RESEARCH PAPER

Obesity And Oral Health: A Cross Sectional Exploration Of Periodontal Disease Prevalence

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Abstract

Obesity and periodontal disease are chronic inflammatory conditions that share several biological and behavioral risk factors. The increasing global prevalence of both disorders has raised concerns regarding their potential interrelationship and impact on systemic as well as oral health. The present cross sectional study aimed to evaluate the association between obesity and periodontal disease and to assess the influence of obesity on clinical periodontal parameters.

A total of 300 participants were included in the study with a mean age of 51.57 ± 15.00 years. Participants were categorized into obese and non obese groups based on body mass index criteria. Demographic characteristics, behavioral habits, and oral hygiene practices were recorded using a structured questionnaire. Clinical periodontal parameters including gingival index, probing pocket depth, clinical attachment level, plaque index, oral hygiene index simplified, and tooth mobility were evaluated. Statistical analysis was performed using chi square test, t test, and analysis of variance.

A statistically significant association was observed between obesity and smoking status, brushing frequency, and all clinical periodontal parameters ($p < 0.001$). Obese individuals demonstrated higher gingival inflammation, deeper periodontal pockets, greater attachment loss, and increased tooth mobility compared with non obese individuals.

Within the limitations of this study, obesity appears to act as a significant systemic risk factor contributing to periodontal disease severity. These findings highlight the importance of integrated preventive strategies addressing both metabolic health and periodontal health.

Keywords: Obesity, Periodontal Disease, Inflammation, Body Mass Index, Periodontal Parameters.

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I. INTRODUCTION

Obesity and periodontal disease represent two major chronic health conditions that have emerged as significant public health concerns worldwide. Both diseases are characterized by complex multifactorial etiologies involving genetic, environmental, behavioral, and systemic factors. Recent evidence suggests that these conditions may be biologically interconnected through inflammatory and metabolic pathways linking systemic and oral health.[1]

Periodontal disease is a chronic inflammatory disorder affecting the supporting structures of the teeth, including gingiva, periodontal ligament, cementum, and alveolar bone. It is estimated that nearly half of the adult population worldwide suffers from some form of periodontal disease.[2] Severe periodontitis is considered one of the most prevalent chronic diseases globally and is a major cause of tooth loss in adults.[3]

Obesity is defined as an excessive accumulation of adipose tissue that may impair health. According to the World Health Organization, more than 650 million adults worldwide are classified as obese.[4] Body mass index is commonly used to assess obesity, with individuals having BMI ≥ 30 kg/m² considered obese.

Adipose tissue is now recognized as an active endocrine organ that produces numerous pro inflammatory cytokines and adipokines, including tumor necrosis factor alpha, interleukin 6, leptin, and resistin. These inflammatory mediators contribute to a chronic low grade systemic inflammatory state.[5]

Several epidemiological studies have reported an association between obesity and periodontal disease. Obese individuals have been shown to exhibit increased prevalence and severity of periodontitis compared with individuals of normal weight.[6–8] The inflammatory mediators released by adipose tissue may enhance host inflammatory responses to periodontal pathogens, thereby accelerating periodontal tissue destruction.[9]

In addition, obesity is associated with metabolic dysregulation, oxidative stress, and altered immune responses, which may further increase susceptibility to periodontal inflammation and impair periodontal tissue healing.[10] Conversely, periodontal infection may contribute to systemic inflammation through the release of inflammatory mediators into the circulation.[11]

Despite growing evidence supporting the relationship between obesity and periodontal disease, the precise mechanisms underlying this association remain incompletely understood. Therefore, the present study was conducted to evaluate the association between obesity and periodontal disease and to assess the effect of obesity on clinical periodontal parameters.

II. MATERIALS AND METHODS

Study Design

The present study was designed as a cross sectional observational study conducted over a period of three months.

Source of Data

Participants were recruited from patients visiting the outpatient department of the Department of Periodontology at Inderprastha Dental College and Hospital, Sahibabad, and from dental camps organized in the Ghaziabad region.

Sample Size

A total of 300 participants were included in the study.

Inclusion Criteria

Participants aged between 30 and 70 years who were categorized as obese or non obese based on WHO body mass index criteria were included. Only systemically healthy individuals who provided informed consent were enrolled in the study.

Exclusion Criteria

Individuals with systemic diseases affecting periodontal status such as diabetes mellitus or cardiovascular disease were excluded. Pregnant or lactating women, individuals undergoing orthodontic treatment, patients who had received periodontal therapy within the last six months, and those taking medications affecting periodontal health were also excluded.

Clinical Parameters

The following periodontal parameters were evaluated:

- Oral Hygiene Index Simplified (Greene and Vermilion)
- Plaque Index (Silness and Loe)
- Gingival Index (Loe and Silness)
- Probing Pocket Depth
- Clinical Attachment Level
- Tooth Mobility according to Miller classification

Clinical examination was performed using a mouth mirror and WHO periodontal probe under natural illumination.

Statistical Analysis

Quantitative variables were analyzed using t test and analysis of variance, while qualitative variables were analyzed using chi square test. Statistical significance was considered at $p < 0.05$.

III. RESULTS

A total of 300 participants were included in the present study with a mean age of 51.57 ± 15.00 years. Among the participants, 185 (61.7%) were females and 115 (38.3%) were males. The majority of individuals were systemically healthy, with 288 participants (96%) reporting no systemic illness**,** while 12 participants (4%) reported systemic conditions**.** Based on body mass index classification, 164 participants (54.7%) were categorized as obese, whereas 136 participants (45.3%) were classified as non-obese**.**

Variable	N (%)
Age (in years)	51.57 ± 15.00
Gender	Male: 115 (38.3%) Female: 185 (61.7%)
Systemic conditions	Yes: 12 (4%) No: 288 (96%)
Smoking status	Never smoked: 256 (85.3%) Former smokers: 37 (12.3%) Current smokers: 7 (2.3%)
Alcohol consumption	Never: 152 (50.7%)

	Occasionally: 124 (41.3%) Regularly: 24 (8%)
Brushing frequency	Irregularly: 16 (5.3%) Once daily: 121 (40.3%) Twice daily: 61 (20.3%) More than twice: 102 (34%)
Obesity	Yes: 164 (54.7%) No: 136 (45.3%)

Table 1: Demographic and baseline characteristics of the study population.

Smoking habits varied among the study population. Overall, 256 participants (85.3%) had never smoked**,** 37 participants (12.3%) were former smokers, and 7 participants (2.3%) were current smokers. A statistically significant association was observed between smoking status and obesity ($p < 0.001$). All non-obese participants reported never smoking, whereas among obese individuals 120 (73.2%) had never smoked, 37 (22.6%) were former smokers, and 7 (4.3%) were current smokers**.**

Oral hygiene habits also differed within the population. 121 participants (40.3%) brushed once daily**,** 61 (20.3%) brushed twice daily**,** 102 (34%) brushed more than twice daily, and 16 participants (5.3%) reported irregular brushing patterns. A statistically significant difference was observed between brushing frequency and obesity status ($p < 0.001$). Among non-obese individuals, brushing once daily was most common (43.4%), whereas among obese participants the majority reported brushing more than twice daily (42.7%). Despite the higher reported brushing frequency, obese individuals demonstrated poorer periodontal health outcomes.

Variable	Category	Non-obese	Obese	p-value
Smoking status	**Never smoked**	136 (100%)	120 (73.2%)	<0.001*
	Former smoker	0	37 (22.6%)	
	Current smoker	0	7 (4.3%)	
Brushing frequency	**Irregularly**	8 (5.9%)	8 (4.9%)	<0.001*
	Once daily	59 (43.4%)	62 (37.8%)	
	twice daily	37 (27.2%)	24 (14.6%)	
	More than twice	32 (23.5%)	70 (42.7%)	

Table 2: Association between smoking status, brushing frequency, and obesity.

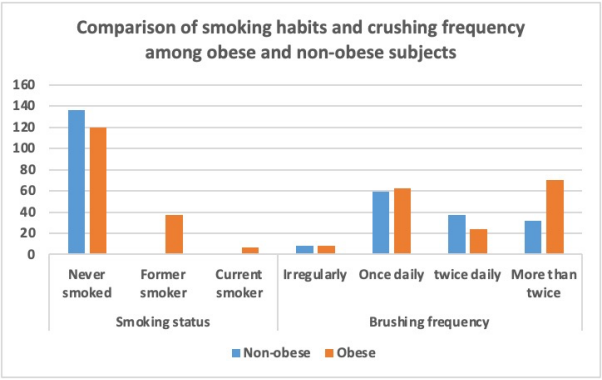

Fig. 1: Comparison of smoking habits and brushing frequency among obese and non-obese participants.

Comparison of periodontal parameters revealed highly significant differences between obese and non-obese participants ($p < 0.001$). With respect to gingival inflammation, mild gingivitis was observed only among non-obese individuals (22.1%), whereas no mild cases were found among obese participants. Moderate gingivitis was present in 61.8% of non-obese individuals and 72% of obese individuals, while severe gingivitis was more prevalent among obese participants (28%) compared with non-obese participants (16.2%)**.**

In terms of probing pocket depth, 4.4% of non-obese participants exhibited normal probing depth (<3 mm), whereas no obese individuals showed normal pocket depth. Advanced periodontal pockets (7–12 mm) were observed in 38.4% of obese participants, indicating more severe periodontal destruction.

Clinical attachment loss also differed significantly between the two groups. Mild attachment loss (1–2 mm) was recorded only among non-obese individuals (27.9%)**,** while severe attachment loss (>5 mm) was markedly higher among obese participants (43.9%) compared with non-obese participants (10.3%)**.**

Similarly, tooth mobility demonstrated greater severity among obese individuals. In the non-obese group, 10.3% of participants exhibited no tooth mobility**,** whereas in the obese group no participants presented with firm teeth**.** Class II mobility (47%) and Class III mobility (28.7%) were considerably more common among obese participants**,** reflecting advanced periodontal tissue destruction.

Variable	Category	Non-obese	Obese	p-value
Gingivitis	**Mild**	30 (22.1%)	0	<0.001*

	Moderate	84 (61.8 %)	118 (72%)	
	Severe	22 (16.2 %)	46 (28%)	
Pocket depth	**Normal (<3mm)**	6 (4.4%)	0	<0.0 01*
	Mild (4-5mm)	55 (40.4 %)	40 (24.4 %)	
	Moderate (5.7mm)	75 (55.1 %)	61 (37.2 %)	
	Advanced (7-12mm)	0	63 (38.4 %)	
CAL	**Mild (1-2mm)**	38 (27.9 %)	0	<0.0 01*
	Moderte (3-4mm)	84 (61.8 %)	92 (56.1 %)	
	Severe (>5mm)	14 (10.3 %)	72 (43.9 %)	
Tooth mobility	**Absent**	14 (10.3 %)	0	<0.0 01*
	Class I	67 (49.3 %)	40 (24.4 %)	
	Class II	52 (38.2 %)	77 (47%)	
	Class III	3 (2.2%)	47 (28.7 %)	

Table 3: Comparison of periodontal parameters between obese and non-obese participants.

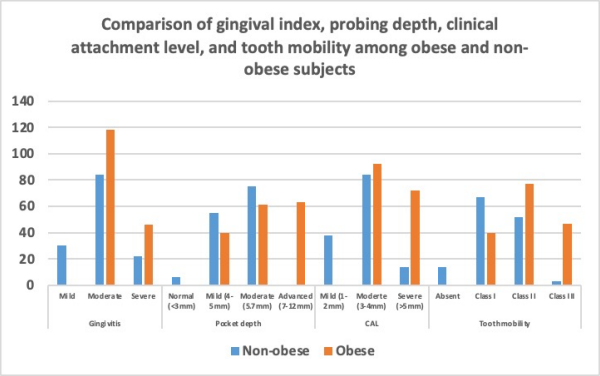

Fig. 2: Comparison of gingival index, probing pocket depth, clinical attachment level, and tooth mobility between obese and non-obese participants.

Overall, the findings of the present study demonstrate that obesity is significantly associated with increased severity of periodontal disease, including higher gingival inflammation, deeper periodontal pockets, greater clinical attachment loss, and increased tooth mobility

IV. DISCUSSION

The present study evaluated the association between obesity and periodontal disease by comparing clinical periodontal parameters among obese and non obese individuals. The results demonstrated that obesity was significantly associated with increased severity of periodontal disease.

These findings are consistent with previous studies that reported a positive association between obesity and periodontal disease. Al Zahrani et al. reported that obese individuals exhibit a significantly greater risk of developing periodontal disease compared with individuals of normal body weight.[6] Similarly, Chaffee and Weston reported that obesity is associated with increased prevalence and severity of periodontitis.[7]

One of the most important biological mechanisms linking obesity and periodontal disease is systemic inflammation. Adipose tissue produces pro inflammatory cytokines such as tumor necrosis factor alpha and interleukin 6 that may enhance inflammatory responses within periodontal tissues.[9] These inflammatory mediators can stimulate osteoclastic activity and increase connective tissue degradation, leading to periodontal tissue destruction.

In the present study, obese individuals exhibited significantly greater probing pocket depth compared with non obese individuals. Elevated systemic inflammatory markers including C reactive protein may influence periodontal microcirculation and promote

inflammatory cell infiltration, thereby accelerating periodontal breakdown.[12]

Additionally, obesity may impair immune responses and host defense mechanisms, leading to increased susceptibility to periodontal infection. Alterations in adipokines such as leptin and resistin may also influence bone metabolism and contribute to alveolar bone loss.[13]

The findings of this study emphasize the importance of recognizing obesity as a potential systemic risk factor for periodontal disease. Management of obese patients should therefore involve an integrated approach including periodontal evaluation, lifestyle modification, nutritional counseling, and weight management.

However, the cross sectional design of this study limits the ability to establish causal relationships. Further longitudinal studies are necessary to clarify the mechanisms linking obesity and periodontal disease.

V. CONCLUSION

Within the limitations of the present study, obesity demonstrated a significant negative impact on periodontal health. Obese individuals exhibited greater gingival inflammation, deeper periodontal pockets, increased clinical attachment loss, and higher tooth mobility compared with non obese participants.

These findings suggest that obesity may function as an important systemic risk factor for periodontal disease through inflammatory and metabolic mechanisms. Recognition of obesity as a modifiable risk factor highlights the need for interdisciplinary collaboration between dental and medical professionals to improve both oral and systemic health outcomes.

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Conflicts of Interest

The authors declare that they have no conflicts of interest regarding this study.

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