

Prevalence of Stress-Related Oral Lesions and Their Association with Academic Stress Among Dental Students: A Multi-Stage Study

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Abstract

Background: Dental education is known to be demanding, often exerting psychological pressure on students, which can manifest physically, including in the oral cavity. Stress-related oral lesions such as aphthous ulcers, bruxism-related trauma, burning mouth, and herpetic eruptions are commonly reported in high-stress populations. However, data on their prevalence and association with academic stress among dental students in Pakistan remain scarce.

Objectives: To determine the prevalence of stress-related oral lesions and explore their association with academic stress among dental students in Pakistan.

Materials and Methods: This cross-sectional analytical study was conducted using a multi-stage sampling method involving one dental college from Punjab and one from Khyber Pakhtunkhwa (KP). Stratified random sampling was employed to recruit students from each academic year. Data were collected using a structured questionnaire that included demographic details and the Perceived Stress Scale (PSS-10). Clinical oral examinations were conducted to identify stress-related oral lesions. Statistical analysis included descriptive statistics, Chi-square test, and logistic regression to evaluate associations.

Result: A total of 356 students participated (Punjab: 178, KP: 178). The overall prevalence of stress-related oral lesions was 38.2%. The most common lesions were aphthous ulcers (18.5%), bruxism-related trauma (12.6%), and burning mouth sensation (7.1%). High levels of academic stress were significantly associated with the presence of oral lesions ($p < 0.01$). Logistic regression identified academic stress (OR = 2.41, 95% CI: 1.45–4.02), female gender (OR = 1.73, 95% CI: 1.02–2.91), and inadequate sleep (OR = 2.19, 95% CI: 1.28–3.74) as significant predictors.

Conclusions: Stress-related oral lesions are prevalent among dental students, with academic stress playing a significant role. Regular mental health support and stress management interventions are recommended to improve students' oral and general well-being.

Keywords: *Stress-related oral lesions, academic stress, aphthous ulcers, perceived stress scale*

Introduction

Dental education is known to be demanding, often exerting psychological pressure on students, which can manifest physically, including in the oral cavity. Stress-related oral lesions such as aphthous ulcers, bruxism-related trauma, burning mouth, and herpetic eruptions are commonly reported in high-stress populations.¹ However, data on their prevalence and association with academic stress among dental students in Pakistan remain scarce.

Academic stress, a prevalent phenomenon among healthcare students, has a profound impact not only on mental health but also on various physiological systems.² Among dental students, the intense curriculum, frequent evaluations, patient interactions, and clinical performance expectations create a highly stressful environment. Several international studies have emphasized the consequences of academic stress in terms of anxiety, depression, sleep disturbances, and psychosomatic symptoms, including oral health issues.³ In Libya, a study by Ahmed et al. (2025)⁴ found that 42% of students experienced recurrent aphthous ulcers during examination periods. Similarly, a study in Poland by Owczarek et al. (2020)⁵ identified a significant correlation between academic load and bruxism among undergraduates. The oral cavity, often termed a mirror of systemic health, is highly susceptible to manifestations of psychological stress. Stress-induced immunosuppression may trigger reactivation of latent viruses, leading to herpetic lesions, while heightened cortisol levels are associated with mucosal inflammation and delayed healing. Bruxism and oral parafunctions also rise during periods of emotional stress, often leading to mucosal trauma or temporomandibular disorders.⁶ While studies from other countries have shed light on the

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clinical significance of this relationship, evidence from Pakistan remains sparse. There is a dire need to quantify the burden of these lesions in our local population to inform curriculum reforms and wellness initiatives. In particular, the cultural reluctance to seek psychological counselling and the high competitiveness among Pakistani dental institutions can aggravate the stress burden, making this investigation timely and crucial.

This study investigates the relationship between academic stress and stress related oral lesions among Pakistani dental students using a two college model from Punjab and KP each, with the hope of guiding future policy on student wellbeing. The objectives of the current study were to determine the prevalence of stress related oral lesions among dental students and to evaluate the association between academic stress and the presence of these lesions.

Material and Methods

A cross-sectional analytical study was conducted involving two dental colleges one from Punjab and one from KP were selected using purposive sampling. Within each college, stratified random sampling was applied to select students proportionally from each academic year (1st to final year). Prior to study, ethical approval was obtained from institutional review boards vide #ERC-09/2024/0021, and all participants provided informed consent. Inclusion criteria included all undergraduate dental students enrolled from 1st to final year at the two selected colleges who provided informed consent. Exclusion criteria were students with systemic illnesses, immunological conditions, or medication use known to influence oral mucosal lesions (e.g., corticosteroids, immunosuppressants).

The recruitment process involved obtaining class lists for each academic year from administrative offices of both colleges. Students were then selected through stratified random sampling to ensure proportional representation from each year. Selected students were contacted during scheduled class hours, briefed about the study objectives, and invited to participate. Those who agreed completed the questionnaire and underwent clinical examination by qualified dental students. Based on an estimated prevalence of 35%, confidence level of 95%, and a 5% margin of error, the minimum required sample size was calculated to be 356 using Wnarifin calculator. Inclusion criteria included full-time enrolment and informed consent, while exclusions were systemic diseases or medication use that could confound lesion presentation. Data collection

comprised a structured questionnaire covering demographics, lifestyle factors, and the PSS-10 for stress assessment. Clinical oral examinations were conducted by calibrated professionals to record presence and type of lesions. Data were analyzed using SPSS version 28. Descriptive statistics summarized demographics, stress scores, and lesion prevalence. Chi-square tests evaluated associations, and logistic regression was applied to determine predictors of lesions. Significance was set at $p < 0.05$.

Descriptive statistics were used to summarize participant characteristics, stress levels, and the prevalence of stress-related oral lesions, which addressed the first objective of determining prevalence. The Chi-square test was suitable for examining associations between categorical variables such as stress categories and presence of lesions. Finally, logistic regression analysis was employed to identify independent predictors of stress-related oral lesions, which directly

corresponds to the objective of exploring the relationship between academic stress and lesion occurrence while controlling for potential confounders. Thus, each analytic approach was chosen to appropriately address both the descriptive and analytical aims of the study.

Results

Among the 356 (178 from each province) participants (63.5% female, 36.5% male), the mean age was 21.3 years. The overall prevalence of stress-related oral lesions was 38.2%. Table 1 shows the distribution of lesions. Aphthous ulcers were the most common (18.5%), followed by bruxism-related trauma (12.6%) and burning mouth sensation (7.1%). Herpetic lesions and other findings were less frequent (<5%). Stress levels measured via PSS-10 indicated that 41.6% of students experienced high stress (Table 1). Stress scores were assessed using the Perceived Stress Scale (PSS-10). The total PSS-10 scores were categorized into low (0–13), moderate (14–26), and high stress (27–40) based on standard cut-off values. Students with high academic stress had significantly higher prevalence of oral lesions ($p < 0.01$). Logistic regression analysis (Table 2) revealed that academic stress (OR = 2.41, 95% CI: 1.45–4.02), female gender (OR = 1.73, 95% CI: 1.02–2.91), and inadequate sleep (<6 hours) (OR = 2.19, 95% CI: 1.28–3.74) were significant predictors (Table 2).

Table 1: Distribution of Stress Related Oral Lesions Among Dental Students

Type of Oral Lesion	Frequency (n)	Percentage (%)
Aphthous Ulcers	66	18.5%
Bruxism Related Trauma	45	12.6%
Burning Mouth Sensation	25	7.1%
Herpetic Lesions	9	2.5%
Others	11	3.1%
Total with Lesions	136	38.2%

Table 2: Logistic Regression Analysis for Predictors of Stress Related Oral Lesions

Predictor	Odds Ratio (OR)	95% Confidence Interval	P-Value
High Academic Stress	2.41	1.45 – 4.02	<0.01
Female Gender	1.73	1.02 – 2.91	0.04
Inadequate Sleep	2.19	1.28 – 3.74	0.005

Table 3: Model Adequacy Summary

Test/Statistic	Value	Interpretation
Hosmer–Lemeshow χ^2	7.84	$p > 0.05$ indicates good model fit
Hosmer–Lemeshow p-value	0.45	Non-significant p-value confirms adequate fit
Nagelkerke R^2	0.32	Represents proportion of variance explained

The logistic regression model demonstrated that students with high academic stress were more than twice as likely to develop stress-related oral lesions (OR = 2.41), while female gender (OR = 1.73) and inadequate sleep (OR = 2.19) also significantly increased the likelihood of lesion occurrence.

Model adequacy was assessed using the Hosmer–Lemeshow goodness-of-fit test, which was non-significant ($\chi^2 = 7.84$, $p = 0.45$), indicating good fit. The model explained approximately 32% of the variance in

stress-related oral lesions, as shown by a Nagelkerke R^2 value of 0.32.

Discussion

This study confirms a strong association between academic stress and the occurrence of stress-related oral lesions among dental students in Pakistan. The 38.2% prevalence observed aligns closely with international findings. In Germany, Feussner et al. (2022)⁷ reported a prevalence of 35% for stress-related oral lesions among medical and dental students. Similarly, another study from Iran by Motallebnejad et al. (2019)⁸ found that nearly 40% of dental students experienced at least one oral lesion linked to academic stress during exams.

Aphthous ulcers, the most reported lesion in our study, were consistent with findings from Al-Sato et al. (2022)⁹, who found a strong correlation between exam stress and ulcer recurrence. Bruxism-related trauma was also prominent, which corroborates results from Ahmed et al. (2025)⁴ in Libya, who found bruxism to significantly increase during stressful periods among undergraduates. Gender differences also appeared notable, with female students more likely to report both stress and lesions. This mirrors findings from a UK-based study by Alotaibi et al. (2025)¹⁰, which suggested that females tend to experience higher levels of academic stress due to multitasking and societal pressures. Similarly, poor sleep, which was also a significant predictor, has been shown in past studies i.e. by Narmadha et al., (2025)¹¹ to exacerbate the stress response and immune dysregulation. The mechanisms underlying these associations include elevated cortisol levels leading to mucosal barrier disruption, behavioral changes like bruxism, and impaired immunity. These responses are well-documented in psychosomatic literature.

In addition to biological mechanisms, psychological pathways may also play a role. Stress can alter pain perception, enhance awareness of oral discomfort, and increase parafunctional habits. Students under stress are more likely to ignore routine oral hygiene or resort to habits such as cheek/lip biting, which can cause or worsen mucosal injuries.¹² Moreover, cultural factors and coping mechanisms vary across regions. For example, in some communities, emotional suppression is more common, which may somatize as physical lesions, while

others might exhibit outward behavioral responses like nail-biting or smoking each with oral consequences. Importantly, the study adds to a limited body of literature from Pakistan.

A previous local study by Tariq et al. (2024)¹³ conducted in Lahore reported a 34% prevalence of stress-related oral manifestations in medical students but did not differentiate lesion types or control for predictors like gender and sleep. Our findings contribute novel insights by stratifying lesion types and applying multivariate analysis. There is also an educational implication. The presence of stress-induced oral lesions can negatively affect students' ability to concentrate, communicate, and perform clinically. Pain or discomfort may lead to class absences or avoidance of food intake, impacting nutrition. Recognizing this, dental institutions must not only emphasize clinical competence but also prioritize emotional resilience.

Dental colleges should consider implementing routine stress-management workshops and peer-support programs to help students cope with academic pressure. Additionally, establishing accessible, confidential counseling services on campus may encourage early psychological support and reduce the incidence of stress-related oral health problems.

Limitation

The study's strengths lie in its multi-institutional approach, calibrated examiners, and use of a validated stress scale. However, generalizability is limited due to the inclusion of only two colleges. Moreover, the cross-sectional nature of the study precludes causality. Future studies may involve multiple dental colleges across different regions and adopt a longitudinal follow-up approach to more clearly establish causal relationships between academic stress and stress-related oral lesions.

Conclusion

Stress-related oral lesions are prevalent among dental students in Pakistan. Academic stress significantly contributes to their development, necessitating mental health and lifestyle interventions in dental education.

CONFLICT OF INTEREST: None

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Author Contributions

1. Alamgir: Conceptualization of the study, designing the methodology, and overall supervision.
2. Muhammad Saeed Azhar: Data collection, statistical analysis, and interpretation of results.
3. Aamna Javed : Literature review, drafting the introduction and discussion sections.
4. Tehmina Naushin : Preparation of questionnaires, data entry, and management.
5. Sana Ikram : Drafting the manuscript, formatting, and referencing.
6. Muhammad Arsalan Raffat : Reviewing the manuscript, critical revisions, and final approval of the version to be published.