

Association Between Academic Stress And Gingival Inflammation Among Dental Students- A Cross-Sectional Study

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Abstract

Background:

Psychological stress is increasingly recognized as an important factor affecting systemic and oral health. Various literature reviews consider stress as one of the triggering risk factors for gingival diseases. A recent trend changed the treatment of gingival disease from solely treating microbial etiology to treating the psychological factors.

Aim:

The objective of the study was to evaluate the association between stress and gingival health among dental students by using various periodontal parameters.

Materials and methods:

Interns and Final year students of JKKN Dental college and hospital were included for the study. Perceived stress scale was used to analyse the stress level. To analyse gingival health, plaque index, gingival index, bleeding on probing was used.

Result:

The result obtained from the survey was tabulated, analysed. The association between stress and gingival disease was found to be statistically significant. Among the 175 participants, 68% demonstrated moderate stress levels, while 32% exhibited high perceived stress and notably no participant belonged to low stress category. Participants with high stress showed significantly higher gingival index, plaque index, and bleeding on probing scores compared to those with moderate stress levels ($p < 0.001$). These findings suggest that psychological stress is significantly associated with gingival inflammation among dental students

Keywords: Gingival health, Academic Stress, Anxiety, Gingivitis

Introduction

According to WHO, Stress can be defined as a state of worry or mental tension caused by different situations. Stress is a natural human response that prompts us to address challenges and threats in our life^[1]. In this 21st century finding a man without stress is rare. It ranges from internal stress, peer stress, work stress. It can be acute or chronic. Acute stress is the response for sudden stressors acting. While chronic stress is the result of prolonged and repeated exposure to stressors.^[2] Stress affects the overall health of the body. In oral cavity stress plays a role in developing diseases.^[2] This article tries to evaluate stress and its role in gingival health. Periodontium is the supporting structure of the tooth. Periodontitis is the inflammation of the

periodontium with loss of supporting structures. Gingivitis is defined as the inflammation of the soft tissue only i.e., gingiva without involving the underlying bone. Periodontal disease is a multifactorial one. The susceptibility of a host to gingival disease based on the severity, progression, and treatment of the disease is determined by several different internal and external factors. These can generally be classified into modifiable and non-modifiable risk factors. Local factors that are modifiable include dental plaque, calculus deposits, overhangs from restorations, partial dentures, and malpositioned teeth. Furthermore, there are other systemic and modifiable risk factors such as alcohol intake, tobacco use, stress, some medication usage,

and various diseases such as uncontrolled diabetes mellitus, obesity, osteoporosis, hypocalcemia, and vitamin D deficiency.^[4] Psychological stress has been associated with inflammatory periodontal conditions, including gingivitis and periodontitis.^[5] Recent studies in psychoneuroimmunology highlighted the bidirectional relationship between psychological status and immune function, supporting the concept that gingival disease should be viewed within a biopsychosocial framework rather than purely as a microbial infection.^[5] Stress triggers the activation of the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic-Adreno-medullary (SAM) system, leading to an increased release of stress hormones, including cortisol, adrenaline, and noradrenaline.^[7] Sustained elevation of these stress hormones can alter immune regulation and inflammatory pathways, which are critical in the pathogenesis of gingival disease. Study shows that stress generated by university study results in decreased oral hygiene and increased crevicular IL 1b levels.^[8] Stress among college students is often linked to the demands of the academic curriculum. Heavy coursework, frequent examinations, and clinical or practical requirements can increase pressure and anxiety. Poor time management and high academic expectations further contribute to stress levels. Since stress is a most frequently encountered problem in modern life and the taking the note of increase in the development of oral diseases, this study aimed to estimate the correlation between stress and gingival disease study among college students.

Materials and method

Students who are at their Internship and Final year of the course at JKKN DENTAL COLLEGE AND HOSPITAL, Kumarapalayam were included in the study. Those with systemic ailment and those with habits such as smoking and alcohol consumption were excluded. Sample size estimation was performed using G*Power software based on the anticipated association between perceived stress and gingival inflammatory parameters. Assuming a small-to-moderate effect size ($r = 0.21$), $\alpha = 0.05$, and power = 80%, the required sample size was estimated to be 175 participants. Ethical approval for the study was obtained from the Institutional Ethical Committee of J.K.K. Nataraja Dental College and Hospital on 24 December 2025. Written informed consent was obtained from all participants before enrolment. A questionnaire was made to

assess the stress of the individual. Perceived Stress scale (PSS – 10) was used to assess the stress level among the participants. It contains 10 questions in English and the responses were collected. Individual responses were assessed by the guidelines given in perceived stress scale. Internal consistency of PSS was evaluated using Cronbach's alpha value which is found to be 0.80. Participants were categorised based on the score into Low (score 0-13) Moderate (14-26) High (27-40). After getting informed consent from the participants, Gingival status was assessed by some indices like plaque, gingival, bleeding on probing indices

Plaque index criteria: Loe and Silness [1967] was used to analyse the plaque score of the individual. Distofacial, Facial, Mesiofacial and Lingual surfaces of index tooth 16, 12, 24, 36, 32, 44 was analysed using 17-23 Explorer and graded using the guidelines provided.

Gingival index criteria: Loe and Silness [1963] criteria was used to analyse the gingival inflammation status of the individual. Distofacial, Facial, Mesiofacial and Lingual surfaces of index tooth 16, 12, 24, 36, 32, 44 was analysed with periodontal probe and graded using the guidelines provided

Bleeding on probing percentage: Six sites of the index teeth 16, 12, 24, 36, 32, 44 was analysed for bleeding on probing and percentage were calculated.

Statistics:

100 Interns and 75 final year students were involved in this observation. All clinical examinations were performed by a single calibrated examiner. Intra-examiner reliability was assessed before the study and demonstrated substantial agreement ($\kappa = 0.85$). Responses obtained from them are tabulated and analysis was performed using SPSS software. Then Independent t Test was performed to compare the stress groups and gingival parameters. Normality was tested using Shapiro-Wilk test and was found to be normally distributed.

Result:

This study aimed to correlate association between perceived stress levels and gingival inflammation among undergraduate dental students. Out of 175 undergraduate students, 68% had score ranging from 14-26 in perceived stress and 32% had score of 27-40, 0% had score of 0-13. The mean age of the participants was 23.

The mean Gingival Index score in the moderate stress group was 1.25 ± 0.10 , whereas the high stress group demonstrated a significantly higher mean score of 1.99 ± 0.13 . Independent t test analysis revealed a statistically highly significant difference between the two groups ($p < 0.001$). These findings indicate that individuals with higher stress levels exhibit greater gingival inflammation compared to those with moderate stress. (Figure 1)

The mean Plaque Index score among participants with moderate stress was 1.15 ± 0.10 , while the high stress category showed elevated mean value of 1.79 ± 0.13 . Statistical analysis using independent t test

was found to be significant ($p < 0.001$). This suggests that increased stress levels may be associated with poorer oral hygiene status and greater plaque accumulation. (Figure1)

The mean percentage of Bleeding on Probing in the moderate stress category was $24.93\% \pm 2.72$, compared to $48.43\% \pm 4.35$ in the high stress category. A statistically significant difference was observed ($p < 0.001$). The results indicate a strong association between elevated stress levels and increased gingival bleeding, reflecting heightened inflammatory response. (Figure 1)

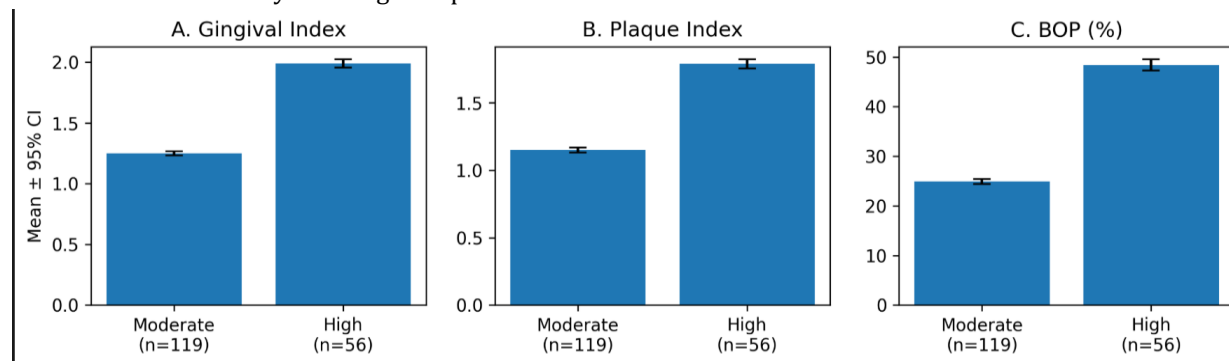


Figure 1: Comparison of gingival inflammatory parameters between moderate- and high-stress dental students. Bars represent mean values and error bars represent 95% confidence intervals. High-stress participants demonstrated higher Gingival Index, Plaque Index, and Bleeding on Probing percentages compared with moderately stressed participants.

S.No	Parameter	Stress group	Mean	SD	Confidence interval [95%]	P value
1.	Gingival index	Moderate stress	1.25	0.10	1.232-1.268	<0.001
		High stress	1.99	0.13	1.955-2.025	
2	Plaque index	Moderate stress	1.15	0.10	1.132-1.168	<0.001
		High stress	1.79	0.13	1.755-1.823	
3	Bleeding on probing	Moderate stress	24.93	2.72	24.44-25.42	<0.001
		High stress	48.43	4.35	47.27-49.59	

Table 1: depicting the result obtained from the statistical analysis

S.NO	Group	Men		Women		Total
		Intern	Final Year	Intern	Final Year	
1	Moderate Stress Group	18	15	52	34	119
2	High Stress group	10	5	20	21	56

Table 2 : Distribution of participants among the groups

Discussion

This work tried to evaluate association between stress and gingival status by assessing the gingival index, plaque index and bleeding on probing among dental students who had moderate and high stress. The finding of this evaluation demonstrated that participant with higher stress levels exhibited significantly poorer gingival health compared to those with moderate levels. The mean indices of gingival inflammation were considerably higher in high-stress category. The profession of the individual act as a significant contributor in determining emotional strain exposure of individual. Studies show professionals get exposed to stress at a higher level when compared to non-professionals. Medical students get exposed to various stressors including exam stress, quota completion ^[9]. In the recent competitive world with developing saturation in the field of dentistry students at the final year and internship has an added stress on their career focus. This was observed to be possible on observing the distribution of participants as there is no low stress group. The reason for this distribution may include the high stress the students may perceive during their academic course duration. Moreover, this study was conducted during their exam timing which may reveal the mindset of the participants during exams. Stress influences the overall function of the body and serves as a risk for many conditions^[2] In this study it is evident that individuals with high stress exhibit gingival disease. The correlation between stress and gingival health may be explained through both behavioural and physiological mechanisms. Psychologically stressed individuals often exhibit changes in oral hygiene practices, including irregular brushing and neglect of oral care, which can lead to increased plaque accumulation^[9]. In addition, stress can influence immune responses through neuroendocrine pathways, particularly through elevated cortisol levels, which may depress immune action and increase susceptibility to inflammatory periodontal conditions.^[7] Stress hormones are primarily regulated through activation of the

hypothalamic-pituitary-adrenal (HPA) axis . During stress, the hypothalamus releases corticotropin-releasing hormone (CRH), which acts on the pituitary gland and stimulates the secretion of adrenocorticotrophic hormone (ACTH). ACTH subsequently acts on the adrenal cortex, leading to the production of cortisol. It has a property of anti-inflammatory and immune suppression which leads to inhibition of humoral mediated immunity. [14] Psychoneuroimmunological mechanism is connected to gingival inflammation by inducing HPA axis which in turn result in increased production of cortisol. [15] Previous studies have also reported similar findings regarding the association between stress and gingival disease^[9,12] Researchers have stated that stress may act as modifying factor that influences host response to plaque bacteria, thereby contributing to gingival inflammation and bleeding^[13]. The present study supports these observations and further emphasizes the importance of considering psychosocial factors in periodontal health assessment

Clinical relevance:

This study was conducted primarily to make the dental educators aware of the emotional strain that the dental students are facing during their course of study. Since many institutions focuses primarily on academics, students may experience significant stress during their course. The high prevalence of stress observed among participants highlights the need for appropriate stress-management interventions and student support programs. Many colleges have adapted various measures to reduce the emotional strain of the students. There should be mass measures like stress management programs to help the students have better quality of life including oral health. This study shows positive correlation between stress and gingival disease. Therefore, effective student welfare policies should be implemented to promote the physical, psychological, and professional well-being of future dental practitioners

Conclusion

This study concludes that the dental students with high levels of stress are presented with gingival inflammation. They had high scores in indices like gingival, plaque and increased bleeding on probing percentage. It is evident that psychological factors appears to be associated with gingival inflammation. The college curriculum plays an important role in influencing student stress levels. Excessive academic workload, examinations, and clinical requirements can contribute to increased stress among students. Therefore, maintaining a balanced curriculum and promoting effective coping strategies are essential to support students' academic performance and overall well-being. So awareness programs and stress management programs must be conducted for dental students to maintain overall health.

LIMITATION:

This study has certain limitation. The study was conducted among dental students from same institution, which may not be suitable for generalisation for the scores obtained from this study. The assessment of stress was done by questionnaire and may be subject to response bias. Other confounding factors such as dietary habits, sleep quality, socioeconomic status, and oral hygiene behaviour were not evaluated. In addition gender based subgroup analysis was not performed which may limit the findings. Therefore this study cannot conclude that stress is independently inducing gingival inflammation. Further longitudinal multicentric studies with many samples are recommended to better understand the relationship between psychological stress & gingival health.

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