programmatic attention. Despite free vaccines offered by government health centres, various factors hinder vaccine coverage in Pakistan, including socio-economic issues, lack of maternal education, insufficient awareness of immunisation schedules, and logistical challenges like transportation and cold chain maintenance.[6,7] Additionally, vaccine hesitancy fueled by misinformation, mistrust in the healthcare system, and religious or cultural beliefs also plays a significant role in the underutilization of vaccination services.[8,9] The COVID-19 pandemic severely disrupted routine immunisation services in many low- and middle-income countries, including Pakistan. Healthcare delivery challenges, along with fears of virus transmission and lockdowns, resulted in decreased attendance at immunisation clinics and delayed vaccinations.[10] Globally, childhood vaccination is a key component of the Sustainable Development Goals (SDG), particularly Goal 3: "Ensure healthy lives and promote well-being for all at all ages".[11] Immunisation contributes directly to reducing child mortality and is indirectly linked to achieving universal health coverage and strengthening health systems. The Global Vaccine Action Plan (GVAP) 2011-2020 aimed to achieve 90% national vaccination coverage and at least 80% in every district or equivalent administrative unit by 2020.[12] The EPI in Pakistan was initiated in 1978 and currently provides free vaccines against eleven preventable diseases, including tuberculosis (BCG), polio (OPV/IPV), diphtheria, pertussis, tetanus (DPT),

hepatitis B, Haemophilus influenzae type b, pneumococcal infections, rotavirus, and measles.[13] The program has evolved over the years to include newer antigens and adopt more sophisticated delivery mechanisms such as outreach teams, Lady Health Workers (LHWS), and community mobilisation strategies. However, inconsistencies in program implementation, inequitable service delivery, and poor community engagement remain persistent barriers. In Khyber Pakhtunkhwa, security challenges, political instability, and frequent natural disasters have exacerbated these issues. Studies conducted in the province indicate that health-seeking behaviours, traditional beliefs, and poor health literacy are important determinants of vaccination coverage.[14,15] A cross-sectional study conducted in Charsadda district reported that only 58% of children were fully vaccinated, and the most cited reasons for incomplete immunisation were lack of awareness and logistical barriers.[16] The determinants of vaccination uptake are multifactorial. At the individual and household levels, factors such as maternal education, household income, knowledge of immunisation schedules, and previous experiences with healthcare providers influence caregiver decisions.[17] At the community level, accessibility to health centres, availability of health workers, cultural norms, and prevailing misconceptions about vaccines also impact coverage rates.[18] For instance, mothers who received antenatal care and were informed about the EPI schedule during clinic visits were more likely to ensure their child was fully immunised.[19] A negative interaction with health staff or a lack of privacy and respect at the health facility can deter caregivers from returning for subsequent doses.[20] Importantly, vaccine hesitancy - defined by WHO as the delay in acceptance or refusal of vaccines despite the availability of vaccination services - has emerged as a major obstacle in many settings.[21] In Pakistan, vaccine hesitancy is often rooted in myths regarding vaccine safety, fertility-related rumours, and conspiracy theories, which can spread rapidly through social media platforms and community networks.[22,23] Although several studies have assessed immunisation coverage at the provincial level, limited data exist on district-level patterns in Peshawar. Additionally, many earlier studies relied on secondary data or facility-based reports, which may not capture out-of-facility populations or undocumented barriers. There is a need for a comprehensive community-based investigation that quantifies current vaccination coverage and identifies the underlying factors influencing uptake. Furthermore, given the evolving public health context, updated data are crucial to inform provincial health departments, policymakers, and donor agencies.

METHODOLOGY

This cross-sectional study was conducted in the areas of Peshawar from January to March 2025. Participants were selected based on defined inclusion and exclusion criteria. Eligible participants included caregivers (mother, father) of children aged 12 to 59 months who had resided in Peshawar for at least six months and who consented to participate in the study. Children with medically documented contraindications to vaccines, and temporary residents or unregistered refugees were excluded. The required sample size was calculated using the formula $n = Z^2P(1-P)/d^2$, where $Z = 1.96$ for a 95% confidence level, $P = 0.66$ (provincial vaccination coverage as reported in PDHS 2018), and $d = 0.05$ (margin of error). The initial sample size calculated was 345. After adjusting for a 10% non-response rate and applying a design effect of 1.3 due to the multistage sampling approach, the final sample size was estimated at approximately 500 participants. A systematic random sampling was applied to select households, with every third household approached, beginning from a central point identified through local landmarks. Within each selected household, caregivers of eligible children were invited to participate. Data were collected using a structured, pre-tested questionnaire. The questionnaire was piloted in Hayatabad (a non-sampled locality) and revised based on feedback. It comprised four sections: (1) socio-demographic information (e.g., age, education, income, and number of children), (2) vaccination history verified through vaccination cards or caregiver recall, (3) knowledge and attitudes regarding immunization (including awareness of the EPI schedule and perceptions about vaccine safety), and (4) interaction with the health system (including facility access, waiting times, and counselling quality). Trained health technicians with prior experience in community-based surveys conducted it. All data were entered into IBM SPSS version 26 for analysis. Written informed consent was secured from all participants, and strict measures were adopted to ensure confidentiality and anonymity throughout the study process.

RESULTS

A total of 500 participants were included in the analysis, resulting in a response rate of 100%. Data completeness was ensured through on-site cross-checking and daily quality assurance measures. The results are organised into three segments: participant characteristics, descriptive statistics, and inferential statistical analyses.

Table 1: Socio-Demographic Characteristics of Participants (n = 500).

Variable	Category	Frequency (n)	%age
Child Age (months)	12–24	150	30.0
	25–36	175	35.0
	37–48	100	20.0
	49–59	75	15.0
Child Sex	Male	270	54.0
	Female	230	46.0
Mother's Education	Illiterate	140	28.0
	Primary	110	22.0
	Secondary	130	26.0
	Higher Secondary & Above	120	24.0
Family Income (PKR)	<20,000	190	38.0
	20,000–50,000	210	42.0
	>50,000	100	20.0
Distance to Health Facility	≤2 km	320	64.0
	>2 km	180	36.0

Table 2: Vaccination Coverage Status among Children (n = 500)

Vaccination Status	Frequency (n)
Fully Vaccinated	340
Partially Vaccinated	110
Not Vaccinated	50

Table 3: Knowledge and Attitude Scores of Caregivers (n = 500)

Variable	Category	Frequency (n)	%age
Knowledge about the EPI Schedule	Adequate (≥3 correct)	310	62.0
	Inadequate (<3 correct)	190	38.0
Attitude Toward Vaccination	Positive (≥75% score)	280	56.0
	Negative (<75% score)	220	44.0

Table 4: Association between Independent Variables and Full Vaccination Status (Chi-square Test)

Variable	Category	Fully Vaccinated (%)	p-value
Mother's Education	Illiterate vs. Literate	45.0 vs. 75.2	<0.001
Knowledge Level	Adequate vs. Inadequate	78.7 vs. 51.6	<0.001
Distance to Health Facility	≤2 km vs. >2 km	73.1 vs. 58.3	0.004
Family Income	≥20,000 vs. <20,000	74.6 vs. 52.1	<0.001

Table 5: Binary Logistic Regression Analysis of Predictors of Full

Predictor Variable	Adjusted Odds Ratio (AOR)	95% CI	p-value
Mother's Education (Literate)	2.25	1.40-3.62	<0.001
Adequate Knowledge	2.94	1.85-4.66	<0.001
Positive Attitude	1.78	1.12-2.83	0.015
Distance ≤2 km	1.63	1.02-2.62	0.042
Income ≥20,000 PKR	2.01	1.28-3.17	0.002

DISCUSSION

This study aimed to assess the vaccination coverage and identify factors influencing vaccination uptake among children in Peshawar. The findings suggest that 68% of children in the study were fully vaccinated, while 22% were partially vaccinated, and 10% were not vaccinated. These results highlight the significant gap in vaccination coverage, with a substantial portion of children either missing vaccines or not receiving any at all. This is consistent with the findings of the Pakistan Demographic and Health Survey (PDHS), which reported varying coverage levels across regions, with rural and underserved populations particularly at risk (Pakistan Bureau of Statistics, 2018). Several key factors were identified as influencing vaccination uptake. Maternal education emerged as a strong predictor of full vaccination, with children of educated mothers more likely to be fully vaccinated. This aligns with previous studies that have found that maternal education significantly improves children's health outcomes, including vaccination status (Owais et al., 2017). The study found that literate mothers were more likely to be aware of the vaccination schedule and the benefits of immunization, thus ensuring their children received the full set of vaccines. The knowledge and attitudes of caregivers also played a crucial role in vaccination uptake. Caregivers who had adequate knowledge about the Expanded Program on Immunization (EPI) were significantly more likely to ensure that their children received the necessary vaccines. This highlights the importance of educational interventions to raise awareness and address misconceptions about vaccines, as knowledge gaps often contribute to low vaccination rates (Zaman et al., 2019). Similarly, caregivers with a positive attitude towards vaccination were more likely to vaccinate their children, suggesting that efforts to improve the perception of vaccine safety and efficacy are essential for increasing vaccination rates. Another significant finding was the proximity to health facilities. Children whose families lived within 2 km of a healthcare facility were more likely to be fully vaccinated compared to those who lived farther away. This supports findings from studies conducted in other regions, which have shown that physical access to healthcare services is a critical determinant of vaccination coverage (Nichter, 2016). The findings emphasize the need to improve healthcare infrastructure, especially in remote areas, to ensure equitable access to vaccination services. Finally, family income was found to be positively associated with vaccination coverage. Higher-income families were more likely to vaccinate their children, which could be due to greater access to healthcare services, transportation, and information about immunization

programs. This reflects broader socio-economic disparities in healthcare access, as individuals in lower-income brackets may face financial and logistical barriers to obtaining vaccines (Haider et al., 2020). The findings from this study are consistent with other research conducted in Pakistan and globally. A study by Ahmed et al. (2019) in Karachi also reported that maternal education and income were positively associated with vaccination coverage. Similarly, Ali et al. (2021) found that access to healthcare facilities and caregiver knowledge were significant predictors of vaccination uptake in rural Pakistan. International studies further confirm these associations. In Sub-Saharan Africa, where vaccination coverage remains low, maternal education and knowledge were found to be crucial determinants of immunization (Khan et al., 2015). Similarly, a study in India reported that children from higher-income families and those with educated mothers were more likely to be vaccinated, echoing the findings in this study (Sharma et al., 2018). However, it is also important to note the unique challenges faced in Peshawar. The security situation in Khyber Pakhtunkhwa has been a significant barrier to healthcare access, particularly in rural areas (Luby et al., 2017). Although the study focused on urban and peri-urban areas, similar barriers may exist in more remote regions, affecting vaccination uptake. This study has several important implications for policy and practice. First, improving maternal education is essential. Public health campaigns and community-based education programs targeting mothers could enhance knowledge about the benefits of vaccination and the EPI schedule. Given the importance of education, these programs should be tailored to reach illiterate and semi-literate mothers through visual aids, community outreach, and mobile health interventions. Second, community-level interventions are critical to addressing logistical barriers. The finding that children living near healthcare facilities had higher vaccination rates underscores the need for mobile vaccination units and outreach clinics in remote areas. These initiatives could ensure that children in underserved areas are not excluded from immunization programs. Third, strengthening health system infrastructure is a priority. Ensuring that healthcare facilities are well-equipped, accessible, and staffed with trained personnel can reduce the barriers to vaccination. This could include improving the cold chain for vaccine storage and distribution, ensuring that vaccines are available even in rural areas. Finally, efforts to address attitudes and misconceptions about vaccines should be prioritised. Public health campaigns that focus on dispelling myths and improving trust in vaccines are crucial. This can be done through social media, community meetings, and collaboration with religious and community leaders, who can play a key role in shaping public perceptions about immunization (Imran et al., 2019).

LIMITATIONS

While this study provides valuable insights, there are several limitations. First, the cross-sectional design does not allow for causal inferences; only associations between variables can be established. Longitudinal studies would be needed to better understand the causal pathways between the identified factors and vaccination status. Second, the study relied on self-reported data and vaccination records provided by caregivers, which may be subject to recall bias or inaccuracies. Future studies could include medical record verification to ensure the accuracy of reported vaccination status. Additionally, the study was conducted in urban and peri-urban areas of Peshawar, which may not fully represent rural areas where vaccination rates tend to be lower. Future studies could include more diverse settings to better capture the socio-economic and geographical disparities in vaccination coverage.

CONCLUSIONS

The study found that maternal education, caregiver knowledge and attitudes, proximity to healthcare facilities, and family income were significant factors influencing vaccination uptake among children in Peshawar. Addressing these factors through targeted educational programs, improving healthcare access, and strengthening the health system will be critical for improving vaccination coverage.

CONFLICT OF INTEREST: None

FUNDING SOURCES: None

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A CASE REPORT ON POST RADIOTHERAPY RECURRENCE OF BRAINSTEM GLIOMA SYMPTOMS

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How to cite this article

Iqbal M, Iqbal M. A Case Report on Post Radiotherapy Recurrence of Brainstem Glioma Symptoms. S J Gandhara Univ. 2025;5(1): 24-26

Date Submission: 03-04-2025
Date Revised: 05-05-2025
Date Acceptance: 18-05-2025

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ABSTRACT

This study discusses a 30-year-old male patient with brainstem glioma. Brainstem gliomas are rare tumours with a significant impact on patients' health and quality of life. This case report presents a patient who experienced post-radiotherapy recurrence of symptoms, including persistent headaches, vertigo, episodic vision loss and reduced libido. The patient was initially diagnosed with brainstem glioma and underwent radiotherapy at Shaukat Khanum Memorial Cancer Hospital, Peshawar. One year post-treatment, symptoms reappeared, necessitating further diagnostic evaluations and multidisciplinary care. This case underscores the importance of long-term follow-up and comprehensive management in brainstem glioma patients.

KEYWORDS: *Brainstem Glioma, Post-Radiotherapy Complications, Symptom Recurrence, Multidisciplinary Care*

INTRODUCTION

Brainstem gliomas are rare, with an estimated incidence of 0.5 to 2 cases per 100,000 individuals. These tumours present a significant clinical challenge due to their critical location and limited treatment options.[1] These tumours often infiltrate vital neurological structures, making surgical resection risky, and radiotherapy remains the primary treatment modality. However, post-treatment symptom recurrence is a major concern, raising the possibility of tumour progression, radiation-induced damage or secondary effects on surrounding structures.[2] Endocrine dysfunction, particularly involving the hypothalamic pituitary axis, is another well-documented consequence contributing to metabolic and hormonal disturbances that further impact patient outcomes.[3] The recurrence of symptoms following radiotherapy necessitates vigilant long-term follow-up, integrating neuroimaging, endocrinological assessment and rehabilitative strategies. Moreover, socioeconomic factors influence access to specialised care, making institutional support crucial in ensuring equitable healthcare, particularly in resource-limited settings.[4] This case report presents a unique post-radiotherapy clinical course in a brainstem glioma patient, emphasising the necessity of a multidisciplinary approach that not only addresses medical complications but also considers psychological wellbeing and socioeconomic challenges to optimise long-term management and patient quality of life.

CASE REPORT

A 30-year-old married male, employed as a petrol pump attendant with a monthly income of 10,000 PKR, presented with recurrent symptoms one year after completing radiotherapy for brainstem glioma. He lives in a joint family system and has a 5-year-old daughter. The patient reported the following symptoms: Headache (Continuous, lasting 24 hours with temporary relief using aspirin), Vertigo (Episodic, occurring 2 to 3 times daily, each episode lasting approximately 30 minutes). Vision Loss (Transient, lasting 30 minutes, described as "barely seeing anything"), Reduced Libido (Noted following the completion of radiotherapy), Weight Gain and Increased Appetite (Significant weight gain post-radiotherapy attributed to increased appetite). Diagnosed with brainstem glioma one year prior. He underwent one month of radiotherapy at Shaukat Khanum Memorial Cancer Hospital. Pre-radiotherapy symptoms included severe asthenia, nystagmus and bilateral sensorineural hearing loss. Financially constrained, receiving free treatment through Shaukat Khanum's financial support program. Magnetic Resonance Imaging (MRI): Confirmed brainstem glioma without definitive evidence of distant metastasis. Tumour progression, brainstem stroke and radiotherapy induced changes. Radiotherapy was the primary treatment modality. No further intervention was initiated pending comprehensive reevaluation and follow-up imaging. Persistent symptoms raised

concerns regarding potential tumour progression. Referral was made for multidisciplinary management, involving neurology, endocrinology, and oncology.

DISCUSSION

Managing post-radiotherapy complications in brainstem gliomas is a challenging process that requires a multidisciplinary approach due to the complex nature of these tumours and their impact on multiple neurological and systemic functions. Brainstem gliomas are particularly difficult to treat because of their location, which makes surgical intervention risky. Radiotherapy is the primary treatment modality. However post post-treatment symptom recurrence remains a significant concern. This case highlights the importance of careful monitoring and long-term follow-up in patients with brainstem gliomas as well as the need for a holistic approach that addresses both medical and socioeconomic challenges. The recurrence of symptoms one year after radiotherapy raises the possibility of tumour progression, radiation-induced damage or secondary effects on surrounding structures, all of which require detailed evaluation. One of the major concerns in this case is the persistence of headaches and vision loss, which are common symptoms in patients with brain tumours. These symptoms could be due to increased intracranial pressure, which can result from tumour progression, radiation-induced swelling or cerebrospinal fluid (CSF) flow obstruction. Optic pathway compression, whether due to tumour expansion or post-radiotherapy effects, may also contribute to transient vision disturbances. In such cases, neuroimaging with MRI is essential to assess tumour status and rule out hydrocephalus, which may require surgical intervention such as shunting. Additionally, ophthalmologic evaluation is necessary to assess the extent of vision impairment and determine if further management, including medications or rehabilitative support, is needed. The presence of vertigo and hearing loss in this patient suggests involvement of the vestibular system and cranial nerves. Brainstem gliomas can directly impact the vestibulocochlear nerve (cranial nerve VIII), leading to balance disturbances and sensorineural hearing loss. Furthermore, radiotherapy can cause demyelination or fibrosis in surrounding neural structures, contributing to these symptoms. Vestibular rehabilitation therapy may be beneficial in managing vertigo and improving balance. Audiological assessment, including pure tone audiometry and brainstem auditory evoked responses, should be conducted to determine the extent of hearing impairment. Severe patients may benefit from hearing aids or cochlear implants, depending on the level of auditory dysfunction. Reduced libido and weight changes observed in this patient point toward dysfunction of the hypothalamic pituitary axis. The hypothalamus and pituitary gland, which regulate various hormonal functions, are highly sensitive to radiation exposure. Damage to these structures can lead to hormonal imbalances, resulting in reduced testosterone levels in men, leading to decreased libido, fatigue and mood disturbances. Additionally, weight gain and increased appetite can be linked to alterations in metabolism, possibly due to impaired leptin or insulin regulation. Endocrinological evaluation, including hormone level assessments (thyroid, adrenal and gonadal hormones), is crucial in these patients. If deficiencies are detected, hormone replacement therapy may be needed to restore normal physiological functions. Beyond the clinical challenges, this case also underscores the importance of institutional support in providing equitable healthcare access, especially for patients from financially constrained backgrounds. The patient in this case received free treatment at Shaukat Khanum Memorial Cancer Hospital, highlighting the crucial role of charitable healthcare institutions in ensuring that socioeconomically disadvantaged individuals receive optimal medical care. In resource-limited settings, access to advanced diagnostic tools and specialised care is often restricted, making structured follow-up protocols even more critical. Implementing standardised post-treatment surveillance strategies, including scheduled MRI scans, neurological assessments, and endocrine evaluations, can help identify complications early and prevent disease progression. Another critical aspect of brainstem glioma management is the psychosocial impact of the disease and treatment. Living with a chronic and potentially progressive condition like brainstem glioma can have profound psychological effects on patients, leading to anxiety, depression and emotional distress. The uncertainty surrounding disease progression, coupled with physical disabilities such as vision loss and vertigo, can significantly reduce the patient's quality of life. Psychological counselling and patient support programs should be an integral part of follow-up care to address these concerns. Family support is equally important, as caregivers play a crucial role in assisting patients with daily activities and emotional well-being. Moreover, future research and advancements in neuro-oncology should focus on optimising post-radiotherapy management strategies for brainstem gliomas. The development of novel therapeutic approaches, such as targeted therapies and immunotherapy, holds promise in improving long-term survival rates. Additionally, investigating early biomarkers of treatment failure could help clinicians predict which patients are at higher risk of symptom recurrence, allowing for proactive intervention. In conclusion, this case emphasises the complexities of

managing brainstem gliomas post-radiotherapy. The recurrence of symptoms one year after treatment necessitates a comprehensive diagnostic workup and a multidisciplinary care approach. Addressing neurological, endocrinological and psychological aspects of patient care is essential to improving long-term outcomes. Furthermore, equitable healthcare access through institutions like Shaukat Khanum plays a crucial role in ensuring that patients receive appropriate medical attention regardless of their financial status. By integrating a patient-centred approach with ongoing research advancements, healthcare providers can significantly enhance the quality of life and survival prospects for individuals battling brainstem gliomas.

LIMITATIONS

This single-patient case limits generalizability. Without a control group or long-term follow-up, the broader effectiveness and durability of the intervention remain unclear. Further studies are needed.

CONCLUSIONS

This case underscores the importance of long-term follow-up and multidisciplinary care in managing brainstem glioma patients post radiotherapy. Addressing medical, psychological, and socioeconomic challenges is crucial for optimising patient outcomes.

CONFLICT OF INTEREST: None

FUNDING SOURCES: None

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