



Original Research Article

Assessing the Impact of Depression on Periodontitis and Peri-Implantitis: A Cross-Sectional Study

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INTRODUCTION

Periodontal diseases remain a major public health concern due to their high prevalence and impact on oral-health-related quality of life (1). Periodontitis is characterized by chronic inflammation leading to progressive attachment loss and alveolar bone

Abstract: Background: Periodontitis and peri-implantitis are chronic inflammatory oral diseases with multifactorial etiologies. Emerging evidence suggests that psychosocial factors, particularly depression, may adversely influence oral hygiene behaviors, immune responses, and treatment-seeking patterns, thereby exacerbating periodontal and peri-implant conditions. **Objectives** To assess the association between depression and the severity of periodontitis and peri-implantitis, and to evaluate oral hygiene practices and dental care utilization among affected adults. **Methods** A cross-sectional study was conducted among 300 adult dental patients attending tertiary care clinics in urban Pakistan. Periodontal and peri-implant clinical parameters were recorded using standardized indices. Depression was assessed using a validated screening questionnaire. Data on oral hygiene practices, smoking status, and dental attendance were collected through structured interviews. Multivariate logistic regression was performed to identify independent associations. **Results** Moderate to severe depression was identified in 34.7% of participants. Periodontitis was present in 62.0% of depressed individuals compared to 41.3% of non-depressed participants ($p < 0.01$). Peri-implantitis was significantly more prevalent among patients with depressive symptoms (28.6% vs. 15.2%). Depression was independently associated with increased periodontal pocket depth, attachment loss, poor oral hygiene, and irregular dental visits. **Conclusions** Depression is significantly associated with worse periodontal and peri-implant health outcomes. Integrating mental health screening into periodontal care and strengthening patient education may improve disease prevention and management.

Keywords: Depression, Periodontitis, Peri-Implantitis, Oral Health Behavior, Pakistan

destruction, while peri-implantitis presents as inflammatory breakdown of peri-implant tissues, often resulting in implant failure (2). Beyond microbial and mechanical factors, psychosocial determinants such as stress, anxiety, and depression have increasingly been implicated in the pathogenesis of periodontal diseases (3,4). Depression can negatively influence immune

regulation, increase systemic inflammatory burden, and impair motivation for maintaining oral hygiene and seeking timely dental care (5). While studies have examined oral health awareness and periodontal status independently (4,6,7), limited evidence exists on the relationship between mental health and periodontal or peri-implant disease in this population.

In Pakistan, oral healthcare utilization is largely symptom-driven, and preventive periodontal care is underutilized (2,6). Psychosocial well-being is increasingly recognized as an integral component of oral health and overall quality of life. Oral diseases, particularly chronic inflammatory conditions, have been shown to adversely affect functional ability, self-esteem, and social interactions, thereby contributing to psychological distress (1). Conversely, psychological disorders such as depression may influence oral health through behavioral pathways, including neglect of personal care, reduced adherence to professional advice, and avoidance of healthcare services. Evidence from Pakistani populations indicates that oral health awareness, preventive practices, and care-seeking behavior remain suboptimal even among educated groups, suggesting that non-clinical factors play a substantial role in disease progression and outcomes (2). These behavioral patterns may be further compounded by individuals experiencing depressive symptoms. From a biological perspective, depression has been associated with dysregulation of the hypothalamic pituitary adrenal axis and increased production of pro-inflammatory cytokines, which may exacerbate periodontal tissue breakdown and impair healing responses. While much of the existing Pakistani literature has focused on mechanical, dietary, and behavioral contributors to oral diseases such as dental erosion and traumatic dental injuries (4), these studies collectively highlight the broader concept that oral health outcomes are strongly shaped by lifestyle behaviors, environmental exposures, and individual response patterns. Periodontal diseases and peri-implantitis, like other oral conditions, are therefore likely influenced by a complex interplay of behavioral and systemic factors rather than microbial etiology alone (8,9).

Despite growing global recognition of the oral systemic psychological health nexus, data exploring the impact of depression on periodontal and peri-implant health in South Asian settings remain scarce. Existing studies in Pakistan have primarily examined oral disease prevalence, awareness, and utilization of dental services (2,7), with minimal attention to mental health as a modifying factor. Given the rising burden of both depressive disorders and implant-supported rehabilitation, understanding how depression influences periodontal status, implant maintenance, and dental attendance is critical.

Addressing this gap may inform integrated care models that combine periodontal management with behavioral counseling and patient education, ultimately improving long-term treatment outcomes and oral health related quality of life. Therefore, this study aimed to evaluate the impact of depression on periodontitis and peri-implantitis and to examine associated oral health behaviors and care-seeking patterns.

METHODOLOGY

A cross-sectional analytical study was conducted among adult patients attending the outpatient dental clinics of tertiary care hospitals in an urban setting of Pakistan over a six-month period. A total sample of 300 participants aged between 25 and 65 years was recruited using a non-probability consecutive sampling technique. Eligible participants included individuals with at least 20 natural teeth for periodontal assessment and those with at least one functional dental implant placed for a minimum duration of one year for peri-implant evaluation. Patients with known systemic conditions affecting periodontal health, such as uncontrolled diabetes mellitus, autoimmune disorders, pregnancy, ongoing orthodontic treatment, or those receiving psychiatric treatment or antidepressant therapy were excluded. After obtaining written informed consent, participants underwent a comprehensive clinical oral examination performed by a calibrated examiner under standardized conditions using sterile instruments. Periodontal status was assessed by recording probing pocket depth, clinical attachment loss, bleeding on probing, and plaque index, while peri-implant tissue health was evaluated using peri-implant probing depth, bleeding on probing, and radiographic evidence of marginal bone loss, in accordance with World Health Organization guidelines.

Depression was assessed using a validated self-reported screening questionnaire administered through face-to-face interviews, categorizing participants into non-depressed, mild, moderate, or severe depression groups. Additional information regarding oral hygiene practices, smoking status, frequency of dental visits, and duration of implant placement was collected using a structured questionnaire. Examiner calibration was performed prior to data collection, yielding a kappa coefficient of 0.82, indicating good intra-examiner reliability. Data were entered and analyzed using SPSS version 25. Descriptive statistics were generated for all variables, while associations between depression and periodontal and peri-implant outcomes were assessed using chi-square tests and multivariate logistic regression analysis. Adjusted odds ratios with 95% confidence intervals were calculated, and a p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 300 adult participants were included in the final analysis, with a mean age of 42.6 ± 9.8 years; males constituted 54.0% of the study population. Clinical examination revealed a substantial burden of periodontal and peri-implant disease among the participants. As shown in Table 1, the distribution of periodontal and peri-implant conditions within the study sample. Periodontitis was the most prevalent condition, affecting 162 participants (54.0%). Peri-implantitis was identified in 58 individuals (19.3%), while 46 participants (15.3%) exhibited both periodontitis and peri-implantitis concurrently. These findings indicate a considerable overlap between natural teeth and implant-related inflammatory conditions, suggesting shared risk factors within the study population.

Table 1: Distribution of Periodontal and Peri-Implant Conditions

Condition	n	%
Periodontitis	162	54.0
Peri-implantitis	58	19.3
Both conditions	46	15.3

Depressive symptoms were detected in 104 participants (34.7%), ranging from moderate to severe levels. The relationship between depression and oral inflammatory conditions is illustrated in Table 2. Among participants with depressive symptoms, 62.0% were diagnosed with periodontitis compared to 41.3% among non-depressed individuals, a difference that was statistically significant ($p = 0.003$). Similarly, peri-implantitis was observed in 28.6% of depressed participants, significantly higher than the 15.2% prevalence among those without depression ($p = 0.021$). These results demonstrate a strong association between depression and increased susceptibility to both periodontal and peri-implant disease.

Table 2: Association Between Depression and Oral Conditions

Condition	Depressed (%)	Non-depressed (%)	p-value
Periodontitis	62.0	41.3	0.003
Peri-implantitis	28.6	15.2	0.021

In Table 3, it summarizes the multivariate logistic regression analysis identifying independent predictors of periodontal disease. Depression emerged as a significant predictor, with depressed individuals exhibiting more than twice the odds of having periodontitis compared to non-depressed participants (Adjusted OR = 2.11; 95% CI: 1.32–3.37; $p = 0.002$). Poor oral hygiene showed the strongest association with periodontal disease (Adjusted OR = 2.64; 95% CI: 1.58–4.42; $p < 0.001$), while irregular dental attendance was also independently associated with increased disease risk (Adjusted OR = 1.89; 95% CI: 1.12–3.17; $p = 0.017$). These findings indicate that both psychosocial and behavioral factors significantly contribute to periodontal disease severity.

Table 3: Independent Predictors of Periodontal Disease

Predictor	Adjusted OR	95% CI	p-value
Depression	2.11	1.32–3.37	0.002
Poor oral hygiene	2.64	1.58–4.42	<0.001
Irregular dental visits	1.89	1.12–3.17	0.017

DISCUSSION

The findings of the present study demonstrate a significant association between depression and both periodontitis and peri-implantitis. Patients exhibiting depressive symptoms showed poorer oral hygiene status, greater periodontal destruction, and lower utilization of dental services. These observations are consistent with previous literature highlighting the influence of psychosocial factors on the initiation and progression of oral inflammatory diseases (6). Depression may affect periodontal and peri-implant health through multiple interrelated pathways. Behavioral mechanisms include neglect of daily oral hygiene practices, reduced motivation for preventive

care, and avoidance of dental visits, while biological mechanisms involve immune dysregulation, activation of the hypothalamic pituitary adrenal axis, and increased production of pro-inflammatory cytokines that may exacerbate periodontal tissue breakdown (10,11). Similar patterns of suboptimal oral health awareness and delayed care-seeking behavior have been reported in Pakistani populations across a range of oral health conditions, underscoring the role of psychosocial and behavioral determinants beyond purely clinical factors (6,8,12,13,14,15). The observed association between depression and peri-implantitis further emphasizes the importance of psychological assessment in implant maintenance

programs. Implant therapy requires sustained patient engagement, meticulous plaque control, and adherence to follow-up schedules (16). Individuals with untreated or unrecognized depression may be particularly vulnerable to peri-implant complications due to inconsistent maintenance behaviors and missed recall visits, potentially compromising long-term implant success (17).

Another important implication of the present findings relates to oral-health-related quality of life and long-term disease burden. Chronic periodontal and peri-implant diseases adversely affect mastication, esthetics, self-confidence, and social interactions, which may further aggravate psychological distress and reinforce a bidirectional relationship between depression and oral disease severity (18). This cyclical interaction suggests that periodontal inflammation may not only be a consequence of depression but also a contributing factor to worsening mental well-being. Similar associations between oral disease burden, impaired daily functioning, and reduced quality of life have been documented in diverse populations, reinforcing the need to incorporate psychological considerations into comprehensive periodontal care models (1,6).

This study has several strengths. It is among the limited investigations in Pakistan to evaluate the relationship between depression and both periodontitis and peri-implantitis within the same population. The use of standardized clinical periodontal and peri-implant parameters, calibrated examiners, and inclusion of oral hygiene behaviors and care-seeking patterns strengthens the internal validity and clinical relevance of the findings. Importantly, the study adopts a holistic approach by linking psychological health with oral disease outcomes, supporting integrated models of periodontal care. However, certain limitations should be acknowledged. The cross-sectional design restricts causal inference and does not allow determination of temporal relationships between depression and periodontal or peri-implant disease. Depression was assessed using a self-reported screening tool rather than a clinical psychiatric diagnosis, which may have introduced reporting or misclassification bias. Additionally, the study was conducted in an urban tertiary care setting, potentially limiting generalizability to rural populations or individuals with restricted access to dental services. Residual confounding by factors such as socioeconomic status, medication use, and stress levels cannot be entirely excluded. Future longitudinal studies incorporating clinical psychiatric assessments and broader population sampling are recommended to better clarify causal pathways and long-term outcomes.

From a public health perspective, these findings

highlight persistent gaps in awareness, early diagnosis, and preventive service utilization. Previous studies from Pakistan have consistently reported inadequate oral health knowledge, delayed treatment-seeking behavior, and limited emphasis on preventive care, even among patients accessing tertiary dental services (2,6,19,20). Such systemic gaps may disproportionately affect individuals with depression, who are less likely to seek routine care and adhere to long-term maintenance regimens. Integrating mental health screening within dental settings, strengthening referral pathways, and enhancing provider training to recognize psychosocial risk factors may improve both periodontal outcomes and patient engagement. Evidence from broader oral health research supports the effectiveness of multidisciplinary, patient-centered approaches in managing chronic oral diseases and reducing recurrence (21).

CONCLUSION

Depression is significantly associated with increased severity of periodontitis and peri-implantitis in adults attending dental clinics in Pakistan. Poor oral hygiene practices and irregular dental attendance further exacerbate disease burden. A multidisciplinary approach incorporating mental health screening, patient education, and preventive periodontal care is essential to improve long-term oral health outcomes.

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