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Abstract

Background: Gingivitis is a risk factor for periodontitis, which is associated with several systemic disorders. Adolescence provides an opportunity to establish good oral health practices but there are few studies on gingivitis in adolescents.

Aims: This study assessed the association between lifestyle habits and gingivitis severity in young Saudi Arabian males.

Methods: A sample of Saudi Arabian males (n = 685) aged 13–15 years from Dammam and Khobar were included in a cross-sectional study in 2016. A questionnaire assessed socioeconomic background and daily lifestyle habits – tooth-brushing, current smoking and consumption of sugary drinks and foods. Clinical examinations recorded plaque and gingival indices on 6 index teeth. Regression analysis was used to evaluate the association of gingivitis severity with tooth-brushing and smoking adjusted for sugary drinks and foods, socioeconomic factors and dental plaque.

Results: The response rate was 96.2%. Only 38% of the respondents brushed their teeth twice daily, 10.2% smoked, and 82.8% and 68.3% consumed sugary drinks and sugary foods respectively. The prevalence of plaque and gingivitis was 87.9% and 73.9% respectively. Tooth-brushing was not significantly associated with more severe gingivitis (regression coefficient = 0.17; 95% CI: –0.16 to 0.49). Current smoking was significantly associated with more severe gingivitis only when consuming sugary drinks (regression coefficient = 0.63; 95% CI: 0.04 to 1.22).

Conclusions: Gingivitis severity was not associated with tooth-brushing but significantly increased with smoking when sugary drinks were used, indicating the effect of unhealthy lifestyle on gingival health, and the need to promote healthy lifestyle habits in this age group.

Keywords: Gingivitis; Lifestyle; Risk factors; Adolescent males; Saudi Arabia

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Introduction

Adolescence is an age where individuals adopt habits that may be carried forward well into adulthood including tooth-brushing (1), smoking (2) and dietary habits (3). Diseases that begin at this stage in life and continue uncontrolled may start cumulative destruction that becomes difficult to tackle later (4).

Gingival inflammation is reversible and occurs mostly in childhood and adolescence (5,6) with the prevalence decreasing as adulthood is reached (1). Gingivitis is a risk factor for periodontitis (7,8), which in turn is associated with several systemic disorders of public health importance including coronary heart diseases (9), diabetes (10), atherosclerosis (11), lung cancer (12), pancreatic cancer (13), psoriasis (14) and male infertility (15). Gingivitis is associated with improper oral hygiene practices related to the frequency and technique of tooth-brushing (6). Smoking is another risk factor for gingivitis, although the evidence is debateable with some investigators reporting that smoking increases gingival inflammation (16) and others that there is

no relation (17). Some studies indicate that frequent sugar intake increases gingival inflammation (18,19). Gingivitis, whether self-reported (16) or clinically-assessed (20), has also been linked to socioeconomic status. For example, the prevalence of gingivitis was lower in individuals who did not live in huts or tents (informal housing structures), were more affluent (16), had higher parental education and family income or owned a car (20).

In spite of the importance of adolescence as an opportunity to establish good oral health practices, there are relatively few studies on gingivitis among adolescents. There is also little evidence to confirm or refute if factors associated with mild gingivitis are associated with the development of more advanced stages of the disease (moderate/severe gingivitis) as is the current understanding of risk factors associated with periodontal diseases (21). In Saudi Arabia, marked changes in lifestyle are taking place and they have public health implications because of their association with several diseases including those of the oral cavity. For example, reports indicate an increase in the consumption of sweetened beverages such as soft drinks (22) and fruit juices (23), in addition to a low prevalence of regular tooth-brushing (24,25) and increased prevalence of smoking among young Saudi Arabians (26,27). The effect of these changing lifestyle habits on oral health needs to be studied.

The aim of the present study was to assess factors associated with the severity of gingivitis, including tooth-brushing and smoking, in a group of young Saudi Arabian males in 2 cities in the Eastern Province of Saudi Arabia. The study also examined if the effects of these habits were modified by other habits such as the daily consumption of sugary drinks and foods.

Methods

Study design

This was a cross-sectional study conducted in Dammam and Khobar in the Eastern Province of Saudi Arabia in 2016. It is part of a larger study assessing the oral health of students in middle schools.

Study sample

The target population was 13–15-year-old Saudi adolescents in middle school. Only males were included in our study on the basis that they would be more likely to smoke so that we could examine its effect on gingival health. Two public schools were selected using simple random sampling (one in Dammam and one in Khobar). All students in the 1st to 3rd grades of middle school were invited to participate if they fulfilled the following criteria: Saudi nationals; free of medical conditions that might affect their ability to brush their teeth well, such as physical or intellectual disabilities; parents consenting in writing to their participation; and participants agreeing to be clinically examined. All available, eligible students in the 2 schools at the time of

the study were included.

Data collection

Data were collected using a questionnaire with 9 items, and a clinical examination was conducted by a periodontist. At the beginning of the questionnaire, there was a brief description of the study, an invitation to participate and a consent form to be signed by parents. The questionnaire had 2 sections. Section 1 asked about socioeconomic background (parents' education, university-educated or not; family residence, owned or rented; number of family members in the household; and number of bedrooms). Section 2 asked about practices related to gingival health: tooth-brushing frequency (≥ 2 times daily, once daily, several times per week, 2–3 times per month and less than that), current daily smoking (yes/no) and daily use of sugary drinks and sugary foods (yes/no). The questionnaire was in Arabic and based on one used in a previous study (28). It was pilot tested for clarity on a group of 20 adolescents whose results were not included in this study.

The clinical examination was conducted in daylight in a room assigned by the schools for the study team. In the examination, a mirror and a periodontal probe (UNC 15, Hu Friedy, United States of America) were used. Plaque accumulation was assessed using the plaque index of Silness and Löe (29). The scale of the index ranges from 0 to 3 where score 0 indicates no plaque, 1 indicates a film of plaque adhering to the gingival margin and adjacent area of the tooth detected by passing the probe on the tooth surface, 2 indicates moderate accumulation of soft deposits within the gingival pocket or the tooth and gingival margin which can be seen by the naked eye, and 3 indicates an abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin. In addition, the severity of gingivitis was assessed using the gingival index of Löe and Silness (30). This index assesses the change in colour and texture of gingival tissue in addition to gingival bleeding. Its scale ranges from zero, indicating normal healthy gingiva, to 3, where there is severe inflammation as indicated by marked redness, oedema, ulceration and tendency to spontaneous bleeding. Gingivitis was considered present when a score of 1 or more was recorded. The 2 indices were applied on the same set of 6 index teeth: upper right first molar, upper right lateral incisor, upper left first premolar, lower right first premolar, lower left lateral incisor and lower left first molar. On each tooth, 4 sites were evaluated: mesiobuccal, distobuccal, mesiolingual and distolingual (31). Examination was conducted by one examiner and intra-examiner reproducibility was established by twice examining 20 students on the same day within several hours so that the gingival condition of each participant would not be affected by oral hygiene procedures (Cronbach alpha = 0.74).

Statistical analysis

Plaque and gingival indices scores were averaged from the 4 examined sites for each of the 6 index teeth. The worst (highest) score among the 6 teeth was identified and recorded for each child. The frequency of brushing was recoded into brushing ≥ 2 times daily versus brushing **Et**

hical considerations

The study was conducted according to the Helsinki declaration. The study was approved by the Institutional Review Board of the University of Dammam (IRB-2015-02-187).

Results

The questionnaire was distributed to 712 boys and 685 returned it (response rate = 96.2%). The mean (standard deviation) age was 14.1 (0.3) years. Most of the participants had university-educated fathers and mothers (60.2% and 52.3% respectively, Table 1) and lived in owned houses (68.2%). The mean (standard deviation) number of family members per bedroom was 1.7 (0.9). A minority of respondents reported brushing their teeth twice daily (38%) and smoking daily (10.2%). Most participants reported daily use of sugary drinks (82.8%) and sugary foods (68.3%).

Just over a quarter of the boys (26.1%) had healthy gingiva in all 6 index teeth (score 0) and 12.1% had no plaque accumulation in any of the index teeth. Severe gingivitis (score 3 of the gingival index) was the worst condition detected in at least one tooth in 2.2% of the participants. An abundance of soft matter within the gingival pocket (score 3 of the plaque index) was recorded in at least one of the index teeth in 7.6% of the participants (Figure 1).

Table 2 shows the ordinal regression models for the association of tooth-brushing and smoking with the severity of gingivitis in the participants after controlling for the effect of different variables. Boys who reported brushing their teeth at least twice daily were more likely than those who did not brush to have more severe gingivitis although this association was not statistically significant (model 1 beta = 0.17; 95% CI: –0.16 to 0.49). Boys who were current daily smokers were also more likely than those who did not smoke to have more severe gingivitis (model 1 beta = 0.54; 95% CI: –0.04 to 1.12). This likelihood of more severe gingivitis among smokers was higher and statistically significant when daily use of sugary drinks was added alone or in combination with daily use of sugary foods (models 2 and 4 beta = 0.63; 95% CI: 0.04 to 1.22). Goodness of fit measured by pseudo R2 indicated that models 2 and 4 had a better fit for the data.

Discussion

Our study showed that when 13–15-year-old male Saudis consumed sugary drinks daily, this modified the effect of their daily smoking and increased the likelihood of greater gingivitis severity. These findings have implications for health education interventions targeting young

males at this age and suggest that lifestyle habits that affect health should be comprehensively targeted. Advocates of the common risk factor approach have called for concerted efforts to tackle health problems that have common causes (32). Our findings provide evidence to support the merit of this recommendation.

A greater portion of the participants in our study had mild gingivitis compared to 13–15-year-old Czech children where 43% and 19.5% had mild and moderate gingivitis (33). The overall prevalence of gingivitis in our study (73.9%) was similar to that among Nigerian schoolchildren (71%) although a higher portion of Nigerian children had moderate/severe gingivitis (20.4%) (34) compared with participants in our study (14.8%). The prevalence of plaque and gingivitis in our study were very similar to that reported among 12-year-old males in Medina, Saudi Arabia (83% and 71%) (35).

The prevalence of twice daily tooth-brushing in our study (38%) is similar to the frequency reported among 8–12-year-old Brazilian schoolchildren (41%) (36). It is also in agreement with figures reported from neighbouring Gulf countries – United Arab Emirates (36%) and Oman (34%) (37). It was much higher than that reported in a Sudanese study of 12-year-old children in Khartoum (6.4%) (38). In our study, gingivitis was not significantly associated with brushing. This is in agreement with the Brazilian study, which reported no association between gingivitis and brushing once/twice daily (36), and another study among South African adolescents, which showed that brushing was not significantly related to gingivitis after adjusting for plaque level (16). This suggests that brushing was only critical for gingivitis as long as it reduced plaque accumulation. In our study, brushing twice or more daily was associated with more severe gingivitis, although the association was not statically significant. This might be attributed to reactive rather than proactive behaviour where children started to brush their more frequently after gingivitis occurred. This concurs with the finding of an Iranian study which reported significantly higher scores of bleeding in the posterior teeth of 15-year-old Iranians who brushed their teeth twice daily compared with those who brushed only once daily (39).

With regard to current smoking, 10% of our participants reported smoking. This agrees with a school-based cross-sectional study in Medina, Saudi Arabia where 11.7% of 13–15-year-old male and female students reported smoking (40). Another Saudi Arabian study in Riyadh reported a prevalence of 20% of ever smoking among 14-19-year-old male and female students (26). The higher prevalence in that study might be due to the inclusion of older students. In our study, daily smoking was associated with a greater likelihood of more severe gingivitis. Our results disagree with another study among 19-year-old individuals in Sweden where the mean gingivitis scores among never smokers and smokers were roughly the same (46% and 42% respectively) (17). The authors ascribed the lack of a difference to misclassification because self-reporting was used to assign smoking status. They also pointed to the relatively short period of potential exposure to smoking because of the young age of their participants. Our

results are in agreement with a study among children with a mean age of 13.9 years, which reported that more current smokers than non-smokers had frequent bleeding gums (51.2% versus 33.1%) (41). They also agree with the South African study which reported greater odds of recent gingivitis among eighth graders who smoked regularly (odds ratio = 1.57) (16).

The high percentage of participants in our study who indicated daily use of sugary drinks is in agreement with recent statistics showing that Saudi Arabia ranked 9th worldwide in the use of soda drinks with 89 L purchased per capita in 2014 (22). Sugary drinks constituted 51% of the daily fluid intake among 12–13-year-old children in Riyadh, Saudi Arabia (23). The problem has been reported to be particularly prominent among males where 14–16-year-old Saudi Arabian males were reported to drink more sugar-sweetened carbonated beverages weekly and to add more sugar to hot beverages than females (3). In our study, sugary drinks increased the significance of the association between smoking and gingivitis severity, in agreement with other studies (18,42). Researchers ascribed this to the role of sucrose in increasing plaque mass although the mass reached a plateau after some time and gingivitis continued for a longer period afterwards (18). The authors commented that this could have been induced by a shift in the microbiological plaque flora rather than an increase in mass per se. The association of gingivitis with a sugary diet was attributed in another study to short chain carboxylic acids that resulted from some sugary snack particles (19). These products increased subgingival temperature and neutrophil emigration to the gingival crevicular fluid among those exposed to a sugary diet compared with those on a low sugar diet. Such changes induced by sugary diet are expected to add to the effects of smoking on gingival tissues, which might explain the additional risk observed in our study where neither habit on its own was a significant risk factor of increased gingivitis severity.

Our study had some limitations related to its design. As a cross-sectional study, time sequence could not be proved; therefore proof of causality needs future longitudinal studies. The schools included could have introduced a degree of sampling bias that might have affected our conclusions. Similarly, the inclusion of only male students limits the generalizability of our findings. Further studies including randomly selected male and female students from public and private schools in different regions in the country would allow generalization to the entire population in Saudi Arabia. Our measurement of brushing focused on frequency. Future studies could add other aspects by measuring brushing time and force applied using toothbrushes with electronic sensors. We assessed gingivitis using the Löe and Silness gingival index on selected teeth (29). This partial recording might have affected our estimate of gingivitis prevalence or severity. However, it was previously reported that the chance of underestimating gingivitis because of partial recording is lowest among adolescents and young subjects since the sites assessed are available compared with older adults whose chances of tooth loss are higher (43). The prevalence of smoking might have been underestimated because it was self-reported. This might be particularly relevant in this young age group in the conservative Saudi society. However, this method has been widely used to assess smoking among different groups in other countries (44).

Our results can be generalized to those with similar backgrounds to the participants in our study, namely 13-15-year-old male Saudis with university-educated parents who come from the more advantaged groups of society. Other researchers have reported better gingival health among children of more educated parents (38). Applied to our setting, this means that the gingival condition of the general population of Saudi males of similar age might be worse than we found, which raises a concern that needs to be addressed through health education.

Our study provides evidence supporting the association of lifestyle habits with the severity of gingivitis in young Saudi males. Daily use of sugary drinks compounded the effect of daily smoking making its association with more severe gingivitis statistically significant. There is a need to promote healthy lifestyle habits in this age group using health education strategies. This is important in view of the relationship between diseases such as diabetes, cardiovascular problems and cancers and the lifestyle habits studied as well as periodontitis which is associated with gingivitis.

Funding: None.

Competing interests: None declared.

Association entre la sévérité de la gingivite et les habitudes de vie des jeunes garçons saoudiens

Résumé

Contexte : La gingivite est un facteur de risque de la parodontite qui est associée à plusieurs troubles systémiques. Alors que l'adolescence est une période clé pour tenter d'établir de bonnes pratiques d'hygiène buccale, il existe relativement peu d'études sur la gingivite chez l'adolescent.

Objectifs : La présente étude visait à évaluer l'association entre les habitudes de vie et la sévérité de la gingivite chez les jeunes saoudiens de sexe masculin.

Méthodes : Un échantillon de garçons saoudiens (n = 685) âgés de 13 à 15 ans originaires de

Dammam et Khobar a été inclus dans une étude transversale en 2016. Un questionnaire a permis d'étudier le milieu socioéconomique et les habitudes de vie quotidiennes – brossage des dents, tabagisme et consommation de boissons et d'aliments sucrés. Des examens cliniques ont fait état de plaque dentaire et d'indices gingivaux sur six dents de référence. L'analyse de régression a été utilisée afin d'évaluer l'association entre la sévérité de la gingivite et le brossage des dents couplé au tabagisme, ajustés en fonction des boissons et des aliments sucrés, des facteurs socio-économiques et de la plaque dentaire.

Résultats : Le taux de réponse était de 96,2 %. Seuls 38 % des répondants se brossaient les dents deux fois par jour, 10,2 % fumaient, et 82,8 % et 68,3 % consommaient des boissons et des aliments sucrés respectivement. La prévalence de la plaque dentaire et de la gingivite était de 87,9 % et 73,9 % respectivement. Le brossage des dents n'était pas associé de façon significative à une gingivite plus sévère (coefficient de régression = 0,17 ; IC à 95 % : –0,16 à 0,49). Le fait de fumer était associé de façon significative à une gingivite plus sévère seulement lorsqu'il y avait également consommation de boissons sucrées (coefficient de régression = 0,63 ; IC à 95 % : 0,04 à 1,22).

Conclusions : La sévérité de la gingivite n'était pas associée au brossage des dents, mais augmentait de façon significative lorsque le tabagisme couplé à la consommation de boissons sucrées était présent, indiquant ainsi l'effet d'habitudes de vie malsaines sur la santé gingivale ainsi que la nécessité de faire la promotion de modes de vie sains au sein de ce groupe d'âge.

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WHO EMRO | Association between gingivitis severity and lifestyle habits in young Saudi Arabian males

: أُدرجت عينة من الذكور السعوديين (685 = n) في الفئة العمرية 13-15 من الدمامطرق البحث
والخبر في المنطقة الشرقية في دراسة مقطعية أجريت عام 2016. وأجري استبيان لتقييم
الخلفية الاجتماعية والاقتصادية ونمط الحياة اليومي – تنظيف الأسنان بالفرشاة
والتدخين الحالي واستهلاك المشروبات والأطعمة المحلاة. وسجلت الفحوص السريرية ترسبات
ومؤشرات لثوية على ستة أسنان قياسية. واستُخدم تحليل انحدار لتقييم الارتباط بين شدة
التهاب اللثة وغسل الأسنان بالفرشاة والتدخين بعد احتساب المشروبات والأطعمة المحلاة
والعوامل الاقتصادية والاجتماعية والترسبات السنية .

: بلغ معدل الاستجابة 96.2%. وأفاد 38% فقط من المستجيبين بمواظبتهم على غسلالنتائ ج
أسنانهم بالفرشاة مرتين يوميا، في حين أفاد 10.2% باعتيادهم التدخين، وأفاد 82.8%
و68.3% باستهلاكهم المشروبات والأطعمة المحلاة على الترتيب. وبلغ معدل انتشار
الترسبات السنية والتهاب اللثة 87.9% و73.9% على الترتيب. ولم يتبين أي ارتباط ذي
دلالة بين غسل الأسنان بالفرشاة وازدياد حدة التهاب اللثة (معامل الانحدار = 0.17 ؛ 95%
التهاب حدة وازدياد الحالي التدخين بين دلالة ذي ارتباط وجود وتبين CI: –0.16 to 0.49).
اللثة فقط عند استهلاك مشروبات محلاة (معامل الانحدار = 0.63 ؛ 95% CI: 0.04 to 1.22).

: لم يتبين وجود ارتباط بين حدة التهاب اللثة وغسل الأسنان بالفرشاة ولكنالاستنتاجات
ازداد الارتباط بصورة ذات دلالة في حالة التدخين مع تناول مشروبات محلاة، مما يدل على
أثر نمط الحياة غير الصحي على صحة اللثة والحاجة إلى التشجيع على اتباع نمط حياة صحي في
هذه الفئة العمرية .

References

1. Hunter ML, Newcombe R, Richmond S, Owens J, Addy M. The Cardiff dental survey: oral hygiene and gingival health between the ages of 11-12 and 30-31 years. Br Dent J. 2007 Dec 8;203(11):E23, discussion 650–1. https://doi.org/10.1038/bdj.2007.964 PMID:17943177
2. Progress for children: A report card on adolescents. New York: UNICEF; 2012 (http://www.unicef.org/publications/index_62280.html, accessed 18 January 2018)
3. Collison KS, Zaidi MZ, Subhani SN, Al-Rubeaan K, Shoukri M, Al-Mohanna FA. Sugar-sweetened carbonated beverage consumption correlates with BMI, waist circumference, and poor dietary choices in school children. BMC Public Health. 2010 05 9;10(1):234. https://doi.org/10.1186/1471-2458-10-234 PMID:20459689
4. Sheiham A, Alexander D, Cohen L, Marinho V, Moysés S, Petersen PE, et al. Global oral health inequalities: task group–implementation and delivery of oral health strategies. Adv Dent Res. 2011 May;23(2):259–67. https://doi.org/10.1177/0022034511402084 PMID:21490238

5. López R, Fernández O, Baelum V. Social gradients in periodontal diseases among adolescents. Community Dent Oral Epidemiol. 2006 Jun;34(3):184–96. https://doi.org/10.1111/j.1600-0528.2006.00271.x PMID:16674750
6. Chiapinotto FA, Vargas-Ferreira F, Demarco FF, Corrêa FO, Masotti AS. Risk factors for gingivitis in a group of Brazilian schoolchildren. J Public Health Dent. 2013 Winter;73(1):9–17. https://doi.org/10.1111/jphd.12001 PMID:23215784

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7. Lang NP, Schätzle MA, Löe H. Gingivitis as a risk factor in periodontal disease. J Clin Periodontol. 2009 Jul;36 Suppl 10:3–8. https://doi.org/10.1111/j.1600-051X.2009.01415.x PMID:19432625

8. Ebersole JL, Nagarajan R, Akers D, Miller CS. Targeted salivary biomarkers for discrimination of periodontal health and disease(s). Front Cell Infect Microbiol. 2015 08 19;5:62. https://doi.org/10.3389/fcimb.2015.00062 PMID:26347856

9. Mustapha IZ, Debrey S, Oladubu M, Ugarte R. Markers of systemic bacterial exposure in periodontal disease and cardiovascular disease risk: a systematic review and meta-analysis. J Periodontol. 2007 Dec;78(12):2289–302. https://doi.org/10.1902/jop.2007.070140 PMID:18052701

10. Corbella S, Francetti L, Taschieri S, De Siena F, Fabbro MD. Effect of periodontal treatment on glycemic control of patients with diabetes: A systematic review and meta-analysis. J Diabetes Investig. 2013 Sep 13;4(5):502–9. https://doi.org/10.1111/jdi.12088 PMID:24843701

11. Teeuw WJ, Slot DE, Susanto H, Gerdes VE, Abbas F, D'Aiuto F, et al. Treatment of periodontitis improves the atherosclerotic profile: a systematic review and meta-analysis. J Clin Periodontol. 2014 Jan;41(1):70–9. https://doi.org/10.1111/jcpe.12171 PMID:24111886

12. Zeng XT, Xia LY, Zhang YG, Li S, Leng WD, Kwong JS. Periodontal disease and incident lung cancer risk: A meta-analysis of cohort studies. J Periodontol. 2016 Oct;87(10):1158–64. https://doi.org/10.1902/jop.2016.150597 PMID:27294431

13. Maisonneuve P, Amar S, Lowenfels AB. Periodontal disease, edentulism, and pancreatic cancer: a meta-analysis. Ann Oncol. 2017 05 1;28(5):985–95. https://doi.org/10.10.1093/annonc/mdx019 PMID:28453689

14. Ungprasert P, Wijarnpreecha K, Wetter DA. Periodontitis and risk of psoriasis: a systematic review and meta-analysis. J Eur Acad Dermatol Venereol. 2017 May;31(5):857–62. https://doi.org/10.10.1111/jdv.14051 PMID:27862342

15. Kellesarian SV, Yunker M, Malmstrom H, Almas K, Romanos GE, Javed F. Male infertility and dental health status: A systematic review. Am J Mens Health. 2016 Jun 23. pii: 1557988316655529 PMID:27339766

16. Ayo-Yusuf OA, Reddy PS, van den Borne BW. Adolescents' sense of coherence and smoking as longitudinal predictors of self-reported gingivitis. J Clin Periodontol. 2008 Nov;35(11):931–7. https://doi.org/10.1111/j.1600-051X.2008.01319.x PMID:18823345

17. Romao C, Wennström JL. Periodontal conditions in a Swedish city population of adolescents: a comparison between smokers and never-smokers. Oral Health Prev Dent. 2007;5(2):105–12. PMID:17722436

18. Sidi AD, Ashley FP. Influence of frequent sugar intakes on experimental gingivitis. J Periodontol. 1984 Jul;55(7):419–23. https://doi.org/10.1902/jop.1984.55.7.419 PMID:6379142

19. Kashket S, Zhang J, Niederman R. Gingival inflammation induced by food and short-chain carboxylic acids. J Dent Res. 1998 Feb;77(2):412–7. https://doi.org/10.1177/00220345980770021001 PMID:9465174

20. Cortellazzi KL, Pereira SM, Tagliaferro EP, Ambrosano GM, Zanin L, Meneghim MdeC, et al. Risk indicators of gingivitis in 5-year-old Brazilian children. Oral Health Prev Dent. 2008;6(2):131–7. PMID:18637390

21. Genco RJ, Borgnakke WS. Risk factors for periodontal disease. Periodontol 2000. 2013 Jun;62(1):59–94. https://doi.org/10.1111/j.1600-0757.2012.00457.x PMID:23574464

22. Silver M. Guess which country has the biggest increase in soda drinking. npr. 19 June 2015 (www.npr.org/sections/goatsandsoda/2015/06/19/415223346/guess-which-country-has-the-biggest-increase-in-soda-drinking, accessed 18 January 2018).

23. Bello LL, Al-Hammad N. Pattern of fluid consumption in a sample of Saudi Arabian adolescents aged 12-13 years. Int J Paediatr Dent. 2006 May;16(3):168–73. https://doi.org/10.1111/j.1365-263X.2006.00715.x PMID:16643537

24. Amin TT, Al-Abad BM. Oral hygiene practices, dental knowledge, dietary habits and their relation to caries among male primary school children in Al Hassa, Saudi Arabia. Int J Dent Hyg. 2008 Nov;6(4):361–70. https://doi.org/10.1111/j.1601-5037.2008.00310.x PMID:19138188

25. Almas K, AlShwaimi E, Al-Shamrani HS, Skaug N. The oral hygiene habits of school students in Riyadh, Saudi Arabia. Saudi Med J. 2003 Dec;24(12):1408–10. PMID:14710297

26. Al-Makadma AS, Moynihan M, Dobson S, Saewyc E. Tobacco use among adolescents in Riyadh Saudi Arabia. Int J Adolesc Med Health. 2015 Aug;27(3):357–60. https://doi.org/10.1515/ijamh-2014-0023 PMID:25153556

27. Kasim K, Al-Zalabani A, Abd El-Moneim ES, Abd El-Moneim S. Beliefs and attitudes of male and female adolescents and the risk of smoking behavior. J Postgrad Med. 2016 Apr-Jun;62(2):80–5. https://doi.org/10.4103/0022-3859.180546 PMID:27089105

28. El Tantawi M, Bakhurji E, Al-Ansari A, Al-Khalifa K, AlSubaie A. Influences of parents, close friends and classmates on four co-existing oral health practices in Saudi male teenagers. Acta Odontol Scand. 2017 Mar;75(2):137–43. https://doi.org/10.1080/00016357.2016.1269192 PMID:27997275

29. Löe H. The Gingival Index, the Plaque Index and the Retention Index Systems. J Periodontol. 1967 Nov-Dec;38(6) Suppl:610–6. https://doi.org/10.1902/jop.1967.38.6.610 PMID:5237684

30. Löe H, Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. Acta Odontol Scand. 1963 Dec;21(6):533–51. https://doi.org/10.3109/00016356309011240 PMID:14121956

31. Burt BA, Eklund SA. Dentistry, dental practice and the community. 6th ed. St Louis, Missouri: Elsevier Saunders; 2005.

32. Sheiham A, Watt RG. The common risk factor approach: a rational basis for promoting oral health. Community Dent Oral Epidemiol. 2000 Dec;28(6):399–406. https://doi.org/10.1034/j.1600-0528.2000.028006399.x PMID:11106011

33. Kukletova M, Izakovicova Holla L, Musilova K, Broukal Z, Kukla L. Relationship between gingivitis severity, caries experience and orthodontic anomalies in 13-15 year-old adolescents in Brno, Czech Republic. Community Dent Health. 2012 Jun;29(2):179–83. PMID:22779381

34. Kolawole KA, Oziegbe EO, Bamise CT. Oral hygiene measures and the periodontal status of school children. Int J Dent Hyg. 2011 May;9(2):143–8. https://doi.org/10.1111/j.1601-5037.2010.00466.x PMID:21356014

35. Bhayat A, Ahmad MS. Oral health status of 12-year-old male schoolchildren in Medina, Saudi Arabia. East Mediterr Health J. 2014 12 17;20(11):732–7. PMID:25601812

36. 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 Dec;40(12):1072–8. https://doi.org/10.1111/jcpe.12163 PMID:24118092

37. McKittrick TR, Jacobsen KH. Oral hygiene practices among middle-school students in 44 low- and middle-income countries. Int Dent J. 2014 Jun;64(3):164–70. https://doi.org/10.1111/idj.12094 PMID:24571228

38. Farah HH, Ghandour IA. Periodontal health status of 12-year-old Sudanese schoolchildren and educational level of parents in Khartoum province. Odontostomatol Trop. 2009 Sep;32(127):25–33. PMID:20441126

39. Yazdani R, Vehkalahti MM, Nouri M, Murtomaa H. Smoking, tooth brushing and oral cleanliness among 15-year-olds in Tehran, Iran. Oral Health Prev Dent. 2008;6(1):45–51. PMID:18399307

40. Al-Zalabani A, Kasim K. Prevalence and predictors of adolescents' cigarette smoking in Madinah, Saudi Arabia: a school-based cross-sectional study. BMC Public Health. 2015 01 21;15(1):17. https://doi.org/10.1186/s12889-015-1363-8 PMID:25604704

41. Ayo-Yusuf OA, van den Borne B, Reddy PS, van Wyk PJ, Severson HH. Longitudinal association of smoking-related attitude to oral health with adolescents' smoking onset. J Public Health Dent. 2009 Winter;69(1):29–33. https://doi.org/10.1111/j.1752-7325.2008.00090.x PMID:18662254

42. Jalil RA, Cornick DER, Waite IM. Effect of variation in dietary sucrose intake on plaque removal by mechanical means. J Clin Periodontol. 1983 Jul;10(4):389–98. https://doi.org/10.1111/j.1600-051X.1983.tb01288.x PMID:6577032

43. Peres MA, Peres KG, Cascaes AM, Correa MB, Demarco FF, Hallal PC, et al. Validity of partial protocols to assess the prevalence of periodontal outcomes and associated sociodemographic and behavior factors in adolescents and young adults. J Periodontol. 2012 Mar;83(3):369–78. https://doi.org/10.1902/jop.2011.110250 PMID:21859320

44. Kim HH, Chun J. Examining the Effects of Parental Influence on Adolescent Smoking Behaviors: A Multilevel Analysis of the Global School-Based Student Health Survey (2003-2011). Nicotine Tob Res. 2016 May;18(5):934–42. https://doi.org/10.1093/ntr/ntv172 PMID:26272211

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