

The Relation Between Stress and Periodontitis in Patients Referred to Shahid Sadoughi Dental School in 2024, Yazd, Iran: A Cross-Sectional Study

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Abstract

Background and Objectives: The risk of occurrence, severity, and response to treatment of periodontal disease depends on several factors, among which stress is considered a notable risk factor. Data from studies on the effect of stress on the periodontium and related diseases are clinically significant, as stress reduction can play a role in the prevention and treatment of periodontal conditions. This study aimed to determine the association between stress and periodontitis among patients referred to Shahid Sadoughi Dental School in 2024 Yazd, Iran.

Materials and methods: In this descriptive cross-sectional study, 87 patients with periodontitis who were referred to the periodontics department and met the inclusion criteria participated. Clinical parameters, including Clinical Attachment Loss (CAL), Bleeding on Probing (BOP), and Probing Depth (PD), were assessed. Stress levels were measured using the Cohen Perceived Stress Scale questionnaire. Data were analyzed using SPSS software version 27 and statistical tests including Chi-square and Independent Samples T-test.

Results: Stress levels were low in 39 patients (44.8%) and moderate to high in 48 patients (55.2%). The mean CAL and PD in patients with moderate to high stress levels were significantly greater than those with low stress levels ($P < 0.001$ and $P = 0.029$, respectively). A statistically significant relationship was observed between the severity of periodontitis and stress level ($P = 0.008$).

Conclusion: The present study concluded that there is a significant positive correlation between stress level and periodontitis indicators (CAL and PD). Additionally, a significant correlation was found between the severity of periodontitis and stress. However, this correlation does not imply causation, and the relationship is influenced by other factors that warrant further investigation.

Keywords: Anxiety, Periodontitis, Periodontal disease.

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1. Introduction

Periodontitis is one of the most common oral diseases and is defined as a chronic inflammatory process in response to bacterial biofilm formation (1). This disease is characterized by the progressive destruction of the tooth-supporting structures, and if left untreated, it may eventually lead to tooth

loss (2). The primary cause of periodontal disease is plaque accumulation (3). However, the risk of onset, severity, and response to treatment of periodontal disease also depend on several host response factors. One such important risk factor is stress, which may be associated with systemic inflammatory processes that can contribute to the progression or exacerbation of periodontitis (4). Stress as an environmental factor affects cognition, decision-making, and

individuals' ability to carry out daily activities (5). Additionally, stress can influence processes related to blood pressure regulation (6) and amplify inflammatory responses triggered by psychological stress (5). Despite numerous studies on the relationship between stress and periodontal disease, the exact mechanisms linking the two remain largely unknown (4, 7). Some studies have shown that stress indirectly affects the periodontium through changes in behavior and lifestyle (4). These include neglecting oral hygiene practices (7), dietary changes towards sugary foods and fast food (8), smoking (9), and parafunctional habits (10). Furthermore, studies have demonstrated that exposure to chronic stress can lead to biological mechanisms that reduce the immune response and promote chronic inflammation. These mechanisms involve complex interactions between immunological, psychological, neurological, and endocrine systems (11). For example, chronic stress can increase cortisol levels, which in turn enhances the body's inflammatory response, a key mechanism in the pathogenesis of periodontitis (12). Stress also contributes to reduced salivary flow, which facilitates plaque and calculus formation and ultimately leads to periodontal disease (13). Moreover, individuals who exhibit heightened stress responses tend to respond less effectively to non-surgical periodontal treatments and are often diagnosed with more severe periodontal conditions (14). Findings from studies investigating the effects of stress on the periodontium are clinically significant, as stress is a modifiable factor. Therefore, stress reduction can play a potential role in the prevention and treatment of periodontal disease (15, 16). Given the limited number of studies investigating the association between psychological stress and periodontitis within Iranian populations, and the inconsistencies reported across different clinical settings, this study aimed to assess the relationship between stress levels and the severity of periodontitis among patients attending the Periodontics Department of Shahid Sadoughi Dental School in Yazd, Iran, during the academic years 2024-2025.

2. Materials and methods

This descriptive cross-sectional study was conducted to evaluate the relationship between stress and periodontitis among patients referred to the periodontics department of Shahid Sadoughi Dental School in Yazd during the years 2024-2025. A total of 87 patients diagnosed with periodontitis who met the inclusion criteria were enrolled in the study.

2.1. Inclusion criteria

- 1) Clinical diagnosis of periodontitis.
- 2) Informed consent to participate in the study.
- 3) Absence of systemic diseases affecting periodontal health (e.g., diabetes).
- 4) Not pregnant.
- 5) Non-smokers.
- 6) No use of sedative or antidepressant medications.
- 7) No history of psychological disorders.

2.2. Exclusion criteria

- 1) Lack of patient cooperation
- 2) Presence of systemic diseases affecting periodontal health

2.3. Data collection procedure

Patients referred to the Periodontics Department between 2024 and 2025 were clinically examined for periodontitis by the researcher. Clinical parameters assessed included: clinical attachment loss (CAL), bleeding on probing (BOP), and probing depth (PD). Eligible patients were informed about the study and its objectives, and written informed consent was obtained. A structured, face-to-face questionnaire was then administered.

2.4. Instruments and measurements

Data were collected using a two-part questionnaire. The first part recorded demographic information (age and gender). The second part included the Perceived Stress Scale (PSS) developed by Cohen et al. (1983) (17), which evaluates perceived stress over the past month using 10 items rated on a 5-point Likert scale (0 = never to 4 = very often). The total score ranges from 0 to 40, with higher scores indicating greater levels of perceived stress.

The Persian version of the PSS, validated by Ghorbani et al., demonstrated a Cronbach's alpha of 0.81 (18), confirming its reliability. Scoring was calculated according to standard procedures, with certain items reverse-scored. Based on the total score, stress levels were categorized as low stress (< 20) and moderate to high stress (≥ 20) (19).

2.5. Clinical examination

Periodontal clinical assessments were performed based on the Ramfjord Index, which evaluates six index teeth: the maxillary right first molar (tooth #16) Maxillary left central incisor (tooth #21) Maxillary left first premolar (tooth #24) Mandibular left first molar (tooth #36) Mandibular right central incisor (tooth #41) Mandibular right first premolar (tooth #44). Using a periodontal probe, the distance from the cemento-enamel junction (CEJ) to the base of the periodontal pocket was measured on the mesial and mid-buccal surfaces (20, 21). Periodontitis was diagnosed when four or more teeth exhibited at least one site with $PD \geq 4$ mm, $CAL \geq 3$ mm, and positive BOP at the same site (16). BOP was considered positive if bleeding occurred within 30 seconds after probing, indicating gingival inflammation (22). CAL was defined as the distance from the CEJ to the base of the gingival sulcus, while PD was measured clinically using a periodontal probe to determine the depth of the gingival sulcus (23).

2.6. Statistical analysis

Data were analyzed using SPSS version 27. Normality of quantitative variables was assessed using the Kolmogorov-Smirnov test. As variables followed a normal distribution,

parametric tests were used. The Chi-square test and Independent Samples T-test were applied to analyze the data. A P-value of < 0.05 was considered statistically significant.

3. Results

A total of 87 patients diagnosed with periodontitis and meeting the inclusion criteria were enrolled in the study. The mean age of the patients was 45.83 ± 11.79 years (25-64 years), of whom 47 (54%) were male, and 40 (46%) were female.

It is noteworthy that, since all patients in the present study exhibited BOP, this variable could not be statistically analyzed.

The mean stress score among patients was 20.82 ± 4.20 (12-34). Among them, 39 patients (44.8%) had low stress levels, and 48 patients (55.2%) had moderate to high stress levels (Table 1).

According to the Chi-square test results, 58.3% of males and 41.7% of females had moderate to high stress levels. No statistically significant association was found between gender and stress level ($P = 0.371$) (Table 1).

The mean age of patients with low stress was 44.64 ± 12.07 years (range 25-64), while in those with moderate and high stress, it was 46.80 ± 11.60 years (range 25-64). No statistically significant difference was found between the mean ages of the two groups ($P = 0.400$) (Table 2).

The mean Clinical Attachment Loss (CAL) in patients with low stress was 2.70 ± 0.71 mm, which was significantly lower

Table 1. Frequency distribution of gender according to stress levels in patients with chronic periodontitis referred to the dental school.

Stress level	Low	Moderate / high	Total	P-value*
Gender				
Male	(48.7%) 19	(58.3%) 28	(54%) 47	0.371
Female	(51.3%) 20	(41.7%) 20	(46%) 40	
Total	(100%) 39	(100%) 48	(100%) 87	

*Chi-square test.

Table 2. Mean age according to stress levels in patients with chronic periodontitis referred to the dental school.

Age	Sample Size	Mean $\pm$ SD (years)	Minimum	Maximum	P-value*
Stress Level					
Low	39	44.64 ± 12.07	25	64	0.400
Moderate / High	48	46.80 ± 11.60	25	64	

*Independent samples T-test.

than in patients with moderate and high stress (3.27 ± 0.55 mm) ($P < 0.001$) (Table 3).

The mean Probing Depth (PD) in patients with low stress was 2.43 ± 0.44 mm, which was significantly lower than that in patients with moderate and high stress (2.63 ± 0.38 mm) ($P = 0.029$) (Table 4).

The results showed that 48.3% of patients had mild periodontitis, while 51.7% exhibited moderate periodontitis. Among patients with mild periodontitis, 35.4% experienced moderate to high stress levels, compared to 64.6% of those with moderate periodontitis. Chi-square analysis revealed a statistically significant correlation between periodontitis severity and stress level ($P = 0.008$) (Table 5).

4. Discussion

Stress is a complex dynamic phenomenon that results from continuous interaction between individual and environment, varying in intensity and outcomes globally (24). Studies showed stress can be a risk factor for pathological disorders by influencing inflammatory processes and predisposing inflammatory diseases (25). The main objective of this study was to evaluate the association between perceived stress levels and periodontal health status in patients with periodontitis. Based on clinical parameters including BOP, CAL, and PD, the results revealed a significant positive correlation between stress levels and periodontal disease severity. Patients with moderate to high stress exhibited greater CAL and PD values compared to those with low stress, suggesting that psychological stress may be an influential factor in the exacerbation of periodontal tissue destruction.

A systematic review by Castro et al. (2020) identified stress

Table 3: Mean CAL according to stress levels in patients with chronic periodontitis referred to the dental school.

CAL Stress Level	Sample Size	Mean $\pm$ SD (mm)	Minimum	Maximum	P-value*
Low	39	2.47 $\pm$ 0.71	1.33	4	<0.001
Moderate / High	48	3.27 $\pm$ 0.55	2	4.17	

*Independent samples T-test.

Table 4: Mean PD according to stress levels in patients with chronic periodontitis referred to the dental school

PD Stress Level	Sample Size	Mean $\pm$ SD (mm)	Minimum	Maximum	P-value*
Low	39	2.43 $\pm$ 0.44	1.67	3.50	0.029
Moderate / High	48	2.63 $\pm$ 0.38	1.83	3.50	

*Independent samples T-test.

Table 5: Frequency distribution of periodontitis severity according to stress levels in patients with chronic periodontitis referred to the dental school

Stress Level Periodontitis Severity	Low	Moderate /high	Total	P-value*
Mild	(61.4%) 25	(35.4%) 17	(48.3%) 42	0.008
Moderate	(35.9%) 14	(64.6%) 31	(51.7%) 45	
Total	(100%) 48	(100%) 39	(100%) 87	

*Chi-square test.

as a psychosocial factor associated with periodontitis, emphasizing its multifactorial etiology (26). In this study, subjective stress was assessed by Cohen's questionnaire. The diagnosis of periodontitis was established through a combination of clinical indices including BOP, CAL, and PD to ensure diagnostic accuracy, consistent with previous research methodologies (27-30). Findings revealed a significant positive relationship between stress levels and periodontal parameters, with higher CAL and PD in patients with moderate to severe stress. Although several studies confirmed this relationship (31-33), others have reported no significant relationship, possibly due to methodological differences, sample size, or specific populations (e.g., pregnant women) (24,34,35). Gender differences in stress levels were not significant in this study, though other studies suggested women experience higher stress and men higher periodontitis prevalence, possibly due to hormonal factors (36). Proposed mechanisms linking stress and periodontitis

include HPA axis activation causing immune suppression and increased inflammatory markers such as IL-6, TNF- α , IL-1 β , and CRP (37-40). Stress also influences oral microbiota, increasing pathogens like *P. gingivalis* correlated with elevated cortisol (41-44). Behavioral changes associated with stress (poor oral hygiene, diet, sleep) contribute to disease risk (45-49). Given the multifactorial nature of periodontitis, involving microbial, systemic, genetic, and environmental factors (50-51), the present study highlights the role of stress as an exacerbating factor. These findings suggest that psychological management, along with oral hygiene improvement, should be considered as part of comprehensive periodontal treatment protocols (52-53). Limitations include reliance on self-report stress measures and cross-sectional design which precludes causal inference. Future longitudinal studies with larger sample sizes and the inclusion of biological markers (such as cortisol, cytokines, and CRP) are recommended to better elucidate these associations.

5. Limitations

This study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design does not allow for establishing a causal relationship between stress and periodontitis. Second, the study was conducted among patients referred to a single dental school, which may limit the generalizability of the findings to other populations and clinical settings. Third, stress was assessed using the Perceived Stress Scale, a self-reported instrument, and therefore the results may be subject to reporting or recall bias. In addition, the relatively limited sample size may have reduced the statistical power of the study. Although potential confounding factors were minimized through the inclusion and exclusion criteria, other behavioral, psychosocial, and environmental factors that may influence both stress and periodontal health could not be completely controlled. Finally, biological markers of stress, such as salivary or serum cortisol, were not assessed. Future longitudinal and multicenter studies with larger sample sizes and objective biological measures of stress are recommended to further clarify the relationship between psychological stress and periodontitis.

6. Conclusion

There is a significant positive correlation between stress levels and periodontal parameters (CAL and PD), as well as between the severity of periodontitis and stress. However, this correlation does not necessarily indicate a causal relationship; rather, it suggests a complex multifactorial interaction that warrants further investigation.

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Ethics

The research protocol was reviewed and approved by the Ethics Committee of Shahid Sadoughi University of Medical Sciences (IR.SSU.DENTISTRY.REC.1403.061).

Using artificial intelligence (AI)

It is declared by the author of this manuscript that no generative artificial intelligence (AI) or AI-assisted technologies were used to generate content, ideas, or theories during the writing process of this work. AI was utilized solely for the purpose of enhancing readability and refining language, and this use was under strict human oversight and control.

Author contributions

Farzane Vaziri: Data curation, Formal analysis, Review & editing.

Safoora Dehghani: Conceptualization, Methodology, Original draft Writing - Review & editing

Reyhaneh safari: Conceptualization, Methodology, Writing - Review & editing

Conflict of interest

The authors declare no conflict of interest.

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