ORIGINAL RESEARCH ARTICLE

PERIODONTAL STATUS AND ITS RELATION TO BODY MASS INDEX AMONG UPPER PRIMARY AND SECONDARY SCHOOL PHYSICAL EDUCATION TEACHERS IN DAVANGERE CITY, INDIA

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ABSTRACT

Background: Periodontitis is among the most common chronic disorders affecting the world population. Over the past few decades, obesity has also become a significant worldwide health problem. Being overweight and obese has been associated with an increased risk for periodontal disease. It has been suggested that obesity is second only to smoking as the strongest risk factor for inflammatory periodontal tissue destruction. The objective of this study was to determine body mass index, periodontal status and their relation, among upper primary and secondary school physical education teachers in Davangere city, India.

Methodology: A total of 109 physical education instructors from 87 upper primary and secondary schools were included in the study. Periodontal status was recorded using Community Periodontal index (CPI). Body Mass Index (BMI) was calculated as the ratio of the subject's body weight (in kg) to the square of their height (in meters).

Results: Of the 109 subjects examined, only 3.7% had healthy periodontal tissues. About 27.5% of the subjects had bleeding only. Presence of calculus was noted in 68.8% of the subjects. 74.3% of the subjects had periodontal pockets. Majority of the respondents had normal body mass index. Logistic regression analysis done to determine the association between BMI and periodontal status, revealed that there is statistically significant association between BMI and periodontal status.

Conclusion: The prevalence of periodontitis is high among the upper primary and secondary school physical education teachers in Davangere city. BMI was significantly associated with periodontal status indicating that a higher body mass index could be a potential risk factor for periodontitis.

Key words: Community Periodontal Index, Body Mass Index, physical education teachers, periodontitis.

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INTRODUCTION

Periodontitis is among the most common chronic disorders affecting the world population. It is initiated by gum colonization by pathogenic bacteria, followed by the activation of defense mechanisms. Nevertheless, the exact mechanism that describes the development of periodontitis is not yet elucidated. It is possible that many factors are associated with the development, progression and aggressiveness of the disease.[1] Periodontitis is now seen as resulting from a complex interplay of bacterial infection and host response, often modified by behavioral factors. Advances in research over recent years have led to a fundamental change in the periodontal disease model.[2]

It is evident from the scientific literature that general health has a considerable impact on oral health and vice versa. Many mediators have been postulated for this relationship, namely infection, chronic inflammation, and genetic predisposition. Apart from these mediators, nutrition has been postulated as an alternative mediator.[3]

Over the past few decades, obesity has become a significant worldwide health problem. Obesity is a complex multifactorial chronic disease that develops from an interaction of genotype and the environment. Overweight and obese adults are considered to be at high risk for various serious, life-threatening medical diseases, such as type 2 diabetes, hyperlipemia, hypertension, cholelithiasis, arteriosclerosis, cardiovascular, cerebrovascular diseases and endocrine and psychological disorders.[4,5]

Being overweight and obese also has been associated with an increased risk for periodontal disease. It has been suggested that obesity is second only to smoking as the strongest risk factor for inflammatory periodontal tissue destruction. According to current knowledge the adverse effect of obesity on the periodontium might be mediated through impaired glucose tolerance, dyslipidaemia or through increased levels of various bioactive substances secreted by adipose tissue such as serum resistin, leptin and adiponectin. Obesity enhances the risk of an individual exhibiting periodontitis, by increasing the numbers or proportions of pathogenic subgingival species.[4,6,7]

Obesity has significant association with periodontitis in terms of BMI, body fat and maximum oxygen consumption. Body Mass Index (also called as Quetelet index) which is a ratio of body weight (in kilograms) to body height (in meters) squared is highly correlated with fat mass, and morbidity and mortality therefore sufficiently reflects obesity related disease risk in a wide range of population. Numerous studies have concluded that individuals with high BMI are at an increased risk of deep periodontal pockets, loss of attachment and periodontal infection compared to individuals with normal BMI.[4-7] However, studies reporting the BMI of physical education instructors are sparse. Hence this study was conducted with the following objectives, to determine the body mass index of upper primary and secondary school physical education instructors in Davangere city, India, to determine their periodontal status and to investigate whether or not there is an association between body mass index, and periodontitis in healthy upper primary and secondary school Physical Education instructors.

METHODOLOGY

The target population was upper primary and secondary school teachers involved in physical education (PE) classes. The list of schools with PE teachers was obtained from the Block Education Officer of Davangere City. The schools in Davangere city are divided into six clusters. A total of 114 PE teachers from 87 upper primary and secondary schools from all the six clusters were included in the study.

The participants were informed about the objective of the study. Based on their approval, participants were asked to read carefully and sign a consent form.

Exclusion criteria for all subjects included: periodontal or antibiotic therapy in the previous 6 months; any systemic condition which might have influenced the course of periodontal disease or treatment (e.g. diabetes); any systemic condition which required antibiotic coverage for routine periodontal procedures. Five subjects were thus excluded from the study and the final sample size was 109.

Periodontal condition was assessed using the World Health Organization community periodontal index.

The CPI probe was used to measure the pocket depth. The subjects were examined by two post graduate students (Cohen's Kappa = 0.92) of Department of Preventive and Community Dentistry, College of Dental Sciences, Davangere. 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).

Body mass index was assessed as indicator of overall adiposity. Body mass index was computed as weight in kilograms divided by square height in meters. The subjects were classified into six groups (underweight, normal, pre-obese, obese class I, obese class II and obese class III) as recommended by the World Health Organization.

Ethical clearance for conducting the study was obtained from the Ethical Committee of the college.

Results were analyzed using the SPSS Version 17.0 software. Chi-square test was performed and the level of significance was set at p = 0.05. Multivariate logistic regression was conducted to determine the association between body mass index and the prevalence of periodontal disease after adjusting for important variables namely age, sex and smoking habit.

RESULTS

Table 1 presents the general profile of the study population. Of the 109 physical education teachers examined, 68.8% (n=75) were males and 31.2% (n=34) were females. 34.9% (n=38) were aged between 20 and 30 years and 37.6% (n=41) were aged between 31 and 40 years.

Majority of the subjects (63.3%, n=69) had normal BMI. About 6.4% (n=7) were underweight and 30.3% were overweight. Of the subjects with overweight, 25.7% (n=28) belonged to Pre-obese category. Only 1.8% (n=2) and 2.8% (n=3) of the subjects belonged to obese class I and obese class II respectively. Only 33.1% (n= 37) were smokers.

Of the 109 subjects examined, only 3.7% (n=4) had healthy periodontal tissues. About 27.5% of the subjects had bleeding only. Presence of calculus was noted in 68.8% of the subjects. (n=75). 52.3% (n=57) of the subjects had shallow pockets and 22% (n=24) of the subjects had deep periodontal pockets. (Table 2)

Chi square test used to analyze the significant relationship between CPI scores with the variables namely gender, age, smoking history and BMI revealed that there was statistically significant relationship of CPI scores with age group (p value = 0.035) and BMI (p value = 0.007).

Logistic regression analysis done to adjust the confounding variables (age group, sex and smoking history) in determining the association between BMI and periodontal status, revealed that there is statistically significant association between BMI and periodontal status. (Table 3)

DISCUSSION

The present survey included 109 physical education teachers from 87 Upper Primary and Secondary schools in Davangere City. Most of the physical education instructors were males (68.8%). Majority of the respondents were less than 40 years of age (72.5%).

The periodontal status, as indicated by the CPI scores reveals that only 3.7% of the subjects had healthy periodontal tissues. The overall prevalence of periodontal disease among the general population of India, belonging to the 35 - 44 years age group, as reported in National oral health survey and fluoride mapping is 89.6%. 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 lack of awareness regarding oral health. The negligence and lack of awareness towards oral health is reflected by the fact that almost a quarter of the subjects (22%) had deep periodontal pockets and more than half of the subjects (52.3%) had shallow pockets. Although no such study that determined the periodontal status of physical education teachers has been reported and the fact that the present study used a wide range of age (22-54 years), the results have been compared with studies conducted among similar age groups.

In a study conducted among adults Kesariyaji India, with age group 18-54 years, it was observed that although the percentage of subjects with healthy

TABLE 1: GENERAL PROFILE OF THE STUDY POPULATION

CHARACTERISTICS	PERCENTAGE OF SUBJECTS
GENDER	
MALE	68.8
FEMALE	31.2
AGE GROUP (IN YEARS)	
20 - 30	34.9
30 - 40	37.6
40 - 50	25.7
> 50	1.8
BODY MASS INDEX (BMI)	
UNDERWEIGHT (<18.5)	6.4
NORMAL (18.5 – 24.99)	63.3
PRE-OBESE (25 – 29.99)	25.7
OBESE CLASS I (30 – 34.99)	1.8
OBESE CLASS II (35 – 39.99)	2.8
OBESE CLASS III (> 40)	0
SMOKING HISTORY	
YES	33.1
NO	66.9

TABLE 2: PERIODONTAL STATUS OF THE SUBJECTS

CPI SCORE	PERCENTAGE OF SUBJECTS
0	3.7
1	27.5
2	16.5
3	30.3
4	22.0
SEXTANT – WISE SCORE	
CHARACTERISTICS	NO. OF SEXTANTS
Mean no. of sextants with healthy periodontal tissues	165
Mean no. of sextants with bleeding or higher score	489
Mean no. of sextants with calculus or higher score	243
Mean no. of sextants with shallow pockets or higher score	147
Mean no. of sextants with deep pockets or higher score	51

TABLE 3: MULTIVARIATE LOGISTIC REGRESSION ANALYSIS WITH CPI SCORE AS DEPENDENT VARIABLE

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.234	.576	-.018	2.140	.035
GENDER	-.046	.286	.171	-.162	.872
AGE GROUP	.250	.146	-.010	1.716	.089
SMOKING	-.025	.275	*.197*	-.090	.928
BMI	*.322*	*.160*		*2.010*	*.047*

periodontal tissues were similar, the prevalence of deep pockets was high (22%) in comparison with this study.[3]

The BMI status of the subjects reveals that majority of the subjects (63.3%) had normal BMI and of the 30.3% who were overweight, majority belonged to Pre-obese category. Only 1.8% (n=2) and 2.8% (n=3) of the subjects belonged to obese class I and obese class II respectively. This can be explained by the fact that the profession of the subjects demands the physical fitness and hence majority of the subjects having a normal BMI.

In the current study, obesity was positively related to periodontal status after adjusting for age, gender and smoking history. Studies that attempt to relate periodontal disease to the systemic status of an individual are often confronted with the issue that periodontal disease increases with age and most of the systemic conditions of interest such as diabetes, heart disease, stroke and obesity also increase in prevalence with age.[4] Subjects with systemic diseases were excluded from the study. After adjusting for age, gender and smoking status using a logistic regression model, BMI was still significantly associated with periodontal status.

Studies conducted by Bali et. al. in India and Ekuni et .al. in Japan [8,9] that have included either young or old subjects and data from those studies on have suggested that periodontal status deteriorates with BMI.

Numerous studies conducted by Santosh et. al, Haffajee et. al., Saitol et. al., Ylostalo et. al. and Khader YS et. al.[3-6, 10] among similar age groups have revealed significant positive association of periodontal disease with BMI. A study conducted by Johanne K et. al. in Copenhagen[11] has shown an inverse association between BMI and clinical attachment loss. The authors have explained that the observed inverse association could be due to the reason that individuals with high BMI had lost their periodontally affected teeth and thereby classified as periodontally healthy.

The underlying biological mechanisms for the association of obesity with periodontitis are not well-known; however, adipose-tissue-derived cytokines and hormones may play a key role.

Fat tissue produces a vast amount of cytokines and hormones, collectively called adipokines or adipocytokines which in turn may modulate periodontitis. Obesity increases the host's susceptibility by modulating the host's immune and inflammatory system, leaving the patient with greater risk of periodontitis. Plasminogen-activating system has been shown to play an important role in gingival inflammation. Plasminogen-activator inhibitor-1 (PAI-1) has an increased expression in visceral fat and induces agglutination of blood increasing the risk of ischaemic vascular disease. Thus, PAI-1 may also decrease the blood flow to the gingiva in obese people that encourage periodontitis progression. These are possibilities and studies are not yet conducted to reveal disease mechanisms.[12]

The association between smoking and the prevalence of periodontal disease was not statistically significant. Furthermore, there was no significant interaction between smoking and other variables on the occurrence of periodontal disease. This finding of the lack of association contradicts the findings of previous epidemiological, clinical, and in vitro studies that have provided irrefutable evidence that smoking negatively impacts periodontal health.

There were limitations to the present study that included subject selection and the cross-sectional nature of the data. Another limitation of this study is that as the periodontal status was assessed using the Community periodontal index, which does not include all the teeth and does not measure attachment loss.

Further studies with a larger sample size are required to confirm the association of body mass index and periodontal disease.

CONCLUSION

Majority of the physical education instructors in Davangere city had a normal body mass index. The prevalence of periodontitis is high among the upper primary and secondary school physical education teachers in Davangere city. After adjusting for age, gender and smoking status using a logistic regression model, BMI was significantly associated with periodontal status indicating that a higher body mass index could be a potential risk factor for periodontitis.

REFERENCES

1. Boesing F, Patiño JSR, da Silva VRG and Moreira EAM. The interface between obesity and periodontitis with emphasis on oxidative stress and inflammatory response. Obesity reviews 2009; 10: 290-7
2. Fenesy KE. Periodontal disease: an overview for physicians. Mt Sinai J Med.1998; 65: 362-9.
3. Santosh K, Rushabh JD, Chandrakant D, Parbhu D. Relationship of Body Mass Index with periodontal health status of green marble mine laborers in Kesariyaji, India. Braz Oral Res. 2009;23(4):365-9
4. Haffajee AD, Socransky SS. Relation of body mass index, periodontitis and Tannerella forsythia. J Clin Periodontol 2009; 36: 89–99.
5. Saitol T, Shimazakil Y, Kogal T, Tsuzuki M, and Ohshima A. Relationship between upper body obesity and periodontitis. J Dent Res 2001; 80(7): 1631-6.
6. Ylo¨stalo P, Suominen-Taipale L, Reunanen A, Knuuttila M. Association between body weight and periodontal infection. J Clin Periodontol 2008; 35: 297-304.
7. Pischon N, Heng N, Bernimoulin JP, Kleber BM, Willich SN, and Pischon T. Obesity, inflammation and periodontal disease. J Dent Res 2007; 86(5):400-9.
8. Bali RK, Mathur VB, Talwar PP, Chanana HB. National oral health survey and fluoride mapping 2002–2003. New Delhi: Dental Council of India; 2004.
9. Ekuni D, Yamamoto T, Koyama R, Tsuneishi M, Naito K, Tobe K. Relationship between body mass index and periodontitis in young Japanese adults. J PeriodontRes 2008; 43: 417–21.
10. Khader YS, Bawadi HA, Haroun TF, Alomari M, Tayyem RF. The association between periodontal disease and obesity among adults in Jordan. J Clin Periodontol 2009; 36: 18–24.
11. Kongstad J, Hvidtfeldt UA, Gronbaek M, Stoltze K, Holmstrup P. The relationship between body mass index and periodontitis in the Copenhagen heart study. J Periodontol 2009;80:1246-53.
12. Anne FR, Jane MR, Melissa S, Philippe H. Total body weight and waist circumference associated with chronic periodontitis among adolescents in the United States. Arch Pediatr Adolesc Med. 2006;160:894-9