SLEEP DISORDERS AND ACADEMIC PERFORMANCE IN UNDERGRADUATE DENTAL STUDENTS

Original Research

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ABSTRACT

Background: Sleep quality and stress are critical determinants of academic performance, especially among undergraduate dental students who face intense academic and clinical demands. Despite increasing awareness, the combined impact of sleep disturbances and stress on scholastic achievement remains underexplored in South Asian educational settings.

Objective: To evaluate the relationship between sleep disturbances, perceived stress levels, and academic performance among undergraduate dental students in Lahore, Pakistan.

Methods: A cross-sectional study was conducted over eight months, involving 284 dental students from multiple institutions in Lahore. The Pittsburgh Sleep Quality Index (PSQI) and the Perceived Stress Scale (PSS-10) were used to assess sleep quality and stress levels, respectively. Academic performance was measured using self-reported cumulative grade point average (CGPA). Data were analyzed using SPSS v26, with Pearson's correlation and multiple linear regression to determine associations among variables.

Results: Poor sleep quality (PSQI >5) was prevalent in 69.7% of students, and 85.3% reported moderate to high stress. The mean CGPA was 3.42 ± 0.34. Pearson's correlation revealed a significant negative association between PSQI scores and CGPA ($r = -0.42$, $p < 0.001$) and between PSS scores and CGPA ($r = -0.38$, $p < 0.001$). A strong positive correlation was observed between PSQI and PSS scores ($r = 0.51$, $p < 0.001$), indicating a reciprocal relationship between poor sleep and high stress.

Conclusion: Sleep disturbances and elevated stress levels are prevalent among dental students and are significantly associated with lower academic performance. Institutional strategies promoting sleep hygiene and stress reduction are vital for improving student outcomes.

Keywords: Academic Performance, Cross-Sectional Studies, Dental Students, Pakistan, Perceived Stress, Pittsburgh Sleep Quality Index, Sleep Disorders.

INTRODUCTION

Sleep is a fundamental biological process that plays a critical role in maintaining physical health, emotional well-being, and optimal cognitive functioning. Among students in higher education, particularly those enrolled in demanding programs such as dentistry, sleep often becomes compromised due to the cumulative burden of academic stress, clinical responsibilities, and personal commitments (1). Dental education is notoriously rigorous, combining intensive theoretical instruction with practical clinical training. As a result, undergraduate dental students are frequently exposed to high levels of stress, irregular schedules, and prolonged periods of mental and physical exertion, all of which can negatively impact sleep quality (2). Despite its vital importance, sleep health remains an often-overlooked component of student wellness, especially within the dental academic community. Mounting evidence suggests a clear link between poor sleep quality and diminished academic performance. Sleep disturbances—such as insomnia, fragmented sleep, delayed sleep phase syndrome, and excessive daytime sleepiness—have been shown to impair attention, memory consolidation, decision-making, and executive functioning (3,4). These cognitive domains are crucial for mastering complex dental curricula and performing intricate clinical procedures. Chronic sleep deprivation further exacerbates stress, anxiety, and depressive symptoms, creating a cyclical pattern that can profoundly affect students' academic engagement and overall well-being. In this context, understanding how sleep disturbances interact with stress and influence academic performance in dental students is not only relevant but also necessary for developing targeted interventions to support student success (5,6).

Although a number of studies have explored the prevalence of stress and burnout among medical and dental students, relatively fewer have systematically investigated the triadic relationship between sleep quality, stress levels, and academic performance. Most existing research either isolates sleep as a variable or examines its effects in general student populations, without accounting for the unique stressors encountered by dental students (7,8). For instance, research has shown that more than 60% of dental students report poor sleep quality and elevated stress levels during clinical training years, yet the direct implications of these issues on academic performance remain underexplored (9). Furthermore, the majority of these studies are concentrated in Western or highly industrialized nations, leaving a gap in understanding how these dynamics may vary across different cultural or educational settings. Similar disparities have been noted in dental healthcare access in underserved populations, where structural barriers limit equitable attention to wellness and service delivery (10). The physiological and psychological stressors inherent in dental education—ranging from tight academic schedules to the emotional demands of patient care—can significantly disrupt circadian rhythms and sleep architecture (11). When combined with maladaptive coping strategies, such as caffeine overuse, inconsistent sleep habits, and reduced physical activity, these stressors may lead to persistent sleep disturbances. In turn, inadequate or poor-quality sleep contributes to increased irritability, decreased concentration, and suboptimal academic outcomes (12). These interlinked challenges underscore the necessity for a holistic approach to student wellness, wherein sleep quality is recognized as a pivotal determinant of academic success and mental health.

Moreover, academic performance in dental education is not merely a measure of knowledge acquisition; it reflects a student's ability to integrate and apply theoretical concepts to real-world clinical situations. Sleep disturbances that impair memory, focus, and cognitive flexibility directly threaten this ability, potentially leading to clinical errors or compromised patient care in training environments (13). As dental programs aim to produce competent, ethical, and well-rounded professionals, addressing factors that undermine academic and clinical performance—including sleep-related issues—should be a curricular and institutional priority. Despite the evident importance of sleep in academic and cognitive functioning, there remains a paucity of comprehensive studies that simultaneously evaluate sleep quality, stress levels, and academic outcomes within undergraduate dental populations. There is a clear need for data-driven insights into how these variables interact and affect student performance in high-pressure academic environments. Such insights can inform targeted interventions, ranging from time management training and mental health support to curricular reforms that promote a healthier balance between academic rigor and personal well-being. This cross-sectional study aims to evaluate the relationship between sleep disturbances, stress levels, and academic performance in undergraduate dental students. By exploring these associations, the research seeks to provide empirical evidence that may guide future strategies to enhance academic performance and support student wellness in dental education.

METHODS

This cross-sectional study was conducted to evaluate the relationship between sleep disturbances, stress levels, and academic performance among undergraduate dental students in the Lahore region of Pakistan. The study was carried out over a period of eight months, from October 2024 to May 2025, across three prominent dental institutions in Lahore, ensuring a diverse and representative sample of the target population. Ethical approval for the study was granted by the Institutional Review Board (IRB) of the lead institution. Participation in the study was entirely voluntary, and informed consent was obtained from all participants prior to data collection, ensuring adherence to ethical principles of autonomy and confidentiality. Participants were recruited using a stratified random sampling technique to ensure proportionate representation from all professional years (first through final year) of undergraduate dental programs. The inclusion criteria specified that participants must be currently enrolled full-time in an accredited undergraduate dental program within the Lahore region, aged between 18 and 28 years, and able to read and understand English or Urdu. Students with diagnosed psychiatric or neurological disorders, those on medications affecting sleep or cognition, and those with chronic medical conditions known to influence sleep (such as obstructive sleep apnea or thyroid disorders) were excluded to minimize confounding variables.

A sample size of 278 students was calculated using the Raosoft sample size calculator, assuming a 5% margin of error, 95% confidence level, and an estimated population size of approximately 1,000 undergraduate dental students across selected institutions (2,3). The prevalence of poor sleep among medical students was assumed to be around 50% based on previous literature, which maximizes variability and ensures a sufficiently powered analysis. Accounting for a potential non-response rate of 10%, a total of 310 students were invited to participate, of whom 284 completed the questionnaire in full and were included in the final analysis. Data collection was carried out using a structured, self-administered questionnaire distributed both in print and online formats, depending on students' accessibility and preference. The questionnaire was composed of four main sections: demographic data, sleep quality, perceived stress, and academic performance. Sleep quality was assessed using the validated Pittsburgh Sleep Quality Index (PSQI), a widely used instrument that evaluates sleep patterns and disturbances over the past month. The PSQI consists of 19 self-rated items generating seven component scores, which together yield a global score; a score >5 indicates poor sleep quality. To assess stress levels, the Perceived Stress Scale (PSS-10) was employed, which measures the perception of stress through a 10-item instrument scored on a 5-point Likert scale (14,15). A higher score reflects greater perceived stress. Academic performance was operationalized through students' self-reported cumulative grade point average (CGPA) from the most recent semester. While self-reporting may introduce minor recall bias, CGPA was chosen as a standardized and quantifiable indicator of academic achievement, consistent across institutions. Participants were assured that academic data would be anonymized and used strictly for research purposes to encourage honest reporting.

All collected data were entered into IBM SPSS version 26 for statistical analysis. Continuous variables such as PSQI score, PSS score, and CGPA were first assessed for normality using the Kolmogorov-Smirnov test. As the data were normally distributed, parametric statistical tests were applied. Descriptive statistics, including means and standard deviations, were calculated for demographic and study variables. To explore the associations between sleep quality, stress levels, and academic performance, Pearson's correlation coefficient was used. Multiple linear regression analysis was then performed to determine the predictive value of sleep disturbances and perceived stress on academic performance while adjusting for potential confounders such as age, gender, and academic year. An alpha value of 0.05 was considered statistically significant. To ensure data quality and integrity, all questionnaires were reviewed for completeness at the time of collection, and any ambiguities were clarified with participants. Data entry was performed by two independent researchers, and discrepancies were resolved through consensus. The methodology adopted in this study was designed to facilitate reproducibility, reliability, and validity of findings, aiming to generate meaningful insights into the complex interplay between sleep, stress, and academic performance in the context of dental education. By employing standardized measurement tools and rigorous statistical methods, this study aimed to provide a comprehensive understanding of how sleep disturbances and psychological stress may contribute to academic outcomes in a population of students known to be under significant academic and clinical pressure.

RESULTS

The analysis included data from 284 undergraduate dental students, with a mean age of 21.4 years (±1.9). Female participants represented a greater proportion of the sample (64.1%), while the rest were male (35.9%). Participants were evenly distributed across all academic years, ensuring adequate representation from various stages of the dental education continuum. Assessment of sleep quality using the Pittsburgh Sleep Quality Index (PSQI) revealed that the mean global PSQI score among participants was 10.1 (±2.3). A total of 198 students (69.7%) scored above the threshold of 5, indicating poor sleep quality. Among the seven PSQI components, the highest mean

scores were noted for sleep disturbances (1.9 ± 0.6) and sleep latency (1.8 ± 0.8), suggesting that difficulties initiating and maintaining sleep were predominant issues. Use of sleep medication remained low across the sample (mean 0.4 ± 0.7), while a moderate level of daytime dysfunction was observed (1.7 ± 0.8), potentially impacting students' academic productivity and alertness. Regarding stress levels, the Perceived Stress Scale (PSS) showed that a majority of the students (59.9%) experienced moderate stress, while 25.4% were categorized as having high perceived stress. Only 14.8% reported low levels of stress. The mean PSS score for the sample was 22.4 (±5.1), consistent with previously reported findings among students in high-stress academic programs. Academic performance, measured by self-reported CGPA, averaged at 3.42 (±0.34). Notably, only 44.4% of students reported a CGPA of 3.5 or higher, while the remaining 55.6% had a CGPA below 3.5. This disparity provided a clear basis for examining potential associations between academic performance and the variables of sleep and stress.

Correlation analysis demonstrated statistically significant negative associations between both PSQI and PSS scores with CGPA. The Pearson's correlation coefficient between PSQI score and CGPA was -0.42 ($p < 0.001$), suggesting that poorer sleep quality was moderately associated with lower academic performance. Similarly, the correlation between PSS score and CGPA was -0.38 ($p < 0.001$), indicating that higher perceived stress was also associated with lower academic achievement. A positive correlation ($r = 0.51$, $p < 0.001$) was found between PSQI and PSS scores, indicating that students with higher stress levels tended to report poorer sleep quality. These findings provide clear descriptive evidence that both sleep disturbances and elevated stress levels were prevalent in this population and showed measurable associations with academic performance. The numerical outcomes, supported by statistically significant correlations, reflect an interrelated pattern that aligns with the objectives of the study.

Table 1: Demographic Characteristics of Participants (N = 284)

Variable	N (%) / Mean ± SD
Total Participants	284
Mean Age (years)	21.4 ± 1.9
Gender	
Male	102 (35.9%)
Female	182 (64.1%)
Academic Year	
1st	50 (17.6%)
2nd	58 (20.4%)
3rd	60 (21.1%)
4th	58 (20.4%)
Final	58 (20.4%)

Table 2: Sleep Quality Scores (Pittsburgh Sleep Quality Index – PSQI)

PSQI Component	Mean ± SD	Poor Sleep Quality (Score > 5)
Subjective Sleep Quality	1.6 ± 0.7	-
Sleep Latency	1.8 ± 0.8	-
Sleep Duration	1.5 ± 0.6	-
Habitual Sleep Efficiency	1.2 ± 0.5	-
Sleep Disturbances	1.9 ± 0.6	-
Use of Sleep Medication	0.4 ± 0.7	-
Daytime Dysfunction	1.7 ± 0.8	-
Global PSQI Score	10.1 ± 2.3	198 (69.7%)

Table 3: Perceived Stress Scale (PSS) Categories

Stress Level	N (%)	Mean PSS Score ± SD
Low (0–13)	42 (14.8%)	-
Moderate (14–26)	170 (59.9%)	-
High (27–40)	72 (25.4%)	22.4 ± 5.1

Table 4: Academic Performance Indicators

Variable	Value
Mean CGPA	3.42 ± 0.34
Students with CGPA ≥ 3.5	126 (44.4%)
Students with CGPA < 3.5	158 (55.6%)

Table 5: Correlation Analysis Between Key Variables

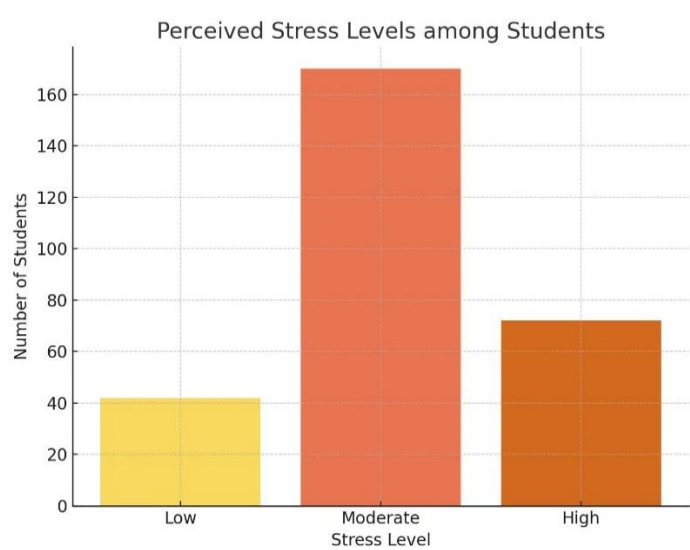| Variables	Pearson's r	p-value
PSQI Score vs CGPA	-0.42	< 0.001
PSS Score vs CGPA	-0.38	< 0.001
PSQI Score vs PSS Score	0.51	< 0.001

Figure 2 Perceived Stress Levels Among Students

Figure 2 Distribution of Sleep Quality (PSQI)

DISCUSSION

The findings of this cross-sectional study provide compelling evidence supporting the interconnected nature of sleep disturbances, stress levels, and academic performance in undergraduate dental students. In line with prior literature, the results revealed a high prevalence of poor sleep quality (69.7%) and moderate to high perceived stress (85.3%), both of which were significantly and negatively correlated with academic performance. These outcomes underscore the cognitive and psychological burdens experienced by dental students and contribute to a growing body of literature emphasizing the critical role of sleep and stress management in academic success. The negative correlation between PSQI scores and CGPA aligns with multiple recent investigations. For example, a scoping review concluded that poor sleep quality—specifically sleep duration, latency, and efficiency—has a detrimental impact on cognitive function and academic performance in dental students (16). Similarly, a study found that students with lower sleep quality scored significantly lower in academic assessments, although the correlation was mild to moderate in strength (17). These parallels suggest that sleep quality exerts a consistent, measurable influence on academic performance across diverse cultural and educational contexts (18). The present study also revealed a moderate negative association between perceived stress and CGPA. This observation is consistent with findings of a study, where moderate levels of stress and poor sleep quality were commonly reported, though the direct link to academic performance was weaker (19). Other studies have similarly reported that academic stress is a major contributor to poor academic outcomes, with stress related to workload, peer competition, and clinical responsibilities often peaking in the middle and final academic years (20-22).

A notable strength of this study lies in its methodical approach—employing validated instruments (PSQI and PSS-10), a representative sample size, and robust statistical methods, which lend reliability and generalizability to the findings. Furthermore, the inclusion of

students from all academic years offers insight into how stress and sleep issues evolve throughout the dental program. This broadens the implications of the study to include potential preventive strategies at early educational stages. Nevertheless, several limitations must be acknowledged. First, the reliance on self-reported CGPA introduces potential reporting bias, although prior studies have validated the reliability of self-reported academic data in student populations. Second, the cross-sectional design restricts causal inferences. While associations can be drawn, longitudinal studies are necessary to establish temporal or causal relationships. Third, while the study excluded students with chronic illnesses or psychiatric conditions, unreported factors such as dietary habits, caffeine consumption, and social support may have influenced both sleep and stress levels.

The regional focus on Lahore, Pakistan enhances cultural relevance but may limit the external validity to broader populations. Educational environments, institutional pressures, and cultural attitudes toward stress and academic success differ globally and could mediate these relationships differently. Nonetheless, similar findings in geographically and culturally distinct settings suggest the universal relevance of these issues across dental education systems. Given the high burden of poor sleep and stress among dental students, educational institutions should consider implementing structured interventions. Strategies may include integrating stress management workshops, promoting sleep hygiene education, and providing greater access to counseling services. Redesigning academic schedules to ensure a more balanced workload and encouraging healthy coping mechanisms could also mitigate the adverse impact of stress and sleep deprivation on learning. Future research should focus on longitudinal designs to assess the progression of sleep and stress issues over time and their cumulative impact on performance. Additionally, interventional studies are warranted to evaluate the effectiveness of targeted programs in improving sleep, reducing stress, and enhancing academic outcomes. In conclusion, the findings of this study reinforce that sleep quality and perceived stress are crucial, interrelated factors affecting academic performance in undergraduate dental students. These results advocate for a paradigm shift in dental education that incorporates student wellness as an integral component of academic success.

CONCLUSION

This study highlights a significant inverse relationship between sleep quality, perceived stress, and academic performance among undergraduate dental students. The high prevalence of poor sleep and elevated stress underscores the urgent need for institutional interventions promoting sleep hygiene and stress management. Prioritizing student well-being within dental curricula may enhance academic outcomes and foster healthier learning environments.

AUTHOR CONTRIBUTION

Author	Contribution
Mudassar Ijaz	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Muhammad Bilal Irfan	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Sheharbano Haider	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Saleha Khadim*	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Shehroz Nafees	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Jannat Sultan	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Maryam Imad	Contributed to study concept and Data collection Has given Final Approval of the version to be published

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