

Unveiling The Hidden Link: The Impact Of Obesity On Periodontal Health In Adults

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Abstract

Background: Obesity and periodontitis are both significant public health concerns, with emerging evidence suggesting a strong link between the two conditions. This study aimed to evaluate the association between obesity and periodontal disease among adults aged 35-44 years.

Methods: A cross-sectional study was conducted on 360 adults, aged 35-44 years, to investigate the relationship between body mass index (BMI) and periodontal health. Periodontal status was assessed using the Community Periodontal Index (CPI) and loss of attachment (LOA) scores. Participants were categorized into normal, overweight, and obese groups based on BMI, and the prevalence of periodontitis was compared across these categories.

Results: The study revealed a significant association between increased BMI and the prevalence of periodontitis. Overweight participants exhibited higher rates of LOA (78.15%) compared to individuals with normal BMI (30.25%). Notably, all obese participants (100%) experienced attachment loss. CPI scores indicated that obese individuals had more severe periodontal pockets (78.69%) than their normal-weight counterparts. These findings suggest that obesity contributes to the progression and severity of periodontal disease.

Conclusion: Obesity is strongly associated with an increased risk of periodontitis, as evidenced by higher rates of LOA and periodontal pockets in overweight and obese individuals. The results underscore the need for integrated health interventions targeting both weight management and oral health to reduce the burden of periodontal disease in obese populations. Further research is required to explore the mechanisms linking obesity and periodontal disease to develop effective preventive strategies.

Keywords: Obesity, Periodontitis, Body Mass Index, Periodontal Health, Community Periodontal Index, Attachment Loss.

Introduction

Obesity and periodontitis are two significant public health challenges that have garnered increasing attention in recent years.[1] Both conditions are prevalent worldwide and share common risk factors, leading researchers to explore potential associations between them.[2] Obesity, defined as an abnormal or excessive accumulation of body fat, is recognized as a major risk factor for several systemic diseases, including cardiovascular diseases, type 2 diabetes, and certain types of cancer. [3] The World Health Organization (WHO) has reported a sharp increase in global obesity rates, with the prevalence of obesity tripling over the last few decades. [4,5] concurrently periodontitis, a chronic inflammatory disease of the supporting structures of the teeth, affects a significant portion of the adult population globally, leading to tooth loss and a decline in oral health quality of life.[6]

Obesity is increasingly recognized as a risk factor for periodontitis due to its impact on systemic inflammation. Adipose tissue in obese individuals secretes pro-inflammatory cytokines, such as tumor necrosis factor-alpha (TNF- α) and interleukin-6 (IL-6), which can exacerbate the inflammatory response in periodontal tissues.[2,6] This systemic inflammatory state contributes to the progression of periodontal disease by enhancing the body's immune response to bacterial plaque, leading to increased tissue destruction. [8,9] Several studies have demonstrated a positive correlation between obesity and periodontitis, with obese individuals showing higher rates of periodontal disease compared to their normal-weight counterparts.[5,6,9-11]

Numerous cross-sectional studies have provided evidence supporting the association between obesity and periodontitis. For instance, a study conducted in India revealed a significant relationship between body mass index (BMI) and periodontal disease severity in adults, highlighting the need for periodontal care in obese populations.[2,3,6,12] Similarly, a population-based study in Australia found that obese individuals had a higher prevalence of periodontitis, although the association diminished after controlling for confounding factors such as smoking and dental hygiene practices.[6] These findings suggest that while obesity plays a role in the development of periodontitis, other lifestyle factors also contribute significantly to disease onset.

The biological mechanisms linking obesity and periodontitis are complex and multifactorial. Obesity induces a chronic low-grade inflammatory state characterized by the overproduction of adipokines, such as leptin and resistin, which modulate immune responses and contribute to periodontal tissue breakdown.[5,6] Additionally, obesity may alter the subgingival microbial composition, further increasing the susceptibility to periodontitis.[13] The role of insulin resistance, commonly associated with obesity, has also been implicated in the progression of periodontal disease by impairing wound healing and enhancing inflammatory pathways.[6] The growing body of evidence underscores the importance of addressing obesity as a modifiable risk factor for periodontitis. Preventive strategies targeting obesity, alongside regular periodontal care, may offer substantial benefits in reducing the global burden of periodontitis. Further research is warranted to elucidate the underlying mechanisms and to develop integrated approaches for managing both conditions effectively.

Methodology

Study Design

This cross-sectional study was conducted to investigate the association between obesity and periodontitis among adult patients. The study was conducted in the selected sample population and informed consent was taken from all participants prior to their inclusion.

Study Population

A total of 360 participants, aged between 35 and 44 years, were included in the study. The participants who were selected were explained about the nature of the study. This age group was chosen based on the World Health Organization's (WHO) recommendations, as it is considered as a key demographic for assessing periodontal disease prevalence. The participants were considered in the study with the following selection criteria.

Inclusion criteria:

- Participants aged 35–44 years.
- Individuals with at least 20 natural teeth.
- Those willing to provide informed consent.

Exclusion criteria:

- Patients with systemic conditions affecting periodontal health, such as diabetes or cardiovascular diseases.
- Individuals who had undergone periodontal treatment or antibiotic therapy within the last three months.
- Pregnant and lactating women.
- Participants with mental health disorders affecting their ability to comply with the study protocol.

Data Collection

Data were collected over a period of three months using a structured questionnaire and clinical periodontal examination. The questionnaire gathered information on demographic details, oral hygiene practices (e.g., frequency of brushing, brushing technique), and lifestyle factors such as smoking habits and body mass index (BMI). BMI was calculated by dividing body weight (in kg) by height squared (in meters), and participants were classified as normal, overweight, or obese based on WHO guidelines.

Clinical Examination

Periodontal status was assessed using the Community Periodontal Index (CPI) and the Loss of Attachment (LOA) index. A trained examiner performed a full-mouth periodontal examination using a CPI probe. Probing depth and clinical attachment loss were recorded at six sites per tooth, excluding third molars. The CPI scores were categorized into periodontal health, bleeding, calculus, and pocket categories to evaluate the severity of periodontal disease.

Training and Calibration

To ensure consistency and accuracy, the examiner underwent a two-day calibration and training session. Inter-examiner reliability was confirmed using Kappa statistics, with a value of 0.84, indicating strong agreement.

Statistical Analysis

Data were analyzed using SPSS software (version 21.0). Descriptive statistics were used to present the demographic characteristics of the study population. The Chi-square test was applied to assess the association between BMI and periodontal disease. A one-way analysis of variance (ANOVA) was conducted to compare CPI and LOA scores between BMI categories (normal, overweight, and obese). A p-value of less than 0.05 was considered statistically significant.

Result

The study included 360 participants, with a majority (54.7%) in the 35-39 years age group, and 45.3% between 40-44 years. The distribution of gender was nearly even, with 52.5% male and 47.5% female participants. Regarding the BMI categories, most participants had a normal BMI (69.4%), while 22.8% were classified as overweight, and a smaller proportion, 7.8%, were obese.

The analysis of loss of attachment (LOA) and CPI scores in relation to BMI revealed significant trends. Among participants with a normal BMI, 69.75% had no LOA, while 30.25% presented with LOA. In contrast, overweight participants exhibited a higher prevalence of LOA, with 78.15% affected and only 21.85% without LOA. All obese participants (100%) had LOA, underscoring the strong association between increased BMI and periodontal attachment loss.

In terms of CPI scores, normal BMI participants showed a distribution across all categories: 15.25% were healthy, 26.27% had bleeding, 22.88% exhibited calculus, and 35.59% had periodontal pockets. Among overweight individuals, the pocket category was predominant (65%), while the healthy category was the smallest (8.33%). Notably, all obese participants (78.69%) had periodontal pockets, with no individuals classified as healthy, indicating a clear relationship between higher BMI and severe periodontal disease progression.

Discussion

The findings from our study demonstrate a significant association between BMI and periodontal disease, particularly in the context of loss of attachment (LOA) and community periodontal index (CPI) scores. In our cohort of 360 participants, the majority (69.4%) had a normal BMI, while 22.8% were overweight, and 7.8% were classified as obese. A higher prevalence of LOA was observed among overweight and obese individuals. Specifically, 78.15% of overweight participants and 100% of obese participants exhibited LOA, compared to only 30.25% of individuals with a normal BMI. Additionally, the CPI score distribution revealed that a larger proportion of obese individuals presented with periodontal pockets (78.69%), indicating advanced periodontal disease, whereas individuals with a normal BMI exhibited a more balanced distribution across the CPI categories. These findings align with previous research that underscores the link between obesity and periodontitis. Obesity has emerged as a major public health concern worldwide, particularly in developing countries [3]. The increasing prevalence of obesity, driven by changing nutritional patterns and sedentary lifestyles, has been associated with a range of systemic health conditions, including periodontitis [14]. Our study adds to the growing body of evidence suggesting a strong association between obesity and periodontal disease. Similar to findings by Sahar et al., our study observed a higher prevalence of periodontitis among overweight and obese individuals [3]. The association between obesity and periodontitis is supported by evidence from multiple studies, including the systematic review by Shawish et al. (2022), which highlights that obesity increases the systemic inflammatory burden, thereby elevating the risk for periodontal disease [5]. But there was also a result that contradicted it [15]. Not only that, but obesity is reportedly second only to smoking in terms of risk factors for inflammatory periodontal tissue destruction [16].

This relationship may be attributed to the chronic inflammatory state induced by obesity, where elevated levels of pro-inflammatory cytokines such as TNF- α and interleukins are known to exacerbate periodontal tissue breakdown [3]. Additionally, the unhealthy dietary habits commonly associated with obesity, such as high sugar intake and lower consumption of essential nutrients, may contribute to the deterioration of periodontal health [5,17,18].

Several studies have highlighted the role of adipokines, such as leptin and resistin, in mediating the inflammatory pathways that link obesity to periodontitis [3,19,20]. Our findings of higher LOA and severe periodontal pockets among obese individuals align with research that suggests that these biochemical mediators exacerbate the immune response to bacterial biofilms, leading to accelerated periodontal tissue destruction. Furthermore, the World Health Organization (WHO) emphasizes BMI as a critical tool for identifying individuals at risk of obesity-related health issues, including periodontal disease. Our study focused on the age group of 35–44 years, which is consistent with WHO recommendations for periodontal disease surveillance. Prior studies, such as those conducted by Chopra et al., have similarly noted a higher prevalence of periodontitis in middle-aged populations, particularly among those with higher BMI [11,21].

The findings of our study reinforce the need for preventive interventions targeting both obesity and periodontal disease. Health professionals, including dentists, must play a proactive role in screening for obesity and educating patients about the importance of maintaining a healthy weight to prevent periodontal complications. Regular monitoring of weight and periodontal health should be integrated into routine clinical practice to reduce the burden of these interrelated conditions [3,22]. Although our study was cross-sectional and cannot establish causality, the observed associations between obesity and periodontal disease highlight the importance of early intervention and prevention strategies in reducing the risk of periodontitis in obese populations. Further longitudinal studies are needed to explore the mechanisms linking these two conditions and to develop comprehensive strategies for managing their co-occurrence.

Conclusion

Our study demonstrates a strong association between obesity and periodontitis among adults aged 35-44 years. Overweight and obese individuals exhibited significantly higher rates of periodontal attachment loss and more advanced periodontal disease, as evidenced by the greater prevalence of periodontal pockets. These findings suggest that obesity plays a critical role in exacerbating periodontal health issues, likely due to the systemic inflammatory burden associated with increased adipose tissue. Given the growing prevalence of obesity, particularly in developing countries like India, these results highlight the urgent need for integrated preventive strategies that address both weight management and oral health. Targeted interventions, including lifestyle modifications, regular dental check-ups, and education on proper oral hygiene practices, are essential in reducing the dual burden of obesity and periodontal disease. Further research should explore the underlying mechanisms linking these conditions to develop more effective management and prevention strategies.

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Table 1: Demographic profile of study participants

Category		Number	Percentage
Age	Age 35-39	197	54.7
	Age 40-44	163	45.3
Gender	Male	189	52.5
	Female	171	47.5
BMI	Normal BMI	250	69.4
	Overweight	82	22.8
	Obese	28	7.8

Table 2: Association between Loss of Attachment and CPI score distribution among study participants by BMI Category

BMI Category	LOA Absent	LOA Present	Healthy (CPI)	Bleeding (CPI)	Calculus (CPI)	Pocket (CPI)
Normal	83 (69.75%)	36 (30.25%)	18 (15.25%)	31 (26.27%)	27 (22.88%)	42 (35.59%)
Overweight	26 (21.85%)	93 (78.15%)	10 (8.33%)	15 (12.5%)	17 (14.17%)	78 (65.0%)
Obese	0 (0.0%)	120 (100.0%)	0 (0.0%)	0 (0.0%)	26 (21.31%)	96 (78.69%)
p-value	0.05		0.001			