Advances in Health Sciences Research, volume 4
11th International Dentistry Scientific Meeting (IDSM 2017)

Factors Associated with Gingivitis in 10-Year-Old School Children in Vietnam

Phuc Anh Nguyen[1], Thuy Anh Vu Pham[2]*

[1]Faculty of Odonto-Stomatology, University of Medicine and Phar-macy, Ho Chi Minh City, 652 Nguyen Trai Str, District 5, Ho Chi Minh City, Vietnam
[2]Department of Periodontology, Faculty of Odonto-Stomatology, University of Medicine and Pharmacy Ho Chi Minh City, 652 Nguyen Trai Str, District 5, Ho Chi Minh City, Vietnam
*Email: pavthuy@ump.edu.vn

Abstract. The objective of this study is to determine factors associated with gingivitis in 10-year-old Vietnamese school children. A cross-sectional study consisted of 1,079 children matched for age 10-year-old who were randomly selected from 16 public schools in Ho Chi Minh City, 2015 applying PPS (Probability Propor-tional to Size) sampling. Self-reported oral health, dental habits, dietary, physical activities habits and anthropometric indices were investigated by self-administered questionnaires. Plaque index (PI) and gingival index (GI) were examined. Children's nutritional status classification was based on Body Mass Index (BMI-for-age percentile). The multivariate logistic regression analysis was performed to further assess the association between the obesity and gingivitis after adjusting confounding factors. The prevalence of gingivitis in study sample was about 100%. Both of PI and GI increased gradually across normal and overweight children then overweight to obese children and both of these differences were statistically significant, ($p<0.001$). The risk factors that significantly related to gingivitis were self-reported gingivitis (OR=1.5; CI=1.0-2.0), regular dental check-ups (OR=1.3; CI=1.0-1.7), self-checked gingiva frequency (OR=1.3; CI=1.0-1.7), overweight (OR=1.5; CI=1.5-2.1), obesity (OR=6.1; CI=3.9-9.6) and dental plaque (OR=1.7; CI=1.3-2.3), ($p<0.05$). In conclusion, Gingivitis were associated with oral and behavioral factors in 10-year-old school children in Ho Chi Minh City. This study also demonstrated the significant association between gingivitis and obesity in school children. Thus, the importance of obesity should not only be emphasized with respect to general diseases but also with regard to oral disease in future preventive programs.

Key words: body mass index, gingivitis, 10-year-old school children, Vietnam.

1 Introduction

Gingivitis is an inflammatory process limited to the mucosal epithelial tissue surrounding the cervical portion of the teeth and the alveolar processes. Gingivitis is the predominant form of periodontal dis-ease in children and adolescents, and it is the second most important and prevalent oral disease in chil-dren [1]. Studies in the USA indicated that gingivitis begins in early childhood and that 9-17% of children aged 3-11 years have gingivitis. At puberty, prevalence rises to 70-90% [2]. Not only in the USA but also all over the world, gingivitis was reported as a

popular disease at all ages. Therefore, an investigation of risk factors associated with gingivitis can provide knowledge in preventing periodontal tissue from inflammation and infection.

According to International Obesity Task Force (IOTF), at least 155 millions children (approximately 10% children) from the age of 5 to 17 were overweight or obese, therein obesity accounted for 2-3%.3 In 2004, World Health Organization (WHO) estimated about 22 million under-5-year-old children were obese [4]. The prevalence of overweight and obesity is increasing in many countries throughout the world, including Vietnam [5].

Ho Chi Minh City, the largest city of Vietnam, is facing with challenges in public health. The rapid de-velopment of the city urbanization, population increasing, population aging and lifestyle changes lead to vary in dietary habits including consuming more fast food and sugar-sweetened beverage or sugary drinks, lack of vegetables and fruits in regular diet causes negative nutritional consequences. Sedentary lifestyles with reducing outdoor sports and physical activities, spending more time on playing computer games or watching television is one of the main causes of obesity [6,7].The number of children with obesity is increasing. Tran et al. (2009) reported that of 1650 children in junior high school in Ho Chi Minh City, 22.5% were overweight or obese, 6.8% were obese which was 3.6 times higher than in 2002.8 The percentage of under-5-year-old children with obesity in Ho Chi Minh City in 2000 was 3.7% and reached 11.5% in 2013; the percentage of children with obesity in high school increased two folds, from 11.6% in 2002 to 21.9% in 2009 [8].

Childhood is a significant stage of a person's life and a bad habit may last into adulthood. Many bad habits for children' oral health may be formed form their surrounding people, their parent and have to be detected, modified and removed as early as possible [9]. Some studies have been heretofore pointed out the relationship between obesity and gingivitis and both are potential risk factors for periodontitis. However, other studies reported statistically significant inverse correlations or no relationship [10] Thus, the association among obesity and periodontal diseases have not yet reached conclusive findings, but have attempted with inconsistence results.

Knowledge regarding the factors associated with gingivitis among individuals at the age of 10-year-old can assist in broadening the understanding of this condition and establishing prevention, treatment options that are more suitable for this group of children. The aim of this study was to assess the relationship between gingivitis and factors including self-reported of gingivitis, dental habits, dietary habits, physical activities and nutritional status in 10-year-old children in Ho Chi Minh City, Vietnam.

2 Materials and Methods

2.1 Subjects

This study investigated a target group of 1,079 children forming 559 boys and 520 girls in 2015, who were randomly selected from 16 public primary schools in Ho Chi Minh City, Vietnam with applying Probability Proportional to Size (PPS)

sampling. The study protocols were approved by the local ethics Committees at the University of Medicine and Pharmacy, Ho Chi Minh City.

2.2 Questionnaire

Sociodemographic information (gender, school area), dental-related behaviors (self-reported gingivitis, self-checked gum frequency, dental check-ups frequency, tooth-brushing frequency, daily sugary soft drinking, snacks eating before going to bed) and daily physical activity behavior were collected from the self-administered questionnare. All subjects were clearly explained about every single item of the questionnaire and instructed to answer by the only one investigator.

2.3 Body Mass Index Assessment

Body Mass Index (BMI) was first introduced in the nineteenth century by Quelete, also called Quelete index, calculated from a person's height and weight. All children were required to wear light clothes without shoes. Height in meters was measured using a Stadiometer with an accuracy of 0.01 m. Weight in kilograms was assessed using a digital scale with an accuracy of 0.1 kg. BMI is calculated by diving the weight by the height squared (kg/m2). BMI-for-age percentile and nutritional status of chil-dren were determined by CDC criteria (2000): underweight (BMI-for-age percentile: <5th percentile), normal weight (5th percentile $\leqslant$ BMI-for-age percentile < 85th percentile), overweight (85th percentile $\leqslant$ BMI-for-age percentile < 95th percentile), obesity (BMI-for-age percentile $\geqslant$ 95th percentile).

2.3 Oral examination

The periodontal status assessment was inspected by two dentists who had been calibrated and trained prior to the investigation. The Plaque Index (PI) was measured using Quigley and Hein standard (1962) and Gingival Index (GI) was measured following Loe và Silness (1963). In this study, we examined plaque and gingival status on permanent teeth.

3 Results

3.1 Relationship of plaque and gingivitis with nutritional status

All children in our study had some gingivitis. The PI mean score was established by group of underweight or normal-weight, overweight and obese children were 2.94±1.0, 3.39±0.94, 3.95±0.83, respectively. The difference of PI mean score between 3 groups was statistically significant ($p<0.001$), thus group of obese children had the highest mean score of PI. The GI mean score increased gradually from overweight/normal children (0.73±0.41) then overweight (0.87±0.51) to obese children (1.51±0.73) and these differences were statistically significant ($p<0.001$). The results of these scores were particularly indicated in Figure 1.

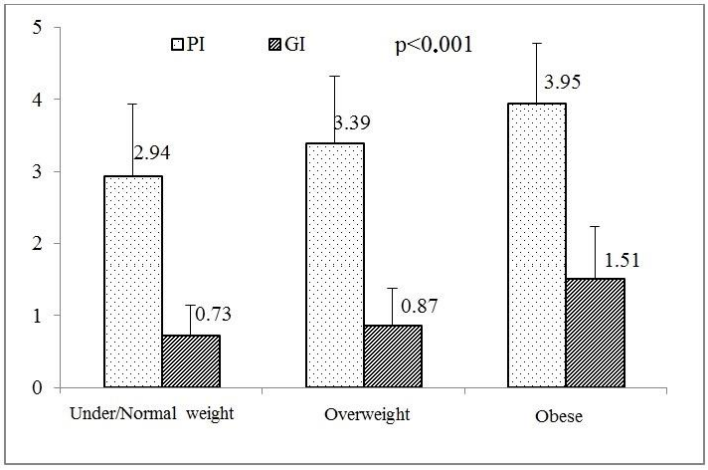

Fig. 1 Relationship of plaque and gingivitis with nutritional status

3.1 Factors associated with gingivitis

Multi-variate regression analysis sample of factors related to gingivitis was shown in Table 1 after adjusting confounding factors such as gender, school area, tooth-brushing frequency, daily sugary soft drinking, snacks eating behavior before going to bed and daily physical activity behavior. The results that the children who couldn't perceive their gingivitis presence themselves had a higher proportion than self-perceived children. Children, who didn't check gum themselves (OR=1.5), or had never visited a dentist, or got a dental check-up just when having problems (OR=1.3), had a higher proportion of gingivitis than children in antipodal group (OR=1.3); $p<0.05$. Children who had the PI median number from 3.5 to 5 had a higher proportion than from 0 to 3 (OR=1.7; $p<0.001$). Overweight or obese children had a higher proportion of gingivitis than underweight/normal children (respectively OR=1.5 and 6.1; $p<0.01$).

4 Discussion

Our cross-sectional study was investigated a target group of 1,079 children age of 10-year-old in Ho Chi Minh City indicated the association between BMI and gingivitis status. Attendees in this present study, who were overweight or obese, were at higher risk of having gingivitis than underweight or normal children. Our study showed that not only the periodical dental check-ups habit but also oral self-checked habit, oral self-reported status had the correlation with gingivitis.

The present study showed that BMI increased following the increase of GI and PI score. Our study had similar results to the case-control study of Hani et al (2014), which proved that obese children had a higher proportion of gingivitis than control group.11 Our results were also consistent with some other studies about the increase of BMI with Plaque and gingival index simultaneously in adults such as Chaffee and Weston (2010) [12], Saxlin et al (2011) [13], Franchini et al (2011) [14]. Anyway, there were still contrary-view studies. For example, the

study of Nascimento (2013) on 1,211 8-12-year-old patients showed a result that there was no significantly correlation between gingivitis and obesity ($p>0.05$) but the clinical examination was unclear [15]. The result may depend on the socio-economic factors and the patients' attitude to oral health. Another sample, study of Onauma Angwarawong (2010) found no statistically significant association of body mass index and gingivitis whereas the statistically significant association between gingivitis and calculus index and age was found [16]. However, we suppose a different epidemiological characteristic in different countries for a reason explaining the inconsistence. Moreover, it has also been reported that obesity is related to the presence of risk factors for periodontal disease, such as biofilm and dental calculus (Borges-Yanez et al. 2006) [17]. Study of Franchini et al (2011) indicated that the overweight/obese subjects showed a worse attitude towards oral hygiene and revealed a significant effect of obesity status on the gingival index [14]. In our study, the results showed a strong relationship between overweight status and gingivitis. After adjusting the confounding factors, the results indicated that obese children had highest prevalence of gingivitis (OR=6.1, $p<0.001$) and overweight children was the second highest one (OR=1.5, $p=0.008$) in comparison to normal or underweight children. A suitable diet routine and a weight-status in a controlled plan can contribute to reduce the risk factors of gingivitis in children. Obesity is associated with a systemic inflammatory state, and elevated levels of C-reactive protein, a marker of low-grade inflammation, have been reported in obese individuals [19-21]. This low-grade inflammation would be one of the mechanisms through which obesity triggers the installation and/or worsening of non-transmissible chronic diseases, and it would also be related to the occurrence of periodontal disease [22]. Therefore, we suggest that there is an association between nutritional status and gingivitis. To decrease the risk of being overweight or obesity can eliminate bad risk factors of gingivitis.

In this present study, a multi-variate regression analysis was assessed to determine the factors that affect on gingivitis. Children who were self-conscious to report their own gingivitis had a lower prevalence of being gingivitis than others (OR=1.5, $p<0.05$). A child who is self-conscious about their oral health will has his way to protect his mouth from being in a bad condition. One of the most important methods to reduce a bad oral health condition is to universalize dental education for people and prevent them from gingivitis. Thus, they can percept their oral health, then know clearly how to do good things for their mouth and when they need to go to the dentist for check-ups. In our study, children who had not habits of self-checking their gingiva had a higher prevalence of being gingivitis than counterparts (OR=1.3, $p=0.038$), and children who never or rarely had a check-up were at higher risk of gingivitis than those who went to see the dentist regularly (OR=1.3, $p=0.047$). The finding of this study was consistent with Khansa et al. (2012) study results that subjects who reported emergency dental visits had a higher prevalence of gingivitis (80.7%) and periodontitis (8.3%) than subjects who reported regular dental visits [18].

Our study also emphasized the importance of oral self-care to gingivitis. It's exactly essential to educate the children to check their oral health up by themselves by providing the oral disease knowledge in prevention from oral disease. In

fact, instruction of appropriate oral hygiene strategies to maintain oral health when a child-patient come to visit dental clinic for a check-up may help patient to pay more attention to the role of oral health and associated oral health messages influencing their self-care behavior. The more effectively cognitive enhancement, the more properly behavioral consequence. It means when children are clearly provided dental knowledge, they can improve their understanding and cognition. On this basis, children express better behaviors in order to avoid themselves from getting diseases. In another word, oral self-care gets better thus risk of gingivitis reduces. Of course, the cooperation between dentists and parents is an indispensable part in their children's habits formation to general diseases but also with regard to oral disease in future preventive programs.

Table 1. Factors related to gingivitis

Factors		n (%)	OR	CI 95%	p
Self-reported gingivitis					
	Yes	162 (15.0%)	1		
	No	917 (85.0%)	1.5	1.0-2.0	0.043
Self-checked gum frequency					
	Yes	400 (37.1%)	1		
	No	679 (62.9%)	1.3	1.0-1.7	0.038
Dental check-ups frequency					
	Regularly/Sometimes	515 (47.7%)	1		
	Never/Only when had problems	564 (52.3%)	1.3	1.0-1.7	0.047
Plaque					
	Median 0-3	326 (30.2%)	1		
	Median 3.5-5	753 (69.8%)	1.7	1.3-2.3	<0.001
Nutritional status					
	Underweight/normal	683 (63.3%)	1		
	Overweight	229 (21.2%)	1.5	1.1-2.1	0.008
	Obese	167 (15.5%)	6.1	3.9-9.6	<0.001

5 Conclusion

Gingivitis was associated with oral health and behavioral factors in 10-year-old school children in Ho Chi Minh City. The improvement of oral hygiene condition and appropriate oral health education with emphasis on oral self-checked behavior are all essential of improving oral health conditions. This study also demonstrated the highly significant association between gingivitis and obesity in school children. Thus, the importance of obesity should not only be emphasized with respect. Multivariate logistic regression analysis, after adjusting factors of gender, school area, tooth-brushing frequency, daily sugary soft drinking, snacks eating behavior before going to bed and daily physical activity behavior, OR: odds ratio; CI 95%: confidence interval 95%; statistical significance at $p<0.05$.

References

1. Mariotti A. Dental plaque-induced gingival diseases. Ann Periodontol. 1999:4:7-19.
2. Stephen, JM. Gingivitis treatmen and management. Emed Emerg Med. http://emedicine.medscape.com/article/763801-treatment. Accessed 3 August 2016
3. Lobstein T, Baur L, Uauy R. Obesity in children and young people: a crisis in public health. Obes Rev. 2004;5(1):4-85.
4. Global strategy on diet, physical activity and health: Childhood obesity and overweight. World Health Organization. 2015. http://www.who.int/dietphysicalactivity/childhood/en Accessed 3 August 2016
5. Seidell JC. Obesity, insulin resistance and diabetes – a worldwide epidemic. Br J Nutr. 2000 Mar; 83(1):5-8.
6. Bawadi HA, Khader YS, Haroun TF, Al-Omari M, Tayyem RF. The association between periodontal disease, physical activity and healthy diet among adults in Jordan. J Periodontal Res. 2011; 46:74–81.
7. Dietz WH. The obesity epidemic in young children: Reduce television viewing and promote playing. Br Med J. 2001; 322:313‑4.
8. Hanh TTM. Nutritional status of junior high school children in Ho Chi Minh city. J Food Nutr Sci. 2012; 8(3): 39-45.
9. Iglesia I, Doets EL, Bel-Serrat S. Physiological and public health basis for assessing micronutrient re-quirements in children and adolescents. The EURRECA network. Matern Child Nutr. 2010; 6:84–99.
10. Chaffee BW, Weston SJ. Association between chronic periodontal disease and obesity: a systematic review and meta-analysis. J Periodontol. 2010;81(12):1708-24.
11. Hani T. Fadel, Anthi PIaki, Eva Gronowitz, Staffan Marild, Per Ramberg &Gunnar Dahlèn, Tülay Yucel-Lindberg, Lars Heijl, Dowen Birkhed. Clinical and biological indicators of dental caries and periodontaldisease in adolescents with or without obesity. Clin Oral Invest. 2014; 18:359–68.
12. Chaffee BW, Weston SJ. Association between chronic periodontal disease and obesity: a systematic review and meta-analysis. J Periodontol. 2010; 81:1708-24.
13. Saxlin, T, Ylostalo, P., Suominen L., Mannisto, Knuuttila, M. Association between periodontal infec-tion and obesity: results of the Health 2000 Survey. J Clin Periodontol. 2011; 38:236–42.
14. Franchini R, Petri A, Migliario M, Rimondini L: Poor oral hygiene and gingivitis are associated with obesity and overweight status in paediatric subjects. J Clin Periodontol. 2011; doi: 10.1111/j.1600-051X.2011.01770.x.
15. Nascimento GG, Seerig LM, Vargas-Ferreira F, Correa FO, Leite FR, Demarco FF. Are obesity and overweight associated with gingivitis occurrence in Brazilian schoolchildren? J Clin Periodontol. 2013; 40(12):1072-8.
16. Angwarawong O. Relationship between body mass index and gingivitis in secondary school children at demonstration School of Khon Kaen University. Khon Kaen Univ Dent J. 2010; 13.
17. Borges-Yanez SA, Irigoyen-Camacho ME, Maupome G. Risk factors and prevalence of periodontitis in community-dwelling elders in Mexico. J Clin Periodontol. 2006; 33:184–94.
18. Ababneh KT, Abu Hwaij ZM, Khader YS. Prevalence and risk indicators of gingivitis and periodontitis in a Multi-Centre study in North Jordan: a cross sectional study. BMC Oral Health. 2012; 12:1.
19. Visser M, Bouter LM, Mcquillan GM, Wener MH, Harris TB. Elevated C-reactive protein levels in overweight and obese adults. J Amer Med Assoc. 1999; 282:2131–35.
20. Rexrode KM, Pradhan A, Manson JE, Buring JE, Ridker PM. Relationship of total and abdominal adi-posity with CRP and IL-6 in women. Ann Epidemiol. 2003; 13:674–82.

21. Nazmi A, Oliveira IO, Victora CG. Correlates of C-reactive protein levels in young adults: a population-based cohort study of 3827 subjects in Brazil. Bra J Med Biol Res. 2008; 41:357–67.
22. Castilhos ED, Horta BL, Gigante DP, Demarco FF, Peres KG, Peres MA. Association between obesity and periodontal disease in young adults: a population-based birth cohort. J Clin Periodontol. 2012 Aug; 39(8):717-24.