ANALYSIS

24(102), March - April, 2020

ISSN
2321–7359
EISSN
2321–7367

Medical Science

Oral hygiene practices, dietary habits and dental caries experience among primary children in Riyadh, Saudi Arabia: A cross-sectional study

Bahija Basheer[1,2,3], **Saleh Aloufi**[1], **Azzam Almeshrafi**[1], **Nawaf Alkubedan**[1], **Khaled Aldalaan**[1]✉, **Abdulelah Alobathani**[1], **Abdulmalek Alhamed**[1], **Faisal Alsaif**[1], **Nawaf Alshahrani**[1], **Raed Alshehri**[1]

[1]College of Dentistry, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia
[2]King Abdullah International Medical Research Centre, Riyadh, Saudi Arabia
[3]Ministry of National Guard- Health Affairs, Riyadh, Saudi Arabia

✉**Corresponding author**
Khaled Abdullah S Aldalaan,
College of Dentistry, King Saud bin Abdulaziz University for Health Sciences,
Riyadh, Saudi Arabia.
Email: Khaledaldalaan@gmail.com

Article History
Received: 30 November 2019
Reviewed: 1/December/2019 *to* 22/January/2020
Accepted: 24 January 2020
E-publication: 29 January 2020
P-Publication: March - April 2020

Citation
Bahija Basheer, Saleh Aloufi, Azzam Almeshrafi, Nawaf Alkubedan, Khaled Aldalaan, Abdulelah Alobathani, Abdulmalek Alhamed, Faisal Alsaif, Nawaf Alshahrani, Raed Alshehri. Oral hygiene practices, dietary habits and dental caries experience among primary children in Riyadh, Saudi Arabia: A cross-sectional study. *Medical Science*, 2020, 24(102), 960-967

ABSTRACT

Background and Aim: Dental caries is a preventable disease; however, public health efforts are hampered due to limited information on associated factors in vulnerable populations. Our study aimed at estimating and assessing dental caries prevalence and experience and identifying key risk factors in association with oral health practices and dietary habits among primary school children living in Riyadh, Saudi Arabia. *Methods:* 355 male and female Saudi primary school children aged 6–9 years participated in this cross-sectional study. The study was conducted using a 31-item self-administered questionnaire followed by oral examination to assess the caries experience. SPSS software version 22 was used for data analysis. *Results:* The severity of caries prevalence was different depending on the type of teeth whether deciduous or permanent. For deciduous teeth 52.1% had caries, while permanent teeth had 82.5%. All in all, the DMFT score was 1.19±1.43 and the def was 3.74±1.43. Multiple individual factors were significant particularly when are compared to caries seen in deciduous teeth. *Conclusion:* Dental caries were more prevalent in primary school children, and individual factors were predominantly associated with the disease.

Keywords: Dental caries, Primary school children, Prevalence, Diet, oral hygiene practices

1. INTRODUCTION

Oral health is a state of being free from mouth and facial pain and other diseases and disorders that disturb the individual's ability in eating, communicating and psychosocial wellbeing (World Health Organization, 2017). Interrelationship among dietary habits, oral hygiene practices with dental caries has been observed, evaluated and widely studied over the past decades to look for possible relative associations. Globally, more than 60% of school children have at least one carious tooth (World Health Organization, 2012). The World Health Organization (WHO) accentuated the need to decrease the worldwide burden of dental caries in achieving ideal well being. Therefore; in the year 2003, WHO and FDI set worldwide objectives in 2020 to guide organizers and policymakers to improve the status of oral wellbeing in their nations (FDI World Dental Federation, 2016). Generally, the prevalence of dental caries in developed countries is diminishing, while in developing countries the prevalence is on the rise (Petersen et al., 2005). To validate the previous statement, in Spain 2015 Monteagudo C et al. found caries prevalence was 21.7% (Monteagudo et al., 2015). Also, in Belgium 2008 Declerck D et al. the caries prevalence was 7% in 3-years old children and 31% in 5-years old children. When comparing these results to the studies had done in the developing countries it shows high caries prevalence (Declerck D et al., 2008). For instance, in Brazil 2015 M. Gonçalves et al. found that caries prevalence was 75.6% in primary dentition and 62.9% in permanent dentition (Gonçalves et al., 2015). Another study in Saudi Arabia 1999 Al-Shammery et al. reported that dental caries prevalence in urban areas to be 74% while it is estimated to be 67% in rural areas (Al-Shammery et al., 1999). Similarly, In KSA 2002, Al-Malik MI et al. did a study on caries prevalence in children and it was 73% (Al-Malik et al., 2002). Oral hygiene is the action cleaning the oral cavity of any source that can cause disease; using the toothbrush, dental floss and other oral hygiene aids. This practice will keep oral cavity clean of plaque which consists of food debris and bacteria (10). In result of poor oral hygiene, young children might exhibit poor growth and vitamin deficiencies when chewing are painful, resulting from advanced dental caries. Also, absence from school, distraction during school's hours, less interaction with society due to dental pain or embarrassing appearance of their teeth. several studies support that, for example in USA 2011 Jackson et al conducted a study on 2183 school children and found that children with poor oral health status were nearly three times more likely to miss school as result of dental pain (Jackson et al., 2011).

In Thailand 2013 Krisdapon et al. found that in every twenty students at least one student missed school due to dental pain (Krisdapon et al., 2013). A healthy diet is considered as the cornerstone for overall good health. Contrarily, an unhealthy diet is one of the major risk factors for many diseases including dental caries; especially the consumption of free sugars, which are recognized as a common risk factor for the occurrence of dental caries tooth (World Health Organization, 2015). In addition, it was found that the viscosity of oral bacterial plaque increases by consumption of sugars due to their ability to enforce colonization of oral microorganisms. Production of extracellular glucans and reduction in PH to low levels occurs from frequent consumption of sugar that provides microorganisms with the substrates tooth (World Health Organization, 2019). Unfortunately, there are other factors which have been related to dental caries, but their relative impact on dental caries remain unclear such as occupational status, family monthly salary, level of education of guardians, socioeconomic status and marital status of parents (Abou Neel et al., 2016). Additionally, similarly conducted studies lacked certain elements and correlations, based on which this study has been structured, formulated and fabricated which is mostly due to access related limitations. Another rationale is the effect of adopting oral hygiene habits including the use of dental floss, mouthwash and miswak with DMF/def indices were not justified clearly. The age at which the child started adopting these habits correlated to the dental caries index needed to be more investigated. Moreover, snacking plays a

critical role in such a study, yet emphasis on certain elements of consumed diet has been lacking the relation between coffee, tea and date consumption with the prevalence of dental caries. To answer the previously stated gaps in the literature, our study aimed at assessing the oral hygiene practices, dietary habits and caries experience, implementing detailed dietary habits and comprehensive oral hygiene practices among primary school children in Riyadh, Saudi Arabia.

2. MATERIALS AND METHODS

The present study is a cross-sectional., analytical study conducted to assess the dietary habits and oral hygiene practices in relation to dental caries prevalence among primary school children living in Riyadh, Saudi Arabia. The research was reviewed and approved under reference #SP19/525/R from the Institutional Review Board (IRB) of the King Abdullah International Medical Research Center MRC) prior to the commencement of the study. In addition to the permission from the authorized personnel of the schools for questionnaire distribution, the informed consent from the guardians of the participants and assents from the participating children were obtained prior to the oral examination. Data was collected from children studying in primary public, private and international schools located in different areas of Riyadh region after receiving the approval was done from September 2019 to November 2019.

An academic list of primary schools was obtained from the office of the ministry of education in Riyadh of all primary schools operating in Riyadh. All the schools were grouped into clusters and random clustering was used for the sampling technique. Data of all male and female children between 6 and 9 years living in Riyadh, Saudi Arabia were included in the study. Any shortage of documentation or unapproved consents was excluded from the study. The recruited sample size was calculated by power-based software on a confidence level of 95%, and a significance interval of 5%, and estimated population response distribution of 50% (Raosoft software). As a result, it was found to be a sample that consists of 355 students. The study was conducted using a 31-item self-administered questionnaire followed by oral examination to assess the caries experience. The questionnaire comprised of 31 open and close-ended questions which gave an insight regarding; a) the sociodemographic data of the child including, the age of the child, gender of the child, nationality, family income, parents' education level, number of family members and marital status of the child's caregivers; b) the general health of the examined child; involving general overview of the body systems profile and the presence of any systemic conditions; c) oral hygiene practices, including frequency of brushing of the child and parents, usage of dental hygiene aids and history of dental visits; and finally; d) the dietary habits including the frequency and consistency of carbohydrate intake and snacking habits and subsequently categorized as high, moderate or low, in accordance with the literature.

Oral dental examination was conducted using dental explorer, mouth mirror and head flashlight for better illumination. The caries was recorded using the DMFT index (decayed, missing, filled/restored teeth) for permanent dentition was done as per WHO criteria. Equivalently, def was used in which the (e) is for teeth that are indicated for extractions in the primary dentition (Hintze, H. and Wenzel, A., 2003). Prior to conducting the oral examination; the following specific criteria with specific inclusion and exclusion measures were considered and agreed upon, with the aid of the principal investigator. First, any tooth with a visual initial sign of discoloration, white spots, tactile catch or cavitated with the use of dental explorer was considered as a carious tooth. Secondly, primary dentition which has been lost due to dental caries was recorded as missed. However, dentition which was normally exfoliated was not reported and excluded. Furthermore, dentition which has been restored with any of dental restorative materials, including composite, amalgam or stainless steel crown were recorded as filled. However, dental sealants were excluded from the documentation. The examinations were conducted by three calibrated dentists who were trained on the assessment criteria. Inter-examiner reliability was checked in the midway and towards the end of participants' examination and the Kappa, the test showed an agreement of K = 0.92. The examination took place in a designated area in the schools and participants were examined sitting on an ordinary chair with headrests and headlight illumination. Dental mirrors, dental explorers and disposal tongue depressors were used in the examination. Data was coded, cleaned and analyzed using SPSS software version 22 (SPSS, Inc, Chicago, IL, USA).

Descriptive statistics including frequency distribution, means, and standard deviations were employed for demographics data, means of DMF and def scores, dietary and oral hygiene practices and caries prevalence. Spearman's rho test was used to find out the correlation between the DMF and def scores to dietary and oral hygiene practices. Regression analyses were used to correlate the effect of the dietary and oral hygiene practices on the presence of caries in the permanent and deciduous dentition of the participants the level of significance was set at $p \leq 0.05$.

3. RESULTS

A total of 550 questionnaires were distributed during the period of September 2019 till November 2019. Only 355 gave their consent to be included in the study. The sample comprised of children aged between 6 and 9 years of age (Mean age 7.26, SD +/- 0.98 years). There were 209 males and 146 females and while the males (Mean age 7.34, SD +/-0.99 years) were slightly higher than those of the females (Mean age 7.15, SD +/-0.97 years). Most of the sample showed the mother's education to be a bachelor and

above (N=272) and the fathers were the same as well (N=273). Table (1) gives a demographical characteristic of the sample. It shows most of the families had a total monthly income of 15000 and above (N=226). The mean number of family members was 5(SD +/-2). Finally, most of the families were Married (N=327).

Table 1 Demographic characteristics of the sample.

		Gender					
		Male		Female		Total	
		N	%	N	%	N	%
Parents' Marital status	Married	197	94.7%	130	89.0%	327	92.4%
	Divorced	8	3.8%	16	11.0%	24	6.8%
	Widowed	3	1.4%	0	0.0%	3	0.8%
Family Monthly Income	Less than 8990	13	6.2%	19	13.0%	32	9.0%
	9000-14990	55	26.3%	42	28.8%	97	27.3%
	15000 and above	141	67.5%	85	58.2%	226	63.7%

Based on Table (2) and figure 1, it shows the prevalence of caries in the sample. The prevalence of caries in permanent teeth was 82.5% and in deciduous teeth it was 52.1%. Table 3 and figure 2 demonstrate the practices of oral hygiene among children. It shows more than half of the children (55.8%) had help from their guardians while brushing. A majority also stated that their children do not use dental floss (83.9%). The use of mouthwash was rare among most of the children (96.1%), similarly with the use of miswak (94.1%). Regarding the number of dental visits for children in the previous year, most reported a lack of visits (49%) and 30% had visited 1-2 and 20% visited 3-5 times. The DMFT score was 1.19 (SD +/-1.43) and the def was 3.74 (SD +/-1.43). Different diet factors were seen to be significant in relation to the prevalence of dental caries based on Table (4). Most of the factors were significant, particularly when compared to caries seen in deciduous teeth. For example, the total carb consumption was significant to caries prevalence of deciduous teeth (p-value=0.004). The consumption of coffee and tea was significant as well with caries in deciduous teeth (p-value= 0.03).

Table 2 Caries prevalence among children

Prevalence of caries in different dentition				
	Permanent teeth		Deciduous teeth	
	N	%	N	%
Free of caries	62	17.5	170	47.9
Caries Present	293	82.5	185	52.1
Total	355	100.0	355	100.0

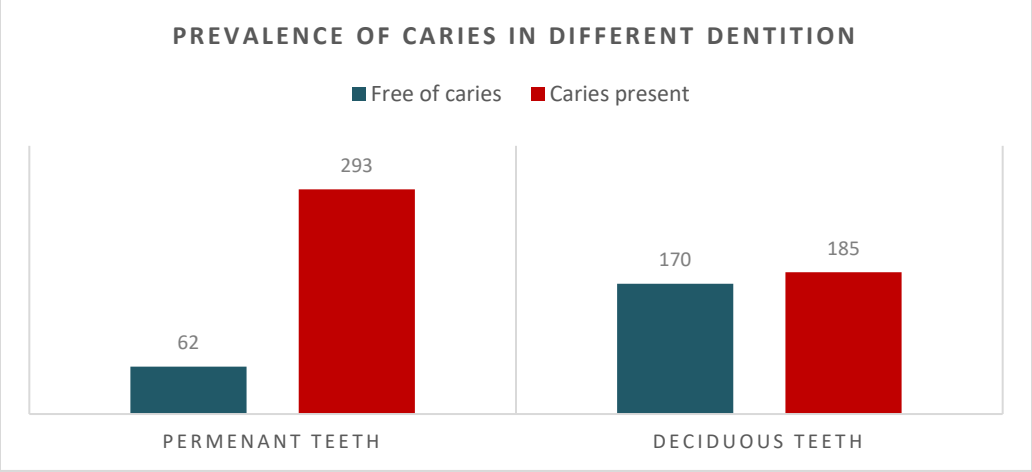

Figure 1 Prevalence of caries in different dentition

Table 3 Description of oral hygiene practices among children.

Oral Hygiene Practices of the children			
		N	%
Parents help the child in Brushing	Yes	198	55.8
	No	157	44.2
Use of Dental Floss	Yes	57	16.1
	No	298	83.9
Use of Mouthwash	Yes	14	3.9
	No	341	96.1
Use of Miswak	Yes	21	5.9
	No	334	94.1

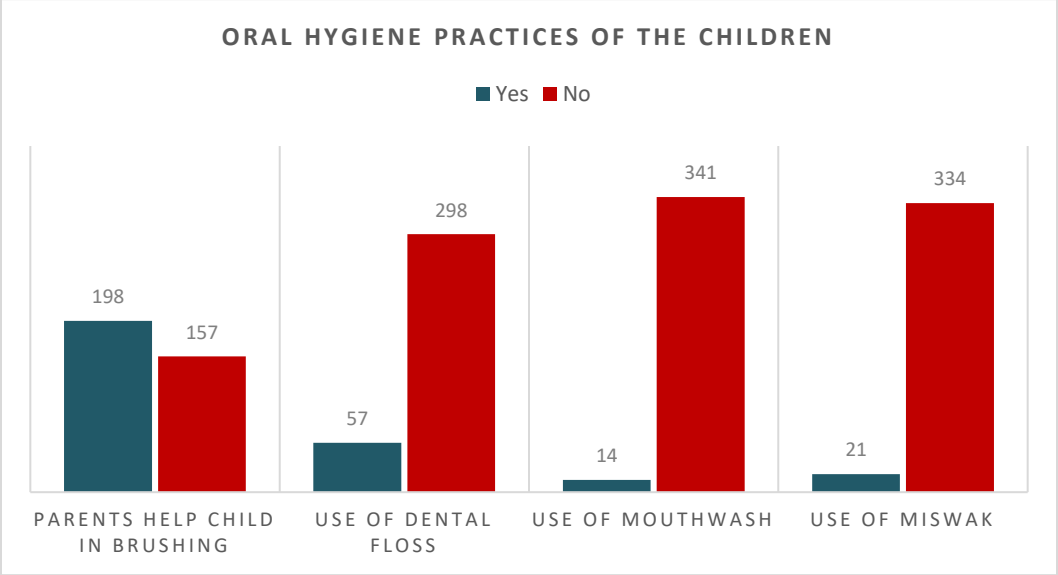

Figure 2 Oral Hygiene Practices of the children

Table 4 correlation between dietary practices and caries prevalence

Relationship between diet and caries prevalence				
	Dental Caries in permanent teeth		Dental Caries in deciduous teeth	
	r	p value	r	p value
Breakfast Carb consumption	-.041	.222	.106	.023
Lunch Carb consumption	.061	.125	.099	.032
Dinner Carb consumption	.024	.329	.149	.002
Total carbs	.015	.392	.139	.004
Child sugary food and drinks in a week	-.005	.463	.069	.097
Child soda consumption in a week	-.041	.218	.059	.132
Child coffee and tea	.028	.299	.100	.030
Child buy from school canteen	.014	.398	-.080	.066
Child snack between meals a day	.021	.347	.132	.006

Child sugar food before sleep	.060	.131	-.183	.000
How many sugar food intake before sleep	-.078	.071	.177	.000
Child fast food in a week	.057	.142	.022	.339
Child date a day	.048	.182	.061	.124

Child snacking between meals had a significance with caries prevalence for deciduous teeth (p-value=0.006). Also, the intake of sugar before sleeping and the amount of sugar the child consumes before sleep had a significant relation to caries prevalence for deciduous teeth (p-value=0.000 and p-value=0.000). For the relationship between caries prevalence and oral hygiene practices the number of dental visits had a significance in relation to caries prevalence in the deciduous teeth based (p-value=0.000). The rest were within normal parameters.

4. DISCUSSION

Primarily, we aimed at Stressing on determinants that have not been given a direct impact on dental caries. Contributing to find out the specific elements in both risk domains, limit them, highlighting the prevalence and eventually promoting and raising the community awareness. Even though there are abundant studies examining dental caries worldwide. There is still a critical need to conduct more studies on dental caries especially in the region (Al Agili D, 2013). Also, there aren't many studies focusing on the role of oral hygiene and dietary habits and its effect on caries prevalence of children in Riyadh, Saudi Arabia. The prevalence of dental caries in our study was found to be 82.5% for permanent and 52.5% for deciduous teeth. It shows a relatively high burden of the condition on the sample. Compared to other similar studies, where it ranges from 68.9%to 91.3% and it shows that our findings falling within the current evidence range (Quadri F et al., 2015) (Amin T et al., 2008). This outcome proves the high burden of dental caries on the region and the need to increase awareness and preventive measures to reduce the effect of the condition on the population. Statistically significant results were observed between snacking frequency and caries in deciduous dentition (p=0.006), but for the permanent teeth, the result showed no statistical significance. Contrasting the findings of results by M. F. A. Quadri et al. where higher caries prevalence in permanent teeth was reported (Quadri F et al., 2015). This could have been due to the difference in the mean age of their sample (12.45 years) as compared to a lower mean age (7.34).

In our study where in the children presented with more deciduous teeth and few early permanent dentition. There is an inverse association between dental visits and DMFT/def scores, hence, high caries results will be found in a patient with low number of visits, 31.5% of our sample had periodic dental visits. Restorations and toothache were the most common reason for the dental visits. According to AlHabdan et al. study; they found that around 21.1% of the children went for periodic dental visits, while the majority went as an emergency for toothache (Alhabdanet al., 2018). This supports the strong association between the lack of dental visits and high caries results. There is a direct correlation between the mean average of the DMFT/ def scores and the frequency of carbohydrates intake, noting that the higher the frequency, the higher would the probability of dental caries is (Panwar et al., 2015). Looking at our study, the mean DMFT is 1 upon low and medium consumption, while the mean DMFT upon high consumption is: 1.5. On the other hand, the def upon low consumption is 3, and 3.5 upon medium carbs consumption, while it is: 4.5 upon high consumption. In addition, according to Abbas et al. in 2019 found out there was an inverse and significant relationship between brushing frequency and DMFT /def scores (Abbass et al., 2019).

However, in our study, there was no significant association between these two variables. Similar results were also found by M. Gonçalves et al. in 2015 (Gonçalves et al., 2015). In addition, there was a significant association between sugary drinks, bed time snacking habits and def score which is not coincident with the findings by Declerck D et al. in 2008 (Declerck D et al., 2008). J.skinnerl et al. and Muhammad Taqi el al. found that there is a significant association between sugary drinks, bedtime snacking habits and DMFT score (Skinner J et al., 2015) (Taqi Muhammad et al., 2018). However, in our study, there was no significant association between sugary drinks, bedtime snacking and DMFT. The probable reason and rational could be due to the multifactorial nature of caries. One of the limitations is the cross-sectional study design which does not help determine the cause and effect relationship. While conducting the research there were certain limitations such as the difficulty to include more female participants due to cultural reasons, which led to an unbalance in the gender ratio. The distribution of sample across different categories of schools was uneven due to the refusal to participate, mainly by public funded schools. Also, there was some discrepancy between survey responses especially with regards to oral hygiene practices and the oral examination findings which could be attributed to social desirability bias. The accuracy of caries detection employing the DMFT/def index cannot give the actual burden of the condition as no supplementary aids like radiographic evidence was present which might have given a better idea of the depth of the treatment needs of the population.

The non-significant differences and lack of correlations between some caries indices and risk factors could be attributed to the small sample size; with a larger set of samples they may have reached statistical significance. The validity of the sample is considered of critical value, since both genders were investigated, examined and included in the study. Few individual variables incorporating the following areas: dietary habits and oral hygiene practices; were more important components related to dental caries than financial as well as auxiliary dental elements.

5. CONCLUSION

In conclusion, the prevalence of dental caries was high among primary school students aged 6–9 years. Our findings were predictable with outcomes in related studies all over the world where poor brushing propensities, high utilization of carbohydrates and soft drinks, frequent snacking and delayed start of teeth brushing were prevalently connected with dental caries. Moreover, further studies comparing private and rural school children using all methods of diagnosis of dental caries and assessment of knowledge, attitude and practices of children and their parents on oral hygiene should be recommended. Future research should concentrate on affirming all related variables for dental caries distinguished in our investigation, including larger representative sample size, and utilization of advanced diagnostic tools for sub-clinical caries detection. Our findings support the need for more oral health awareness programs focused on children at the earliest age possible as well as to their parents or guardians to incorporate the concept of dental home for a better oral health in the community.

Acknowledgment

Appreciation and thanks to the organization of the targeted primary schools, guardians, kids, and fellow dental colleagues, and experts who took an interest and gave indispensable participation with our valuable investigation. We additionally express our gratitude toward King Abdullah International Medical Research Center (KAIMRC) for the needed support.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

REFERENCE

1. Abbass M, Mahmoud S, El Moshy S, Rady D, AbuBakr N, Radwan I et al. The prevalence of dental caries among Egyptian children and adolescences and its association with age, socioeconomic status, dietary habits and other risk factors. A cross-sectional study. F1000Research. 2019;8:8.
2. Abou Neel E, Aljabo A, Strange A, Ibrahim S, Coathup M, Young A et al. Demineralization & remineralization dynamics in teeth and bone. International Journal of Nanomedicine. 2016;11:4743-4763.
3. Al Agili D. A systematic review of population-based dental caries studies among children in Saudi Arabia. Saudi Dent J. 2013;25(1):3-11.
4. Alhabdan Y, Albeshr A, Yenugadhati N, Jradi H. Prevalence of dental caries and associated factors among primary school children: a population-based cross-sectional study in Riyadh, Saudi Arabia. Environmental Health and Preventive Medicine. 2018;23(1).
5. Al-Malik MI, Holt RD, Bedi R. Erosion, caries and rampant caries in preschool children in Jeddah, Saudi Arabia. Community Dentistry and Oral Epidemiology. 2002 Feb;30(1):16-23.
6. Al-Shammery AR. Caries experience of urban and rural children in Saudi Arabia. Journal of Public Health Dentistry. 1999 Mar;59(1):60-4.
7. Amin T, Al-Abad B. 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;6(4):361-370.
8. Declerck D, Leroy R, Martens L, Lesaffre E, Garcia-Zattera M, Broucke S et al. Factors associated with prevalence and severity of caries experience in preschool children. Community Dentistry and Oral Epidemiology. 2008;36(2):168-178.
9. Fact sheet on oral health. World Health Organization. April 2012.
10. FDI policy statement on dietary free sugars and dental caries. International Dental Journal. 2016;66(1):9-10.
11. Hintze H, Wenzel A. Diagnostic Outcome of Methods Frequently Used for Caries Validation. Caries Research. 2003;37(2):115-124.
12. Jackson S, Vann W, Kotch J, Pahel B, Lee J. Impact of Poor Oral Health on Children's School Attendance and Performance. American Journal of Public Health. 2011;101(10):1900-1906.
13. Krisdapong S, Prasertsom P, Rattanarangsima K, Sheiham A. School absence due to toothache associated with sociodemographic factors, dental caries status, and oral health-related quality of life in 12- and 15-year-old Thai

children. Journal of Public Health Dentistry. 2013;73(4):321-328.
14. M. Gonçalves É, C. Cavalcanti L, T. Firmino R, L. Ribeiro G, F. Granville-Garcia A, A. Menezes V. Dental caries experience among indigenous children and adolescents. Journal of Oral Science. 2015;57(2):123-129.
15. Monteagudo C, Téllez F, Heras-González L, Ibañez-Peinado D, Mariscal-Arcas M, Olea-Serrano F. School dietary habits and incidence of dental caries. Nutricionhospitalaria. 2015;32(1):383-8.
16. Nutrition [Internet]. World Health Organization. 2019 [cited 30 October 2019]. Available from: https://www.who.int/health-topics/nutrition
17. Panwar N, Mohan M, Arora R, Gupta A, Marya C, Dhingria S. Study on Relationship Between the Nutritional Status and Dental Caries in 8-12 Year Old Children of Udaipur City, India. Kathmandu University Medical Journal. 2015;12(1):26-31.
18. Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day S, Ndiaye C. The global burden of oral diseases and risks to oral health. Bull World Health Organ 2005; 83: 661-669.
19. Quadri F, Hendriyani H, Pramono A, Jafer M. Knowledge, attitudes and practices of sweet food and beverage consumption and its association with dental caries among schoolchildren in Jazan, Saudi Arabia. Eastern Mediterranean Health Journal. 2015;21(6):403-411.
20. Sample Size Calculator by Raosoft, Inc. [Internet]. Raosoft.com. [cited 31 October 2019]. Available from: http://www.raosoft.com/samplesize.html
21. Shannon, J. Dental care and oral health sourcebook. Detroit, MI: Omnigraphics, 2012;20:22.
22. Skinner J, Byun R, Blinkhorn A, Johnson G. Sugary drink consumption and dental caries in New South Wales teenagers. Australian Dental Journal. 2015;60(2):169-175.
23. Sugars and dental caries [Internet]. World Health Organization. 2017 [cited 29 October 2019]. Available from: https://www.who.int/oral_health/publications/sugars-dental-caries-keyfacts/en/
24. Sugars intake for adults and children [Internet]. World Health Organization. 2015 [cited 30 October 2019]. Available from: https://www.who.int/nutrition/publications/guidelines/sugars_intake/en/
25. Taqi, Muhammad & Ab-Murat, Norintan& Razak, Ishak. Sugar consumption and caries occurrence among Pakistani school children. Journal of the Pakistan Medical Association. 2018;68. 1483.