

ORIGINAL ARTICLE

Relationship between Obesity and Periodontal Status in Vietnamese Patients: A Pilot Study

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ABSTRACT

Objectives: To investigate periodontal status and the relationship between obesity and periodontal status in female patients who first visited the Traditional Medicine Institute, Ho Chi Minh city, Vietnam.

Materials and methods: One hundred and three female patients aged 18 or older, including 45 obese subjects and 58 nonobese subjects were enrolled in a period of 5 months from February to June 2014. The information on sociodemographic characteristics and dental habits were collected by questionnaire. Periodontal status [plaque index (PI1), gingival index (GI), bleeding on probing (BOP), pocket depth (PD), clinical attachment level (CAL)] was examined and the anthropometric index was measured.

Results: There was significantly higher prevalence of periodontitis (40.0%) in obese females than nonobese females (13.8%). The means values of periodontal parameters in obese females were significantly higher than those in nonobese females. Significantly, higher percentage of subjects who did not use dental flossing, or less regularly visited dental offices, or less regularly had their teeth scaled and polished was in the obese group than those in the nonobese group. Multiple logistic regression analysis revealed that age [odds ratio (OR) = 3.60], routine of dental visit (OR = 3.75) and obesity (OR = 3.46) were significantly related to periodontitis.

Conclusion: Periodontal status in obese subjects was poorer than nonobese ones. Obesity, age and dental visit were associated with periodontitis in Vietnamese female patients.

Keywords: Body mass index, Obesity, Periodontitis.

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INTRODUCTION

Obesity is considered as a severe health problem worldwide. It is supposed that obesity is strongly associated with several major health risk problems, especially cardiovascular disease, hypertension, type 2 diabetes, metabolic syndrome.¹ Obesity has been recognized as a large public health issue, not only in European and American countries but recently in Asia.²

Obesity is also supposed to be a risk factor for periodontal status. Since the first study on rats which found an association between obesity and the level of the alveolar bone loss,³ there have been numerous studies on the relationship between obesity and periodontal disease. In 1998, for the first time a link between obesity and periodontal disease in humans was reported in a study on Japanese people.⁴ Adipose tissue is not a passive tissue which stores energy in body. It secretes various hormones and cytokines which are involved in inflammatory process. Many proteins secreted from adipose tissue have been found to have different effects on distant organs, in which a number of proteins are the key regulating factors in the inflammatory response.⁵

Although many studies on the relationship between obesity and periodontitis have been reported,⁶ however, conflicting data exist.⁷ In Asia, there have not been many studies which have examined the association between obesity and periodontitis based on Asia populations and most of these were on Japanese people.^{4,8,9} There is a need for more research about the link in this area, where the data and extent of obesity is still not known well, especially in lower- and middle income countries. There was no data about the oral health status in Vietnamese obesity people. Therefore, we firstly conducted a pilot study to initially investigate the association between obesity and periodontal status in a population of Vietnamese females. Additionally, this study evaluated the sociodemographic characteristics and dental habits in Vietnamese obese women and their influences to the presence of periodontitis.

MATERIALS AND METHODS

Subjects

This is a cross-sectional study which carried out from February to June 2014. A total of 151 patients aged 18

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or older who first visited at the Clinic of Overweight—Obesity, the Traditional Medicine Institute, Ho Chi Minh city, Vietnam, were recruited and underwent a periodontal examination. Because there were nine male patients, thus they were excluded in this study. In addition, after adopting the following exclusion criteria: less than 14 teeth present, wearing fixed orthodontic braces, pregnant or lactating, having systemic diseases that could influence periodontal conditions, using medicine that could influence periodontal conditions and treating for periodontitis in the previous 3 months, 39 subjects were excluded. Therefore, the study population consisted of 103 female subjects in total with between 18 and 66 years. This study was approved by the Ethics Committee of the University of Medicine and Pharmacy at Ho Chi Minh city. All subjects participated voluntarily and provided written informed consent before commencement of the study.

QUESTIONNAIRE

Each participant was interviewed over a questionnaire by a trained 6-year dental student. Sociodemographic information including age, gender, educational background and smoking habit was collected. Education background was recorded and classified into two categories: those who have less than or equal to 12 years of schooling *vs* those who have post high school education. Dental habits, such as flossing (categorized as yes or no), daily tooth brushing (categorized as yes or no), routine of dental visit (categorized as those who regularly have dental checks-ups *vs* those who never have dental services, or just used them when having symptoms) and past professional cleaning (the time elapsed since the previous cleaning categorized as less than 1 year *vs* more than 1 year) were also obtained.

Anthropometric measurements which included weight (in kilograms) and height (in meters) were measured while subjects were wearing light clothes and no shoes by a trained nutritional nurse from the clinic. Body mass index (BMI) (kg/m^2) was calculated for all participants. Obesity was defined as $\text{BMI} \geq 27.5$ and nonobese as $\text{BMI} < 27.5$. This BMI cut-off was based on these Asian-specific cut-off values which World Health Organization (WHO) had suggested as overweight and obesity 'action trigger points for public health action' for Asian populations.¹⁰ This value was proposed to be appropriate for Vietnamese and were used in previous research about obesity epidemic in Vietnam.^{11,12}

Periodontal Status Examination

A full-mouth periodontal examination was performed for all participants to assess periodontal index: Plaque

index (PII), pocket depth (PD), clinical attachment level (CAL), bleeding on probing (BOP) and gingival index (GI). Pocket depth, CAL and BOP were recorded for all teeth in mouth except for the third molars at six sites per tooth, using a Williams probe (HuFriedy). Plaque index and GI were evaluated at four sites per tooth based on Loe and Silness index (1967).¹³ All clinical data were recorded by one well-trained examiner. Ten patients were chosen randomly to duplicate periodontal status examination. Interexaminer agreements in assessing PII, PD, CAL, BOP, GI were higher than 80%.

Periodontitis was defined as the presence of two or more interproximal sites with $\text{CAL} \geq 4$ mm, not on the same tooth, or two or more interproximal sites with $\text{PD} \geq 5$ mm, not on the same tooth, following the moderate periodontitis definition of CDC and AAP, 2007.¹⁴

STATISTICAL ANALYSIS

Statistical analysis included descriptive and analytical statistics. Descriptive statistical methods were used for characterization of obese and nonobese groups: frequency distribution for categorical variables and median, mean, and standard deviation for continuous variables. Normality of the distributions for the variables was measured by the Kolmogorov-Smirnov test. Statistically significant differences between groups were tested using independent samples t-test, Chi-square test or Mann-Whitney test. Multivariate regression model was examined by using periodontitis as dependent variable and social-demographic characteristic or dental habit variables as independent ones. All statistical tests were performed using a software statistical package for social sciences (SPSS) (version 20.0) and considered to be significant for $p < 0.05$.

RESULTS

Sociodemographic Characteristic of Subjects

This study included a total of 103 female participants aged between 18 and 66 years old with a mean (SD) of 35.58 (13.01). According to BMI, there were 45 obese and 58 nonobese subjects. Sociodemographic data for the group, including age, education and dental habits are shown in Table 1. There were 6.7% of the subjects who did not brush their teeth daily and 64.1% of the participants who did not use dental flossing. Obese group had a significantly lower percentage of subjects who had routine of using dental flossing (28.6%) compared with nonobese group (71.4%). The percentages of women who had less regular dental visit and professional dental cleaning in obese group were respectively 54.0 and 53.8%. All of these were statistically higher than in nonobese one (46.0 and

Table 1: Sociodemographic characteristics of obese and nonobese groups

| Variables | Obese (n = 45) | Nonobese (n = 58) | p-value |
|-----------------------|-------------------|----------------------|---------|
| Age | | | 0.23 |
| ≤ 35 years | 26 (49.1) | 27 (50.9) | |
| > 35 years | 21 (38.0) | 31 (62.0) | |
| Educational level | | | 0.06 |
| ≤ High school | 18 (34.6) | 34 (65.4) | |
| > High school | 27 (52.9) | 24 (47.1) | |
| Daily toothbrushing | | | 0.08 |
| Yes | 40 (41.7) | 56 (58.3) | |
| No | 5 (71.4) | 2 (28.6) | |
| Dental flossing | | | 0.03 |
| Yes | 10 (28.6) | 27 (71.4) | |
| No | 35 (51.5) | 33 (48.5) | |
| Dental visit | | | 0.03 |
| Regular | 18 (34.0) | 35 (66.0) | |
| Never/rarely | 27 (54.0) | 23 (46.0) | |
| Professional cleaning | | | 0.007 |
| < 1 year | 10 (26.3) | 28 (73.7) | |
| >1 year | 35 (53.8) | 30 (46.2) | |

Chi-square test

Table 2: Periodontal status in the obese and nonobese groups

| Parameters | Obese (n = 45) | Nonobese (n = 58) | p-value |
|--------------------------------|--------------------|----------------------|--------------------|
| Plaque index | 1.18 (1.05 – 1.52) | 1.11 (1.02 – 1.26) | 0.058 ^a |
| Gingival index | 1.08 (1.04 – 1.19) | 1.05 (1.01 – 1.09) | 0.009 ^a |
| Bleeding on probing (%) | 4.08 (1.14 – 7.62) | 6.41 (3.40 – 14.44) | 0.007 ^a |
| Pocket depth (mm) | 1.69 ± 0.42 | 1.50 ± 0.32 | 0.009 ^b |
| Clinical attachment level (mm) | 1.76 ± 0.48 | 1.54 ± 0.31 | 0.004 ^b |

^aMann-Whitney test, ^bIndependent t-test

46.2%, respectively). There was no significant difference in age, educational level and daily tooth brushing habit between the two groups.

Periodontal Status

There was a significantly higher prevalence of periodontitis (40.0%) in the obese group compared with the nonobese group (13.8%). Table 2 shows the periodontal condition of the obese and nonobese groups. The means of GI, BOP, PD, CAL in obese subjects were significantly higher than those in nonobese subjects ($p < 0.01$). However, there was no difference in PI1 between the obese and the nonobese groups ($p = 0.058$).

Multivariate Logistic Regression for the Periodontitis

The multivariate logistic regression model was carried out to assess the association between the occurrence of

Table 3: Multivariate logistic regression model for the periodontitis

| Variables | N (%) | OR (95% CI) | p-value |
|--------------|------------|---------------------|---------|
| Age | | | 0.03 |
| ≤ 35 years | 53 (51.5%) | 1 | |
| > 35 years | 50 (48.5%) | 3.23 (1.09 – 9.54) | |
| Dental visit | | | 0.01 |
| Regular | 53 (51.5%) | 1 | |
| Never/rarely | 50 (48.5%) | 4.79 (1.58 – 14.48) | |
| Obesity | | | 0.01 |
| Nonobese | 58 (56.3%) | 1 | |
| Obese | 45 (43.7%) | 4.13 (1.47 – 11.60) | |

Adjusted by educational level, dental flossing behavior and professional dental cleaning

periodontitis and age, dental visit and obesity with the adjustment of education level, dental flossing and professional dental cleaning (Table 3). It showed that age, routine of dental visit and obesity were significantly associated with periodontitis ($p < 0.05$). The odds ratios for age, dental visit and obesity were 3.23, 4.79 and 4.13, respectively (95% CI).

DISCUSSION

Our study showed that the periodontal status in the obese woman subjects was observed to be poorer than women in the nonobese. Except for PI1, the means of GI, BOP, PD, CAL in the obese female subjects were significantly higher than those in the nonobese female subjects. There was another study on Iranian people also reported that PD and CAL were significantly higher in the obese group compared to the nonobese group but there was no difference in PI1 between the two groups.¹⁵ Saito et al showed that the proportion of subjects with the highest quintile of mean PPD or CAL increased significantly with the quartiles of BMI.⁹ Wood et al (2003) reported that PD, CAL and BOP were significantly correlated with waist-hip-ratio and BMI, based on data from The third National Health and Nutrition Examination Survey (NHANES III) the USA.¹⁶

Also, a significantly higher prevalence of periodontitis was found in obese female patients compared to the nonobese female ones in this study. Similarly, Haffajee and Socransky (2009) showed that overweight or obese women had a greater percentage of periodontitis than woman individuals with normal BMI and the relationship between periodontitis and obesity may be enhanced in females.¹⁷ This relationship is also confirmed by the findings of many reports on obesity and periodontal disease,^{4,9,18,19} suggesting that obesity is related to periodontitis. However, Torrungruang et al in Thailand reported that there was no association between obesity and periodontitis.⁷ There has been a rising concern about the link between obesity and periodontal disease. Our

finding supported the hypothesis of the relationship between obesity and periodontitis. It has been proposed that adipose-tissue-derived cytokines and hormones may play a key role. 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.⁵

The present findings suggested that obese female people had worse dental habits, including less regular dental flossing, dental visit and professional dental cleaning compared to nonobese ones. Our results agreed with the findings published by Hujuel PP et al (2006) who observed that the higher the BMI was, the less likely to use dental floss.²⁰ Anna LO, Calle B (2012) showed that obese subjects had a lower likelihood of regular use of dental health services compared with the nonobese.²¹ A study conducted by Helen BF et al revealed that dental anxiety was more common among women with higher BMI levels.²² We suppose that inadequate habits of oral care can put obese women in higher risks of dental problems.

A number of studies showed different results when evaluating the relationship between obesity and periodontitis after adjusting for other factors, such as sociodemographic factors, routine dental or systemic disease.^{19,23} In the recruiting criteria, we excluded the subjects who were males or having systemic diseases or using medicines that could influence periodontal conditions. Moreover, there were no smokers or past-smokers in our participants. Therefore, we could eliminate the effects of gender, smoking and other confounders to the relationship between obesity and periodontitis.

Age is a risk factor for periodontitis, the prevalence and severity of periodontitis increase with age.²⁴ In this study, female individuals aged over 35 were more likely to have periodontitis (OR = 3.10). However, educational level was not found to be associated with periodontitis in this analysis. This finding is rather similar to a previous study on Vietnamese people, in which subjects in the 50 to 60-year-old group were more likely to have periodontitis than those in the 30 to 39-year-old group.²⁵ It is suggested that periodontal attachment loss can be due to a long-time exposure with risk factors and accumulate with increasing age.

In the present study, irregular dental visit habit was shown as a risk factor for periodontitis. Subjects who did not have frequent check-ups had 4.79 times more chance to show periodontitis. This result confirms previous research about the relationship between the utilization of dental care and periodontal status.²⁶ A possible explanation proposed for this pattern is that people who have regular dental visit have a tendency to be provided adequate prevention to periodontal disease in time.

After being adjusted for age, education, dental habits, such as flossing, dental visits and professional cleaning, a significant OR (OR = 4.13) for the association between obesity and periodontitis was observed. Consequently, our study indicated a relationship between obesity and periodontitis. Similarly, a recent study which assessed this association in the Brazilian women population also found a significant association between periodontitis and obesity, after adjusting for age, education, marital status, smoking, diabetes, hypertension, and dyslipidemia.¹⁸ Nishida et al determined that obesity was the second strongest risk factor after smoking for periodontitis.⁸ However, Torrungruang et al (2005) reported that obesity was not a risk factor for the periodontal disease severity, whereas age, genders, education, smoking, diabetes and oral hygiene status were.⁷ The majority of studies on the relationship between obesity and periodontal status were cross-sectional, thus they did not clarify whether obesity was the causing of periodontitis. It is supposed that there has been a need for study designs, mainly longitudinal and/or interventional research to investigate this association.

CONCLUSION

This study reported the poorer periodontal condition, higher prevalence of periodontitis in obese female people compared to nonobese female ones. Furthermore, age, dental visit habit and obesity were significantly associated with periodontitis in Vietnamese females. These findings indicate the need for early diagnosis and the inclusion of periodontal care in healthcare programs for obese women in Vietnam. Association of periodontal infection with organ systems like cardiovascular system, endocrine system, reproductive system, and respiratory system makes periodontal infection a complex multi-phase disease.²⁷

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