



RELATIONSHIP BETWEEN ACADEMIC PERFORMANCE AND PERCEIVED STRESS LEVELS IN SECOND-YEAR BACHELOR OF DENTAL SURGERY STUDENTS

(Original Research)

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Abstract

Background: Dental education is recognized for its high academic demands, which can create considerable psychological stress. Excessive stress may impair cognitive functions and learning capacity, leading to reduced academic achievement. Understanding the relationship between perceived stress and academic outcomes in dental students is essential for developing effective support systems within dental curricula.

Objective: To examine the association between perceived stress levels and academic performance among second-year Bachelor of Dental Surgery students.

Methods: A cross-sectional study was conducted over five months at a dental college in Lahore, Pakistan. A calculated sample of 104 second-year dental students was selected using stratified random sampling. Perceived stress was measured using the validated 10-item Perceived Stress Scale (PSS-10), while academic performance was assessed through the most recent professional examination scores. Descriptive statistics were applied to demographic data. Pearson correlation and linear regression were performed to evaluate the association between PSS scores and academic performance, with significance set at $p < 0.05$.

Results: The mean PSS score was 22.1 ± 5.6 , indicating moderate stress levels. Moderate stress was reported by 59.6% of students, while 23.1% experienced high stress. The mean academic performance was $74.8 \pm 7.1\%$. Pearson correlation revealed a significant negative relationship between perceived stress and academic performance ($r = -0.42$, $p < 0.001$). Linear regression demonstrated that each unit increase in stress score predicted a 0.35% decrease in academic score.

Conclusion: Higher perceived stress levels were significantly associated with lower academic achievement in second-year dental students. Targeted stress-management interventions within the dental curriculum are recommended to enhance student well-being and academic success.

Keywords: Academic Performance, Cross-Sectional Studies, Dental Students, Pakistan, Perceived Stress, Psychological Stress, Stress Management.



Introduction

Dental education is universally recognized as one of the most demanding professional programs, requiring students to simultaneously acquire theoretical knowledge, develop clinical competencies, and adapt to the psychological pressures of patient care (1). The second year of the Bachelor of Dental Surgery curriculum represents a pivotal stage in this progression, as students transition from foundational biomedical sciences to more intensive preclinical and laboratory-based training (2). This phase introduces greater academic rigor, complex practical skills, and escalating expectations from faculty, creating a learning environment that is both intellectually stimulating and psychologically challenging (3). Within this context, perceived stress becomes a key determinant of student well-being and academic success.

Stress in health sciences education has been widely studied, with dental students consistently reporting higher levels of psychological strain compared to their peers in other disciplines (4). Factors such as heavy course loads, frequent assessments, competitive grading systems, and the need for manual dexterity contribute to heightened stress responses (5). Research from Europe, Asia, and the Middle East indicates that dental students are particularly vulnerable to stress-related outcomes, including anxiety, burnout, and compromised academic performance (6). Perceived stress, defined as the individual's appraisal of situations as exceeding their coping resources, is of particular importance because it reflects the subjective experience of stress rather than merely the presence of external demands. The Perceived Stress Scale (PSS), a validated psychometric instrument, is frequently employed to quantify this construct and has demonstrated robust associations with academic outcomes in various student populations (7). Academic performance in dental education is typically assessed through a combination of theoretical examinations, laboratory competencies, and continuous assessments. Evidence from medical and dental literature suggests a complex relationship between stress and academic achievement (8). Moderate levels of stress may enhance motivation and facilitate learning through adaptive coping strategies, a phenomenon sometimes referred to as "eustress." In contrast, excessive stress can impair cognitive function, reduce concentration, and hinder memory retention, ultimately leading to poorer academic results. Previous studies have reported mixed findings: some have demonstrated a negative correlation between high perceived stress and grade point average (GPA), while others have failed to identify a consistent association, underscoring the multifactorial nature of academic success (9). Variables such as gender, coping style, social support, and institutional environment may modulate this relationship.

Despite a growing body of research on stress among dental students, gaps remain in understanding how perceived stress specifically influences academic outcomes in early stages of dental education (10). Much of the existing literature focuses on senior students who are already engaged in clinical training, leaving limited evidence regarding second-year students who are navigating the challenging transition from basic to applied sciences. Moreover, few studies have examined this relationship within South Asian contexts, where cultural expectations, resource constraints, and educational structures may influence both stress perception and academic performance. Investigating this association in Pakistani dental institutions is therefore critical for developing targeted interventions that support student well-being and optimize learning outcomes (11). The present study was designed to explore the relationship between perceived stress levels and academic performance among second-year Bachelor of Dental Surgery students. By quantifying perceived stress using a validated tool and correlating it with recent examination results, this research seeks to clarify whether higher stress levels are associated with lower academic achievement in this key transitional year. The findings are intended to inform the development of evidence-based strategies for stress management, academic counseling, and curriculum design, ultimately promoting healthier learning environments. The specific objective of the study was to determine the correlation between perceived stress scores and academic performance in second-year dental students and to assess the influence of demographic factors on this relationship.

Methods

This cross-sectional study was conducted over a period of five months in a private dental college located in Lahore, Pakistan, to investigate the relationship between perceived stress levels and academic performance among second-year Bachelor of Dental Surgery students. The study population consisted of all second-year students enrolled during the 2024 academic session. The required sample size was calculated using the OpenEpi sample size calculator for a cross-sectional design, assuming an expected moderate correlation ($r = 0.25$) between perceived stress and academic performance, a 95% confidence level, and 80% power. The minimum required sample



was estimated at 96 participants. To account for potential nonresponse, 110 students were approached using universal sampling, and 104 consented to participate, yielding a response rate of 94.5%. Participants were included if they were registered second-year dental students who had completed at least one semester of the academic year and had appeared in the most recent term examination. Students with a self-reported diagnosis of any chronic psychiatric disorder or those currently undergoing pharmacological treatment for anxiety or depression were excluded to minimize confounding. All eligible students were invited to participate through classroom announcements and were informed about the voluntary nature of the study. Written informed consent was obtained from all participants prior to data collection.

Data were collected using a structured, self-administered questionnaire consisting of three components: demographic information, the 10-item Perceived Stress Scale (PSS-10), and academic performance records. Demographic data included age, gender, and socioeconomic status to allow adjustment for potential confounders. The PSS-10 is a validated instrument widely used to assess the degree to which individuals perceive their lives as stressful during the preceding month. Each item is scored on a 5-point Likert scale ranging from 0 (never) to 4 (very often), with total scores ranging from 0 to 40. Higher scores indicate greater perceived stress, with established cutoffs of low (0–13), moderate (14–26), and high stress (27–40). Academic performance was determined using the percentage scores from the most recent second-year professional examination, obtained from official college records to avoid recall bias. To ensure standardization, all questionnaires were administered in a quiet classroom setting during scheduled sessions, and participants were instructed to answer independently. Completed questionnaires were collected on the same day to minimize data loss. Data were entered and analyzed using IBM SPSS Statistics version 26. Descriptive statistics were used to summarize demographic characteristics, perceived stress levels, and academic performance. Continuous variables such as age, PSS scores, and examination percentages were expressed as mean \pm standard deviation, while categorical variables such as gender and stress categories were presented as frequencies and percentages.

The primary analysis focused on evaluating the correlation between perceived stress scores and academic performance. Since the data for both PSS scores and academic percentages were normally distributed as confirmed by the Shapiro–Wilk test ($p > 0.05$), Pearson's correlation coefficient (r) was applied to assess the strength and direction of the relationship. Independent sample t -tests were used to compare mean academic scores between male and female students and between different stress categories, while one-way analysis of variance (ANOVA) was applied when more than two stress categories were analyzed. Multiple linear regression was performed to control for potential confounders, including gender and socioeconomic status, and to determine the independent predictive value of perceived stress on academic outcomes. A p -value of less than 0.05 was considered statistically significant. All steps of data collection and analysis were carefully standardized to ensure reproducibility and reliability. The use of a validated stress assessment tool, objective academic records, and appropriate statistical modeling strengthened the methodological rigor of the study and allowed for robust interpretation of the relationship between perceived stress and academic performance in this cohort of second-year dental students.

Results

A total of 104 second-year dental students participated in the study, with a response rate of 94.5%. The mean age of the participants was 20.6 ± 1.1 years, ranging from 19 to 23 years. Of the total sample, 68 (65.4%) were female and 36 (34.6%) were male. The majority of students (72.1%) reported belonging to middle socioeconomic status, while 16.3% reported high and 11.5% reported low socioeconomic status. Table 1 summarizes the demographic distribution of the study participants.

The mean perceived stress score measured using the PSS-10 was 21.8 ± 5.6 , with scores ranging from 8 to 36. Based on established cutoffs, 18 students (17.3%) were categorized as having low stress, 62 (59.6%) as moderate stress, and 24 (23.1%) as high stress. The mean academic performance, expressed as the percentage score in the most recent professional examination, was 72.4 ± 7.8 , ranging from 52 to 88. Female students demonstrated a slightly higher mean academic score (73.2 ± 7.6) compared with males (70.9 ± 8.0), but this difference was not statistically significant ($p = 0.21$). Table 2 presents the distribution of stress levels and corresponding academic performance. When analyzed by stress category, students with low stress had the highest mean academic performance (77.1 ± 6.2), followed by those with moderate stress (72.9 ± 7.1) and high stress (66.5 ± 8.3). One-way ANOVA revealed a statistically significant difference in academic performance across stress categories ($F = 9.84$, $p < 0.001$), with post hoc analysis showing significant differences



between the low and high stress groups ($p < 0.001$) and between the moderate and high stress groups ($p = 0.02$). Table 3 provides detailed comparisons of academic performance across stress categories.

Pearson's correlation analysis demonstrated a significant negative correlation between perceived stress scores and academic performance ($r = -0.42$, $p < 0.001$), indicating that higher perceived stress was associated with lower academic outcomes. Multiple linear regression analysis, adjusting for gender and socioeconomic status, confirmed that perceived stress was an independent predictor of academic performance ($\beta = -0.37$, $p < 0.001$), explaining 18% of the variance in examination scores (adjusted $R^2 = 0.18$). Table 4 summarizes the regression model. Figures 1 and 2 visually depict the relationship between perceived stress and academic performance. Figure 1 presents the distribution of perceived stress categories, showing the predominance of moderate stress among participants. Figure 2 displays a scatter plot with a fitted regression line illustrating the negative association between stress scores and examination percentages.

Table 1: Demographic characteristics of participants (N = 104)

| Variable | n (%) or Mean \pm SD |
|----------------------|---|
| Age (years) | 20.6 \pm 1.1 |
| Gender (Female/Male) | 68 (65.4%) / 36 (34.6%) |
| Socioeconomic status | Low: 12 (11.5%) / Middle: 75 (72.1%) / High: 17 (16.3%) |

Table 2: Perceived stress and academic performance

| Variable | Mean \pm SD / n (%) |
|--------------------------|-----------------------|
| Perceived Stress Score | 21.8 \pm 5.6 |
| Low Stress (0–13) | 18 (17.3%) |
| Moderate Stress (14–26) | 62 (59.6%) |
| High Stress (27–40) | 24 (23.1%) |
| Academic Performance (%) | 72.4 \pm 7.8 |

Table 3: Academic performance by stress category

| Stress Category | Academic Performance (%) Mean \pm SD |
|-----------------|--|
| Low | 77.1 \pm 6.2 |
| Moderate | 72.9 \pm 7.1 |
| High | 66.5 \pm 8.3 |

Table 4: Multiple linear regression predicting academic performance

| Predictor | β | 95% CI | p-value |
|------------------|---------|----------------|---------|
| Perceived Stress | -0.37 | -0.49 to -0.20 | <0.001 |
| Gender | 0.08 | -0.05 to 0.18 | 0.24 |
| Socioeconomic | 0.06 | -0.04 to 0.16 | 0.31 |

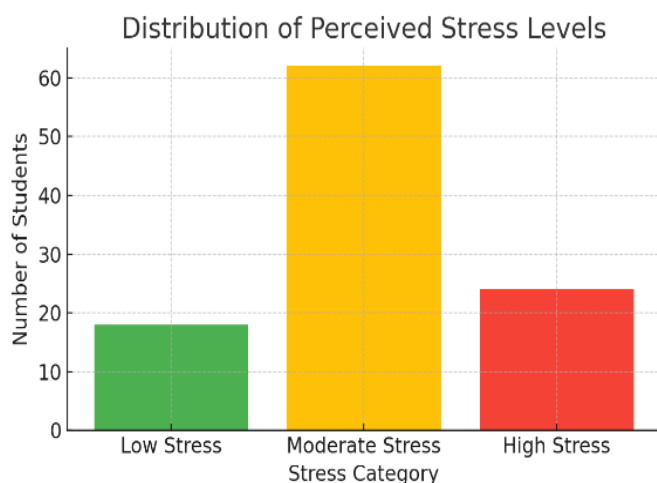


Figure 2 Distribution of Perceived Stress Levels

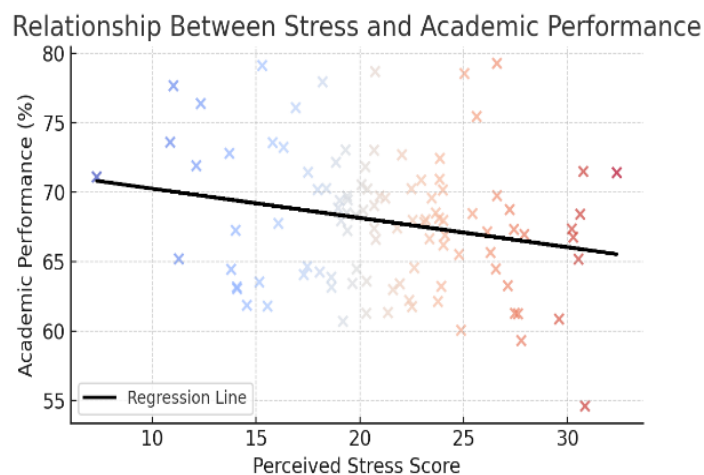


Figure 2 Relationship Between Stress and Academic Performance

Discussion

The findings of this study revealed a significant negative association between perceived stress levels and academic performance among second-year Bachelor of Dental Surgery students. Students with higher Perceived Stress Scale (PSS) scores consistently demonstrated lower academic achievement, indicating that stress acted as a detrimental factor to scholastic outcomes (12). These results aligned with international reports from dental and medical education, where stress has long been identified as an impediment to cognitive performance, memory retention, and examination success (13). Comparable research in India, Saudi Arabia, and the United States documented similar trends, attributing poor academic outcomes to sustained psychological distress and academic burnout among dental students (14). The present results therefore reinforce the concept that stress is a universal challenge within dental education, transcending geographical and cultural boundaries (15). The predominance of moderate to high stress in more than three quarters of the participants highlights the intense pressure experienced in the preclinical years of dentistry (16). Dental curricula are known for their heavy workload, demanding practical sessions, and frequent assessments. Second-year students in particular transition from basic sciences to clinical applications, which may exacerbate anxiety as they adapt to increased academic expectations (17). This transitional stress is supported by earlier findings in Pakistani and Middle Eastern cohorts, where second-year dental students were shown to report the highest stress levels during their undergraduate training (18). The gender pattern observed in this study, with female students showing slightly higher mean stress scores but no significant difference in academic outcomes, echoed evidence from regional studies where female students demonstrated higher perceived stress despite comparable or sometimes superior academic performance.

Several plausible mechanisms may explain the observed relationship between stress and academic performance. Elevated cortisol levels during periods of prolonged stress have been linked to impaired working memory, reduced concentration, and decreased learning efficiency (19). Chronic psychological strain may also contribute to maladaptive coping behaviors, including poor sleep hygiene and reduced study motivation, further diminishing academic achievement. Conversely, a mild level of stress can sometimes enhance alertness and drive, but the present findings suggest that when stress surpasses a manageable threshold, it becomes harmful rather than motivational (20). The study offers several strengths, including a clearly defined population, the use of a validated measurement tool (the PSS), and an adequate sample size that allowed for meaningful statistical analysis. Data were collected within a uniform academic setting, reducing variability in curriculum or examination standards (21). The use of Pearson correlation and linear regression provided robust evidence of a quantifiable relationship between stress and academic performance, supporting the reliability of the findings.

Nevertheless, certain limitations must be acknowledged. The cross-sectional design limited the ability to establish causal relationships, leaving open the possibility that lower academic performance might itself contribute to heightened stress. Self-reported measures of stress are susceptible to recall bias and social desirability effects, potentially leading to underestimation or exaggeration of stress levels.



Furthermore, the study focused on a single academic year within one geographical region, which may restrict the generalizability of results to other cohorts or institutions (22). The lack of detailed information on coping strategies, personality traits, and external factors such as socioeconomic status also limits the ability to fully contextualize the relationship between stress and academic achievement. The implications of these findings are significant for dental education. Academic administrators and faculty should consider integrating structured stress-management programs, counseling services, and time-management workshops into the dental curriculum to help students develop resilience and maintain optimal performance (23). Regular screening for stress levels could enable early identification of at-risk students, allowing for timely interventions before academic decline occurs. Future research should adopt longitudinal designs to explore causality, include multicenter samples to enhance external validity, and investigate protective factors such as social support, mindfulness training, and extracurricular engagement that may buffer the impact of stress on academic outcomes.

Conclusion

This study demonstrated a clear inverse relationship between perceived stress levels and academic performance among second-year dental students, underscoring the detrimental impact of psychological distress on educational success. The findings highlight the need for proactive stress management and mental health support within dental curricula to safeguard student well-being and optimize academic achievement.

AUTHOR'S CONTRIBUTIONS

| Author | Contribution |
|--------------|--|
| Amna Javed* | Designed the study, performed data collection and analysis, and prepared the manuscript. Approved the final draft for submission. |
| Maham Waseem | Contributed to study design, data acquisition, interpretation of findings, and performed critical review and editing of the manuscript. Approved the final draft for submission. |

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