Assessment of relationship between body mass index and periodontal status among state government employees in Shimla, Himachal Pradesh

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Abstract

Background: The literature shows that an increased body mass index (BMI) may be a potential risk factor for periodontitis. Association between BMI and periodontitis has been ascribed to unhealthy dietary patterns with insufficient micronutrients and excess sugar and fat content. **Aim:** The present study intended to assess the relation between BMI and periodontal status among state government employees in Shimla city, Himachal Pradesh in India. **Materials and Methods:** The study sample comprised 1,008 subjects aged 18-58 years, drawn by a proportional sample from 10,908 employees. BMI was calculated by the Quetelet index as the ratio of the subject's body weight (in kg) to the square of the height (in meters). Periodontal status was recorded using the Community Periodontal Index (CPI). Binary multiple logistic regression analysis was done to assess the relation between BMI and periodontal status. The dependent variable for logistic regression analysis was categorized into control group (scores 0-2 of the CPI) and periodontitis group (scores 3 and 4 of the CPI). **Results:** The overall prevalence of periodontal disease was 98.9%. Score 2 (bleeding and calculus) was the highest score prevailing among the subjects. They had an increased risk of periodontitis by 56% for each 1 kg/m² increase in BMI, which means that a higher BMI could be a potential risk factor for periodontitis among the adults aged 18 to 58 years. **Conclusion:** BMI evaluation could be used in the assessment of periodontal risk.

Key words: *Body mass index, government employees, periodontal status*

INTRODUCTION

Health is a common theme in most cultures and is a fundamental human right without distinction of race, religion, and political belief, and economic and social condition.[1] Oral health is a standard of health of the oral and related tissues that enables an individual to eat, speak, and socialize without active disease, discomfort, or embarrassment and contributes to the general well-being. It is concerned with maintaining the health of the craniofacial complex, the teeth, and gums as well as the tissue of the face and head that surrounds the mouth.[2] Periodontal diseases constitute the major cause of tooth extraction in adults. High prevalence of periodontal diseases among adults with considerate disparities between populations has been reported.[3] Many mediators have been postulated for this relationship, namely, infection, chronic inflammation, and genetic predisposition.[4] Nutrition has been postulated as an alternative mediator apart from these mediators.[5] The body mass index (BMI) has always been considered a simple method for analysis of the nutritional status. The normal value for this index ranges from 20 to

25 kg/m^2, which correlates with body fat.[6] Recently, studies have been conducted to assess the association of BMI and periodontitis. Sheiham *et al.*, (2002)[7] stated, "The nature of the relationship between BMI and oral health is clearly rather complex. A low BMI is easily explainable on the basis of there being real functional difficulties that can prevent normal eating in some cases. On the other hand, the association of poor oral health with obesity is likely to be associated with the quality of the diet." Though no definite mechanism of association between BMI and periodontal health is identified, it has been ascribed to unhealthy dietary patterns with insufficient micronutrients and excess sugar and fat content, which could pose a risk both for periodontal disease and obesity.[8] Hence, this study has been taken up to assess the relationship between BMI and periodontal status among state government employees in Shimla city, Himachal Pradesh.

MATERIALS AND METHODS

This cross-sectional study was conducted among state government employees who were working in Shimla city. Shimla is the capital of the state of Himachal Pradesh in India with a total area of 32.30 sq. km and a population of 1, 42, 535.[9] Being the capital, it harbors the head offices of all the departments. The total number of state government employees in Shimla city was 10,908. This cross-sectional study was conducted on 1,008 dentate subjects out of 10,908 government employees accounting for about 10% of the universe. A proportionate sample was taken from each department and cadre. Inclusion criteria were employees of the state government of Himachal Pradesh who were dentate and were willing to participate in the study. Exclusion criteria were any disease or ailment that could affect or cause deterioration in the subject's general health and oral health, diabetes mellitus patients, the edentulous, and those unwilling to participate in the study. Official permission was obtained from the corresponding authorities, and an ethical approval was obtained from the institutional ethical committee of the dental college and hospital. Informed consent was obtained from all those examined. The height of the participants was measured in centimeters, and weight was assessed in kilograms using a mechanical scale. The BMI was calculated as the ratio of the subjects' body weight (in kg) to the square of their height (in meters). Based on the World Health organization (WHO) criteria, four categories were defined: 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). Oral examination was performed by a single examiner using a WHO CPI periodontal probe. Periodontal status was recorded under five scores: score 0 (healthy), score 1 (bleeding), score 2 (calculus), score 3 (shallow periodontal pockets), and score 4 (deep periodontal pockets).[10] Intraexaminer reliability for periodontal status was analyzed by the weighted kappa statistic, which was found to be 84.2%.[11]

Statistical analysis

The data was processed and analyzed using the Statistical Package for the Social Sciences (SPSS version 15.0). To facilitate the statistical analysis, the subjects were grouped into two categories based on CPI scores, individuals in the control group (CPI score 0-2) and periodontitis group (CPI score of 3-4).[12] The Mann–Whitney *U* test was used to analyze the significant differences between the two periodontal status categories in relation to age and BMI. Binary logistic regression analysis was performed to determine the relationship of BMI and age. The dependent variable for the multiple logistic regression analysis was categorized into control group (scores 0-2 of the CPI) and periodontitis group (scores 3 and 4 of the CPI). All the independent variables were continuous and comprised BMI and age. Both adjusted and crude odds ratio were calculated for assessing the influence of various independent variables on the periodontal status with 95% confidence intervals. To analyze the adjusted odds ratio, the effect of each independent variable was assessed, adjusting for all other variables in the model; *P* < 0.05 was accepted as statistically significant.

RESULTS

Table 1 presents the general profile of the study population. The age group of 35-44 years contributed for more than one-third of the sample size, whereas there were fewer subjects who belonged to the youngest age group (18-24 years). The overall prevalence of periodontal disease was 98.9%. A CPI score of 2 (bleeding and calculus) was widespread among the study population, whereas deep periodontal pockets were presented by 14.78% of the subjects.

None of the subjects was obese, whereas almost two-thirds of the subjects (65.8%) belonged to the normal weight group. Mean subject characteristics with periodontal status are illustrated in Table 2. There was a significant difference for age between the groups, with the mean age of the periodontitis group

Table 1: Distribution of subjects agewise according to CPI score and BMI		
Characteristics	Number of subjects	Percentage
Age groups (years)		
18-24	20	1.98
25-34	197	19.54
35-44	397	39.38
45-54	355	35.21
55-58	39	3.86
Periodontal status		
CPI score 0	11	1.1
CPI score 1	30	2.97
CPI score 2	628	62.3
CPI score 3	190	18.84
CPI score 4	149	14.78
BMI		
<18.5 (underweight)	227	22.6
18.5-24.9 (normal weight)	664	65.8
25.0-29.9 (overweight)	117	11.6
≥30.0 (obese)	0	0.0

BMI = Body mass index, CPI = Community periodontal index

Table 2: Periodontal status of subjects by age and periodontal status			
Characteristics	CPI Score 0-2 (*n*=669)	CPI Score 3-4 (*n*=339)	*P* value
Age	31.41±8.12	35.73±9.18	0.036
BMI (kg/m^2)	19.35±2.42	24.85±3.71	0.004

BMI = Body mass index, CPI = Community periodontal index

Table 3: Crude and adjusted odd ratio and 95% confidence interval of body mass index and age as independent variable and presence of periodontal pockets as dependent variable (CPI≥3=1, CPI≤2=0)				
Characteristics	Crude odds ratio	*P* value	Adjusted odds ratio	*P* value
Age	1.89 (1.79-1.98)	0.218	1.82 (1.73-1.91)	0.128
BMI (kg/m^2)	1.55 (1.26-1.82)	0.027	1.56 (1.26-1.92)	0.001

BMI = Body mass index, CPI = Community periodontal index, CI = Confidence interval

being approximately 4 years more than that of the control group. An almost similar trend was observed for BMI, with subjects belonging to the periodontitis group presenting a higher BMI. Logistic regression analysis revealed that subjects had an increased risk of periodontitis by 56% for each 1 kg/m^2 increase in BMI (adjusted odds ratio: 1.56; 95% confidence interval: 1.26-1.92). Moreover, though the risk of periodontitis increased with increase in age, its influence was not significant [Table 3].

DISCUSSION

The literature shows that the prevalence of periodontal disease is greater among obese people, and studies have proposed that an increased BMI may be a potential risk factor for periodontitis. Previous studies[7,13,14] have 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. The present study included a wide range of age groups, with the youngest individuals being 18 years of age, that is, minimum age of recruitment and the oldest being 58 years of age, that is, age of superannuation. The overall prevalence of periodontal disease was 98.2%, whereas this prevalence is 89.6% among the general population of India belonging to the 35-44 years age group.[15] The higher prevalence of periodontal disease among the present study population can be attributed to a multitude of reasons like poor oral

hygiene practices and not availing the present dental health-care facilities available. However, the widespread prevalence of score 2, namely, bleeding and calculus is in accordance with previous studies.[16-18] None of the subjects was obese, whereas almost two-thirds of the subjects (65.8%) belonged to the 18.5-24.9 BMI group. It was observed that the subjects with higher BMI and age had an increased risk for periodontal disease. The influence of age on periodontal disease is consistent with previous literature. Miyazaki *et al*., (1991)[18] used the CPI to assess the periodontal profiles of adults and found that periodontal disease increased with increase in age. The present study population had an increased risk of periodontitis by 57% for each 1 kg/m^2 increase in BMI, whereas the risk of periodontitis increased by 16% among young Japanese adults aged 18-24 years.[13] This difference in risk might be due to difference in age composition, geographical status, oral hygiene habits, and dietary practices. Hypponen *et al.,*[19] and Salekzamani *et al.,*[20] in their studies, revealed that BMI increases with age. Al-Zahrani *et al*.,[8] assessed the association of BMI and periodontal disease among adults aged 18-34 years and observed that the prevalence of periodontitis was 76% higher among obese individuals.

Furthermore, Reeves *et al*.,[14] studied the association of body weight and waist size with chronic periodontitis among individuals aged 17-21 years and reported that weight significantly influenced the periodontal status. However, the present study is not devoid of limitations, as the periodontal status was assessed using the CPI,

which does not include all the teeth and does not measure attachment loss.

CONCLUSION

A higher BMI could be a potential risk factor for periodontitis among adults aged 18 to 24 years. Thus, the evaluation of BMI could be used in periodontal risk assessment. Longitudinal studies with a larger sample size are required to confirm the association of BMI and periodontal disease.

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