



Depression in patients with chronic periodontitis: A case-control study

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Abstract

Introduction: Periodontal disease is a widespread, multifactorial inflammatory condition affecting the supporting structures of teeth. Chronic periodontitis, its most common form, progresses gradually and is influenced by both biological and psychosocial factors. Depression, a prevalent mental disorder, has been linked to periodontitis in several studies, though findings are inconsistent. This study aims to explore the potential association between the two conditions.

Materials and Methods: This study included 70 participants—35 with severe chronic periodontitis and 35 healthy controls—matched by age, sex, and education in Yazd-Iran. Depression levels were measured using the Beck Depression Inventory (BDI). Data were analyzed using SPSS-26 with Chi-square and independent t-tests to compare group differences.

Results: Demographic data showed no significant differences between the periodontitis and control groups, confirming successful matching. There was no significant difference in depression levels between the two groups ($P=0.11$). These findings suggest that the prevalence of depression in individuals with chronic periodontitis is comparable to that of periodontally healthy individuals.

Conclusion: This study found no significant difference in depression levels between individuals with severe chronic periodontitis and healthy controls. Possible reasons include a limited age range, strict inclusion criteria, and a relatively small sample size. Future research should explore biological markers and lifestyle factors to better understand the complex link between depression and periodontal disease.

Keywords: Chronic periodontitis, Depression, Inflammation

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Introduction

Periodontal disease is a multifactorial infectious condition and ranks among the most prevalent chronic diseases affecting humans (1). It encompasses a range of inflammatory disorders resulting from the invasion and accumulation of bacteria within the supporting structures of the teeth. Severe forms of the disease affect approximately 5 to 20 percent of the population. Major types of periodontal disease include gingival diseases, aggressive periodontitis, and chronic periodontitis (2).

Chronic periodontitis, the most common form of periodontal disease, is marked by the gradual destruction of the tissues that support the teeth. It typically progresses slowly and results from a persistent inflammatory response to local irritants such as dental plaque and calculus (3). Widely recognized as a multifactorial condition, chronic periodontitis is influenced by a range of etiological factors. Among these, dental biofilm is identified as the primary causative agent. Other contributing risk factors include smoking, systemic diseases, poor oral hygiene, inadequate nutrition, immune system deficiencies, and hormonal imbalances (4).

Furthermore, psychosocial variables such as stress, anxiety, and depression have also been implicated as potential risk factors in the development and progression of chronic periodontitis. Several studies have reported a possible association between psychological distress and periodontal tissue breakdown, although this link remains a subject of ongoing debate and investigation among researchers (5). Among psychosocial factors, depression has garnered particular attention due to its widespread prevalence and potential to significantly influence both mental and physical health—including oral health (6).

Depression is a prevalent mental health disorder characterized by enduring feelings of sadness, hopelessness, and a marked loss of interest or pleasure in daily activities. It is often accompanied by severe symptoms, including suicidal thoughts, pervasive feelings of guilt, and self-blame. Depression can profoundly impair an individual's ability to function, leading to significant disruptions in social, occupational, and emotional well-being (7). Additionally, it is commonly associated with physical manifestations such as restlessness, changes in appetite or sleep patterns, and difficulty concentrating. Recognized as a multifactorial condition, depression arises from

the interplay of genetic, environmental, and psychological factors that collectively contribute to its onset and progression (5).

Several clinical studies have indicated a significant relationship between periodontitis and depression. Depression in patients with periodontitis has been shown to be closely linked with the progression of the disease (8). Conversely, chronic depression may worsen the progression of periodontitis by influencing health-related behaviors, such as poor oral hygiene, smoking, and unhealthy dietary habits (9). Additionally, a population-based cohort study with a 10-year follow-up revealed a higher incidence of subsequent depression in individuals with periodontitis compared to those without the condition (10). Further research supports this connection, with one study demonstrating that psychological factors adversely affected plaque accumulation and gum health among students (11).

Regarding the underlying causes of the association between periodontitis and depression, both psychosocial and biological mechanisms have been proposed. Periodontitis may contribute to the onset of depression through the psychosocial consequences of halitosis, including feelings of shame, social isolation, embarrassment, and diminished overall well-being (12). Moreover, edentulism resulting from the inflammatory destruction of periodontal supporting structures—such as the periodontal ligament and alveolar bone—can profoundly impact an individual's quality of life (13). Tooth loss not only compromises masticatory function but also negatively affects body image, self-esteem, and perceived social standing (14). Although several studies have demonstrated a relationship between periodontitis and depression, some findings suggest otherwise. For instance, a study examining periodontal indices in elderly individuals found that while the average depression scale score was slightly higher in patients with periodontitis compared to healthy controls, the association between depression and periodontal disease index was not statistically significant (15). Similarly, a cross-sectional study assessing clinical depression across different types of periodontitis reported no significant difference in the psychological status between individuals with chronic periodontitis and healthy participants (16). Given the conflicting findings in the existing literature, the relationship between

periodontitis and depression remains inconclusive. While several studies support a significant association, others have failed to demonstrate a clear link. These inconsistencies highlight the need for further investigation using well-defined methodologies and appropriately matched control groups. Therefore, the present study aims to examine the potential relationship between chronic periodontitis and depression, and to compare the depression status of affected individuals with that of healthy controls.

Materials and Methods

This study included a total of 70 individuals, comprising 35 patients diagnosed with severe chronic periodontitis who attended the clinic at Shahid Sadoughi Dental School in Yazd, and 35 periodontally healthy controls, selected using a convenience sampling method. Inclusion criteria required the absence of systemic conditions or disorders that could influence the progression of periodontal disease. Participants were excluded if they had a history of systemic diseases, were currently taking or had taken within the past six months medications known to affect periodontal health—such as antibiotics, phenytoin, cyclosporine, non-steroidal anti-inflammatory drugs, or calcium channel blockers. Individuals undergoing treatment for depression, including psychotherapy, were also excluded. Additional exclusion criteria included unwillingness to participate or continue in the study, postmenopausal status, smoking, and the use of antidepressant medications. To minimize the confounding effects of age, sex, and educational level on depression scores, the two groups were matched accordingly using group matching. The sample size (n) was determined using the formula for comparing the means of

two groups, based on a 95% confidence level (Z) and referencing mean values from a similar study (Aeran et al., 2020). The calculated sample size was 35 individuals per group.

Research instrument

A) The Beck Depression Inventory-II (BDI-II): This tool was used to assess the level of depression among participants. The BDI is a widely recognized, validated, and reliable self-report questionnaire designed to measure the severity of depressive symptoms. It consists of 21 multiple-choice items, each scored on a scale from 0 to 3, with higher scores indicating more severe depressive symptoms. The total score ranges from 0 to 63, and the results are categorized into minimal, mild, moderate, and severe levels of depression (17,18). Participants in both the periodontitis and control groups completed the questionnaire under standardized conditions to ensure consistency and minimize bias. Statistical analyses were conducted using Chi-square tests and independent samples t-tests, with data analyzed using SPSS version 26.

Results

The demographic data are presented in Table 1. Based on the Table 1, there were no statistically significant differences between the case and control groups, indicating appropriate group matching. The results of the comparison between the two groups on the depression scale are presented in Table 2. Based on Table 2, there was no significant difference in Beck Depression Inventory (BDI) scores between the case and control groups. Therefore, the prevalence of depression in individuals diagnosed with chronic periodontitis does not differ from that of healthy individuals without the condition.

Table 1. Demographic data in case and control group

Variable	Case (n=35)	Control (n=35)	P
Gender (male:female)	16:19	17:18	0.811*
Years of education (12:16:18:22)	18:13:4:0	10:11:12:2	0.56*
Age	37.02 (5.62)	35.94 (7.28)	4.88**

*Chi-square **t-test

Table 2. Comparison of BDI scores between groups

Group	Case Mean (SD)	Control Mean (SD)	Mean Difference	P
BDI	12.00 (9.88)	8.62 (7.32)	3.37	0.11

Discussion

The aim of the present study was to compare the level of depression in individuals diagnosed with severe chronic periodontitis and healthy individuals. The results revealed no statistically significant difference in depression scores between the two groups. These findings are consistent with several previous studies that reported no meaningful association between depression and periodontal disease.

In line with our findings, Delgado-Angulo et al. investigated the association between depression, anxiety, dental caries, and periodontal disease in adults and found no significant correlation between depression and periodontal pocket depth (19). Similarly, a systematic review and meta-analysis conducted by Kisely et al., aimed at assessing oral health in individuals with anxiety and depressive disorders, concluded that there was no significant association between periodontal disease and depression (20). Other recent studies indicated that there are no significant correlation between periodontal parameters and major depressive disorder (21,22). Also in a study that conducted in Iran, researchers periodontal parameters in patients with depressive disorders and reported no significant relationship between depression and periodontal disease (23). In contrast, some studies have identified a significant relationship between periodontal disease and depression. A study found significant relationships between depression severity and worsening periodontal clinical parameters, indicating depression as a potential risk factor for periodontitis (24). Similarly other study report that a significant association between depression and periodontal disease in 135 participants, with patients experiencing moderate depression showing greater periodontal destruction and inflammation, indicated by higher bleeding on probing and probing pocket depth compared to those with mild depression and healthy controls (25). The findings of the present study, which involved 35 individuals in each group aged between 25 and 45, also indicated that the mean score on the Beck Depression Inventory (BDI) was higher in the periodontitis group compared to controls. However, this difference was not statistically significant. Several factors may explain this discrepancy with studies that reported significant associations. First, geographical and cultural differences, as well as

variability in study designs, types of depression assessed, sampling methods, and the range of controlled variables (e.g., smoking, medication use), may contribute to inconsistent results across the literature.

One notable factor in this study is the restricted age range (25–45 years), which may have influenced the findings. Previous research suggests that the likelihood of depression increases with age, and higher prevalence rates have been observed in individuals aged 45–59 compared to those aged 16–29 (26). The decision to limit the age range in this study was intended to minimize the influence of age-related confounding variables.

Another factor that may explain the absence of a significant association is the strict inclusion and exclusion criteria. Unlike some earlier studies, participants in this study were excluded if they were taking antidepressants or any other medications that could affect either depression or periodontal disease (27). Additionally, we exclude individuals who smoked cigarettes, as prior research has demonstrated that smoking can contribute to both increased depression and the progression of periodontitis (28). Moreover, some studies that have found significant associations utilized larger sample sizes, which may have increased their statistical power. In the present study, the COVID-19 pandemic and the resulting decline in clinic visits limited our ability to recruit a larger sample, which may have impacted the power to detect a statistically significant effect.

This study had several limitations. First, it did not comprehensively evaluate lifestyle factors, nutritional status, or coping mechanisms, all of which may influence both depression and periodontal health. Second, the study focused solely on depression, without considering other psychiatric comorbidities. Lastly, the study was conducted in a single urban dental clinic, which may limit the generalizability of the findings to broader or more diverse populations.

Based on the findings and limitations of this study, future research should incorporate biological markers—such as inflammatory or neurochemical indicators—alongside self-reported measures to more objectively assess depression in relation to periodontal disease. Increasing sample size, broadening the age range, and examining factors such as psychiatric medication use, lifestyle, and coping mechanisms could enhance

understanding of the complex relationship between mental health and periodontal health.

Conclusion

In summary, the present study found no statistically significant association between chronic periodontitis and depression as measured by the Beck Depression Inventory. While the mean depression score was higher in the periodontitis group, the difference did not reach statistical significance. These findings contribute to the growing body of mixed evidence on the relationship between periodontal disease and psychological health. Given the methodological strengths—such as strict inclusion criteria and control of confounding factors—as well as its limitations, including a modest sample size and narrow age range, further research is warranted. Future studies employing larger, more diverse samples and integrating objective biological and psychosocial measures may offer deeper insight into the complex interplay between periodontal and mental health.

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Conflict of Interests

The authors declare no conflict of interest.

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Ethical Considerations

This study was approved by the Ethics Committee of Shahid Sadoughi University of Medical Sciences. All participants participated after completing a written consent form and ensuring compliance with ethical standards, including the confidentiality of results.

Code of Ethics

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Authors' Contributions

E. Fallah Tafti: Data collection and fieldwork.

S.M.S. Sahaf: Manuscript drafting and submission.

Z. Salimi: Study design support and manuscript revision.

S.M. Arab Farashahi: Study design and supervision.

F.S. Vaziri: Study design and supervision.

R. Bidaki: Study design, manuscript writing, and critical revision.

A. Askari Noghani: Manuscript writing, and critical revision.

All authors reviewed and approved the final version of the manuscript.

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