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ORIGINAL RESEARCH

Association between Obesity and Periodontitis in a South Indian Population: A Cross-sectional Study

[1]Surabhi Gigras, [2]Sudhir R Patil, [3]Veena HR, [4]Komal D Walia

ABSTRACT

Aim: The aim of the study was to assess the relationship between obesity and periodontal status as well as evaluate its association with other demographic variables like age and gender among patients in KLE Society's Institute of Dental Sciences, Bengaluru, Karnataka, India.

Materials and methods: A total of 200 patients (aged between 18 and 70 years) visiting the KLE Dental College in Bengaluru were analyzed for obesity and periodontal status. The body mass index (BMI) was used as an indicator of obesity and calculated as the ratio of the subject's body weight (in kg) to the square of the height (in meters). Periodontal status was evaluated using community periodontal index (CPI). The relationship between BMI and periodontal status was assessed using binary multiple logistic regression analysis.

Results: Results indicated a positive correlation between BMI and periodontitis in the study group. Logistic regression analysis revealed that risk of periodontitis increases by 38% for each 1 kg/m^2 increase in BMI. The risk of periodontitis increases with increase in age and influence of gender is not found to be significant.

Conclusion: Obesity could be a potential risk factor for periodontitis. Estimation of the BMI could, thus, be used in periodontal risk assessment.

Clinical significance: Obesity, as measured by BMI, is hypothesized to be involved in immunoinflammatory alterations, including periodontitis. The study also showed that obesity can be a potential risk factor for periodontitis. The BMI measurement should be used regularly as a part of periodontal risk assessment. Moreover, periodontists should counsel obese persons regarding the possible oral complications of obesity, to diminish morbidity for these individuals.

Keywords: Body mass index, Community periodontal index, Periodontitis.

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[1,4]Postgraduate Student, [2]Head, [3]Reader

[1-4]Department of Periodontics, KLE Society's Institute of Dental Sciences, Bengaluru, Karnataka, India

Corresponding Author: Surabhi Gigras, Flat no. 153, Power Grid Residency, Sector 21-C, Part III, Faridabad, 121005 Haryana, India, Phone: +917259728918, e-mail: gigrassurabhi@gmail.com

INTRODUCTION

Periodontitis is a complex disease in which disease expression involves intricate interaction of microbial biofilm with host imunoinflammatory response and subsequent alteration in bone and connective tissue homeostasis. Systemic factors including diabetes, smoking, stress, osteoporosis, and obesity may impair host barrier function and immune defense against periodontal pathogens, thereby creating opportunity for destructive periodontal diseases.

Obesity is a serious health problem that has reached epidemic proportions. Obesity is defined as an unhealthy accumulation of body fat with an excessively high amount of adipose tissue in relation to lean body mass.[1] It is a risk factor for a number of chronic health conditions, including hypertension, type II diabetes mellitus, and cardiovascular diseases.[2]

Obesity may represent a systemic condition capable of influencing the onset and progression of periodontal disease.[3] Possible association between the two involves increased lipid and glucose blood levels and alterations in host immunity, including increased secretion of adipokines.[4] Although many studies[2,3,5-14] on the relationship between obesity and periodontitis have been reported, some of these studies[2,9,14] did not show consistent relationships and the age groups and study variables in each study population were not always the same. Moreover, very few epidemiologic studies have examined the association between obesity and periodontitis in an Asian population, and most of these were on the Japanese population.[4-6,10] More research is needed in developing countries like India, where the data about the link are still not known well.

The study was designed to assess the relationship between obesity and periodontal status among patients in the KLE Society's Institute of Dental Science, Bengaluru, Karnataka, India, and evaluate its association with other demographic variables like age and gender.

MATERIALS AND METHODS

Study Participants

This cross-sectional study was done on a total of 200 systemically healthy subjects, who were selected from the outpatient division of the Department of Oral Medicine

and Radiology, KLE Society's Institute of Dental Sciences, Bengaluru, India. The study was carried out between July 2015 and September 2015. The following were exclusion criteria: (1) <20 years of age; (2) <20 teeth; (3) pregnancy or lactating mothers; (4) alcohol or drug abuse; (5) systemic conditions, such as diabetes or chronic hypertension; or (6) any infectious disease requiring antibiotic treatment. A written informed consent was obtained from those who agreed to participate voluntarily in the study. The Institutional Ethics Committee gave ethical clearance for the study.

Body Mass Index Calculation

The BMI represents weight levels associated with the lowest overall risk to health and is an indicator of overall adiposity and, thus, obesity.[15] The BMI was calculated as the ratio of body weight (in kg) to the square of height of the subject (in meters). The World Health organization (WHO) has classified BMI into four categories: underweight (BMI < 18.5 kg/m^2), normal weight (BMI from 18.5 to 24.9 kg/m^2), overweight (BMI from 25 to 29.9 kg/m^2), and obese (BMI > 30 kg/m^2).[16]

Periodontal Status Examination

Periodontal status was recorded using the CPI as follows: score 0 (healthy), score 1 (bleeding), score 2 (calculus), score 3 (shallow periodontal pockets 4–5 mm), and score 4 (deep periodontal pockets ≥ 6 mm).[17] Subjects were examined for the following teeth—16, 11, 26, 36, 31, 46 on mesial, buccal, distal, and lingual surfaces. Oral examination was performed by a single examiner using a WHO CPI periodontal probe. Intraexaminer reliability for periodontal status was analyzed by the weighted kappa statistic, which was found to be 87.2%.[18]

Statistical Analysis

To facilitate statistical analysis, the subjects were grouped into two categories based on CPI scores—control (CPI scores 0–2) and periodontitis (CPI scores 3–4) groups.[19]

The Mann–Whitney U-test was used to analyze the significant differences between the two periodontal status categories in relation to age, BMI, and gender. Multivariate logistic regression analysis was performed to determine the relationship of obesity and periodontal status taking into consideration age and sex as confounding variables. Adjusted odds ratio was calculated for assessing the influence of various independent variables on the periodontal status with 95% confidence intervals (CIs).

RESULTS

Table 1 presents the demographic features of the study population. One-third of the sample size was contributed by the older age group of 40 to 49 years, whereas fewer subjects belonged to younger age groups (20–29 years, <20 years). Among 200 patients, 95 (47.5%) were males and 105 (52.5%) were females. A CPI score of 2 (bleeding and calculus) was widespread (32.5%) among the study population, whereas deep periodontal pockets were present in only 14.78% of the subjects. Almost two-thirds of the subjects (54%) belonged to the normal weight group and obese were only 9%

Table 1: General profile of the study population

		Number	*Percentage*
Age (years)			
	<20	7	3.5
	20–29	16	8.0
	30–39	51	25.5
	40–49	78	39.0
	50–59	37	18.5
	≥60	11	5.5
	Mean ± SD	34.9 ± 12.168	
	(Min–Max)	(18–67)	
Gender			
	Male	95	47.5
	Female	105	52.5
BMI			
	Underweight	12	6.0
	Normal	108	54.0
	Overweight	71	35.5
	Obese	9	4.5
Periodontal status	Score 0 (Healthy)	10	8%
	Score 1 (Bleeding)	45	2.5
	Score 2 (Bleeding and calculus)	65	32.5
	Score 3 (Pocket 4–5 mm)	60	30.0
	Score 4 (Pocket >6 mm)	20	10.0

Table 2 describes mean subject characteristics with periodontal status. There was a significant difference for age between the groups, with the mean age of the periodontitis group being approximately 2 years older than that of the control group. A similar trend was noticed for the BMI with subjects belonging to the periodontitis group presenting greater BMI. However, no significant difference was observed in terms of gender (Table 3).

Logistic regression analyses revealed that risk of periodontitis increases by 38% for each 1 kg/m^2 increase in BMI (adjusted odds ratio 1.385; 95% CI 1.184–1.620). Moreover, the risk of periodontitis increases with increase in age, but the influence on gender is not significant (Table 4).

DISCUSSION

Obesity is one of the most common health problems affecting human beings. There has been a rising concern, in recent years, about the link between obesity and periodontal disease. The underlying biological mechanisms

Table 2: Periodontal status of subjects by age and BMI

	n	*Mean*	*SD*	*t-value*	*p-value*
Age					
Control group (score 0–2)	120	28.24	7.640	165.188	<0.001
Periodontitis group (score 3–4)	80	44.95	10.742		
Total	200	34.92	12.168		
Body mass index					
Control group (score 0–2)	120	22.2	3.225	88.895	<0.001
Periodontitis group (score 3–4)	80	26.4	2.889		
Total	200	23.9	3.717		

Table 3: Periodontal status of subjects by gender

	Community periodontal index				
	Control group (score 0–2)	*Periodontitis group (score 3–4)*	*Total*	*χ^2-value*	*p-value*
Male	45	50	95	12.030	0.001
	47.4%	52.6%	100.0%		
Female	75	30	105		
	71.4%	28.6%	100.0%		
Total	120	80	200		
	60.0%	40.0%	100.0%		

for the association of obesity with periodontitis are not well known; however, adipose-tissue-derived cytokines and hormones may play a key role.[20] Fat tissue is not merely a passive triglyceride reservoir of the body, but also produces a vast amount of cytokines and hormones, collectively called adipokines or adipocytokines, which, in turn, may modulate periodontitis.[20]

This study showed a strong association between obesity and periodontitis. Logistic regression analyses revealed that subjects had an increased risk of periodontitis by 38% for each 1 kg/m^2 increase in BMI (adjusted odds ratio, 1.385; 95% CI, 1.184–1.620). Similar results were also observed in other studies done on Indian population.[21-23] In the study by Bhardwaj et al,[21] subjects had an increased risk of periodontitis by 56% for each 1 kg/m^2 increase in BMI, which means that a higher BMI could be a potential risk factor for periodontitis. Mathur et al[22] reported higher prevalence of periodontal disease in obese (88%) than in nonobese (74.4%) individuals (odds ratio = –20.4 and 95% CI 1.3–1.3). Chopra et al[23] showed that obese individuals were at 1.26 times (95% CI 1.02–2.78) higher risk for developing periodontal diseases when compared with nonobese individuals.

Previous studies had included either young or old subjects and data from those studies, on both the young and adult individuals, had suggested that periodontal status deteriorates with BMI.[11,24,25] But in this study, there was a significant difference for age between the groups, with the mean age of the periodontitis group being approximately 2 years older than that of the control group. Moreover, the risk of periodontitis increases with increase in age. This is in accordance with several studies showing that the prevalence and severity of periodontal disease increase with age.[26-29] The increased severity of periodontal disease and bone loss with age is probably related to the length of time where the periodontal tissues have been exposed to bacterial plaque, and is considered to reflect individual's cumulative oral history.[30]

In this study, no significant difference was observed among the genders in terms of periodontal destruction. On the contrary, a number of studies have reported higher periodontal destruction among males compared with the female population.[26,31,32] The reasons for these sex differences are not clear, but they are thought to be related to the ignorance of oral hygiene, which is usually observed among males.[31,32]

As per our knowledge, this is the first study done to assess the relation between obesity and periodontal status in a South Indian population. However, the study is not free of limitations. Due to its cross-sectional design, the direction of the causal relationship between obesity and periodontal disease cannot be assessed. The problem of imperfect measurement of confounders may also exist in the study.[23] Moreover, clinical attachment levels were not recorded, which could have added more value to the study. Due to its fixed reference point, the assessment of attachment levels provides better information relating to gain

Table 4: Adjusted OR and 95% CI of BMI, sex, and age as independent variables and presence of periodontal pockets as dependent variable

								95% CI for OR	
		B	*SE*	*Wald*	*df*	*p-value*	*Adjusted OR*	*Lower*	*Upper*
Step 1[a]	Age	0.165	0.027	36.595	1	<0.001	1.180	1.118	1.244
	Male *vs* female	0.817	0.472	3.006	1	0.083	2.265	0.899	5.707
	Body mass index	0.326	0.080	16.611	1	<0.001	1.385	1.184	1.620
	Constant	−14.803	2.278	42.217	1	<0.001	0		

[a]Variable(s) entered on step 1: age, sex, BMI; SE: Standard error; df: Degree of freedom; OD: Odds ratios; B: Unstandardized regression weight; Wald: Test static for individual predator variable

or loss of attachment to the root surface and in assessing the disease progression as compared with pocket depth measurements.[33]

CONCLUSION

The present study showed that a higher BMI could be a potential risk factor for periodontitis. Thus, BMI measurement should be used in periodontal risk assessment on a regular basis. Further prospective studies, on a larger sample size, are needed to determine if obesity is a true risk factor for periodontitis.

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