# Correlation Between Oral Health and Body Mass Index among Nepalese Teachers

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## ABSTRACT

**Background**

Health problems like high body weight and oral diseases have the same essential risk factors as the inflammatory nature of obesity and periodontal disease are widely recognized. Body Mass Index and oral health indices are correlated and may be a confounder of disease status.

**Objective**

To assess oral health status and Body Mass Index of school teachers of Kathmandu valley and to find the correlation between them.

**Method**

A cross sectional study with purposive sampling was done on 100 Nepalese teachers to assess Body Mass Index, Community Periodontal Index and Decayed Missing Filled Teeth index. Mann-Whitney U-test, crude and adjusted odds ratio were used to analyze the difference between periodontal status based on Community Periodontal Indexscores in relation to age, Body Mass Index, Decayed Missing Filled Teeth.

**Result**

The prevalence of periodontal disease according to Community Periodontal Index score was: bleeding on probing 14%, calculus 34%, pocket depth 4-5 mm 35%, pocket depth ≥ 6 mm 12%. The mean Decayed Missing Filled Teeth index was 4.41, and mean number of teeth present was 29.22. According to Body Mass Index score; 10% were underweight, 38% overweight and 2% obese. There were significant differences in age, Body Mass Index and number of teeth present between the control and periodontitis groups. Logistic regression analysis revealed that the risk of periodontal disease increased with age, and there is an increased risk of periodontitis by 39% for each 1 kg/m$^2$ Body Mass Index increase.

**Conclusion**

There is increased risk of periodontitis with gain in Body Mass Index in teachers of Kathmandu valley.

## KEY WORDS

*Body mass index, correlation, dental caries, periodontitis, prevalence*

## INTRODUCTION

Oral disease is one of the most prevalent diseases in the world. It is evident from scientific literature that general health has considerable impact on oral health and vice versa. Many mediators have been postulated for this relationship like infection, chronic inflammation, genetic predisposition, metabolism, diet, nutrition.[1,2]

In oral cavity, more than 700 bacterial species have been identified. Oral bacterial flora is altered in disease conditions like periodontal disease, dental caries etc.[3] Salivary bacterial study showed the composition of salivary bacterial changes in overweight women.[4] The inflammatory nature of obesity and periodontal disease is widely recognized producing increased level of inflammatory mediators. Adipose tissue was recognized as the reservoir for inflammatory cytokines and suggested that obesity affects periodontal disease.[5]

High body weight is risk factor for numerous diseases. According to WHO report (1998); 10-20% of male and 30% of female population are obese. Decreased physical activity, sedentary life style, and adverse dietary habits affect general health.[6] Correlations between Body Mass Index (BMI) and oral diseases have been described in many literatures.[7,8,9] National Health Survey indicated that BMI and periodontal disease are positively correlated.[10] Population studies indicate that 70% subjects with periodontitis are overweight or obese. Overweight individuals showed more severe periodontal disease as evaluated by plaque, bleeding on probing, pocket depth, attachment loss.[11]

Among many professionals; school teachers play an important role in community to prevent and promote healthy behavior of the students. However, studies indicate that the teachers have more health problems.[12] Very few studies have been done on teachers' general health status and their relationship to oral health. The present study intends to assess BMI and oral health parameters of the teachers. Specifically the study aims to find the correlation between BMI and periodontal disease among Nepalese school teachers residing in Kathmandu Valley.

## METHODS

A cross sectional, purposive sampling survey was done on one hundred government school teachers of Kathmandu valley aged 27-58 years. The study was done on September 16-17, 2012 at a private dental clinic in Kathmandu after receiving approval from institutional ethical review committee. After obtaining informed consent from the participants; nutritional status was assessed to calculate BMI, and periodontal disease, dental caries and number of teeth present were examined to assess oral health status.

Anthropometric parameters like statural height and body weight were measured to assess BMI. The height of the participants was measured in centimeters on the wall mounted with standardized height measuring scale. The vertical measurement was determined using a hard ruler placed horizontally at the level of top of the head with the participant standing straight on stable base with no shoes. A standardized weighing machine (Prestige Aiwa, ISO 9001) was used to measure the weight in kilograms. The weight was adjusted to the nearest 0.1 kg value for each participant. The weight was measured with light clothing without shoes. BMI is considered as a simple method for the analysis of nutritional status which correlates with body fat. The BMI was calculated as the ratio of the subject's body weight (in kg) to the square of their height (in meters). Based on the WHO criteria, four categories were defined: underweight (BMI <18.5 kg/m$^2$), normal weight (BMI 18.5-24.9 kg/m$^2$), overweight (BMI 25-29.9 kg/m$^2$), and obese (BMI >30 kg/m$^2$).[6]

Oral health status was assessed using Community Periodontal Index (CPI) for periodontal disease and Decayed Missing Filled Teeth (DMFT) index for dental caries. WHO-Oral health survey basic methods was used and oral examination was performed by a single examiner using CPI periodontal probe.[13,14] Periodontal status was recorded under following five scores: Score 0 (healthy), Score 1 (bleeding on probing), Score 2 (calculus), Score 3 (pocket depth 4-5 mm) and Score 4 (pocket depth ≥ 6 mm). DMFT Index was recorded to assess caries experience by each individual for decayed, missing and filled teeth. Carious lesions with clearly visible cavities, restoration with secondary caries were considered as decayed (D) teeth. Teeth with permanent restoration was considered as filled (F) teeth and teeth extracted due to caries as missing (M) teeth.[13,14] The total number of functional teeth were counted to assess the number of teeth present.

The data was processed and analyzed using Statistical Package and Service Solutions (SPSS version 17.0). To facilitate the statistical analysis; the participants were grouped into two categories based on CPI scores; individuals in the control group had CPI scores ranging from 0-2, whereas those in the periodontitis group had CPI scores of 3-4.[15] The Mann-Whitney U test was used to analyze the significant difference between the two periodontal status categories in relation to age, BMI, DMFT and number of teeth present.

The dependent variable for the multiple logistic regression analysis was categorized into control group and periodontitis group. All the independent variables were continuous and comprised of BMI, age, DMFT and number of teeth present. Both adjusted and crude odds ratio were calculated for assessing the influence of various independent variables on the periodontal status with 95% confidence intervals (CI). To analyze the adjusted odds ratio, the effect of each independent variable was assessed adjusting for all other variables in the model. A significance value of $p < 0.05$ was accepted as statistically significant.

## RESULTS

A total of 100 government school teachers of Kathmandu

valley were examined; out of which 47% were male and 53% were female. The participants' age ranged from 27 to 58 years with the mean age of 42 years.

The prevalence of periodontal disease according to CPI was: Score 1 (bleeding on probing) 14%, Score 2 (calculus) 34%, Score 3 (pocket depth 4-5 mm) 35%, Score 4 (pocket depth ≥ 6 mm) 12% (Figure 1). DMFT was 4.41 (standard deviation 3.2), and mean number of teeth present was 29.22 (standard deviation 2.1) (Table 1). Among 100 teachers examined; 10% were underweight, 50% were normal, 38% were overweight and 2% were obese according to BMI score (Figure 2).
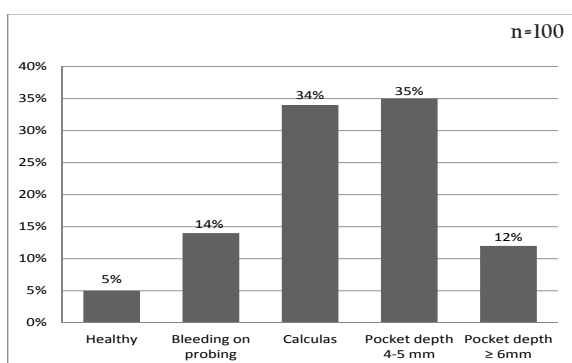


**Figure 1. Distribution of community periodontal index score**

**Table 1. Mean DMFT and number of teeth present**

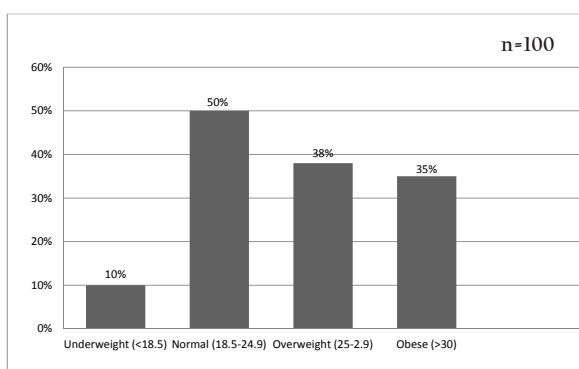|  | Range | Mean | SD |
|---|---|---|---|
| DMFT | 1-10 | 4.41 | 3.2 |
| No. of teeth | 24-32 | 29.22 | 2.1 |



**Figure 2. Distribution of Body Mass Index in kg/m²**

The characteristics of participants by prevalence of periodontal problem are shown in Table 2. Among 100 teachers examined, 47 were suffering from periodontal disease with varying periodontal pocket depths. There was a significant difference for age between the groups, with the mean age of periodontitis group being 7 years older than that of the control group. Body Mass Index of the periodontitis group was higher as compared to control group. The DMFT scores were less in periodontitis group and more number of teeth were present in periodontitis group. The present study showed that there were significant differences in age, BMI and number of teeth present

between the control group and periodontitis group. No significant difference in DMFT was found between the two groups.

The dependent variable for the multiple logistic regression analysis was categorized into control group (CPI ≤ 2 = 0) and periodontitis group (CPI ≥ 3 = 1) and the independent variables were BMI, age, DMFT and number of teeth present. Both adjusted and crude odds ratio were calculated for assessing the influence of various independent variables on the periodontal status.

**Table 2. Characteristics of participants by periodontal status**

| Characteristics | CPI Score 0-2 (n = 53) | CPI Score 3-4 (n = 47) | p-value |
|---|---|---|---|
| Age | 38.83 ±9.13 | 45.72±8.45 | 0.000* |
| BMI index | 22.03 ±3.54 | 25.00 ±3.10 | 0.000* |
| DMFT | 4.70 ±2.80 | 4.09 ±3.61 | 0.245 |
| No. of teeth | 28.72 ±2.15 | 29.79 ±1.98 | 0.016* |

*statistically significant

Logistic regression analysis revealed that the risk of periodontal disease increased with the age (adjusted odd ratio 1.10; 95 % CI, 1.03-1.17). The present study revealed that subjects had an increased risk of periodontitis by 39% for each 1 kg/m² Body Mass Index increase (adjusted odd ratio 1.39; 95 % CI, 1.15-1.67) (Table 3).

**Table 2. Characteristics of participants by periodontal status**

| | Crude odd ratio (95 % CI) | p-value | Adjusted odd ratio (95 % CI) | p-value |
|---|---|---|---|---|
| Age | 1.09(1.03-1.14) | 0.001* | 1.10(1.03-1.17) | 0.004* |
| BMI | 1.33(1.14-1.54) | 0.000* | 1.39(1.15-1.67) | 0.000* |
| No. of teeth | 1.29(1.05-1.58) | 0.014* | 1.55(1.15-2.09) | 0.004* |

*statistically significant

## DISCUSSION

The study found that the prevalence of periodontal problem in adult Kathmandu valley school teacher sample was 95% according to all categories of CPI Scores (bleeding on probing 14%, calculus 34%, shallow periodontal pocket 35%, deep periodontal pocket 12%). The prevalence of periodontal disease according the presence of periodontal pocket was 47%. National Oral Health Pathfinder Survey-2004 found prevalence of periodontitis was 43.8% and 34.3% for 35-49 years and 50+ years old respectively.[16] The prevalence of periodontal disease among Indian general population of 35-44 years age group was reported to be 89.6%.[17]

The prevalence of dental caries was 85% with the mean DMFT score of 4.41. National Oral Health Pathfinder Survey-2004 found prevalence of dental caries was 57.5% for 35-44 years age group and 69.6% for >50 years age group.[16] WHO and FDI (World Dental Federation) jointly formulated the oral health goal-2000 that the 85% of the population should retain all their teeth at the age of 18

years. The present study showed the mean number of teeth present among the adult Kathmandu valley school teacher sample was 29.22.

The present study showed that the individuals with higher BMI and increased age had an increased risk for periodontal disease. The study result showed that, there is an increased risk of periodontitis by 39% for each 1 kg/$m^2$ gain of BMI (adjusted odd ratio 1.39; 95% CI, 1.15-1.67). Ekuni et al. revealed increased risk of periodontitis by 16% for each 1 kg/$m^2$ BMI increase through CPI Scores in young Japanese adults.[8] Kumar et al. reported increased risk of periodontitis by 57% for each 1 kg/$m^2$ increase in BMI in adult Indians.[9] Miyazaki et al. used CPITN to assess periodontal status and found that the periodontal disease increased with the age.[18]

Periodontal disease and chronic disease have the same essential risk factors; severe periodontal disease is related to poor oral hygiene and to poor general health. Periodontal disease is thus a component of global burden of health care.[19] Higher BMI score indicates greater risk for developing serious health problems like diabetes, heart disease and stroke. BMI has a positive relationship with pro-inflammatory markers. Significant positive relationships were identified between BMI and Apolipoprotein B, C-reactive protein, uric acid, RBC's, WBC's, eosinophils, and lymphocytes. Thus BMI scores are related to oral health and may be a confounder of disease status.[20]

This study had some limitations as purposive sampling technique was used and the number of participants was small (n=100). Other factors like oral health behaviors, dental plaque, smoking, alcohol consumption, dietary habit, roles of genetic etc; which have been shown to affect the prevalence of periodontitis were not considered in the study. Longitudinal studies with a larger sample size are required to confirm the association of BMI and periodontal disease.

## CONCLUSION

The present study found that the prevalence of periodontal problem was 95% and prevalence of dental caries was 85%. The mean DMFT score was 4.41. Mean number of teeth present was 29.22 among adult Kathmandu valley school teachers. Among 100 teachers examined; 10% were underweight, 38% were overweight and 2% were obese according to BMI. Higher BMI could be a potential risk factor for periodontitis among adult population as the present study showed the increased risk of periodontitis by 39% for each 1 kg/$m^2$ BMI increase. Additionally, developing periodontal problems could be a causative factor for overweight in Nepalese adults.

## ACKNOWLEDGEMENT

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