Relationship between Obesity and Periodontitis in 20-50 Year Old Adults of South Canara, India

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Abstract

Background: There is an increase in prevalence of obesity all over the world, including developing countries like India. There are studies showing correlation between obesity and periodontitis, but there are contradictory studies too. The purpose of this study is to delineate the relationship between obesity and periodontitis, in a small representative sample of South Indian population, by eliminating the confounding factor tobacco smoking.

Objective: The aim was to evaluate the relationship between obesity and periodontitis in 20-50 years old adults in South Canara District, Karnataka, India.

Materials and Methods: A cross-sectional descriptive study was conducted to evaluate the relationship between obesity and periodontitis in 20-50 years old adults. Study population consisted of 148 patients who visited Yenepoya Medical and Dental colleges meeting the inclusion criteria. Of the total sample, 74 patients were obese, and 74 were non-obese. The study sample included the age group of 20-50 years old adults. The criteria used to differentiate obese and non-obese subjects were based on the criteria given by World Health Organization (2000). (i.e., body mass index [BMI] ≥30 kg are obese). BMI was calculated as body weight in kg/height in meter square. The periodontal status was compared between obese and non-obese persons by community periodontal index and loss of attachment. Informed consent was obtained prior to examination from the subjects. Data were statistically analyzed using SPSS version 18 and Pearson’s Chi-square test.

Results: In this study, prevalence of periodontal disease was higher in the obese group (59.6%) when compared to the normal group (40.4%). However, the association was not statistically significant. (P = 0.063).

Conclusion: Prevalence of periodontal disease is higher in the obese group, but there is only a weak association between obesity and periodontitis.

Keywords: Body mass index, Obesity, Old adults, Periodontitis

INTRODUCTION

Obesity is a chronic disease with multifactorial etiology, in which excess body fat has accumulated to the extent that it have an adverse effect on general health and life expectancy and also causes disfigurement of the body.1 The global obesity epidemic has been described by the World Health Organization (WHO) (2000) as one of the most escalating, yet most neglected, public health problems that astounds both more- and less-developed countries. Statistics have already alerted health care workers, as excess body weight is now the sixth important risk factor contributing to disease worldwide.2 Obesity is a major culprit for a variety of co-morbidities and complications that affect overall health. Hence, it is high time to consider obesity as a major public health problem today.3 Statistics reveal that two-thirds of adults in the United States today are obese or overweight. In the United States, 28% of men, 34% of women, and nearly 50% of non-Hispanic black women are currently obese. What

INTRODUCTION
that is really alarming is the fact that, the distribution of (body mass index [BMI], the weight in kilograms divided by the square of the height in meters) has shifted in a skewed fashion such that the proportion of people with extreme obesity has increased at an especially rapid rate. These trends are not pertaining to a specific group, but have affected all major racial and ethnic groups, all regions of the country, and all socio-economic strata, with the largest increases in obesity occurring among children and minorities. Obesity is a risk factor for several chronic diseases, such as hypertension, type two diabetes, dyslipidemia, and coronary heart disease. Statistics showed that the cost associated with the management of obesity and obesity-related diseases accounts for about 5% of total healthcare expenditures in most industrialized countries. Hence, it has become mandatory to acquire more knowledge on the versatile areas like obese persons and their management, the need for awareness regarding the change in lifestyles across the spectrum of health professionals, including dentists.

In spite of all this, the Third National Family Health Survey-3 has reported that there is an increasing tendency of obesity in Indian population. Cross sectional studies suggest that the obesity is also associated with oral diseases, but its severity and extent still not clearly defined. On accordance with the advent of newer diagnostic methods recent studies have suggested that obesity is associated with oral diseases, particularly the periodontitis. Periodontitis is an inflammatory disease of the supporting tissues of the teeth. It can be caused by specific microorganism or group of microorganism, resulting in progressive destruction of the periodontal ligament and alveolar bone. Cardinal signs of periodontal destruction are pocket formation, recession, or both. Fat tissue as we consider, is not merely a passive triglyceride reservoir of the body, but also produces a vast amount of inflammatory cytokines and hormones, that has a devastating effect on the periodontium. There are enough evidences for the fact that inflammatory diseases like periodontitis induce the production of pro-inflammatory cytokines such as tumor necrosis factor alpha (TNF-α), interleukin (IL-1), and IL-6. TNF-α plays a crucial role in the development of periodontitis. An enhanced level of TNF-α is reported in gingival-crevicular-fluid (GCF) in patients with periodontitis. These observations suggest that there can be considerable correlation in the incidence of obesity, periodontitis, and associated chronic diseases. All these can be complementary, i.e., one predispose to the other, which makes the measurement of correlation cumbersome. However, present studies are insufficient to conclude whether such associations are causal. Hence the current study was conducted with an objective to evaluate the relationship between obesity and periodontitis in 20-50 years old adults in South Canara, India.

**MATERIALS AND METHODS**

A cross-sectional descriptive study was conducted for a period extending from May-November 2013. Sample size had been taken on the basis of allowable error of (L) of 6%. Study sample consisted of 148 patients attended Yenepoya medical and dental college’s outpatient department (OPD) who met the inclusion criteria. Of the total sample, 74 patients were obese, and 74 were non-obese. Ethical clearance was obtained from Institution Ethics Committee, Yenepoya University (YUEC118/1/6/2013). The inclusion criterion for the study was as follows: Dentate persons with minimum six or more teeth including both upper and lower dental arches between the age group of 20-50 years, who were non-smokers (who had quit smoking cigarettes after smoking for <10 years, those who had no history of smoking). Obese and non-obese persons without any systemic diseases. Patients who have not received periodontal treatment or antibiotics for at least 3 months prior to study. Individuals who provide consent to participate in the study. Chronic use of anti-inflammatory drugs and premedication 3 months prior to the study, pregnancy were categorized as exclusion criteria’s. The criteria used to differentiate obese and non-obese subjects based on the criteria given by WHO 2000 (i.e., BMI ≥30 kg are Obese). BMI was calculated as body weight in kg/height in meter square. The periodontal status was compared between obese and non-obese persons by community periodontal index and loss of attachment. Variables relating to the measurement of periodontal supporting tissues include attachment loss, probing depth and furcation involvement. Periodontitis group involved dentate individuals having, one or more teeth with >3 mm probing depth or one or more posterior teeth with Grade I furcation involvement. An examination was carried out by a single examiner, with the assistance of a recorder. Informed consent was obtained prior to examination from the subjects. The BMI of the study population was calculated and conducted two-sample independent T-test. Data was statistically analyzed using Statistical Package for the Social Sciences version 18.0 (Inc, Chicago, USA) and Pearson’s Chi-square test was used to determine the association of BMI with periodontitis.

**RESULTS**

The present study comprised a total of 148 subjects including 114 males and 34 females. When we consider the prevalence of the periodontal loss in study population, of the total 148 subjects, 91 subjects were free of periodontal disease and 57 subjects had periodontitis (Table 1). Of the total 114 males examined, only 72 males were free
of periodontal disease and 42 males had periodontal disease. Of the 34 females, only 19 females were free of periodontal disease and 15 females had periodontal disease. In the present study prevalence of the periodontal loss was higher in males (73.7%) when compared to females (26.3%) (Table 2). The BMI of the study population was calculated and conducted two-sample independent T-test. There is a statistically significant difference in mean BMI between two groups. \( P < 0.001 \) (Table 3).

Comparing the relationship between obesity and periodontitis in the study population, in the non-obese group (control) out of 74 subjects, 51 subjects (56%) were free of periodontal disease and 23 subjects (40.4%) had periodontal disease. In the obese group (case) out of 74 subjects, 40 subjects (44%) were free of periodontal disease and 34 subjects (59.6%) had periodontal disease (Table 4).

In this study, prevalence of periodontal disease was higher in the obese group (59.6%) when compared to the normal group (40.4%). Data was statistically analyzed using Pearson’s Chi-square test (test value-3.452). In this study we found that there was no association between study groups (i.e., non-obese group and obese group) and the periodontal loss (\( P = 0.063 \)).

### DISCUSSION

 Obesity is a multifactorial disease. There are several possible mechanisms that could explain the relationship between obesity and periodontitis. Adipose tissue, can be considered as an endocrine organ, because it secretes adipokines like TNF-\( \alpha \), IL-6, IL-8, leptin, plasminogen activator inhibitor-1, resistin, and angiotensinogen.\(^5\) Recent researches reported that TNF-\( \alpha \), in adipose tissue, has been shown to cause liver injury in obese patients, and this can predispose to insulin resistance.\(^6\) It has been suggested that the Lipopolysaccharides from periodontal Gram negative bacteria can trigger secretion of TNF-\( \alpha \) by adipose tissue which promotes hepatic dyslipidaemia and decreases insulin sensitivity. Production of advanced glycation end products, as a result, of type two diabetes and decreased insulin sensitivity is the main pathogenesis for periodontitis as it triggers inflammatory cytokine production.\(^7\)

 Obesity even affects host immunity. Studies conducted in obese, hypertensive rats have showed that they had a higher incidence of periodontitis than normal rats, and have intimal periodontal blood vessel thickening, indicating diminished blood flow. Visceral fat shows increased expression of plasminogen activator inhibitor-1 gene, which is responsible for diminished periodontal blood flow, predisposing to periodontitis and its progression.\(^8\)

In this study prevalence of periodontal disease was higher in the obese group (59.6%) when compared to the normal group (40.4%). This finding is in agreement with the study conducted by Mathur \textit{et al.},\(^2\) Linden \textit{et al.}\(^9\) In the present study, subjects categorized as obese (\( \geq 30 \) kg/m\(^2 \)) were observed to have no association with periodontal disease (\( P = 0.063 \)). Our findings are consistent with the study done by Kim \textit{et al.}\(^10\) where he found no association between BMI and periodontitis, but a significant association between abdominal obesity and periodontitis was found. In the present study, waist, circumference was not recorded as this would be embarrassing to the female study population. Ylöstalo \textit{et al.}\(^11\) detected a weak exposure association of BMI with deepened periodontal pocket.

This study utilized the BMI classification as given by WHO to determine obesity.\(^12\) But recent studies are highlighting the need for a different classification for the Asian population’s they are more susceptible to obesity-related conditions, where BMI \( \geq 25 \) kg/m\(^2 \) is considered as obese.\(^13\) The modified classification system suggests that BMI <18.5 kg/m\(^2 \)indicates underweight, 18.5-22.9 kg/m\(^2 \) indicates normal weight, 23-24.9 kg/m\(^2 \) may be considered as overweight, and \( \geq 25 \) kg/m\(^2 \) are obese.\(^14\) Because of the lack of evidence and sufficient literature, more studies should be conducted regarding this; it was tempting to

### Table 1: Sex versus periodontal loss-cross tabulation

<table>
<thead>
<tr>
<th>Sex</th>
<th>Normal/healthy (%)</th>
<th>Periodontal disease (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>72 (79.1)</td>
<td>42 (73.7)</td>
<td>114 (77)</td>
</tr>
<tr>
<td>Female</td>
<td>19 (20.9)</td>
<td>15 (26.3)</td>
<td>34 (23)</td>
</tr>
<tr>
<td>Total</td>
<td>91 (61.5)</td>
<td>57 (38.5)</td>
<td>148 (100)</td>
</tr>
</tbody>
</table>

### Table 2: Prevalence of the periodontal loss in study population

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject without periodontal disease</td>
<td>91</td>
<td>61.5</td>
</tr>
<tr>
<td>Subject with periodontal disease</td>
<td>57</td>
<td>38.5</td>
</tr>
<tr>
<td>Total</td>
<td>148</td>
<td>100.0</td>
</tr>
</tbody>
</table>

### Table 3: To assess the BMI of the study population

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td>74</td>
<td>23.946</td>
<td>3.2091</td>
</tr>
<tr>
<td>Obese</td>
<td>74</td>
<td>31.770</td>
<td>1.8248</td>
</tr>
</tbody>
</table>

BMI: Body mass index

### Table 4: The relationship between obesity and periodontitis in the study population

<table>
<thead>
<tr>
<th>Group</th>
<th>Normal/healthy (%)</th>
<th>Periodontal disease (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-obese</td>
<td>51 (56)</td>
<td>23 (40.4)</td>
<td>74</td>
</tr>
<tr>
<td>Obese</td>
<td>40 (44)</td>
<td>34 (59.6)</td>
<td>74</td>
</tr>
<tr>
<td>Total</td>
<td>91</td>
<td>57</td>
<td>148</td>
</tr>
</tbody>
</table>
follow the traditional classification. In the present study, prevalence of the periodontal loss was higher in males (73.7%) when compared to females (26.3%). This finding is in accordance with the study conducted by Dalla Vecchia et al. The present finding is not in agreement with the study conducted by Mathur et al.

Smoking is now considered to be one of the significant risk factor in development and progression of periodontal disease. Smokers have deeper pockets and greater attachment loss compared to non-smokers. Studies have shown that Smokers have approximately 3 times more risk for severe periodontitis than non-smokers and chance of improvement following periodontal therapy is just the half. There are many epidemiological studies suggesting consistently found poorer oral hygiene in tobacco smokers than in non-smokers. There are reports of increased quantities of calculus in smokers. Evidences shows that tobacco smoke and water soluble components of tobacco smoke adversely affect the chemotactic and phagocytic ability of normal polymorphonuclears. There are reports of the increase in GCF volume with the degree of inflammation. The increased volume of GCF shows the presence of marked inflammation in smokers. In this study smokers were excluded hoping that this will delineate the relationship between obesity and periodontitis better.

Considering the limitations of this study, stress, socio-economic status and oral hygiene practices could confound the results. Furthermore, this study should be conducted in a large population to correctly assess the relationship between obesity and periodontitis. Also, the study population was limited to patients coming to the OPD. In the present study, the severity of periodontal disease was not actually examined. The main concern was whether the disease is present or absent.

CONCLUSION

Within the scope of this study, the following observations are made: Prevalence of periodontitis was higher in the obese group than normal group. The prevalence of the periodontal loss was more in obese males than in obese females. Future longitudinal studies are needed to confirm these findings and extend them to more diverse populations. In periodontal disease prevention campaigns, it’s time to highlight obesity prevention. Discussing the patient’s weight in the dental setting although that is quite embarrassing to some patients should be the prevention strategy what we need to look forth. Also, the dental workforce should concentrate on giving dietary advice, a topic they are more familiar with and confident to deliver.

REFERENCES


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