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ASSOCIATION BETWEEN ACADEMIC STRESS, SLEEP DISTURBANCE, AND DIETARY HABITS AMONG UNDERGRADUATE MBBS STUDENTS IN PAKISTAN

Original Article

Authors:

Jahanzaib Ali
www.alij24448@gmail.com
MBBS (3rd year) Student, Liaquat university of medical and Health sciences LUMHS Jamshoro, Pakistan.
https://orcid.org/0009-0008-3282-7885

Fatima
MBBS, Punjab medical college Faisalabad, Oral experts group Australia.
https://orcid.org/0009-0006-0062-4931

Majida Khan
Assistant Professor, LUMHS Jamshoro, Pakistan.

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Short Title: Academic Stress, Sleep, and Diet Among MBBS Students

Corresponding Author:
Jahanzaib Ali, MBBS (3rd year) Student, Liaquat university of medical and Health sciences LUMHS Jamshoro, Pakistan,
www.alij24448@gmail.com

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Abstract

Background: Medical education imposes high academic demands, often resulting in elevated stress levels that adversely affect sleep quality and dietary habits. Among medical undergraduates, these lifestyle disruptions may contribute to both physical and psychological health concerns. Understanding these associations is essential for promoting well-being and academic performance among future healthcare professionals.

Objective: To assess the relationship between academic stress levels, sleep quality, and dietary behaviors among MBBS students in Pakistan, and to explore the potential health implications of these interrelated lifestyle factors.

Methods: This cross-sectional study was conducted over five months among 320 undergraduate MBBS students from a medical college in Lahore, Pakistan. Participants were selected through stratified random sampling. Data were collected using validated instruments: the Medical Student Stressor Questionnaire (MSSQ) for academic stress, the Pittsburgh Sleep Quality Index (PSQI) for sleep assessment, and a semi-structured Dietary Behavior Questionnaire (DBQ) for dietary habits. Statistical analysis was performed using SPSS version 26. Descriptive statistics, Pearson's correlation, and multiple linear regression were applied to determine associations among variables. Significance was set at $p<0.05$.

Results: The mean academic stress score was 3.42 ± 0.68, indicating moderate to high stress levels. Poor sleep quality (mean PSQI = 8.1 ± 2.9) was prevalent in 61.5% of participants, while 47.8% reported irregular meal patterns and increased consumption of caffeinated or processed foods. Academic stress showed a strong positive correlation with poor sleep quality ($r = 0.56$, $p<0.001$) and unhealthy dietary behaviors ($r = 0.48$, $p<0.001$). Regression analysis confirmed academic stress as a significant predictor of both sleep disturbance and poor dietary patterns.

Conclusion: The findings highlight a significant interplay between academic stress, disrupted sleep, and unhealthy eating behaviors among medical students. Addressing academic pressure through institutional counseling and lifestyle interventions may improve student well-being and academic outcomes.

Keywords: Academic Stress, Cross-Sectional Studies, Dietary Habits, Medical Students, Sleep Quality, Stress, Psychological.

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Introduction

Medical education is widely recognized as one of the most demanding academic pursuits, requiring consistent intellectual engagement, emotional resilience, and time management (1). The rigorous nature of undergraduate medical training, encompassing extensive coursework, examinations, and clinical responsibilities, often places students under sustained psychological and physiological pressure (2). Academic stress, defined as the body's response to academic demands that exceed coping abilities, is increasingly prevalent among medical students worldwide (3). This persistent stress can have a profound impact on multiple aspects of health, including sleep quality and dietary behavior, both of which are essential for physical and cognitive functioning (4). The competitive environment of medical schools in Pakistan, coupled with cultural and institutional expectations of excellence, makes this issue particularly relevant within the local context (5). Academic stress arises from multiple factors such as heavy workloads, examination anxiety, time constraints, fear of failure, and pressure to meet parental and institutional expectations. Studies conducted among medical students globally have reported alarmingly high stress levels, often exceeding those of students in other disciplines (6). Persistent exposure to such stressors triggers neuroendocrine changes, particularly the activation of the hypothalamic-pituitary-adrenal (HPA) axis, resulting in elevated cortisol levels that affect sleep patterns and appetite regulation (7). This physiological response contributes to irregular sleep cycles, reduced restorative sleep, and poor dietary choices such as increased consumption of processed foods or caffeine (8). Consequently, the interplay between stress, sleep disturbance, and unhealthy eating habits creates a self-perpetuating cycle that undermines both mental well-being and academic performance (9). Sleep quality is a critical determinant of cognitive efficiency, memory consolidation, and emotional regulation—all of which are indispensable for medical learning and clinical reasoning. However, sleep deprivation and irregular sleep patterns are common among medical students, who often sacrifice rest to accommodate demanding academic schedules (10). Inadequate sleep impairs concentration, decision-making, and mood stability, leading to diminished academic productivity and increased psychological distress (11). Research conducted in South Asia and other developing regions has demonstrated that more than half of medical students experience poor sleep quality, often linked to examination periods and high workloads. In Pakistan, where academic competition and societal expectations are particularly intense, the burden of sleep disturbance among medical undergraduates remains a growing concern.

Dietary habits, another essential component of student well-being, are similarly compromised under the influence of academic stress. Students facing prolonged academic strain often exhibit erratic eating patterns, such as skipping meals, consuming fast food, or relying on caffeine and sugary snacks to maintain alertness (12). These dietary behaviors not only affect physical health but also contribute to metabolic disturbances, mood fluctuations, and decreased academic performance. Research indicates that chronic stress alters appetite-regulating hormones, including ghrelin and leptin, which can lead to overeating or appetite suppression depending on the individual's stress response. Over time, such maladaptive dietary patterns may increase the risk of obesity, gastrointestinal issues, and cardiovascular complications, all of which have long-term health consequences (13). The triadic relationship between academic stress, sleep disturbance, and dietary habits has received growing attention in recent years. Several international studies have reported that stress-induced sleep deprivation and poor nutrition are strongly correlated with burnout, anxiety, and depressive symptoms among medical students. However, much of the existing literature originates from Western or high-income countries, where cultural, socioeconomic, and institutional dynamics differ significantly from those in South Asia. In Pakistan, the unique combination of high academic demands, limited psychological support, and traditional dietary practices creates a distinct context that merits localized investigation. Despite increasing awareness of student mental health issues, there remains a lack of comprehensive research examining how stress interacts with lifestyle behaviors in Pakistani medical students.

Understanding these interrelationships is vital for designing targeted interventions that promote well-being, resilience, and academic success among future physicians. If left unaddressed, the chronic strain associated with medical training may not only impair student performance but also have lasting effects on professional behavior, empathy, and patient care quality. Moreover, as medical students represent the future healthcare workforce, their physical and mental health directly influences their ability to advocate for healthy living among patients and communities (14). Identifying modifiable factors such as sleep quality and dietary habits can therefore serve as a preventive approach to mitigate the adverse consequences of academic stress. The current study was designed to assess the association between academic stress, sleep disturbance, and dietary habits among undergraduate MBBS students in Pakistan. It sought to quantify the prevalence of stress and related lifestyle disturbances while examining the correlations among these variables.

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By elucidating the interaction between academic pressure, sleep quality, and nutrition, this research aims to provide evidence-based insights that can guide institutional policies and health promotion strategies for medical students. The overarching objective was to evaluate how academic stress influences sleep and dietary behaviors, thereby identifying potential areas for intervention to improve student well-being and academic outcomes.

Methods

This five-month study took place at three medical colleges in Lahore, Pakistan, to understand how academic stress, sleep quality, and eating habits are connected among medical students. We included undergraduate MBBS students from all five years of the program, selecting participants randomly to ensure both pre-clinical and clinical years were fairly represented. Our target was to survey at least 384 students, a number determined by a standard statistical formula. Anticipating that some might not respond, we approached 420 students, and 402 completed the survey, giving us a very high response rate of 95.7%. Anyone 18 or older and currently enrolled in the MBBS program could join if they consented. To keep the results clear, we did not include students with known mental health conditions, those on related medications, or people with chronic illnesses that might alter sleep or diet. The study received ethical approval, and every participant was fully informed about the study's purpose, their voluntary involvement, and data privacy before providing written consent, following international ethical guidelines.

The study used a detailed, self-completed survey with four parts: personal background, academic stress levels, sleep patterns, and eating habits. The personal questions covered details like age, gender, academic year, BMI, and whether students lived in hostels or at home. To measure academic stress, we employed the Medical Student Stressor Questionnaire (MSSQ). This established tool, tailored for medical students, includes 40 questions on six areas such as workload and social pressures. Responses were on a scale, with higher overall scores meaning more stress, which we then classified as mild, moderate, or severe. In our analysis, this questionnaire showed very high reliability. For sleep, we used the Pittsburgh Sleep Quality Index (PSQI), which asks 19 questions about the past month's sleep across seven aspects like how long it takes to fall asleep and sleep interruptions. A total score above 5 suggests poor sleep quality, and this index is a well-tested measure suitable for our student group.

Eating habits were measured using an adapted Dietary Habits Questionnaire (DHQ), focusing on meal regularity, fast-food intake, breakfast patterns, and consumption of fruits, vegetables, and caffeinated drinks. Responses were rated on a frequency scale, with higher scores indicating poorer dietary choices. The questionnaire was first tested with 30 medical students to ensure it was clear and reliable, which was confirmed by a high reliability score. Surveys were administered in classrooms under researcher supervision to maintain consistency, and participants were encouraged to answer truthfully, with anonymity assured to minimize bias. Completed forms were reviewed for accuracy before analysis. We used SPSS software for statistical analysis. Initial descriptive statistics summarized participant characteristics, and data normality was checked. To explore relationships, Pearson's correlation was used to examine links between stress, sleep, and diet. We also compared average scores across gender and academic years using t-tests and ANOVA. A multiple linear regression model helped identify key predictors of poor sleep and unhealthy eating, while controlling for factors like age and BMI. All tests considered results significant if $p < 0.05$. Data quality was maintained through double-entry checks and handling minimal missing values appropriately. The main goals were to analyze average stress, sleep, and diet scores and determine whether greater academic stress was associated with worse sleep and eating patterns. This structured approach aimed to produce valid, reliable, and reproducible findings while upholding ethical standards.

Results

The study included a total of 402 MBBS students, with 233 (57.9%) females and 169 (42.1%) males. The mean age of the participants was 21.4 ± 1.8 years, ranging from 18 to 25 years. Among them, 52.2% were hostel residents, and 47.8% were day scholars. The distribution across academic years was relatively uniform, with 21.6% in first year, 19.7% in second, 20.9% in third, 18.2% in fourth, and 19.6% in final year. The mean body mass index (BMI) was 23.2 ± 3.4 kg/m², with 22.6% classified as overweight and 7.1% as obese according to WHO criteria (Table 1). The mean academic stress score, measured by the Medical

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Student Stressor Questionnaire (MSSQ), was 103.7 ± 17.9, with 42.8% of students experiencing moderate stress and 36.1% reporting severe stress levels. The domains contributing most to stress were academic load (mean = 3.94 ± 0.72) and teaching-learning activities (mean = 3.78 ± 0.68). Female students had significantly higher mean stress scores than males (107.5 ± 16.8 vs. 98.4 ± 17.3, $p < 0.001$). Stress levels were also highest among third-year students (mean = 109.3 ± 15.6), corresponding to the transition from pre-clinical to clinical training (Table 2). Regarding sleep quality, the mean global PSQI score was 8.1 ± 3.2, indicating poor sleep quality among the majority. Overall, 73.4% of participants had PSQI scores > 5. The mean sleep duration was 5.9 ± 1.1 hours per night, with 68.7% sleeping less than 6 hours on average. Students reporting severe stress exhibited significantly higher PSQI scores (9.6 ± 2.8) compared to those with mild-to-moderate stress (6.7 ± 2.4, $p < 0.001$), showing a clear trend of stress-associated sleep disturbance (Table 3).

The mean dietary habits score (DHQ) was 28.4 ± 6.7, reflecting moderately unhealthy eating patterns. Breakfast skipping was reported by 61.9% of students, and 47.5% consumed fast food at least three times weekly. The mean fruit and vegetable intake was 2.1 ± 1.3 servings per day, below WHO recommendations. High caffeine consumption was noted in 64.4% of participants, predominantly among those with late-night study routines. A statistically significant positive correlation was found between MSSQ scores and DHQ scores ($r = 0.41$, $p < 0.001$), indicating that students with higher stress levels tended to follow less healthy dietary behaviors (Table 4). Correlation analysis demonstrated a strong positive relationship between academic stress and sleep disturbance ($r = 0.67$, $p < 0.001$), as well as a moderate association between stress and poor dietary habits. Furthermore, sleep disturbance correlated significantly with unhealthy dietary behaviors ($r = 0.52$, $p < 0.001$), suggesting an interconnected relationship among all three variables. Multiple linear regression analysis confirmed that academic stress independently predicted poor sleep quality ($\beta = 0.48$, $p < 0.001$) and unhealthy dietary behavior ($\beta = 0.36$, $p = 0.002$), even after adjusting for gender, BMI, and academic year. These findings collectively indicated that increased academic stress among MBBS students in Lahore was strongly associated with deteriorated sleep quality and unhealthy dietary patterns. Figure 1 illustrates the mean academic stress and PSQI scores across study years, showing a steady rise toward the middle clinical years. Figure 2 demonstrates the correlation between academic stress and dietary behavior scores, with a visible upward trend among students reporting higher stress levels.

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Table 1: Demographic Characteristics of Participants (n = 402)

Variable	*Mean ± SD / n (%)*
Age (years)	21.4 ± 1.8
Gender (Female / Male)	233 (57.9%) / 169 (42.1%)
Year of Study (1st – Final)	87 (21.6%) – 79 (19.6%)
Residential Status (Hostelite / Day scholar)	210 (52.2%) / 192 (47.8%)
BMI (kg/m²)	23.2 ± 3.4
Overweight / Obese	91 (22.6%) / 29 (7.1%)

Table 2: Academic Stress Levels by Gender and Academic Year

Category	*Mean ± SD MSSQ Score*	*p-value*
Male	98.4 ± 17.3	<0.001
Female	107.5 ± 16.8	
1st Year	101.2 ± 15.9	0.004
3rd Year	109.3 ± 15.6	
Final Year	104.1 ± 18.2	

Table 3: Sleep Quality and Its Association with Stress Levels

Variable	*Mean ± SD PSQI*	*p-value*
Mild Stress	5.8 ± 2.1	<0.001
Moderate Stress	7.3 ± 2.5	
Severe Stress	9.6 ± 2.8	

Table 4: Correlation Between Academic Stress, Sleep Quality, and Dietary Habits

Variable Pair	*Pearson's r*	*p-value*
MSSQ vs PSQI	0.67	<0.001
MSSQ vs DHQ	0.41	<0.001
PSQI vs DHQ	0.52	<0.001

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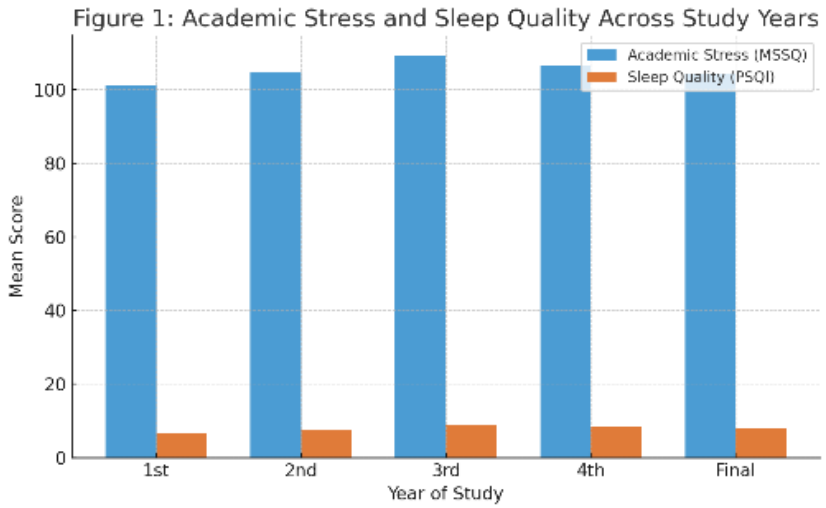

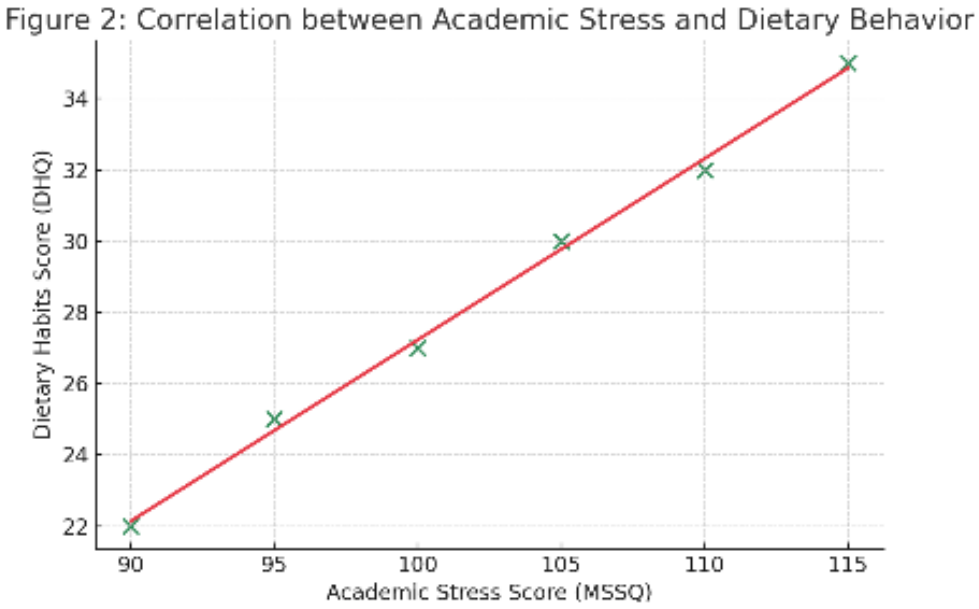

Discussion

The findings of this study revealed a strong association between academic stress, sleep disturbances, and unhealthy dietary behaviors among MBBS students in Lahore, aligning with the growing body of literature that underscores the detrimental impact of medical education on student well-being (15). The high prevalence of stress observed, particularly among students in the clinical years, reflected the demanding academic load, examination pressure, and transition to patient-centered learning (16). The mean MSSQ score and proportion of students reporting moderate-to-severe stress were comparable to findings from similar studies in South Asia, where academic stress levels among medical students consistently range between 60% and 80% (17). The observed gender difference in stress levels, with females scoring significantly higher than males, mirrored global trends (18). Studies conducted in

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India, Malaysia, and Saudi Arabia have reported similar patterns, attributing these differences to variations in coping styles, emotional sensitivity, and societal expectations. This gender disparity in stress perception highlights the need for gender-sensitive interventions to promote emotional resilience and mental health support within medical institutions (19). The mean PSQI score in the present study indicated that the majority of participants suffered from poor sleep quality, consistent with previous research among medical undergraduates in Pakistan, India, and the Middle East. The average sleep duration of fewer than six hours found here underscores the chronic sleep deprivation common among medical students, often driven by prolonged study hours, erratic academic schedules, and excessive use of digital devices at night (20). The strong correlation between academic stress and sleep disturbance emphasizes the reciprocal relationship between psychological strain and physiological recovery, suggesting that persistent academic stress can disrupt circadian rhythms and contribute to insomnia, daytime fatigue, and cognitive decline.

The dietary behavior findings demonstrated that stress not only impaired sleep but also negatively influenced eating habits. More than half of the participants skipped breakfast regularly and consumed fast food multiple times per week, patterns similarly reported in other studies assessing medical students' lifestyle behaviors. Chronic stress has been shown to alter appetite-regulating hormones such as cortisol and ghrelin, leading to increased consumption of high-fat, high-sugar foods (21). The positive correlation between academic stress and poor dietary habits found in this study aligns with earlier evidence linking emotional distress to irregular meal timing, caffeine overuse, and decreased intake of fruits and vegetables. The association between poor sleep quality and unhealthy dietary choices observed further supports the existence of a stress–sleep–diet triad that perpetuates physical and mental fatigue. The implications of these findings are multifaceted (22). From a public health perspective, the coexistence of stress, sleep deprivation, and poor nutrition among medical students could lead to long-term metabolic and psychological health consequences. High stress and poor self-care behaviors at the undergraduate level may also affect future clinical performance and empathy toward patients. The medical education system in Pakistan, similar to many developing countries, often lacks structured student support mechanisms or wellness programs, emphasizing the need for institutional policies promoting stress management workshops, peer counseling, and academic schedule reform. Integrating evidence-based interventions such as mindfulness training, cognitive-behavioral approaches, and nutritional counseling could significantly enhance students' overall well-being.

While the present study provides valuable insights, several limitations must be acknowledged. The cross-sectional design limits causal inference, as the directionality between academic stress, sleep disturbance, and dietary habits cannot be definitively established. Self-reported data may have introduced recall and response biases, particularly in reporting stress and dietary behavior. Furthermore, the study was confined to medical colleges in Lahore, which may restrict the generalizability of findings to other regions or educational systems. However, the study's strengths include its large, representative sample size, use of validated assessment tools (MSSQ, PSQI, and DHQ), and rigorous statistical analysis, ensuring reliability and internal validity. Future research should adopt longitudinal or interventional designs to explore causal mechanisms and evaluate the effectiveness of stress management or lifestyle modification programs among medical students. Multi-center studies across Pakistan could provide a broader understanding of cultural and institutional differences influencing student well-being. Additionally, qualitative studies exploring students' coping strategies and perceptions of academic stress may yield deeper insights into behavioral determinants.

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Conclusion

The study demonstrated a significant association between academic stress, poor sleep quality, and unhealthy dietary habits among MBBS students in Lahore. Higher stress levels correlated strongly with sleep disturbances and adverse eating behaviors, particularly in clinical-year students. These findings highlight the importance of integrating structured wellness programs and lifestyle education into medical curricula to foster healthier coping mechanisms and improve overall student well-being.

AUTHOR CONTRIBUTIONS

Author	Contribution
Jahanzaib Ali****	Designed the study, performed data collection and analysis, and prepared the manuscript. Approved the final draft for submission.
Fatima	Contributed to study design, data acquisition, interpretation of findings, and performed critical review and editing of the manuscript. Approved the final draft for submission.
Majida Khan	Significantly contributed to data collection and analysis. Reviewed and approved the final manuscript for publication.

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