

Relationship between Body Mass Index and Periodontal Health Status: An Observational Study

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ABSTRACT

Introduction: From the scientific literature, it is evident that general health has a considerable impact on oral health and vice versa. Association between body mass index (BMI) and periodontitis can be due to unhealthy dietary patterns with insufficient micronutrients and excess sugar and fat content. This study intended to assess the relationship between BMI and periodontal health status in students.

Materials and methods: The study included both males and females, aged between 18 and 25 years. The oral hygiene index was used to assess the oral hygiene status of students. The community periodontal index was used to assess the periodontal status. The BMI was calculated as the ratio of subject's body weight (in kg) to the square of their height (in meters).

Results: The highest positive relation was seen in males by 43%. Obese subjects showed highly significant correlation by 97%.

Conclusion: Positive relation was seen between overweight, obesity, and BMI, and negative relation was observed between underweight, normal weight, and BMI.

Clinical significance: Medical and dental professionals can develop interdisciplinary approaches for diagnosing and treating early signs of oral disease among young individuals. It might be useful for BMI evaluations to be included on a regular basis during general and oral health examinations.

Keywords: Body mass index, Community periodontal index, Periodontal health.

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INTRODUCTION

General health has a considerable impact on oral health and even oral health can affect general health of an individual. Many mediators have postulated this relationship, namely factors, such as infection, chronic inflammation, and genetic

predisposition.¹ Periodontitis is a chronic inflammatory disease affecting the supporting structures of the teeth resulting from the interaction between pathogenic bacteria and host's immune response.^{2,3}

It is seen that an increased body mass index (BMI) may be a potential risk factor for periodontitis. Association of BMI and periodontitis has been related to unhealthy dietary patterns with insufficient micronutrients and excess sugar and fat content.⁴ Recent studies have reported a relationship between obesity and periodontitis, but few studies have investigated this relationship in adolescents.

The present study population has been plagued by unhealthy nutritional practices; hence, the aim of this study was to investigate the relationship between BMI and periodontal health status in students.

MATERIALS AND METHODS

A total of 753 students of Bharati Vidyapeeth Deemed University campus (BVDUDCH), Navi Mumbai, India, including males and females were enrolled in the study with age above 18 years after obtaining informed written consent. The study was conducted after approval by the Scientific Review Committee and the Institutional Ethical Committee of BVDUDCH, Navi Mumbai.

Subjects having any systemic diseases like diabetes mellitus, thyroid diseases, those who have received any periodontal treatment, or who have undergone professional tooth cleaning in the last 6 months were excluded from the study. Oral hygiene condition was assessed by taking the simplified oral hygiene index (OHI-S). To assess periodontal condition, the World Health Organization community periodontal index (CPI) was used.⁵ Oral examination was performed by a single examiner using mouth mirror and community periodontal index of treatment needs (CPITN) probe. To assess the BMI, height and weight were measured and calculated as ratio of body weight to the square of their height.

$$\text{Body Mass index} = \frac{\text{mass (kg)}}{\text{height (m}^2\text{)}}$$

All data were captured from the paper form (data collection form) into a Microsoft Office Excel (version 2013) in a spreadsheet and checked for errors and discrepancies. Data analysis was done using Windows-based "MedCalc Statistical Software" version 13.3.1 (MedCalc Software bvba, Ostend, Belgium; <http://www.medcalc.org>; 2014).

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Table 1: WHO BMI criteria – four groups

Underweight	BMI less than 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
Obese	BMI equal to or more than 30 kg/m ²

BMI: Body mass index

Discrete data like data for gender were expressed as numbers with percentages. Measurement data like age (years) and data for OHI-S and CPI were expressed as means with one standard deviation (SD).

Correlation was done between BMI with periodontal status using Spearman’s rank correlation. The OHI-S and CPI were compared between the subjects having different BMIs (four categories as per WHO) using Kruskal–Wallis test (nonparametric analysis of variance) (Table 1). *Post hoc* multiple pairwise comparisons between two BMI categories was done using Wilcoxon test.

RESULTS

Table 2 represents the males and females with their BMI and OHI-S scores. Out of 753 subjects, 185 were males and more than half the sample size were females (568). The highest positive relation between BMI and OHI-S was seen in males by 43% (r = 0.4326), while in females, it was 35% (r = 0.3538). This was found to be statistically significant (p < 0.0001).

Graph 1 showed correlation of OHI-S and BMI in males and females. As the BMI was increasing, the OHI-S score was also increasing. Those subjects having normal BMI score had their OHI-S scores less (Graph 2).

Table 2: Correlation between BMI and OHI in males and females

	Males (n = 185)	Females (n = 568)
R	0.4326	0.3538
95% confidence interval	0.3075–0.5429	0.2796–0.4237
Significance level	p<0.0001	p<0.0001

Obese subjects showed highly significant correlation by 97% with sample size of only four subjects (Table 3).

About 21% males showed positive correlation between BMI and CPI, while 18% females showed positive relation (Table 4 and Graph 3).

With increase in CPI score, overweight subjects showed the highly significant correlation with BMI (Table 5 and Graph 4).

The BMI showed more positive correlation in males than in females for OHI-S and CPI.

With an increase in BMI, an increase in OHI-S and CPI scores was observed (Graph 2).

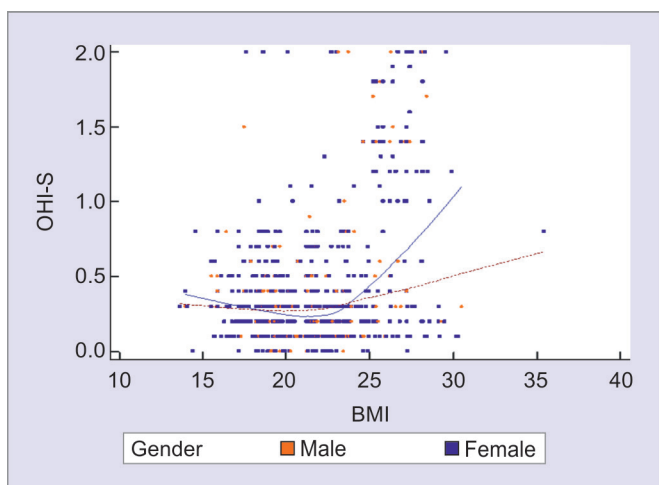
DISCUSSION

Kumar et al¹ in 2009 conducted a study on the relationship of BMI with periodontal health status of green marble mine laborers in Kesariyaji, India, and they reported that subjects had an increased risk of periodontitis by 57% for each 1 kg/m² increase in the BMI. This means that a higher BMI could be a potential risk factor for periodontitis.

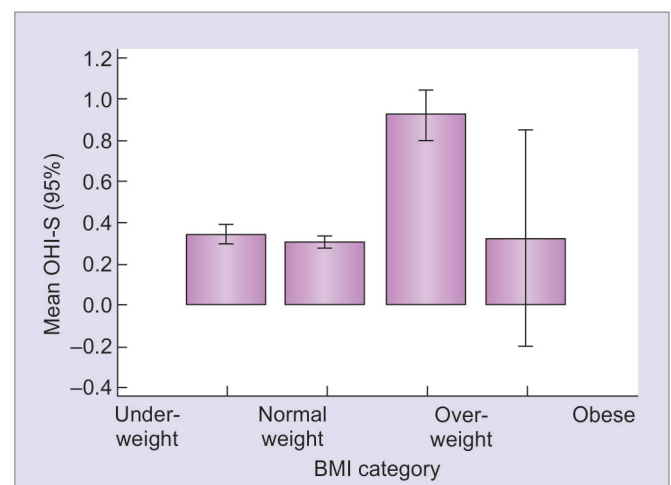
Sheiham et al⁶ have stated that the relationship between BMI and oral health is clearly rather complex. A low BMI is easily explainable based on there being real functional difficulties that can prevent normal eating in some cases. On the contrary, the association of poor oral health with obesity is likely to be associated with the quality of the diet. Past studies have included either

Table 3: Mean OHI-S in different BMI categories

Body mass index category	n	Mean	SD
Underweight	136	0.3456	0.2724
Normal weight	488	0.3066	0.3085
Obese	125	0.9280	0.6759
Overweight	4	0.3250	0.3304



Graph 1: Correlation between BMI and OHI in males and females



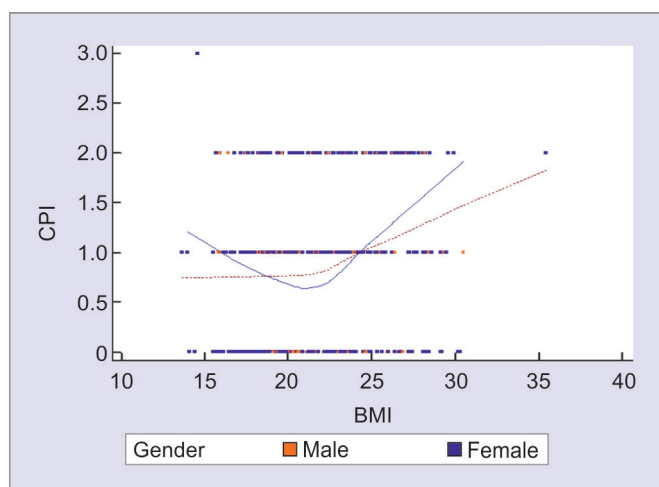
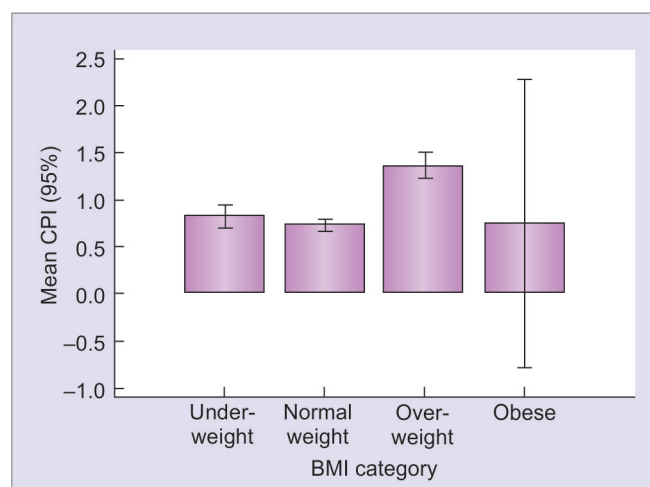
Graph 2: Mean OHI-S in different BMI categories

Table 4: Correlation between BMI and CPI in males and females

	Males (n = 185)	Females (n = 568)
R	0.2153	0.1887
95% confidence interval	0.07335–0.3488	0.1081–0.2668
Significance level	p < 0.0001	p < 0.0001

Table 5: Mean CPI in different BMI categories

Body mass index category	n	Mean	SD
Underweight	136	0.8309	0.7051
Normal weight	488	0.7316	0.6929
Obese	125	1.3600	0.7662
Overweight	4	0.7500	0.9574

**Graph 3:** Correlation between BMI and CPI in males and females**Graph 4:** Mean CPI in different BMI categories

young or old subjects and have suggested that periodontal status deteriorates with BMI.

Miyazaki et al⁷ in 1991 conducted a study in which they used the CPITN to assess the periodontal condition of adults, and they found that periodontal disease increased with the increase in age. Al-Zahrani et al,⁸ in 2003, assessed the association of BMI and periodontal disease among adults of age between 18 and 34 years and reported that the prevalence of periodontitis was 76% higher among the obese subjects. In this study, only four subjects were obese, while more than half of the subjects (64.8%) belonged to the 18.5 to 24.9 BMI group.

In 2006, Reeves et al⁹ conducted a study among subjects aged 17 to 21 years. They studied the association of body weight and waist size with chronic periodontitis and reported that the weight significantly influences the periodontal status of individuals. Ekuni et al,⁴ in 2008, conducted a study on relationship between BMI and periodontitis in young Japanese adults, and reported that the BMI of all subjects was less than 30 kg/m². The study also revealed that there was a 16% increased risk for periodontitis per 1 kg/m² increase in body mass.

Saito et al¹⁰ conducted a study in which they used the CPITN and reported a strong association between BMI and periodontal disease in the Japanese group. In another study, they studied the relationship

between upper body obesity, BMI, and periodontitis in healthy dentate Japanese adults and found that the subjects with high upper body obesity or high total body fat had significantly increased adjusted risk of periodontitis.¹¹

CONCLUSION

Positive relation was seen between overweight, obesity, and BMI, and negative relation was observed between underweight, normal weight, and BMI. Thus, we can conclude that increase in BMI seems to be a potential risk factor for periodontitis.

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