

## Relationship between Obesity and Periodontal Status in Vietnamese Patients

Nguyen Thi Xuan Ngoc, Pham Anh Vu Thuy\*

1. Faculty of Odonto-Stomatology, University of Medicine and Pharmacy, Ho Chi Minh City,  
217 Hong Bang, Quang 5, Vietnam

\*E-mail: pavthuy@hotmail.com

---

### Abstract

This study aims to investigate periodontal status, and the relationship between obesity and periodontal status in patients who first visited the Institute of Traditional Medicine, Ho Chi Minh City, Vietnam. 118 patients aged 18 or older, including 56 obese subjects (BMI 27.5, mean age: 33.8, males: 11, females: 45) and 62 non-obese subjects (BMI<27.5, mean age: 34.3, males: 4, females: 58) were enrolled for a period of 5 months from February 2014 to June 2014. The information on socio-demographic characteristics and dental habits were collected by questionnaire. Periodontal status (PLI, GI, BOP, PD, CAL) was examined and the anthropometric index was measured. There was significantly higher prevalence of periodontitis (39.3%) in the obese group than the non-obese group (16.4%). Means of GI, BOP, PD, and CAL in obese subjects were significantly higher than those in non-obese subjects. Significantly higher percentages of subjects who had lower education, visited dental offices, scaled and polished their teeth regularly were in the non-obese group than in the obese group. Multiple logistic regression analysis revealed that age (OR=3.10), routine of dental visit (OR=3.34) and obesity (OR=2.79) were risk factors significantly related to periodontitis. Periodontal status in obese subjects was poorer than non-obese subjects. Obesity might be the risk factor for periodontitis in Vietnamese patients.

### Abstrak

**Hubungan antara Obesitas dan Status Periodontal Pasien di Vietnam: Studi Pendahuluan.** Penelitian ini bertujuan untuk menginvestigasi status periodontal serta hubungan antara obesitas dan status periodontal pasien-pasien yang baru pertama kali mengunjungi Institute of Traditional Medicine, Kota Ho Chi Minh, Vietnam. Terdapat 118 pasien berumur 18 tahun atau lebih yang terdiri dari 56 subjek penelitian yang mengalami obesitas (IMT 27,5 dengan rata-rata umur 33,8 tahun, 11 orang pria dan 45 orang wanita), dan 62 orang subjek penelitian non-obesitas (IMT<27,5 dengan rata-rata umur 34,3 tahun, 4 orang pria dan 58 orang wanita) yang terdaftar di institusi tersebut dalam kurun waktu 5 bulan dari bulan Februari hingga Juni 2014. Informasi mengenai karakteristik sosio-demografi dan kebiasaan mereka dalam merawat gigi dikumpulkan melalui kuesioner. Penelitian ini mengkaji status periodontal (PLI, GI, BOP, PD, dan CAL), dan dilakukan pengukuran indeks antropometri. Kelompok yang mempunyai obesitas memiliki prevalensi periodontitis yang secara signifikan lebih tinggi (39,3%) dibandingkan dengan kelompok non-obesitas (16,4%). Nilai rata-rata GI, BOP, PD, dan CAL pada subjek penelitian yang mengalami obesitas juga jauh lebih tinggi daripada subjek penelitian non-obesitas. Dalam hal latar belakang pendidikan yang lebih rendah, kunjungan ke dokter gigi serta tindakan pembersihan karang gigi rutin, persentase yang lebih tinggi ditemukan pada kelompok non-obesitas daripada kelompok obesitas. Analisis regresi logistik ganda yang dilakukan menunjukkan bahwa umur (OR=3,10), rutinitas kunjungan ke dokter gigi (OR=3,34) dan obesitas (OR=2,79) merupakan faktor risiko yang memiliki hubungan signifikan terhadap periodontitis. Status periodontal subjek penelitian yang mengalami obesitas lebih buruk daripada subjek yang non-obesitas. Terdapat kemungkinan bahwa obesitas merupakan faktor risiko periodontitis pada pasien di Vietnam.

*Keywords: body mass index, obesity, periodontitis*

---

### Introduction

Obesity is observed as a severe health problem worldwide. It is supposed that obesity is strongly associated with several major health risk problems. Especially, hypertension, metabolic syndrome, cardiovascular disease, type 2 diabetes.<sup>1</sup> Also, obesity is

considered as a large public health issue, not only in American and European countries, but also in Asia.<sup>2</sup>

Obesity is also supposed to be a risk factor for periodontal status. The first study on rats which found relationship between the level of the alveolar bone loss and obesity.<sup>3</sup> Some previous studies show the relationship between periodontal disease and obesity.

The relationship between obesity and periodontal disease in humans was found for the first time in 1998, in a study on Japanese people.<sup>4</sup> Adipose tissue is not a passive tissue which serves as a source of energy reserves in body. It secretes cytokines and various hormones are involved in the inflammatory process. Proteins produced from adipose tissue have been found to have different effects on distant organs, in which some proteins are the key regulating factors in the inflammatory response.<sup>5</sup>

Despite the fact that many studies on the relationship between obesity and periodontitis have been reported; however, conflicting data exist.<sup>7</sup> There have not been many studies which have investigated the association between periodontitis and obesity in Asia population and most of these were on Japanese people.<sup>4,8-9</sup> There is a need for more research on the link in this area, where the data and obesity is still not known well, especially in lower and middle-income countries. Therefore, we conducted to investigate the association between obesity and periodontal status in a population of Vietnamese. Additionally, this study evaluated the socio-demographic characteristics and dental habits in Vietnamese obese people and their influences to the presence of periodontitis.

## Methods

The cross-sectional study is carried out from February to June 2014. A total of 151 patients aged 18 or older who first visited at the Clinic of Overweight-Obesity, the Institute of Traditional Medicine, Ho Chi Minh city, Vietnam were recruited and underwent a periodontal examination. After adopting the following exclusion criteria: younger than 18, less than 14 teeth present, pregnant or lactating, wearing fixed orthodontic braces, using medicine that could influence periodontal conditions, having systemic diseases that affect treating for periodontitis and periodontal conditions in the previous 3 months, 33 subjects were excluded. Therefore, the study population consisted of 118 subjects in total, including 103 females and 15 males aged between 18 and 66. Ethics Committee of Medical and Pharmacy University approved this study. All subjects participated voluntarily and provided written informed consent before commencement of the study.

The participant was interviewed over a questionnaire by a trained 6-year dental student. Socio-demographic information such as: 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 versus those who have post high school education. Dental habits such as daily tooth brushing (categorized: yes or no), flossing (categorized: yes or no), routine of

dental visit (categorized: regularly have dental check-ups versus never have dental services, or just used them when having symptoms) and past professional cleaning (the time elapsed since the previous cleaning categorized: less than 1 year versus more than 1 year) were also obtained.

Anthropometric measurements which included weight (kilograms) and height (meters) were measured while subjects were wearing clothes and no wearing shoes by a trained nutritional nurse from the clinic. BMI (in kilograms per square meter) was calculated for participants. Obesity was defined as non-obese as  $BMI < 27.5$  and  $BMI \geq 27.5$ . The BMI cut-off was based on these Asian-specific cut-off values which WHO had suggested as overweight and obesity 'action trigger points for public health action' for Asian.<sup>10</sup> This value was proposed for Vietnamese and were used in previous studies about obesity epidemic in Vietnam.<sup>11,12</sup>

**Periodontal status examination.** A full-mouth periodontal examination was performed for all participants to assess periodontal index: Pocket Depth (PD), Plaque Index (PII), Clinical Attachment Level (CAL), Gingival Index (GI), and Bleeding On Probing (BOP). PD, CAL and BOP were recorded for teeth in mouth except for third molars at six sites per tooth, using a Williams probe. PII and GI were evaluated at four sites per tooth based on Loe and Silness index (1967).<sup>17</sup> All clinical data were recorded by well-trained examiner. 10 patients were chosen randomly to duplicate periodontal status examination. Inter-examiner agreements in assessing PD, PII, BOP, CAL, and GI were higher than 80%.

Periodontitis was defined as presence of two or more interproximal sites with  $CAL \geq 4$  mm, not on same tooth, or two or more interproximal sites with  $PD \geq 5$  mm, not on same tooth, following moderate periodontitis definition of CDC and AAP, 2007.<sup>13</sup>

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

## Results and Discussion

**Socio-demographic characteristic of subjects.** This study included a total of 118 participants aged between 18 and 66 years old with a mean (standard deviation) of 35.6 (13.5). There were 15 males and 103 females with the mean age respectively  $34.33 \pm 17.45$  and  $35.73 \pm 12.89$ . According to BMI, there were 56 obese and 62 non-obese subjects. Socio-demographic data for the group, including age, gender, education, BMI, dental habits are shown in Table 1. There were significantly higher percentages of subjects who were females; had higher education; less regular routine of dental flossing, dental visit and professional dental cleaning in the obese group than in the non-obese group. There was no significant difference in age and daily tooth brushing habit between the two groups.

**Table 1. Socio-demographic Characteristics of Obese and Non-obese Groups**

Variables	Obese (n=56)	Non-obese (n=62)	p
<b>Age (years old)</b>			NS
35	35 (55.6)	28 (44.4)	
>35	21 (38.2)	34 (61.8)	
<b>Gender</b>			0.03
Male	11 (21.1)	4 (6.6)	
Female	45 (78.9)	58 (93.4)	
<b>Educational level (year)</b>			0.04
12	20 (37.0)	34 (63.0)	
>12	36 (56.3)	28 (43.7)	
<b>Daily tooth brushing</b>			NS
Yes	48 (44.9)	59 (55.1)	
No	8 (72.7)	3 (27.3)	
<b>Dental flossing</b>			0.02
Yes	13 (32.5)	27 (67.5)	
No	43 (55.1)	35 (44.9)	
<b>Dental visit</b>			0.03
Regular	23 (37.7)	38 (62.3)	
Never/rarely	33 (57.9)	24 (42.1)	
<b>Professional cleaning</b>			0.01
<1 year	13 (30.2)	30 (69.8)	
>1 year	43 (57.3)	32 (42.7)	

Chi-square test,  $p < 0.05$  NS: no significance

### Periodontitis percentage and periodontal status.

There was a significantly higher prevalence of periodontitis (39.3%) in the obese group compared with the non-obese group (16.4%). The periodontal condition of the obese and non-obese groups (Table 2). The means of BOP, GI, CAL, PD, in obese subjects were higher significantly than those in non-obese subjects. However, there was no difference in PII between the obese and the non-obese groups.

The multivariate logistic regression model presented in Table 3 was carried out to assess the association between the occurrence of periodontitis and several factors such as: age, gender, education and dental habits. It showed that routine of dental visit, age, and obesity were significantly related with periodontitis. Furthermore, subjects over 35-year-old were more likely to have periodontitis than those who were less than or equal to 35-year-old (OR=3.10,  $p=0.03$ ). Participants who did not have dental visit habit (OR=3.34,  $p=0.03$ ) and were obese (OR=2.79,  $p=0.04$ ) had a higher risk to have periodontal disease compared with their counterparts. Gender, education, routines of dental flossing and professional dental cleaning were not associated with the occurrence of periodontitis in this analysis.

This study showed that the periodontal status in the obese subjects was observed to be poorer than those in the non-obese. Except for PII, the means of GI, BOP, PD, CAL in the obese subjects were significantly higher than those in the non-obese subjects. Another study on Iranian also reported that CAL and PD were higher in the obese group significantly compared to the non-obese group, but there was no difference in PII between the two groups.<sup>14</sup> The proportion with the highest quintile of mean CAL OR PPD significantly increased with the quartiles of BMI.<sup>9</sup> Also the previous study was reported that CAL, PD, and BOP were correlated significantly with BMI and waist-hip-ratio, based on data from NHANES III, the USA.<sup>15</sup>

Also, a significantly higher prevalence of periodontitis was found in obese subjects compared to the non-obese in this study. The result of our study is similar to the findings of many reports on obesity and periodontal disease,<sup>4,9,16,26</sup> suggesting that obesity is related to periodontitis. However, Torrungruang *et al.* in Thailand reported that there was no association between obesity and periodontitis.<sup>18</sup> There has been a rising concern about the relationship between periodontal disease and obesity. The finding supported the hypothesis of the relationship between periodontitis and obesity. It has been proposed that hormones and adipose-tissue-derived cytokines may play an important part. Adipose tissue secretes a large amount of cytokines and hormones which may moderate periodontitis.<sup>5</sup>

**Table 2. The Periodontal Parameters in the Obese and Non-Obese Group**

Parameters	Obese (n=56)	Non-obese (n=62)	p
Plaque index (PII)	1.18 (1.04-1.55)	1.11 (1.02-1.26)	0.054 <sup>(1)</sup>
Gingival index (GI)	1.10 (1.04-1.20)*	1.04 (1.01-1.09)*	0.001 <sup>(1)</sup>
Bleeding on probing (BOP) (%)	6.85 (3.37-15.26)*	3.85 (1.14-7.45)*	0.002 <sup>(1)</sup>
Pocket depth (PD) (mm)	1.70±0.43*	1.50±0.33*	0.006 <sup>(2)</sup>
Clinical Attachment Level (mm)	1.77±0.50*	1.54±0.32*	0.005 <sup>(2)</sup>

<sup>(1)</sup>: Mann-Whitney test, <sup>(2)</sup>: Independent t-test, p<0.05

**Table 3. Multivariate Logistic Regression Model for the Periodontitis**

Variables	N (%)	OR (95% CI)*	p
<b>Age (years old)</b>			
35	63 (53.4%)	1	
>35	55 (46.6%)	3.10 (1.12-8.54)	
<b>Dental visit</b>			
Regular	61 (51.7%)	1	0.03
Never/rarely	57 (48.3%)	3.34 (1.13-9.84)	
<b>Obesity</b>			
Non-obese	62 (52.5%)	1	0.04
Obese	56 (47.5%)	2.79 (1.04-7.50)	

Adjusted by gender, educational level, dental flossing behavior and professional dental cleaning, p<0.05

Obesity is more prevalent among the higher-socioeconomic status groups (i.e. those with higher education or level of income) than in the lower ones within low-income countries.<sup>19</sup> In contrary, a study from the Organization for Economic Co-operation and Development (OECD) showed an associated between the lower number of years spent in education and the probability of obesity, with survey data collected from Australia, Canada, England and Korea.<sup>20</sup> In our research, the obese group had a higher level of education than the non-obese group; particularly there were a greater proportion of people who had post high school education in obese subjects than the non-obese. Overweight and obesity rates in Vietnam are in the early stages of development. Vietnamese urban areas have been strongly affected by obesity<sup>21</sup> which largely appears in groups of people with better socioeconomic conditions and a sedentary lifestyle.<sup>12</sup>

The present findings suggested that obese people had worse dental habits, including less regular dental flossing, dental visit and professional dental cleaning compared to non-obese ones. The results of this study agreed with the findings in 2006 who observed that the higher the BMI was, the less likely to use dental floss.<sup>22</sup> Anna L.O, Calle B (2012) showed that obese subjects had a lower likelihood of regular use of dental health services compared with the non-obese.<sup>23</sup> A study conducted by Helen BF *et al.* revealed that dental anxiety was more common among women with higher

BMI levels.<sup>24</sup> We suppose that inadequate habits of oral care can put obese people in higher risks of dental problems.

Some studies showed different results when evaluating the relationship between obesity and periodontitis after adjusting for other factors such as socio-demographic factors, routine dental or systemic disease.<sup>25,26</sup> In the recruiting criteria, we excluded the subjects 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 some confounders to the relationship between obesity and periodontitis.

Age is a risk factor for periodontitis, the prevalence and severity of periodontitis increase with age.<sup>27</sup> In this study, individuals aged over 35 were more likely to have periodontitis (OR=3.10). However, gender and education were 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 50-60 years old group were more likely to have periodontitis than those in the 30-39 years old group but there was no significant association between gender and periodontal status.<sup>28</sup> 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 3.34 times more chance to show periodontitis. This result confirms previous research about the relationship between the utilization of dental care and periodontal status.<sup>29</sup> 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, gender, education, dental habits such as flossing, dental visits and professional cleaning, a significant OR (OR=3.33) 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.<sup>16</sup> Nishida *et al.* determined that obesity was the second strongest risk factor after smoking for periodontitis.<sup>30</sup> 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.<sup>5</sup> 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.

This study had some limitations. Firstly, the cross-sectional design could evaluate only temporal relationships. Secondly, the size of study population was not large, especially as there were only a few men in the study due to females tended to visit the obesity clinic more commonly than males. It could lead to be misleading when assessing the effect of gender on periodontitis. Further studies with a broader sample are necessary to confirm this relationship.

## Conclusion

In conclusion, this study reported the poorer periodontal conditions, higher prevalence of periodontitis in obese people compared to non-obese ones. Furthermore, age, dental visit habit and obesity were significantly associated with periodontitis.

## Acknowledgment

We would like to thank the Director Board and Dr. Tran Thi Huong Lan, Head of the Clinic of Overweight–Obesity, the Institute of Traditional Medicine at Ho Chi Minh City, Vietnam; and Dr. Tran Huynh Trung, Faculty of Odonto-Stomatology, Can Tho University of Medicine and Pharmacy, Vietnam for their help.

## References

- Mokdad AH, Bowman BA, Dietz WH, Vinicor F, Prevalence of obesity, diabetes, and obesity-related health risk factors. *J. Am. Med. Assoc.* 2001;289:76-79.
- Ramachandran A, Snehalatha C, *et al.*. Rising burden of obesity in Asia. *J. Obesity.* 2010;191-198.
- Perlstein MI, Bissada NF, Influence of obesity and hypertension on the severity of periodontitis in rats. *Oral Surg. Oral Med. Oral Pathol.* 1977;43:707-726.
- Saito T, Sakamoto M, Obesity and periodontitis. *N Engl. J. Med.* 1998;339:482-483.
- Torrungruang K, Tamsailom S, Rojanasomsith K, Risk Indicators of Periodontal Disease in Older Thai Adults. *J. Periodontol.* 2005;76:558-565.
- Benjamin W. Chaffee, Scott J. Weston. Association between chronic periodontal disease and obesity: a systematic review and meta-analysis. *J. Periodontol.* 2010;81:1708–1724.
- Nishida N, Hayashi N, Nagata H, Takeshita T, Nakayama K, Determination of smoking and obesity as periodontitis risks using the classification and regression tree method. *J. Periodontol.* 2005;76:923-928.
- Saito T, Shimazaki Y, Kiyohara Y, Relationship between obesity, glucose tolerance, & periodontal disease in Japanese women: the Hisayama study. *J. Periodon. Res.* 2005;40:346-353.
- WHO (2004). Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *The Lancet* 2004;363:158-163.
- Helen LW, Son PT, Quang NN, *et al.*. Prevalence of underweight, overweight and obesity in urban Hanoi, Vietnam Asia. *Pac. J. Clin. Nutr.* 2009;18:234-239.
- OanhTH Trinh, Philayrath P, *et al.*. Prevalence and risk factors with overweight and obesity among Vietnamese adults: Caucasian and Asian cut-offs. *Asia Pac. J. Clin. Nutr.* 2009;18:226-233
- Page RC, Eke PI, Case definitions for use in population-based surveillance of periodontitis. *J. Periodontol.* 2007;1387-1399.
- Sarlati F, Akhondi N, *et al.*. Relationship between obesity and periodontal status in a sample of young Iranian adults. *Int. Dental J.* 2008;58:36-40.
- Wood N, Johnson RB, Streckfus CF, Comparison of body composition and periodontal disease using nutritional assessment techniques: Third National Health and Nutrition Examination Survey (NHANES III). *J. Clin. Periodontol.* 2003;30:321-327.
- André LP, Fernando OC, Association between severity of body mass index and periodontal condition in women. *Clin. Oral Invest.* 2012;727-734.
- LoeHarald. The Gingival index, the Plaque index and the Retention index systems. *J. Periodontol.* 1967;38:610-616
- Torrungruang K, Tamsailom S, Rojanasomsith K, *et al.*. Risk indicators of periodontal disease in older thai adults. *J. Periodontol.* 2005;76:558-565.
- Dinsa GD, Goryakin Y, Fumagalli E, Suhrcke M. Obesity and socioeconomic status in developing countries: a systematic review. *Obesity Rev.* 2012;13:1067-1079.
- Devaux M, Jody Church, Michele C, Exploring the relationship between education and obesity, *OECD J.* 2010;121-159.
- Cuong T, Dibley M, Boew S, Hanh T, Loan T, Obesity in adults: an emerging problem in urban areas of Ho Chi Minh city, Vietnam. *Eur. J. Clin. Nutr.* 2007;61:673-81.
- Hujoel PP, Kressin NR, *et al.*. Spurious associations in oral epidemiological research: the case of dental flossing and obesity. *J. Clin. Periodontol.* 2006;33:520-523.
- Anna LO, Lissner L, Hakeberg M, Oral health and obesity indicators. *BMC Oral Health* 2012;12:324-329.
- Helene BF, Anna KL, Number of teeth, body mass index, and dental anxiety in middle-aged Swedish women, *Acta Odontology of Scandinavi.* 2002;60:346-352.
- Al-Zahrani MS, Bissada NF, Borawskit EA, *et al.*

- Obesity and periodontal disease in young, middle-aged, and older adults, *J Periodontol.* 2003, 74:610-615.
27. Kongstad J, Morten G, The relationship between body mass index and periodontitis in the copenhagen city heart study. *J. Periodontol.* 2009;80:1246-1253.
  28. Grossi Z, Dunford HK, Norderyd OH, et al.. Risk assessment for periodontal disease: Attachment loss. *J. Periodontol.* 1994;65:260-267
  29. Thuy PAV, Ueno M, Shinada K, Yanagisawa T, et al.. Periodontal disease and related factors among Vietnamese dental patients. *Oral Health Prev. Dent.* 2011;9:185-194.
  30. Al-Shammari KF, Al-Khabbaz AK, Al-Ansari JM, Neiva R, Wang HL, Risk indicators for tooth loss due to periodontal disease. *J. Periodontol.* 2005;76:1910-1918.