ORIGINAL ARTICLE

PREVALENCE AND ASSOCIATED FACTORS OF DENTAL CARIES, GINGIVITIS, AND CALCULUS DEPOSITS IN SCHOOL CHILDREN OF SARGODHA DISTRICT, PAKISTAN

Muhammad Farooq Umer, Umer Farooq*, Arham Shabbir, Shumaila Zofeen***, Hasan Mujtaba†, Muhammad Tahir†**

Health Services Academy, Quaid e Azam University, Islamabad, *Department of Community Medicine, Ayub Medical College, Abbottabad, **Department of Pharmacology, University of Health Sciences, Lahore, ***Nishter Institute of Dentistry, Multan, †Punjab Dental College, Lahore-Pakistan

Background: According to a pathfinder survey conducted by World Health Organization, dental caries is the single most common chronic childhood disease in Pakistan. The update information regarding dental health of school children of Sargodha district is required to plan community caries prevention programs and for better understanding of existing situation, and may improve longevity, treatment, and care. **Methods:** This cross sectional study was conducted in four randomly selected schools of Sargodha district, stratified by gender selected. Two well-trained dentists examined the oral cavities of children for dental caries, gingivitis, and calculus deposits. The sample consisted of children aged between 3–12 years. **Results:** The overall prevalence rate of gingivitis, calculus, and dental caries was found as 14.5%, 14.3%, and 45.9% respectively. A significant association was found between DMFT score ($p<0.001$), gingivitis ($p<0.01$), and calculus ($p<0.05$) with the increase in age of children. More children living in urban area were detected with gingivitis ($p<0.01$), calculus ($p<0.01$), and dental caries than children residing in rural areas. Incidence of gingivitis ($p<0.05$), calculus, and dental caries in primary ($p<0.001$) and permanent teeth were found higher in those children who were not brushing their teeth. Experience of dental caries in primary teeth was found higher ($p<0.01$) in children who brushed occasionally. Study also showed that none of the children ever visited dentist for treatment. **Conclusions:** The results emphasize the need for initiation of awareness programs to achieve 0 DMFT/df scores.

Keywords: Dental caries, gingivitis, calculus, DMFT, df

J Ayub Med Coll Abbottabad 2016;28(1):152–6

INTRODUCTION

Dental caries is a major cause of teeth loss and is characterized as progressive bacterial damage to teeth by bacteria.[1] Caries leads to the demineralization of teeth, which is caused by the interaction of different factors, such as, diet rich in fermentable carbohydrates, especially refined sugars, specific bacteria in dental plaque, and a susceptible tooth surface.[2]

Different other morbid conditions of the body and oral cavity are also caused by dental caries.[3] Many general health conditions enhance the risk of dental caries which, in turn, is a risk factor of cardiovascular diseases, and diabetes etc.[4] Dental caries continue to be important public health problem at global scale and is highly prevalent among children.[5] In developing countries, rise in the prevalence of dental caries is attributed to many reasons, such as, unhealthy dietary habits, unsatisfactory and inappropriate public health services, poor access to public health services, and limited use of fluoride. On the other hand, decrease in the prevalence of dental caries among developed countries is ascribed to modification in sugar eating and oral hygiene habits, better participation in oral health programs, and population based preventive programs. Moreover, urbanization and acceptance of western lifestyle by developing countries without introducing effective public health programs is also responsible for sudden rise in dental caries.[6]

According to a pathfinder survey conducted by World Health Organization (WHO) in many districts of Pakistan, dental caries is 7 times more common than hay fever and 5 times more common than asthma in children, which makes it single most common chronic childhood disease.[7,8] It is very likely that school children of Sargodha district have high prevalence of caries and poor oral health status. We did not find any study reporting oral health status of school children of Sargodha district, to the best of our knowledge. The update information regarding dental health of school children of Sargodha district is required to plan community caries prevention programs and for better understanding of existing situation, and may improve longevity, treatment, and care.

The present study was aimed to investigate the prevalence and associated factors of dental caries, gingivitis, and calculus deposits in school children of

Sargodha district, Pakistan so as to provide baseline data for planning prevention programs.

MATERIAL AND METHODS

It is a cross sectional study and was conducted among children studying in public sector primary schools of Sargodha district, Pakistan during May to June, 2013. We selected four different schools randomly by balloting method which includes two male schools and two female schools. The sample consisted of children aged between 3–12 years. We sought written consent from Executive District Officer Education and the Principals of the respective schools to collect data after examination of children. Teachers and students were explained the purpose of the study and informed verbal consent was taken. Confidentiality and privacy was maintained at all costs. Present study was approved by Institutional Review Board of Health Services Academy, Quaid e Azam University, Islamabad, Pakistan.

Dental caries of students were recorded by a team comprising of two well-trained dentists. Basic demographic information was collected along with oral hygiene habits. Data collection was followed by examination of children in ordinary chair under natural light. Radiograph was not taken and presence of frank cavity was used as a criterion of dental caries. The parameters measured were df (Decayed and filled primary teeth) and DMFT (Decayed, missing and filled permanent teeth). Oral cavity for dental caries was examined by using tongue depressors, while dental explorer and mirror were used to examine the status of gingivitis and calculus deposits. Gingivitis was labelled at visible inflamed gums with or without bleeding having hyperemia. Calculus was labelled when hard deposits were seen and confirmed with dental probe. Only those children were included in the studies that were present in school on examination day. Those children who were non-cooperative or suffering from any other disease were excluded from the study.

The data were analysed by using the statistical package SPSS, version 18.0 software and presented as mean±SD for quantitative variables. In case of categorical variables, data was presented in terms of frequencies and percentages. To know the association of risk factors with dental caries Chi Square test was applied at 5% significance level.

RESULTS

A total of 518 children were included in the study. Among them, 109 (21.1%) were aged between 3–5 years, 189 children (36.5%) belonged to the ranges of 6–8 years, and 220 children (42.4%) were between the age ranges of 9–12 years. Majority of the children who participated in the study were living in urban areas (n=285; 55.0%), while 233 (45.0%) children were residing in rural areas.

It was found that among 518 children, 194 (37.5%) brush their teeth, while majority (n=324; 62.5%) do not brush their teeth. One hundred and thirty-eight (71.13%) children described that they brushed their teeth occasionally. Fifty-five (28.35%) children told that they brushed once a day, while only one child (0.52%) brushed twice a day. When children were inquired for any visit to dentist in past for treatment, surprisingly, we found that no child ever visited dentist in past.

We found that 75 (14.5%) children were suffering from gingivitis. Children who were 9–12 years old suffered the most (n=41; 7.9%) from gingivitis ($p<0.01$), followed by children who were 6–8 years old (n=29; 5.6%), and 3–5 years old (n=5; 1.0%). Children who were residing in urban areas suffered more (n=52; 10.0%) from gingivitis ($p<0.01$) than children who were living in rural areas (n=23; 4.5%). Significantly higher ($p<0.05$) number of children (n=56; 10.8%) who were not brushing their teeth were found suffering from gingivitis than those (n=19; 3.7%) who were brushing their teeth (Figure-1).

Seventy-four (14.3%) students had calculus problem. Majorly, those children who were 9–12 years old were (n=45; 8.7%) detected with calculus ($p<0.05$), followed by children who were 6-8 years old (n=25; 4.8%), and 3-5 years old (n=4; 0.8%). Significantly higher number ($p<0.01$) of children (n=53; 10.2%) who were residing in urban areas were detected with calculus than children who were living in rural areas (N=21; 4.1%). Generally (Statistically non-significant), children who were not brushing their teeth (n=53; 10.2%) suffered more with calculus than children (n=21; 4.1%) who were brushing their teeth (Figure-2).

According to DMFT score, 33 decayed teeth were observed in children who were 6–8 years old (DMFT=0.174±0.589), and 64 decay, 1 missing and 1 filled teeth were found among children who were 9–12 years old (DMFT=0.300±0.689; $p<0.001$). Statistically non-significant difference was observed among children living in urban areas (n=38; 7.34%) who were detected with DMFT score above 0 as compared with children residing in rural areas (n=25; 4.82%). Generally, higher percentage (statistically non-significant) of children (n=42; 8.10%) who did not brush their teeth were detected with DMFT score above 0 as compared with children (n=21; 4.06%) who brushed their teeth (Figure-3). Generally, higher percentage of children (Statistically non-significant) who brushed occasionally (n=16; 3.09%) were detected with DMFT score above 0 as compared with children who brushed once daily (n=5; 0.96%) or twice daily (n=0).

According to df score, 145 decayed were found in children (27.99%) who were 3–5 years old

(df=1.33±1.92), 267 decayed were observed in children (51.55%) who were 6-8 years old (df=1.41±1.92), and 192 decayed were seen among children (37.06%) who were 9–12 years old (df=0.87±1.41). Non-significant difference was found among children residing in urban area (n=134; 25.87%) who were detected with df score above 0 as compared with children (n=104; 20.08%) living in rural areas. Significantly (p<0.001) higher number of children (n=184; 35.49%) who did not brush their teeth were detected with df score above 0 as compared with children (n=54; 10.43%) who brushed their teeth (Figure-4). Those children who brushed their teeth more frequently (p<0.05) had significantly lower df scores than those children who brushed occasionally.

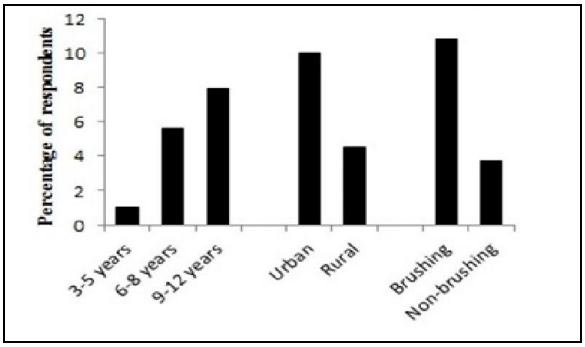

Figure-1: **Prevalence of gingivitis**

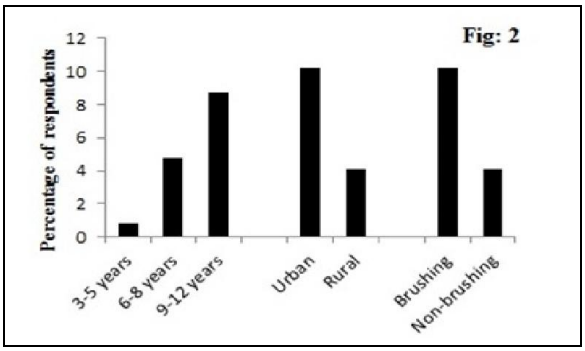

Figure-2: Prevalence of Calculus deposits

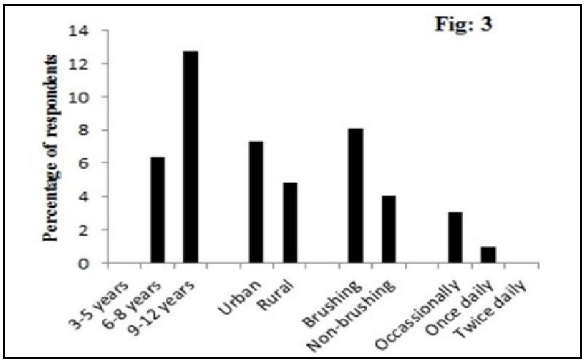

Figure-3: Prevalence of dental caries in permanent teeth

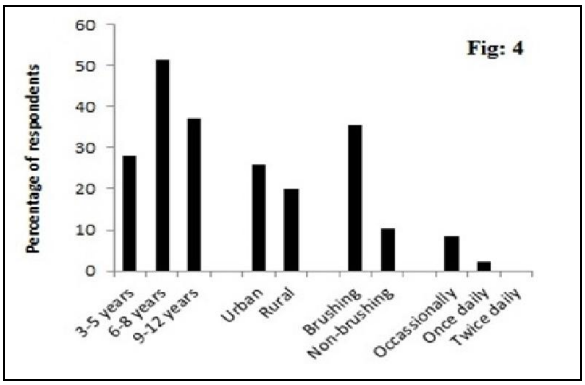

Figure-4: Prevalence of dental caries in primary teeth

DISCUSSION

The objective of the study was to assess the prevalence of dental caries among school children of public sector schools of Sargodha district, Pakistan. The overall rate of caries experience in school children of Sargodha district was (DMFT > 0/df >0) found as 45.9% which is less than 12 years old school children (62%) of Iraq[6], and higher than school children (30.52%) of Chandigarh, India[9], and Mathira West district (24%) of Nairobi[10]. It can be safely perceived that rate of caries experience in school children of Sargodha district is in line with the guidelines of WHO/FDI for 2000, i.e., 50% of children (5–6 years age) should be free of caries.[11,12]

Present study shows that dental caries is most likely to be associated with children who were 9–12 years old. The mean DMFT score for children aged 9–12 years was found as 0.300±0.689 which is well below 3 as recommended by WHO.[13,14] These results are similar to DMFT of 12 years old children of Mathira West districts (0.36±0.7) of Nairobi[10], and are less than the findings of studies conducted in poor locality school children (3.70) of Lahore[8], and Brazilian school children (1.75) residing in Japan[15]. The difference in scores may be attributed to dietary, nutrition, cultural, and oral hygiene habits, as well as, socioeconomic and socio-demographic patterns among children.[12] According to global data 2003 report by WHO, DMFT scores of 12 years old Pakistani children have increased from 0.9 to 1.38.[16] However, DMFT scores of school children of Sargodha district were found lower than the WHO reported range. Main portion of total DMFT score consists of decayed teeth followed by missing and filled teeth, which is in line with the previously published studies.[5,12,17] The explanation can be attributed to high treatment cost, false believes of parents regarding importance of holding primary teeth, and deficiency of inexpensive dental services which serve as key factors to prevent majority of children to undergo dental restoration. Extraction

process is also preferred over restoration by patients who undergo treatment.[12]

The mean df score for 9–12 years old children in our study was found as 0.87±1.41, which is similar to df of primary school children (0.7983) of urban Peshawar.[18] Current study demonstrated high prevalence of dental caries in primary teeth than in permanent teeth. This could be attributed to structural differences and lower calcium content in primary teeth. It can also be ascribed to the lower susceptibility of the permanent teeth towards dental caries than primary teeth.[19] Tooth brushing and frequency of brushing were not significantly associated with DMFT score in present study. A previous study conducted in Singapore also found non-significant association between dental caries and frequency of tooth brushing, and the authors attributed their results to poor tooth brushing technique and acidogenicity of biofilm.[20] Significantly higher df scores and incidence of gingivitis were found among children who did not brush their teeth as compared with those who brushed their teeth. Frequency of tooth brushing also had significant influence on the caries of primary teeth. Data showed that children who brushed twice daily had significantly less df scores. Children should be emphasized regarding tooth brushing habits and importance of oral hygiene in early age. In Pakistan, and in most of the developing countries, tooth brushing habits are established at school going age, whereas in developed countries, children adopt tooth brushing habits at the age of three.[21]

The DMFT score in our study increased with the age of children which is in line with the findings of study conducted in Mexican school children.[22] Similarly, incidences of gingivitis and calculus were also associated with increase in age. This can be explained by the change in dietary habits of children as they grow old. Involvement of parents decrease in their child's tooth brushing habits, children prefer junk food and unhealthy snacks which are easily accessible at school canteens over homemade nutritious food, and also the exposure time of teeth to the oral environment increases.[12]

Current study shows that children residing in urban areas have significantly higher incidence of gingivitis and calculus than children living in rural areas. This may be attributed to the fact that refined and readily available carbohydrates are easily available to children in urban areas as compared with children of rural areas who generally consume raw food having less carbohydrate content. Adoption of western and western-type diets in urban areas is also considered as an important factor for increase in prevalence of dental caries.[23] High incidence of dental caries has been associated with both per capita and population ingestion of sugar above 15 kg.[23, 4]

Present study showed that no children ever visited to dentist for treatment. This is an alarming situation and requires initiation of immediate public awareness programs especially for parents and teachers. This attitude may be attributed to the fact that mostly children who study in public sector schools of Pakistan belong to low income families. A recent study also showed that caries were significantly associated with socioeconomic variables.[25] Oral health plays key role in public's well-being and general health.[26] Lack of dental care programs by government at rural level, low affordability of rural families, and high dental care cost at private clinics which are mostly situated in urban areas may be the causative factors which prevented rural children to visit dentist. On the other hand, busy urban life schedule and lack of awareness of parents might have led the parents to neglect their responsibility towards dental health care of their children.

Being a cross-sectional study, temporal associations cannot be established by present study. Future longitudinal studies are required to establish causal associations for dental caries with risk factors. Incorrect reporting (Reporting bias) by young children might have affected the results of the study. Random selection of schools among different tehsils of Sargodha district, which includes both male and female schools, may allow generalization of results.

CONCLUSIONS

Present study showed that 54.1% school children of Sargodha district were caries free. DMFT scores for 9–12 years old children were determined as 0.300. Although, it is in agreement with the recommendations of WHO and it may be concluded that WHO global oral health goals for 12 years old children have been achieved, yet we should aim to achieve 0 DMFT for school going children. Dental caries can be reduced by introducing dental care programs at school levels.

These programs should intend to educate both teachers and students regarding prevention and prevalence of dental caries. Children should especially be advised to reduce the use of cariogenic food and readily available commercial carbohydrate products which are leading cause of dental caries. Awareness should be created among parents through health education programs at community level for early oral examination of their children to protect them from dental caries.

Conflict of interest: The authors state no conflict of interests.

AUTHOR'S CONTRIBUTION

Study concept and design: MFU, UF. Acquisition of data: MFU, MT. Analysis and interpretation of data: AS, SZ, MFU. Drafting of the manuscript: AS. Critical revision of the manuscript for important intellectual content: AS, UF. Statistical analysis: HM, AS, MT. Administrative, technical, and material support: SZ, HM, MT. Study supervision: UF.

REFERENCES

1. Abdullah S, Qazi HS, Maxood A. Dental caries status in 6–9 years old children. Pak Oral Dent J 2008;28(1):107–12.
2. Adewakun AA, Percival TM, Barclay SR, Amaechi BT. Caries status of children in eastern Trinidad, West Indies. Oral Health Prev Dent 2005;3(4):249–61.
3. Aggeryd T. Goals for oral health in the year 2000: cooperation between WHO, FDI and the national dental associations. Int Dent J 1983;33(1):55–9.
4. Ahmed NA, Astrom AN, Skaug N, Petersen PE. Dental caries prevalence and risk factors among 12-year old schoolchildren from Baghdad, Iraq: a post-war survey. Int Dent J 2007;57(1):36–44.
5. Ali S, Bhatti MUD, Syed A, Chaudhry AH, Iqbal Z. Prevalence of dental caries among 5-14 years old poor locality school children of Lahore. Pak Oral Dent J 2012;32(2):279–82.
6. Bratthall D. Estimation of global DMFT for 12-year-olds in 2004. Int Dent J 2005;55(6):370–2.
7. Cawson RA, Odell EW. Cawson's essentials of oral pathology and oral medicine. 7th ed. Edinburgh; New York:: Churchill Livingstone; 2002.
8. Chakraborty M, Saha JB, Bhattacharya RN, Roy A, Ram R. Epidemiological correlates of dental caries in an urban slum of West Bengal. Indian J Public Health 1997;41(2):56–67.
9. Dawani N, Nisar N, Khan N, Syed S, Tanweer N. Prevalence and factors related to dental caries among pre-school children of Saddar town, Karachi, Pakistan: a cross-sectional study. BMC Oral Health 2012;12:59.
10. Gathecha G, Makokha A, Wanzala P, Omolo J, Smith P. Dental caries and oral health practices among 12 year old children in Nairobi West and Mathira West Districts, Kenya. Pan Afr Med J 2012;12:42.
11. Gonzalez M, Cabrera R, Grossi SG, Franco F, Aguirre A. Prevalence of dental caries and gingivitis in a population of Mexican schoolchildren. Community Dent Oral Epidemiol 1993;21(1):11–4.
12. Hashim R, Williams SM, Thomson WM, Awad MA. Caries prevalence and intra-oral pattern among young children in Ajman. Community Dent Health 2010;27(2):109–13.
13. Hashizume LN, Shinada K, Kawaguchi Y. Dental caries prevalence in Brazilian schoolchildren resident in Japan. J Oral Sci 2006;48(2):51–7.
14. Hong CH, Bagramian RA, Hashim Nainar SM, Straffon LH, Shen L, Hsu CY. High caries prevalence and risk factors among young preschool children in an urban community with water fluoridation. Int J Paediatr Dent 2014;24(1):32–42.
15. Joshi N, Sujan S, Joshi K, Parekh H, Dave B. Prevalence, severity and related factors of dental caries in school going children of vadodara city - an epidemiological study. J Int Oral Health 2013;5(4):35–9.
16. Khan MA. Prevalence of dental caries among 3-12- years-old children of Swat – Pakistan. Pak Oral Dent J 2009;29(2):321–6.
17. Leopold CT, Mander C, Utting C, Watkins K, Rock WP. The world health organization goals for oral health: a progress report. Community Dent Health 1991;8(3):245–51.
18. Llompart G, Marin GH, Silberman M, Merlo I, Zurriaga O. Oral health in 6-year-old schoolchildren from Berisso, Argentina: falling far short of WHO goals. Med Oral Patol Oral Cir Bucal 2010;15(1):e101–5.
19. Maher R. Dental disorders in Pakistan--a national pathfinder study. J Pak Med Assoc 1991;41(10):250–2.
20. Moynihan P, Petersen PE. Diet, nutrition and the prevention of dental diseases. Public Health Nutr 2004;7(1A):201–26.
21. Piovesan C, Tomazoni F, Del Fabro J, Buzzati BC, Mendes FM, Antunes JL, *et al*. Inequality in dental caries distribution at noncavitated and cavitated thresholds in preschool children. J Public Health Dent 2014;74(2):120–6.
22. Rahman SS, Rasul CH, Kashem MA, Biswas SS. Prevalence of dental caries in the primary dentition among under five children. Bangladesh Med J (Khulna) 2010;43(1-2):7–9.
23. Sohi RK, Gambhir RS, Veeresha KL, Randhawa AK, Gingh G. Assessment of prevalence of dental caries among 5 and 12-year-old schoolchildren in Chandigarh (U.T.), India. Arch Oral Res 2012;8(1):39–45.
24. Umer A, Umer A. Prevalence of dental caries among the primary school children of urban Peshawar. J Khyber Coll Dent 2011;2(1):1–6.
25. Weir E. Dental caries: a nation divided. CMAJ 2002;167(9):1035.
26. Fallahi A, Ghofranipour F, Ahmadi F, Malekafzali B, Hajizadeh E. Challenges of Iranian adolescents for preventing dental caries. Iran Red Crescent Med J 2014;16(9):e15009.

Address for Correspondence:

Dr. Arham Shabbir, Assistant Professor, Faculty of Pharmacy, The University of Lahore, Lahore-Pakistan.
Cell: +92 323 622 0766
Email: charham007@hotmail.com