Status of Dental Caries and Its Association with Oral Hygiene Practices among School-going Children of Rural and Urban Areas in Kamrup District of Assam

Sulekha Doley[1], Manvi Srivastava[2], Ankita Piplani[3], Roopali Gupta[4], Yatendra Gautam[5], Chanchal Singh[6]

Abstract

Aim and objective: The study aimed to assess and compare the prevalence of dental caries with its association with oral hygiene practices among 13–14 years old schoolchildren in urban and rural areas in Kamrup Metropolitan (M) District, Assam.

Materials and methods: A total of 1,501 schoolchildren in the age group of 13–14 years were included in the study and dental caries was recorded from decayed missing filled teeth (DMFT)/deft index as described by World Health Organization (WHO) (1997). The children were asked to fill in the basic information in the proforma by themselves. The statistical tests used in this study were unpaired *t*-test, Chi-square test, and one-way ANOVA test to compare the DMFT among the different age groups, gender, and location.

Results: A statistically significant difference was found in the prevalence of the decayed (D) component between the 14 years old (33.9%) and the 13 years old (28.5%) age groups and a highly statistical difference was found between the male (27.9%) and the female (35.7%) population. However, the prevalence of decayed components for the rural (30.1%) and the urban (33.1%) population was not statistically significant.

Conclusion: The overall prevalence of dental caries among schoolchildren of Kamrup (Metropolitan) District was 33.6%.

Clinical significance: Dental caries is a major public dental health problem; hence, an active and effective preventive program for dental care is needed for the child population in the area.

Keywords: Decayed missing filled teeth index, Dental caries, Prevalence.

International Journal of Clinical Pediatric Dentistry (2022): 10.5005/jp-journals-10005-1936

Introduction

The oral cavity is the passage to the body which performs a major role in the maintenance of the overall health of an individual.[1] Dental caries is a very common oral disease, which is caused due to various factors and is affecting 60–90% of school-going children all over the world.[2] Not only it affects speech, esthetic but also interferes with daily nutrition intake which leads to malnourishment in children.[3]

Researchers have been working for years to reduce the prevalence of caries in children and adults. According to the literature, the World Health Organization (WHO) aimed to reduce the chances of developing dental caries in children by 50% by the year 2020 in developing countries.[4] The most effective and efficient way to reach out to the children are the schools where we can reach out to the children and their families and community members. To our knowledge, no epidemiological studies have been conducted to evaluate the prevalence of dental caries among 13–14 years old schoolchildren of Kamrup Metropolitan District, Assam. Hence, the study aimed to assess and compare the prevalence of dental caries with its association with oral hygiene practices among 13–14 years old school-going children in urban and rural areas in Kamrup Metropolitan (M) District, Assam.

Materials and Methods

Before the commencement of this cross-sectional study, the approval was taken from the institutional review board (THE/150C) and Official permission was taken from District Elementary Education Officer (Assam Letter No. EAC/Esstt./39/2014/3), Kamrup

[1]Department of Pedodontics and Preventive Dentistry, Regional Dental College, Guwahati, Assam, India

[2,5]Department of Pedodontics and Preventive Dentistry, KD Dental College and Hospital, Mathura, Uttar Pradesh, India

[3]National Oral Health Program, New Delhi, India

[4]Department of Public Health Dentistry, KD Dental College and Hospital, Mathura, Uttar Pradesh, India

[6]Department of Pedodontics and Preventive Dentistry, NIMS Dental College, Jaipur, Rajasthan, India

Corresponding Author: Manvi Srivastava, Department of Pedodontics and Preventive Dentistry, KD Dental College and Hospital, Mathura, Uttar Pradesh, India, Phone: +917906529801, e-mail: manvi_srivastava@yahoo.co.in

(M), Guwahati and School Principal/Headmaster/Headmistress of concerned schools.

The sample size was calculated from the pilot study done before the commencement of this survey on a sample of 50 children who were not included in the final sample.

The sample size for this cross-sectional study was calculated as follows using the following formula for cross-sectional studies based on the prevalence of disease:

$$\text{Sample size} = \frac{Z\alpha^{2*}(p)*(1-p)}{c^2}$$

Where:

Z = Z value (1.96 for 95% confidence level)

p = percentage of picking a choice expressed as a decimal

There was a 20% prevalence of decayed missing filled teeth (DMFT) ≥1. So, this was expressed as 0.20.

c = precision expressed as a decimal

Absolute precision = 16.4% of c

So, the sample size was calculated as per formula $= \dfrac{(1.96)^2 \times 0.8 \times 0.2}{(0.05)^{2*} 0.164}$

So, the sample size was calculated to be 1501.

The data collection was scheduled during the school working hours with an average of 30–35 children examined per day. The study period in which data were collected was from the month of August 2014 to March 2015.

Healthy children of age 13–14 years were included in this study. The children who were suffering from any serious systemic health problems that can affect their oral health or any intellectual developmental disorder, children with behavioral disorders, and also with impaired audio, speech, or visual acuity were excluded from the study.

A specially designed pretested proforma to collect data was used in the study. The proforma consisted of three parts; the first part had a provision to collect data related to the basic information of the child, the second and third part collected data related to oral hygiene practices and food habits, respectively. Dental caries was recorded from DMFT index as described by WHO (1997). The children were asked to fill in the basic information in the proforma by themselves.

A preliminary visit was made to these schools to obtain consent from the parents and school administration. An area with adequate daylight was selected for the examination purpose. The examiner was assisted by a cooperative assistant whose duty was to record the data correctly in the examination forms. The armamentariums used were plane mouth mirrors, dental probes, explorers, and tweezers. The used instruments were first disinfected in a disinfectant solution and then were autoclaved for sterilization. Children who required dental treatment were referred to the nearby Dental hospitals. After every dental examination, a dental health education class was held daily for the students so that children could be educated regarding their oral hygiene maintenance.

The data collected were entered into the Microsoft Excel sheet, 2007 version and were sent to the statistician for the statistical analysis. The statistical analysis was done using SPSS version 21 and the tests used for the assessment and comparison of the parameters were unpaired t-test, Chi-square test, and one-way ANOVA test.

RESULTS

Out of 1,501 children, 655 (43.6%) were of 13 years and 846 (56.3%) were 14 years of age. Among them, 709 (47.2%) were females and 792 (52.8%) were males. The rural population and urban population constituted 50% of the total study sample each.

The mean score of decayed, missing, and filled teeth among 13 years old children were 187, 12, and 55, respectively, whereas in 14 years old children, it was 287, 35, and 133 ,respectively. Hence, the overall DMFT index was higher in 14 years old children as compared to children with age 13 years. On comparing these data, a statistically significant result (p value 0.000) was found as shown in Table 1. Gender distribution showed that the mean score of decayed, missing, and filled teeth in the girls were 253, 25, and 100, whereas in boys it was 221, 22, and 88, respectively. Therefore, the overall DMFT score was more in girls when compared to the boys (Table 2). As the mean score of decayed teeth was more in girls as compared to boys, therefore the p value came out to be significant (p value was 0.000) whereas the difference of filled (p value was 0.580) and missing (p value was 0.080) teeth was nonsignificant among the groups.

The score of decayed, missing, and filled teeth in rural subjects were 226, 6, and 21, whereas among urban subjects it was 248, 41, and 167, respectively. The overall DMFT index was higher among the urban population in comparison to the rural. Hence, when the mean scores were compared, the difference was statistically significant among the children residing in two different localities (Table 3).

The mean DMFT score of those subjects who uses toothbrush as the cleaning aid (0.98 ± 1.60) was higher than those using a finger (0.76 ± 1.13) and the difference was statistically significant. Mean DMFT score was higher for those who clean their teeth once daily (1.10 ± 1.62) than those who clean twice daily (0.62 ± 1.25) and the difference was also statistically significant (Fig. 1). The difference in the mean DMFT score of those using tooth powder (1.05 ± 1.23) and those using toothpaste (0.93 ± 1.54) which was not statistically significant.

Figure 2: shows the mean DMFT score of subjects consuming sweets at various frequencies. It was seen that the maximum DMFT was in the subjects who were consuming the sweets thrice

Table 1: Mean and standard deviation of decayed, missing, filled, and mean DMFT among the age groups

	Age (years)	Mean	Std. deviation	t-test value	p value	Mean difference
No. of decayed teeth	13	0.56	1.02	−3.105	0.002**	−0.18
	14	0.73	1.16			
No. of missing teeth	13	0.03	0.20	−2.350	0.019*	−0.03
	14	0.06	0.30			
No. of filled teeth	13	0.13	0.47	−5.131	0.000***	−0.18
	14	0.31	0.80			
DMFT score	13	0.71	1.29	−5.189	0.000***	−0.41
	14	1.12	1.66			

Unpaired t-test

*Significant difference (p value < 0.05)

**Highly significant difference (p value < 0.01)

***Very highly significant difference (p value < 0.001)

Table 2: Mean and standard deviation of decayed, missing, filled, and mean DMFT among the gender

	Location	Mean	Std. deviation	t-test value	p value	Mean difference
No. of decayed teeth	Male	0.53	0.97	−4.669	0.000*	−0.27
	Female	0.80	1.23			
No. of missing teeth	Male	0.04	0.26	−0.553	0.580#	−0.01
	Female	0.05	0.27			
No. of filled teeth	Male	0.21	0.64	−1.753	0.080#	−0.06
	Female	0.27	0.72			
DMFT score	Male	0.78	1.40	−4.207	0.000*	−0.33
	Female	1.11	1.63			

Unpaired *t*-test
#Non-significant difference (*p* value > 0.05)
*Very highly significant difference (*p* value < 0.001)

Table 3: Mean and standard deviation of decayed, missing, filled, and DMFT by location

	Location	Mean	Std. deviation	t-test value	p value	Mean difference
No. of decayed teeth	Rural (R)	0.55	0.95	−3.840	0.000*	−0.22
	Urban (U)	0.77	1.24			
No. of missing teeth	Rural (R)	0.01	0.09	−5.374	0.000*	−0.07
	Urban (U)	0.08	0.36			
No. of filled teeth	Rural (R)	0.03	0.20	−12.168	0.000*	−0.41
	Urban (U)	0.44	0.89			
DMFT score	Rural (R)	0.58	0.99	−9.378	0.000*	−0.72
	Urban (U)	1.30	1.84			

Unpaired *t*-test
*Very highly significant difference (*p* value < 0.001)
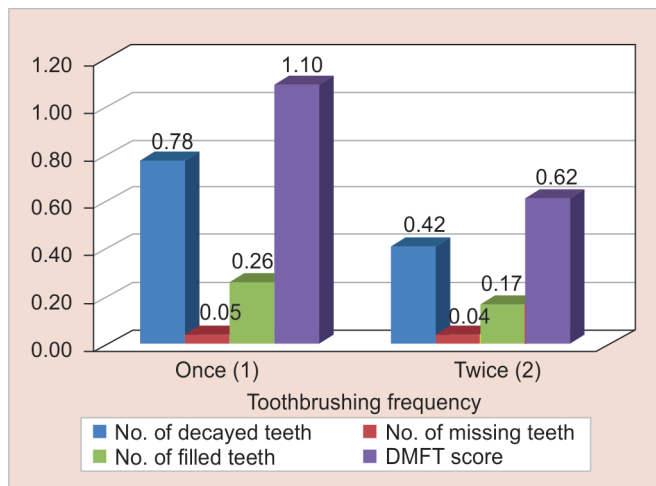
Fig. 1: Bar diagram showing the distribution of decayed, missing, filled teeth and DMFT score on the basis of tooth brushing frequency
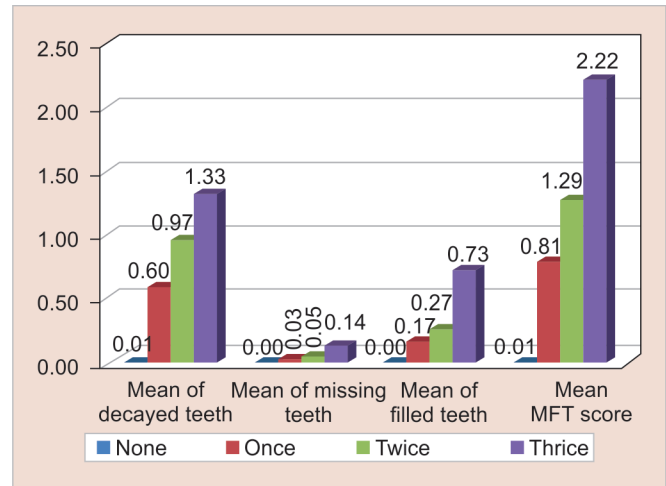
Fig. 2: Bar diagram showing the distribution of decayed, missing, filled teeth and DMFT score based on the frequency of sweets consumed

in a day. The intergroup differences in mean DMFT score of those consuming the sweets once, twice, and thrice were found to be highly significant. Subjects were asked about the time intervals between the frequency of consumption of sweets. The mean DMFT score of those who ate sweets in-between the meals (1.56 ± 1.71) was higher than those who ate during meals (0.24 ± 0.67) and both during and in-between meals (1.38 ± 1.73). This difference came out to be statistically significant.

Discussion

According to WHO (2013), the high-risk group for dental caries is between 11 years and 14 years of age,[2] therefore, an age group of 13–14 years old children was chosen for this study. Research by Lewis and Ismail also claimed that the peak ages for maximum caries exposure are 14 years.[5]

The total frequency of dental caries among 13–14 years old school-going children was 33.6%. Almost similar results were found

in the study done by Nasser et al. in Chennai[6] where the prevalence of dental caries was 34.72% whereas, a study conducted by Dash et al. in Cuttack,[7] Jose in Kerala,[8] Saravanan et al.[9] in Puducherry showed a higher frequency of dental caries, i.e., 64.3, 54.3, and 44.4%, respectively. Also, a study conducted by Dhar et al., Moses et al., and Shingare et al. also reported higher percentages of dental caries in Udaipur (46.75%), Chidambaram (63.83%), and Raigad (73%), respectively.[10-12] The vast difference in the dental caries experience in India can be contributed to the diverse dietary factors in different areas, morphological defects of teeth.

The dental caries exposure was found to be more among the older age group, i.e., 29.2% for the 13 years old compared to 37.0% for the 14 years old. The results of our study were supported by Praveena who stated that the increase in caries experience with advancing age can be attributed to the longer exposure of teeth to the cariogenic challenge in the oral environment.[13] Results of this study showed that females (38.1%) have a higher chance of developing dental caries as compared to the males (29.5%). Similar results were found by Okeigbemena, Mahesh Kumar et al., Grewal et al., and Bhaskar et al. where they found that the mean DMFT score was more in females in comparison with males,[14-17] whereas Yee et al. and Kalita et al. in their study found out that females were less exposed to dental caries as compared to males.[18,19] Blay et al. reported from their findings that females are seriously more affected by dental caries than their male counterparts. The most likely reason for this finding could be that girls tend to appreciate sugary foods and snacking more than boys; hence, the teeth are more exposed to cariogenic foods.[20]

In this study, the DMFT score was higher in the urban population (36.8%) as compared to the rural population (30.4%). The result of our study was similar to the results of the study done by Mandal et al., Irigoyen et al., Kalita et al., and Varenne et al. as a similar difference was found among rural and urban schoolchildren. This difference was attributed to the dietary and snacking habits (higher intake of candy and sweetened beverages) among urban schoolchildren.[21-24]

The results of the present study showed that the decayed teeth accounted for 66.8% of the DMFT index as compared to filled teeth and missing teeth. The untreated carious lesions among school-children can be attributed to limited access to dental care. The prevalence of decayed teeth was higher in urban (33.1%) than rural (30.1%), higher in females (35.7%) than males (27.9%) and higher in 14 years (33.9%) than the 13 years (28.5%). The prevalence of missing teeth was higher in urban (5.5%) than rural (.8%), higher in females (3.5%) than males (2.8%), and higher in 14 years old (4.1%) than the 13 years (1.8%). The prevalence of filled teeth was higher in urban (22.3%) than rural (2.8%), higher in 14 years (15.7%) than 13 years old (8.4%) and higher in females (14.1%) than males (11.1%).

In the present study, the score of filled teeth in the DMFT index was higher among the urban schoolchildren as compared to children residing in rural areas as the people in urban areas are more aware of their dental health and the dental care is more easily accessible. Mean DMFT score for 14 years (1.12 ± 1.66) was higher than 13 years (0.71 ± 1.29), it was also more in females (1.11 ± 1.63) than males (0.78 ± 1.40). Udoye et al. in Enugu also found similar patterns of DMFT score.[25]

According to the results of the present study, the DMFT score increased with the increase in the frequency of consumption of sweets and decreased with an increase in the frequency of toothbrushing in the study population. Decayed missing filled teeth score was low for those who clean their teeth with fingers and high for those who clean their teeth with a toothbrush. The reason for the higher DMFT score among the population using the toothbrush could be due to improper brushing technique among the study subjects or due to inadequate oral hygiene measures and also it might be due to some error in the scoring system.

Decayed missing filled teeth score was also low for those who clean their teeth with toothpaste compared to those who clean their teeth with tooth powder. Our results were similar to the study done in Gujarat by Parmar where they found less DMFT score among children using toothpaste as a dentifrice.[26] Reason could be fluoride as an active ingredient in toothpaste which prevents caries and acts as remineralizing agent. A higher DMFT score was seen in subjects consuming sweets in-between the meals than those consuming it during the meals and was also high among those who consumed a greater number of sweets. Sudha et al. also concluded a similar finding in their study where they demonstrated that chances of developing caries are more when sugar consumption increases.[27]

Conclusion

Dental caries is still a huge dental health problem despite so many preventive programs conducted by WHO and government agencies; hence, more active and effective preventive and educational programs should be conducted regularly in urban and rural areas of the country. The prevalence of dental caries among school-going children of Kamrup (Metropolitan) District was found to be 33.6% and the decayed teeth score was highest as compared to filled and missing teeth score. The DMFT score was more in females and among the children who were residing in urban areas of Kamrup (Metropolitan) District of Assam.

Clinical Significance

The present study provides objective data which will be required for dental health programs to be formulated and implemented in the future to control and prevent dental diseases by the authorities.

Authors Contribution

All authors had contributed to study conception, data collection, data acquisition and analysis, data interpretation, and manuscript writing. All the authors approved the final version of the manuscript for publication.

Ethical Policy and Institutional Review Board Statement

All the procedures have been performed as per the ethical guidelines laid down by the Declaration of Helsinki (2013). The Institutional Review Board approval was obtained from the institutional review board, K.D Dental College and Hospital, Mathura, India.

Patient Declaration of Consent

Consent forms were distributed to participants and their legal guardians who include statements to allow participation in the study and publication of the data for research and educational purposes.

References

1. Stella YLK, Petersen PE, Pine CM, et al. Health promoting schools: an opportunity for oral health promotion. Bullet WHO 2005;83:677–685.

2. http://www.who.int/mediacentre/factsheets/fs318/en/. Updated on 23rd May 2013 [Accessed on 1st June 2014].

3. Campus G, Sacco G, Cagetti M, et al. Changing trend of caries from 1989 to 2004 among 12-year old Sardinian children. Bio Med Central Public Health 2007;7(1):28. DOI: 10.1186/1471-2458-7-28.

4. Harikiran AG, Pallavi SK, Hariprakash S, et al. Oral health related KAP among 11-to 12-year-old school children in a government aided missionary school of Bangalore city. Indian J Dent 2008;19(3):236–242. DOI: 10.4103/0970–9290.42957.

5. Lewis DW, Ismail AI. Prevention of dental caries. Canadian Med Associat J 1995;152:12–22.

6. Nasser GA, Rupkumar, Junaid M. Prevalence of dental caries and gingivitis among corporation school-going children in Chennai city – a population based cross-sectional study. SRMJ Res Dent Sci 2019;10(1):7–11. DOI: 10.4103/srmjrds.srmjrds_59_18.

7. Dash JK, Sahoo PK, Bhuyan SK, et al. Prevalence of dental caries and treatment needs among children of Cuttack (Orissa). J Indian Soc Pedo Prev Dent 2002;20(4):139–143.

8. Jose A. Prevalence of dental health problems among school going children in rural Kerela. J Indian Soc Pedo Prev Dent 2003;21:147–151.

9. Saravanan S. Prevalence of dental caries and treatment needs among children of Pondicherry, India. J Indian Soc of Pedo Prev Dent 2003;21(1):1–12.

10. Dhar V, Jain A, Van Dyke TE, et al. Prevalence of dental caries and treatment needs in the school going children of rural areas in Udaipur district. J Indian Soc Pedod Prev Dent 2007(3):119–121. DOI: 10.4103/0970–4388.36560.

11. Moses J, Rangeeth BN, Gurunathan D. Prevalence of dental caries, socio–economic status and treatment needs among 5–15 year old school going children of Chidambaram. J Clin Diag Res 2011;5(1):146–151.

12. Shingare P, Jogani V, Sevekar S, et al. Dental caries prevalence among 3–14 year old school children, Uran, Raigad District, Maharashtra. J Contemp Dent 2012;2(2):11–14. DOI: 10.5005/jp-journals-10031-1002

13. Praveena S, Thippeswamy HM, Nanditha K, et al. Relationship of oral hygiene practices and dental caries among school children of Sullia Taluk, Karnataka, South India. J Med Res Dent Otol 2013;13(2):8–14.

14. Okeigbemena A. The prevalence of dental caries among 12 to 15-year-old school children in Nigeria: report of a local survey and campaign. Oral Hlth Prev Dent J 2004;2(1):27–31.

15. Mahesh Kumar P, Joseph T, Varma RB, et al. Oral health status of 5years and 12 years school going children in Chennai city – an epidemiological study. J India Soc Pedo Prev Dent 2005(1):17–22. DOI: 10.4103/0970–4388.16021.

16. Grewal H, Verma M, Kumar A. Prevalence of dental caries and treatment needs in the rural child population of Nainital district, Uttaranchal. J Indian Soc Pedod Prev Dent 2009;27(4):224–226. DOI: 10.4103/0970-4388.57657

17. Bhaskar DJ, Sardana V, Aswini YB, et al. Prevalence of dental caries and treatment needs among 12- year old school going children in rural Bagalkote, Karnataka. J Indian Dent Assoc 2011;5(1):85–86.

18. Yee R, McDonald N. Caries experience of 5-6-year-old and 12–13–year–old school children in central and western Nepal. Int Dent J 2002;52(6):453–460. DOI: 10.1111/j.1875–595x.2002.tb00642.x.

19. Kalita C, Choudhury B, Sarmah PC, et al. Caries prevalence of school going boys and girls according to sweet taking frequency among different age groups in and around Guwahati city. Pediatr Dent J 2015;3(3):82–87. DOI: 10.4103/2321–6646.164877.

20. Blay D, Astrom N, Haugejorden O. Oral hygiene and sugar consumption among urban and rural adolescents in Ghana. Community Dent Oral Epidemiol 2000;28(6):443–450. DOI: 10.1034/j.1600–0528.2000.028006443.x.

21. Mandal KP, Tewari A, Chawla HS, et al. Prevalence and severity of dental caries and treatment needs among population in the Eastern states of India. J Indian Soc Pedod Prev Dent 2001(3):85–91.

22. Irigoyen ME, Luengas IF, Yashine A, et al. Dental caries experience in Mexican schoolchildren from rural and urban communities. Int Dent J 2000;50(1):41–45. DOI: 10.1111/j.1875–595x.2000.tb00545.x.

23. Kalita C, Choudhury B, Saikia AK, et al. Caries prevalence of school-going boys and girls according to cleaning methods and soft drink-taking frequency in different localities, in and around Guwahati City. J Indian Soc Pedod Prev Dent 2016;34(3):249–256. DOI: 10.4103/0970–4388.186755.

24. Varenne B, Petersen PE, Ouattara S. Oral health status of children and adults in urban and rural areas of Burkina Faso, Africa. Int Dent J 2004;54(2):83–89. DOI: 10.1111/j.1875–595x.2004.tb00260.x.

25. Udoye CI, Aguwa EN, Chikezie RU, et al. Prevalence and distribution of caries in 12–15–year urban school children in Enugu. Internet J Dent Sci 2019;7(2):1–5.

26. Parmar G. A Project Report "Management of dental caries in rural areas of Gujarat through Atraumatic Restorative Technique (ART) 2006–07.

27. Sudha P, Bhasin S, Anegundi RT. Prevalence of dental caries among 5–13 year old children of Mangalore city. J Indian Soc Pedo Prev Dent 2005(2):74–79. DOI: 10.4103/0970–4388.16446.