

APHTHOUS ULCERS AND PSYCHOLOGICAL STRESS AMONG DENTAL STUDENTS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Introduction: Recurrent aphthous ulcers are one of the most frequent painful conditions affecting the oral mucosa in young adults. Psychosocial stress has been recognized as a contributing factor to the causation of recurrent aphthous ulcers.

Aim: To assess the occurrence rate of recurrent aphthous ulcers and their correlation with levels of psychosocial stress among dental students.

Materials and Methods: The present cross-sectional study included 383 undergraduate and postgraduate students of a dental college. Google Forms was used for collecting the responses from the participants. In this survey, a questionnaire was used. Two parts were developed for data collection. Part one covered demographic details as well as some prerequisite information on recurrent aphthous ulcers. Psychological stress was evaluated through the second part of the questionnaire using the Perceived Stress Scale (PSS-10).

Results: Among the 383 participants, 80.9% (n=310) had moderate stress, 11.2% (n=43) had high stress and 30 participants had no to minimal stress according to the PSS-10 scale.

Conclusion: Recurrent oral ulcers are prevalent among dental students, with stress emerging as a major associative factor. Early identification of stress-related triggers and incorporation of stress-management strategies may play a vital role in tackling their stress levels.

KEYWORDS: Aphthous ulcer; dental students; perceived stress scale; psychological stress; recurrent oral ulcers

1. INTRODUCTION

According to World Health Organization (WHO), stress is described as "a condition of mental strain and tension caused by a difficult situation." Stress is a natural response of humans to any problem and threats which make their bodies react accordingly. According to WHO, stress is a condition of mental strain, and at the same time, it is a reaction comprising physical, emotional, and behavioral responses to different changes. Physical or psychological stimulation that disturbs the balance produces stress responses. The body has mechanisms to produce stress response reactions, which include nervous, endocrine, and immunological systems activation. SAM and HPA axes along with immune system responses participate in the mechanism of the stress response.¹

In the present paper, we will explore the complicated connection between stress and dentistry. Dental education is essentially stressful because it demands simultaneous excellence in two different domains: intellectual thoroughness and manual artistry. This leads to severe pressure from academic overload, meeting clinical quotas, fear of failure, the need for perfectionism in clinical procedures, social stress from peer competition and intense examination pressure. Postgraduate trainees have to bear responsibility for complex cases and specialty examinations. The tenure is long enough to keep a student in continuous stress for years, leading to various health problems. This stress does not remain limited to college life but transforms into occupational stress in the life of a dentist. Dentists face stress while engaged in dual roles as clinicians and entrepreneurs. Financial pressure to earn, manage overheads and maintain consistent patient flow, time constraints, physical and mental fatigue from performing intricate work under pressure, and medico-legal anxiety over potential errors and litigation are important contributors.

This extensive stress elevates the risk of burnout, various health problems, musculoskeletal issues and impaired performance throughout a dental career. 2

Several investigations have established that stress can also play a role in causing oral ulcers among dental students. In our study, we also conducted a survey to demonstrate the correlation between stress, aphthous ulcers and dentistry. As such, it becomes important for the educators to increase knowledge and raise awareness about how to prevent aphthous ulcers in students to help them deal with the problem. Our survey attempts to establish a relationship between recurrent oral ulcers and stress in Indian dental students. Such a study would be useful in better treatment and management of stress-related mouth ulcers. 3

The psychological stress of the subjects was measured by applying the second part of our questionnaire based on Perceived Stress Scale (PSS-10). The Perceived Stress Scale is a questionnaire of 10 items published by Cohen et al. in 1983. This Perceived Stress Scale is a well-established questionnaire to measure the degree to which respondents perceive certain aspects of their life situations as stressful. It assesses how unpredictable, uncontrollable and overloaded people find their lives in the past month rather than focusing on specific stressful events. It focuses on subjective stress perception rather than objective stressors. The scale exists in different formats, most commonly comprising 10 or 14 items, with responses captured through a Likert-style rating system. Because it is straightforward to administer, time-efficient and demonstrates strong reliability and validity, the PSS is frequently utilised in epidemiological investigations, clinical settings and population-based surveys. Its broad applicability across varied groups makes it a useful measure for assessing perceived stress and for studying its links with multiple physical and mental health outcomes. 4,5

MATERIALS AND METHODS

For this investigation, a cross-sectional approach was adopted, involving a total number of 383 participants. Google Forms was used for collecting the responses from the participants.

A questionnaire was designed and divided into two parts. The first part consisted of basic questions relating to demographic details of the participants and knowledge base of aphthous ulcers. The questions were as follows:

1. Gender
2. Age
3. Educational status
4. Do you know what an aphthous ulcer (mouth ulcer) is?
5. Have you ever suffered from aphthous ulcers?
6. If yes, how frequently do you experience them?
7. How long do your ulcers usually last?
8. Common site(s).
9. Do your ulcers cause pain or discomfort while eating or talking?
10. Have you ever taken treatment for it?
11. Which of the following trigger your ulcers?
12. Do you notice ulcers after stressful situations (examinations, deadlines, emotional stress)?
13. Do you smoke or consume alcohol?
14. Do you sleep adequately (6-8 hours/day)?

The second section assessed psychological stress using the standard 10-item Perceived Stress Scale (PSS-10). The original item wording was retained to preserve the validity of the instrument. The PSS-10 evaluates perceived stress during the previous month by assessing feelings of unpredictability, lack of control, nervousness, coping ability and perceived overload. Each item was rated on a five-point scale:

- 0 – Never
- 1 – Almost never
- 2 – Sometimes
- 3 – Often
- 4 – Very often

Total stress score will be calculated as the sum of the scores of all 10 items where reverse scoring would apply to questions 4, 5, 7, and 8 (whereby 0=4, 1=3, 2=2, 3=1, and 4=0) while the answers to questions 1, 2, 3, 6, 9, and 10 are straightforwardly answered (whereby 0=0, 1=1, etc.). Stress is then classified into three categories, that is:

1. Low stress (0-13)
2. Moderate stress (14-26)
3. High stress (27-40)

RESULTS

The survey revealed that the majority of participants belonged to the 19-24-year age group (87.4%), while the least representation was from participants above 25 years (12.6%). Females constituted a greater proportion of respondents (75.2%), and most participants were undergraduates (97.1%). Awareness regarding aphthous ulcers was reported by 89.6% of respondents, while 10.4% were unaware. A history of oral ulcers was noted in 71.3% of participants. Among the 383 total respondents, 41.5% experienced ulcers occasionally (<5 episodes/year), 15.9% frequently (>5 episodes/year), 12.5% reported a single episode in their lifetime, 26.4% never experienced ulcers and 3.7% reported continuous occurrence. With respect to ulcer duration, 39.2% reported healing within 1-3 days, 35.5% within 4-7 days and 5.2% for more than 7 days.

Further analysis reveals that buccal mucosa (56.1%) was the most common area of the ulcers, tongue came second (32.4%), followed by lips (29.2%), the floor of the mouth (14.1%), and soft palate (6.3%). As for pain/discomfort while speaking/eating, 77.5% of the participants with ulcers experienced it. In terms of management, 51.2% never sought treatment, 23.8% used over-the-counter gels, 11.5% preferred home remedies and 6.3% opted for prescription medication. The most commonly reported trigger was specific food items (42.6%), followed by stress (39.9%), traumatic injury (29.2%), nutritional deficiency (22.2%), inadequate sleep (21.4%) and menstrual-cycle influence (12.3%). Additionally, 30.5% observed ulcers following stressful conditions such as examinations or emotional strain, while 19.1% reported stress-related ulcers occasionally. A small proportion (3.4%) reported smoking or alcohol consumption, and 28.2% were found to have insufficient sleep. According to the PSS-10 scale, most of the 383 participants (80.9%) reported moderate stress levels. High stress was found in 11.2% of the participants, with only 30 individuals falling into the no-to-minimal stress category.

DISCUSSION

Thus, the main objective of the current study is to explore whether stress makes the appearance of ulcers more probable among dental undergraduate students. Recurrent aphthous ulcer is a chronic ulcerative disease of the mouth that has no clear etiology and causes extreme pain. Various psychological parameters have been suggested to serve as possible risk factors for the development and progression of recurrent aphthous ulcers. Depression and stress greatly impact people's perception of pain.⁶

While the exact mechanism is not fully understood, stress is known to affect immune function by altering immune-cell activity and the release of inflammatory mediators. These immune changes have been associated with the development of recurrent oral ulcers. In addition, stress may lead to increased salivary cortisol levels, oxidative stress and harmful oral habits such as lip or cheek biting, which can damage the oral mucosa and initiate ulcer formation in vulnerable individuals.⁷

Hence, we aimed to explore the relationship between stress and recurrent aphthous ulcers among undergraduate and postgraduate dental students.

Depression, anxiety, and stress are complex conditions, which may be caused by a range of reasons. They include genetic predispositions, addiction, chronic stress, environmental stimuli, and other factors. Genetic variation greatly impacts predisposition to depression, substance abuse, among other conditions.⁸

Recurrent ulcers of the mouth are one of the most painful illnesses of the oral mucosa. Etiology of recurrent ulcers is diverse, but emotional stress is believed to be among the main risk factors in their development especially among younger patients.⁹

Stress can be highly detrimental to dental students' physical and psychological health as well as academic achievements.¹⁰

The appearance of ulcers in the oral mucosa is extremely painful and interferes with speech, eating, and drinking activities. According to the hypothesis, stress is able to start the process of developing recurrent oral ulcers and create pain that is harmful for the individual and causes further stress. Unfortunately, it leads to the establishment of a vicious circle where stress causes ulcers and ulcers in return cause stress.¹¹

The physiological consequences of stress and anxiety do not affect everyone in the same way and in some situations may have multiple and intricate processes. Even with two people having similar degrees of stress or anxiety, they can present differently. The purpose of the current study is to examine the presence of recurring oral ulcers among the dental graduates and whether there is any relationship between emotional stress and ulcers. There are many studies that show that emotional or psychological stress leads to the high possibility of developing recurring oral ulcers. Therefore, in case of no presence of any other risk factors, stress management can lead to the prevention of recurring oral ulcers.¹²

Physiologically, the impact of stress starts the process which involves the hypothalamus-pituitary-adrenocortical (HPA) axis and the production of hormones like adrenaline and cortisol. Cortisol is the main stress hormone that provides extra energy to the body by increasing the blood sugar levels and concentrating on the immediate survival activities. One of the main problems with high levels of cortisol is the suppression of the immune system due to its role in decreasing the number of white blood cells.¹³

Stress contributes to ulcer development through several pathways. Immune dysregulation: stress-related immunosuppression reduces the oral mucosa's ability to defend against minor mechanical irritants and commensal microbial activity. Under normal conditions, these challenges are effectively controlled by a competent immune response. However, during periods of stress, impaired immune regulation may allow localised inflammation to develop, resulting in epithelial disruption and subsequent ulcer formation. Inflammatory cascade: chronic stress can increase overall systemic inflammation. This creates a highly reactive environment in the oral cavity, making it more prone to inflammatory breakdown. Stress-related trauma: stress frequently triggers parafunctional habits, such as cheek biting, lip chewing or overly vigorous toothbrushing. These forms of repetitive minor trauma can disrupt the integrity of the oral mucosa, leading to oral ulcers. Nutritional factors: elevated stress levels can negatively affect dietary habits, resulting in deficiencies of B vitamins, particularly B12, or iron, both of which are recognised contributing factors in the development of recurrent aphthous stomatitis.¹⁴

According to the findings of the present study, the vast majority of the 383 participants experienced measurable levels of psychological distress. Specifically, data derived from the PSS-10 revealed that 80.9% (n=310) of the cohort fell into the category of moderate stress, while an additional 11.2% (n=43) reported high perceived stress.

In contrast, only a small fraction of the group, comprising 30 participants, reported no-to-minimal stress levels. These results underscore a significant trend of elevated stress within the sampled population, suggesting that nearly nine out of 10 participants are navigating academic or clinical environments with stress levels that could potentially impact their systemic health and oral well-being.

McCartan & Lamey determined the correlation between anxiety and cortisol levels in saliva of individuals with recurrent aphthous stomatitis (RAS). The researchers found out that individuals with RAS had higher levels of anxiety in comparison with healthy people; however, results of measuring salivary cortisol were inconsistent. It was proposed that psychological stress could be one of the causes of developing recurrent ulcers in RAS. 15

Nadendla et al. considered the connection between salivary cortisol levels and anxiety of people with recurrent aphthous stomatitis. The results of the study showed that patients with RAS had significantly increased levels of salivary cortisol and anxiety in comparison with healthy control subjects. It was suggested that psychological stress might be a contributing factor of developing ulcers repeatedly. Zakaria & Hosny examined the correlation between the level of salivary cortisol, alpha-amylase levels, and anxiety of Egyptian people with minor recurrent aphthous stomatitis. The study showed increased levels of both stress markers and anxiety in people suffering from this disease. Thus, it can be assumed that stress markers are involved in the recurrence of aphthous ulcers. 17

Nurdiana et al. studied the influence of psychological stress on the development of recurrent aphthous stomatitis. It was revealed that patients with higher stress levels had a greater number of ulcer episodes. Therefore, stress was regarded as an important trigger for developing recurrent aphthous ulcers. 18

A clear understanding of the interaction between the mind and body forms the foundation for developing effective strategies aimed at reducing the prevalence of coexisting disorders and improving care for individuals affected by mental health conditions, chronic diseases or their coexistence.

The physiological transition from perceived stress to the manifestation of oral ulcers, likely mediated by cortisol-induced immunosuppression and inflammatory dysregulation, represents a critical health concern for students. Consequently, the results of this study underscore the necessity for dental institutions to implement formal stress-management programmes. Addressing these psychological factors is not only essential for improving the general well-being of the student body but also serves as a primary preventive measure against the recurrence of stress-related oral mucosal diseases.

Furthermore, there is evidence for the existence of this relationship since we observed high levels of stress in students suffering from recurrent aphthous ulcers. Psychological factors were positively related to the intensity of pain experienced by students as a result of their ulcerations. This indicates that treating such psychological problems would decrease stress among students.

CONCLUSION

Although a majority of dental students did not self-report high stress levels, analysis using the Perceived Stress Scale demonstrated a significant association between stress and recurrent oral ulcers in the present study. The relatively high stress burden observed among participants highlights the need for periodic psychological counselling interventions to mitigate stress and improve quality of life.

Key Messages

Stress appears to be an important correlate of recurrent aphthous ulcers among dental students. Periodic screening using tools such as PSS-10, combined with counselling and stress-management interventions, may help reduce stress-related oral morbidity and improve student well-being and academic quality of life.

REFERENCES

1. Chu B, Marwaha K, Sanvictores T, Awosika AO, Ayers D. Physiology, stress reaction. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024.
2. Elani HW, Allison PJ, Kumar RA, Mancini L, Lambrou A, Bedos C. A systematic review of stress in dental students. *J Dent Educ* 2014;78:226-42.
3. Verma S, Srikrishna K, Srishti, Shalini K, Sinha G, Srivastava P. Recurrent oral ulcers and its association with stress among dental students in the Northeast Indian population: A cross-sectional questionnaire-based survey. *Cureus* 2022;14:e27653.
4. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav* 1983;24:385-96.
5. Cohen S, Williamson G. Perceived stress in a probability sample of the United States. In: Spacapan S, Oskamp S, editors. *The Social Psychology of Health*. Newbury Park (CA): Sage Publications; 1988. p. 31-67.
6. Shinkre R, Mukherji I, Bharadwaj A, Suresh NV, Banik AD, Pednekar SJ, et al. Depression, anxiety, stress, and pain severity in patients with recurrent aphthous stomatitis: A cross-sectional study. *Cureus* 2024;16:e62694.
7. Al-Mohaya MA, Al-Madi EM, Al-Hadi AM, Al-Khalaf MM. The relationship between stress and recurrent aphthous stomatitis among dental students. *J Contemp Dent Pract* 2015;16:285-90.
8. Hellman M. Social causes of depression, anxiety and stress. *Nordisk Alkohol Nark* 2018;35:149-51.

9. Handa R, Bailoor DN, Desai VD, Sheikh S, Goyal G. A study to evaluate the impact of examination stress on recurrent aphthous ulceration in professional college students in Jaipur district. *Minerva Stomatol* 2012;61:499-507.
10. Karambelkar MV, Ashwinirani SR, Sande A, Kamala KA. Comparative study of occurrence of recurrent aphthous stomatitis during exam stress and relaxed phase in dental college students of Krishna Institute of Medical Sciences. *BLDE Univ J Health Sci* 2020;5:173-7.
11. Kandagal VS, Shenai P, Chatra L, Ronad YA, Kumar M. Effect of stress on oral mucosa. *Biol Biomed Rep* 2012;1:13-6.
12. Gallo CB, Mimura MA, Sugaya NN. Psychological stress and recurrent aphthous stomatitis. *Clinics (Sao Paulo)* 2009;64:645-8.
13. Chu B, Marwaha K, Sanvictores T, Awosika AO, Ayers D. Physiology, stress reaction. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024.
14. Glick M, Greenberg MS, Lockhart PB, Challacombe SJ, editors. *Burket's Oral Medicine*. 13th ed. Hoboken (NJ): Wiley-Blackwell; 2021.
15. McCartan BE, Lamey PJ, Wallace AM. Salivary cortisol and anxiety in recurrent aphthous stomatitis. *J Oral Pathol Med* 1996;25:357-9.
16. Nadendla LK, Meduri V, Paramkusam G, Pachava KR. Relationship of salivary cortisol and anxiety in recurrent aphthous stomatitis. *Indian J Endocrinol Metab* 2015;19:56-9.
17. Zakaria M, Hosny R. Relation between salivary cortisol and alpha-amylase levels and anxiety in Egyptian patients with minor recurrent aphthous stomatitis. *Egypt Dent J* 2018;64:1235-43.
18. Nurdiana N, Ritonga PWU, Wulandari P. The role of stress in recurrent aphthous stomatitis. *Eur J Gen Dent* 2023;12:42-7.