ORIGINAL RESEARCH

To Assess the Prevalence of Dental Caries and Its Association with Body Mass Index, Socioeconomic Status, Dietary Habits, and Oral Hygiene among 6–12-year-old Children in Faridabad

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Abstract

Aim: The aim of our study was to assess the prevalence of dental caries and the body mass index (BMI) in included school-going children. Moreover, to examine the relationship between the prevalence of dental caries, BMI, and socioeconomic (SES) status and to evaluate sugar consumption and other dietary habits as risk factors for dental caries.

Materials and methods: The present cross-sectional study was performed among 400 school-going children aged 6–12 years from Faridabad city, Haryana. Parents filled out questionnaires for their respective children. The clinical examination of dental caries was performed according to World Health Organization (WHO) 1997. The BMI calculation was done by measuring height and weight.

Statistical analysis: The collected data were analyzed statistically using parametric and nonparametric tests.

Results: The prevalence of dental caries in deciduous teeth was 95.5% and in permanent teeth was 47.3%, respectively.

Conclusion: This study displayed the positive correlation of dental caries to BMI, oral hygiene practices, beverages, aerated drinks, chips, candy, and tea/coffee. Whereas the SES status and dietary habits Jam group variable had no significance in relation to dental caries.

Keywords: Body mass index, Carbonated beverages, Deciduous dentition, Dental caries, Oral hygiene, Socioeconomic status.

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Introduction

Dental caries, like childhood obesity, is a lifestyle-related condition that may harm a child's teeth and general health.[1] Many poor and middle-income nations, especially in metropolitan areas, are struggling with two types of problems: those related to hunger or nutritional inadequacy, and those related to food excess, caused by fast lifestyle changes.[2] Dietary sugar consumption, salivary flow, salivary fluoride level, and preventative behavior all have a role in a patient's risk for developing dental caries. Because of these variables and the passage of time, children whose diets are rich in sugar and children who eat carbonated soft drinks and sugary snacks are more likely to develop dental caries.[3] Obesity is strongly linked to dietary habits. Weight gain and obesity have been linked to a diet heavy in energy-dense, low-nutrient meals that are often high in saturated fats and sweets and a diet low in fruits and vegetables. Poor nutrition may also have an effect on the immune system, as well as on physical growth and development, the aging process, and even the state of your teeth. The development of dental caries is a hallmark of poor oral health and is now the most prevalent chronic illness in children.

Studies all across the globe have looked at the correlation between childhood obesity and dental caries, with some finding that eating sugary snacks in between meals is to blame. High-fructose-containing beverages and high carbohydrate foods is related to a higher prevalence of dental caries and obesity.[1–4] However, some studies have found dental caries related to a low body mass index (BMI) in children with harmful eating habits, such as being a picky eater, leading to malnutrition and inability to consume food adequately.[5] Some research has revealed no link between childhood dental caries and BMI.[6]

Multiple studies detailed the correlation between caries and obesity, finding that overweight children were more likely to suffer from caries than their normal-weight counterparts.[7] While some studies found substantial variations in decayed, missing due to caries, and filled permanent teeth(DMFT)/decayed, missing, and filled primary teeth (dmft) scores amongst children of varying BMIs (3–8 years old), others came to the opposite conclusion.[8] Therefore, the question of whether or not children who are overweight are at an increased risk of developing dental caries is still up for debate. School-going children in urban and rural locations were studied to determine the impact of age, gender, dental hygiene, socioeconomic (SES) status, physical activity, diet, and sugar consumption on BMI and dental caries.

Materials and Methods

Children in Faridabad between the ages of 6 and 12 who met the inclusion and exclusion criteria were tested for the presence

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of dental caries. Every child was examined under World Health Organization (WHO) examination; DMFT/deft was also noted. Children's height and weight measurements for calculating BMI were recorded. In addition, a questionnaire regarding SES status, dietary habits, and oral hygiene was given to parents.

The study's primary investigator received expert instruction and calibration in the field of pediatric and preventive dentistry from the head supervisor. This action was taken to eliminate examiner bias.

Inclusion and Exclusion Criteria

Inclusion Criteria

- Children with the chronological age of 6–12-year-old and their parents residing in Faridabad.
- Children for whom parent consent is given.

Exclusion Criteria

- People with obvious obesity-induced or linked syndromes, such as those with chronic sickness, severe malnutrition, endocrine disorders, physical and mental impairments, and so on.
- Children for whom parental consent is not given.
- Undergoing orthodontic treatment.
- Those who refused to let their anthropometrics be taken were left out.

Methodology

Prior to the study method, written agreement was sought from the parents of the participating children. The participants were polled on their sociodemographics (such as age, gender, and ethnicity) and physical well-being. Before administering the surveys, instructions were given on answering the survey questions. One of the two parents filled out the oral hygiene, diet chart, and sugar consumption questionnaire. Institutional Ethical clearance has been obtained from the review board committee.

Table 1: Correlation of sugar score with DMFT and dmft score

	Spearman's correlation coefficient	*p-value*
Sugar score and DMFT score	0.190	<0.001. S
Sugar score and dmft score	0.313	<0.001. S

The population was examined using WHO (2013) criteria of oral health examination. The data was collected by combining "Interviewer administered structured questionnaire" and "Clinical Examination" of children. The last section of the questionnaire included the information of parents concerned about their occupation, education, and their income, and according to that, the SES status of that family was calculated through" Modified Kuppuswamy's SES Scale 2019,"[9] that is, most popular tool for assessing a household's economic standing in metropolitan settings.[10]

Proposed Statistical Analysis

The obtained information was imported into an Excel spreadsheet and analyzed using Statistical Package for the Social Sciences version 21. For inferential statistics, we utilized the parametric tests of significance (independent *t*-test, paired *t*-test), and for nonparametric statistics, we used the Wilcoxon test and the Mann–Whitney *U* test. The significance threshold was determined to be 0.05.

Results

Demographics

The children aged 6–12 years from Faridabad (Haryana) were included, 268 were males, and 132 were females ($n = 400$). The mean age for males was 8.571 ± 2.15 years, and for females was 8.348 ± 1.34 years, respectively, with no statistically significant difference (p-value = 0.279 according to Chi-squared test of significance) (Tables 1 and 2).

Caries Prevalence

The overall prevalence of Dental caries in ages 6–12 years in deciduous teeth was 95.5%. In permanent teeth was 47.3% which was statistically significant (p-value of <0.001). The prevalence of dental caries associated with BMI in deciduous teeth was 100% in underweight, 96.1% in average weight, 95.8% in obese, and 88.9% in overweight, which was statistically not significant (p-value 0.111). On the other hand, the prevalence of dental caries associated with BMI in permanent teeth was 73.3% in overweight, 45.9% in average weight, 40% in underweight, and 27% in obese, respectively, which was statistically significant (p-value of 0.001) (Fig. 1). According to

Table 2: Independent factors predicting the DMFT index according to linear regression

	Unstandardized Coefficients		*Standardized coefficients*		
Independent variables	*B*	*Standard error*	*β*	*t*	*p-value*
(Constant)	0.573	0.778		0.736	0.462
Age	0.340	0.025	0.463	13.650	**<0.001**
Sex	−0.824	0.117	−0.273	−7.012	**<0.001**
School Type	0.692	0.106	0.239	6.540	**<0.001**
SES	0.017	0.065	0.010	0.262	0.793
Frequency of oral cleaning	−0.761	0.266	−0.092	−2.855	**0.005**
Beverages	−0.476	0.185	−0.078	−2.571	**0.011**
Aerated	1.326	0.119	0.467	11.187	**<0.001**
Jam	0.038	0.122	0.013	0.312	0.756
Chips	−0.654	0.162	−0.176	−4.035	**<0.001**
Candy	−0.336	0.121	−0.105	−2.769	**0.006**
Tea/coffee	−0.352	0.173	−0.062	−2.034	**0.043**
BMI	−0.082	0.012	−0.211	−6.782	**<0.001**

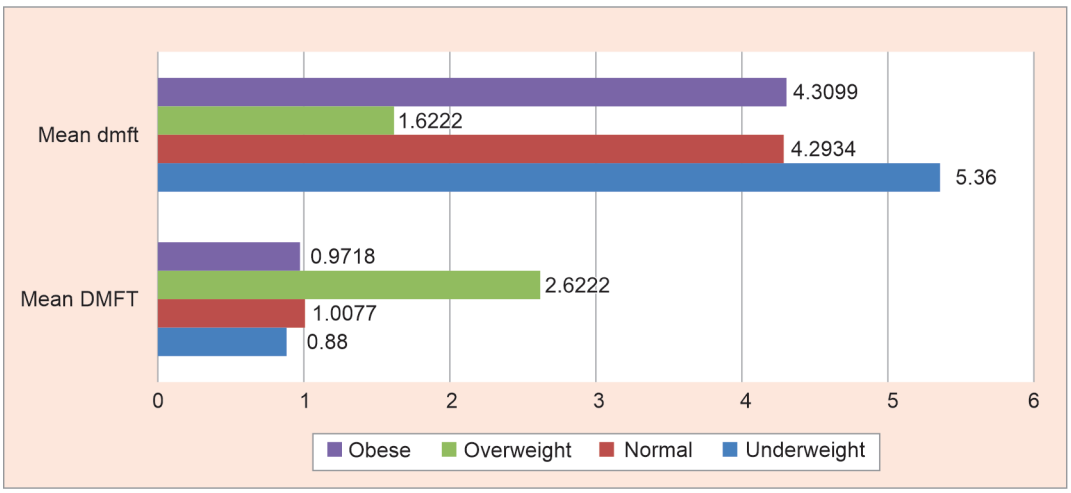

Fig. 1: Body mass index (BMI) category wise comparison of mean DMFT and mean dmft

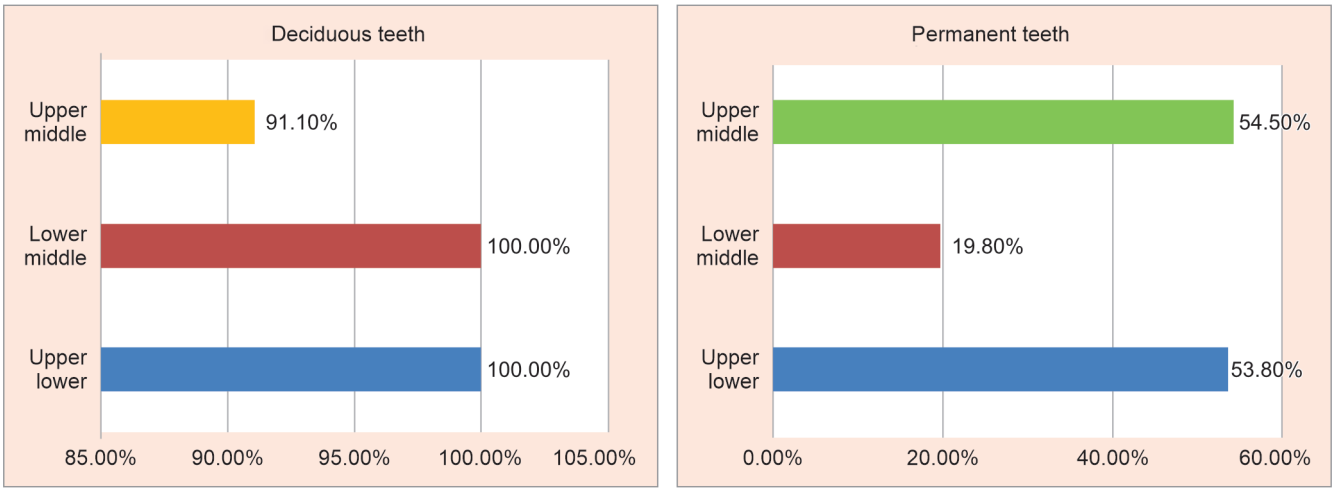

Fig. 2: Socioeconomic (SES) class wise comparison of prevalence of dental caries in deciduous and permanent teeth

SES, the prevalence of dental caries in deciduous teeth was highest at 100% in upper-lower and lower-middle-class followed by 91.1% in upper-middle-class, respectively (Fig. 2). In contrast, in permanent teeth, it was 54.5% in the upper-middle-class, 53.8% in the upper-lower, and 19.8% in the lower-middle-class, which was statistically significant (*p* -value of <0.001). The highest mean dmft score in deciduous teeth was 5.36 ± 2.09 in underweight, and in permanent teeth was 2.62 ± 1.74 in overweight.

Dental Hygiene Behavior

According to oral hygiene practices, the mean dmft score was found to be highest at 9.00 ± 0.0 in children who brush once a week, and the mean DMFT score was found to be highest at 2.24 ± 1.76 in children who brush several times a week (Fig. 3). Also, the highest mean dmft score of 5.47 ± 2.34 was recorded in children who visited thrice in the past 12 months and 5.37 ± 2.81 who never received any visits in the past 12 months. The highest mean DMFT score of 2.91 ± 1.41 was recorded in children who visited once in the past 12 months and 1.41 ± 1.04 who visited more than four times in the past 12 months (Fig. 4).

Dietary Habits

The correlation of sugar score with dmft was 0.313 in deciduous teeth, and DMFT in permanent teeth was 0.19 (Table 1).

The multivariate linear regression model estimates the prevalence of dental caries depending on SES status, oral hygiene practices, eating behavior, and demographic variables (Table 2). The demographics variables had significant values (*p*-value 0.001) according to the population selected. (The SES status and dietary habits Jam group variable had no significance about dental caries. At the same time, oral hygiene practices, beverages, aerated drinks, chips, candy, and tea/coffee and BMI had a significant correlation to the prevalence of dental caries (*p*-value 0.005, 0.011, <0.001, <0.001, 0.006, 0.043, and <0.001).

Discussion

Prevalence of Dental Caries According to Age

We found that the incidence of dental caries was greater in the baby teeth than in the adult teeth. In 2016, Jain et al.,[11] deciduous teeth had a lower calcium content, and structural changes make them more prone to dental caries, you said. Moreover, children during early childhood could be associated with a nutrition deficiency. Caries prevalence was higher in the 11–12-year-old age range for permanent dentition than in the 6–8-year-old range. There are fewer adult teeth present in children aged 6–7 than in those aged 11–12. Oral health among school-aged children was also investigated in research conducted in Chennai, with findings

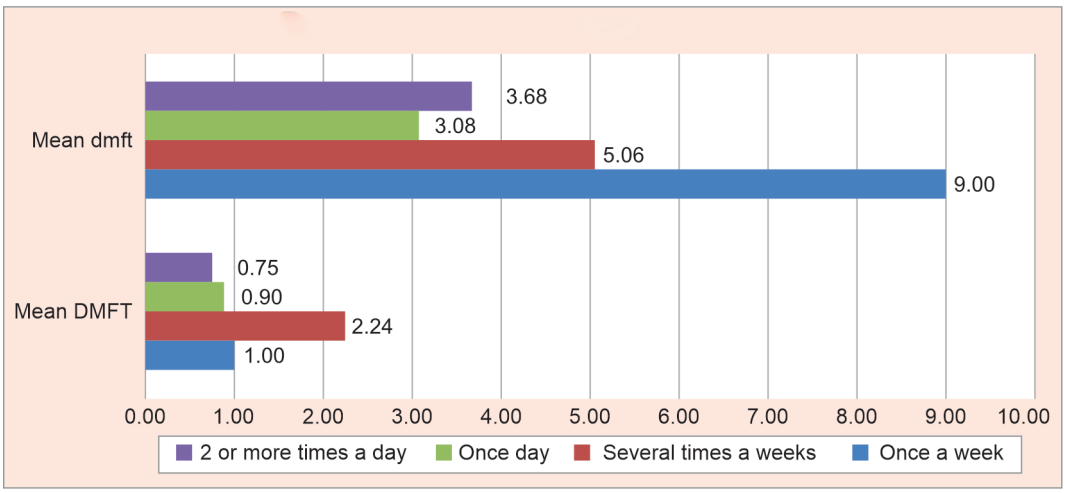

Fig. 3: Frequency of oral cleaning with mean DMFT and mean dmft

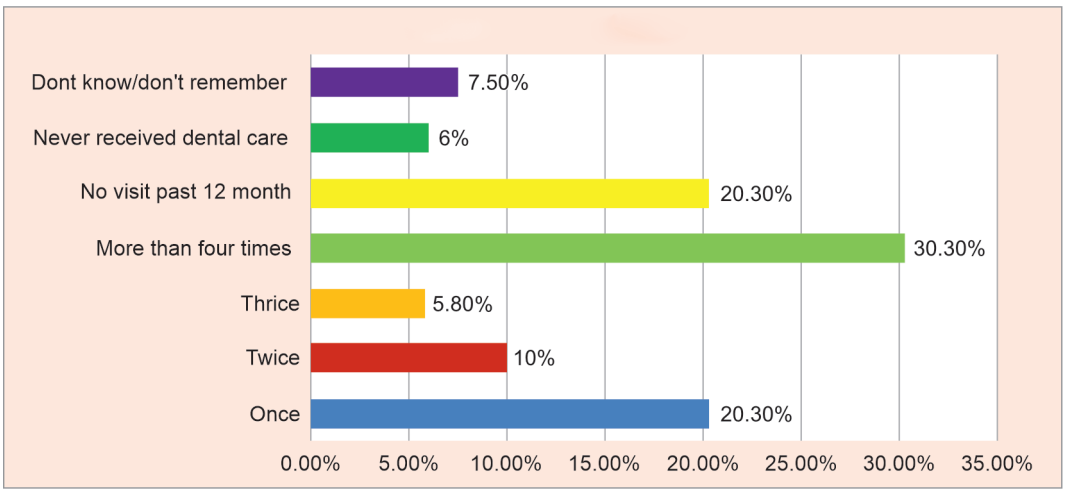

Fig. 4: Frequency of visits to dentist during past 12 months

correlating similarly.[12,13] According to Psoter et al.,[10] the clinical composition, micro and macro morphology, and eruption patterns may respond to a wide range of minerals, including vitamins A and D, calcium, and phosphorus.

Prevalence of Dental Caries According to Gender

Jose found no significant gender gap in his research of the population of children and adolescents in Kerala, India.[13] But Moses et al.,[14] demonstrated the shift in the prevalence of dental caries from male to female with the increasing age. In the 5-year-old age group, the prevalence of dental in males was about 47.4%, and in females was 1.1% which switched to the female population in the 12-year-old age group, which was found to be more in females versus the male population. Ferraro and Vieira,[15]explained why girls had greater caries rates than guys on average. The risk of dental caries in pregnant women should take into account the woman's social environment, which includes her saliva flow, saliva composition, food, hormonal changes, and specific AMELX gene variations. Females in the current research had a higher rate of dental caries than men, perhaps because their teeth erupted earlier than males' teeth. This suggests that females' teeth were first exposed to the oral cavity.

Association between BMI and Dental Caries

Swaminathan et al.,[16] in India and Abbass et al., in Egypt[17] discovered no statistically significant association between BMI and dental caries in the developing permanent teeth. Similarly, the current investigation demonstrated no association between BMI and dental caries in deciduous dentition. However, underweight children had the greatest mean dmft in deciduous dentition. Research by Oliveria et al., provides similar evidence.[4,18] in Brazil, showing that underweight kids had a higher prevalence of caries lesions.

In permanent dentition, the overweight children concluded the highest DMFT, which linked excessive body fat to cavities in teeth. This was supported by the research done in German primary schools,[18] which found a correlation between BMI and DMFT. One research, however, found a nonstatistical association between DMFT and BMI among teenagers in public and private schools in Sao Paulo state over a period of 1 year.[19]

Oral Hygiene/DMFT

According to our present study, the questionnaire responded to by parents revealed that children who brush once a week had higher dmft/DMFT scores. Prada,[20] found tooth brushing habits

to be statistically significantly associated with dental caries. Jessri et al.,[21] did a study in Tehran on primary schools which revealed that children who brushed their teeth once a week have almost four times the chance of having dental caries compared to those who brushed their teeth less than ≥ 2 times a day. Likewise, children who were not aware of dental floss were more prone to experiencing gingivitis. Similar studies reported in Hong Kong[22] dental caries were shown to be positively correlated with the number of times per day that people brushed their teeth. Additionally, our research demonstrated that the majority of children only went to the dentist when they were experiencing discomfort, swelling, or trauma. Many studies supported this evidence and provided a similar pattern, that is, patients visit dentist visit only in emergencies.[23,24]

Prevalence of Dental Caries According to SES

Elger et al.,[25] showed a correlation between dmft in deciduous dentition and SES status and poor oral hygiene. Our research similarly found that dental caries in deciduous teeth were more common in those of lower SES status due to inadequate diet and lack of access to dental care. Mathur et al.,[26] investigated area-wise prevalence of dental caries, which showed that adolescents from highly deprived areas, such as urban slums, had high caries. Also, in a systematic review, 272 articles revealed the prevalence of dental caries to be higher in children with low SES families.[27] In addition to this, a study by Piovesan et al.,[28] revealed that highly educated parents are probably more interested and responsible for health issues in maintaining oral hygiene and a balanced diet because their children have healthier teeth. They know preventive dental services and the harmful effects of sugar-containing food and drinks. Also, It was also suggested that this is because persons with higher incomes and levels of education tend to have better access to dental care. Cross-section research in German published by Pieper et al., found that these parents took care of their children's dental health and taught them how to wash their teeth before the age of two.[29] which could be related to low dental caries in high SES status.

On the contrary to this study, high SES and obesity have a crucial role in the risk of dental caries, which was concluded in a study by Abbass et al.[17] Also, the logic was explained by Nabipour et al.,[30] Dental caries are exacerbated by the fact that higher-income households can afford to purchase more sugary and snack foods than lower-income ones. According to the results of a research by Reddy et al.[22] The number of permanent teeth is lower in the 11–12-year-old age group, which may explain why dental caries is more common in this age range than in the 6–7-year-old age range. We found comparable results, with a greater frequency of dental caries in the permanent dentition among those of higher SES status.

Dietary Habits and Dental Caries

Sugar Consumption

We observed that the more sugar one consumes, the higher their DMFT/dmft. Data from throughout the world compiled by Sreebny et al.,[31] observed a statistically significant correlation between sugar intake and tooth decay. The availability of more than 50 gm of sugar per person per day was associated with lower dmft or DMFT scores, as shown by statistics from the WHO on the prevalence of caries in children aged 6 in 23 countries (or 12 in 47 countries).[33]

While McDonald did not find a link between sugar intake and the occurrence of dental caries, he did find a strong link between sugar intake and SES status. We found a strong correlation between the consumption of biscuits, cakes, sweets, candies and the incidence of dental caries and chocolate consumption. A similar study previously reported a positive correlation to these items.[32] In addition, similar to the findings of previous research, chocolate intake was the primary factor in the increase of caries indices.

Because sugar is easily digested by many bacteria, it contributes to the development of caries by causing the production of dental biofilm, which in turn produces acid byproducts and ultimately leads to demineralization of tooth structure.[33]

Beverages and DMFT/dmft

Caries in baby teeth were shown to be associated with the use of aerated drinks. The explanation provided in multiple studies suggests that the acidic nature of drinks causes the pH to reach 5.5, which dissolves the hydroxyapatite crystals, and decalcification occurs in enamel. This factor is crucial in understanding the causes of tooth decay. Increased DMFT may be the long-term outcome of drinking more soft drinks than normal and practicing poor dental care.[34]

In our study, tea, and coffee showed a positive correlation with DMFT as the sugar added into tea and coffee makes them a risk factor. However, on the contrary, it was found that caffeinated drinks consumption did not correlate with DMFT. It was reported that in coffee and tea, polyphenols are present, which reduces the cariogenic potential of foods, but the added sugar, caramel, and syrup to milk, tea, and coffee might be the leading cause of tooth decay.[35]

Correlation Between Eating Snacks While Watching Television and DMFT/dmft

Arya and Mishra,[36] showed that junk food and snack consumption while watching television was more which led to the intake of more calories for a more extended period thus, increasing the acid secretion amount displaying the positive association between increased dental caries and BMI. Our study also showed a significant increase in mean dmft/DMFT in deciduous and permanent dentition children who consume snacks while watching television. The study conducted by Docimo et al.,[37] evaluated the cariogenic risk related to sedentary and dietary habits during coronavirus disease 2019 (COVID-19). During the lockdown, the daily shopping for fresh fruits and vegetables was limited, which led to the consumption of exceedingly processed foods with high sugar and fat content, intensifying the risk of caries. This can be a significant factor for a drastic change in lifestyle and sports activity influencing the sleeping pattern and routines. This present study was also performed during COVID-19. Hence, it provides us with more relevant results showing correlation.

Conclusion

Children's baby teeth, known as deciduous dentition, had a higher prevalence of dental caries than their permanent teeth.

Dental caries was shown to have a favorable link with obesity, poor dental hygiene, and a poor diet (including soda, potato chips, sweets, and tea/coffee).

The correlation between SES status and dental caries among residents of Faridabad city was not significant.

Summary of Methodology

- School-going children in Faridabad.
- All the children who fulfil the inclusion criteria and volunteered to participate were approached.
- Selected 400 children.

- Parents filled out questionnaires for their respective children.
- The weight and height of each child were recorded.
- Examination of Dental caries in each child (DMFT/deft) was performed.
- Data related to dental caries was tabulated.
- Calculation of BMI and its classification was performed.
- Tabulation of data related to BMI.
- Statistical analysis.
- Result analysis, comparison, and conclusion were drawn.

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References

1. Hooley M, Skouteris H, Boganin C, et al. Body mass index and dental caries in children and adolescents: a systematic review of literature published 2004 to 2011. Syst Rev 2012;1:57. DOI: 10.1186/2046-4053-1-57
2. Joint WHO/FAO Expert Consultation. Diet, nutrition and the prevention of chronic diseases. World Health Organ Tech Rep Ser 2003;916:i-viii.
3. Selwitz RH, Ismail AI, Pitts NB. Dental caries. Lancet 2007;369(9555):51–59. DOI: 10.1016/S0140-6736(07)60031-2
4. Oliveira LB, Sheiham A, Bönecker M. Exploring the association of dental caries with social factors and nutritional status in Brazilian preschool children. Eur J Oral Sci 2008;116(1):37–43. DOI: 10.1111/j.1600-0722.2007.00507.x
5. Norberg C, Hallström Stalin U, Matsson L, et al. Body mass index (BMI) and dental caries in 5-year-old children from southern Sweden. Community Dent Oral Epidemiol 2012;40(4):315–322. DOI: 10.1111/j.1600-0528.2012.00686.x
6. Mitrakul K, Asvanund Y, Arunakul M, et al. Assessing associations between caries prevalence and body mass index and nutritional data among children aged 6-12 years. Southeast Asian J Trop Med Public Health 2016;47(1):152–159.
7. Thippeswamy HM, Kumar N, Acharya S, et al. Relationship between body mass index and dental caries among adolescent children in South India. West Indian Med J 2011;60(5):581–586.
8. D'Mello G, Chia L, Hamilton SD, et al. Childhood obesity and dental caries among paediatric dental clinic attenders. Int J Paediatr Dent 2011;21(3):217–222. DOI: 10.1111/j.1365-263X.2011.01112.x
9. Saleem SM. Modified Kuppuswamy socioeconomic scale updated for the year 2019. Indian J Forensic Community Med 2019;6(1):2019. DOI: 10.18231/2394-6776.2019.0001
10. Psoter WJ, Reid BC, Katz RV. Malnutrition and dental caries: a review of the literature. Caries Res 2005;39(6):441–447. DOI: 10.1159/000088178
11. Jain A, Jain V, Suri SM, et al. Prevalence of dental caries in male children from 3 to 14 years of age of Bundelkhand region, India. Int J Community Med Public Health 2016;3(4):787–790.
12. Mahesh Kumar P, Joseph T, Varma RB, et al. Oral health status of 5 years and 12 years school going children in Chennai city–an epidemiological study. J Indian Soc Pedod Prev Dent 2005;23(1):17–22. DOI: 10.4103/0970-4388.16021
13. Jose A, Joseph MR. Prevalence of dental health problems among school going children in rural Kerala. J Indian Soc Pedod Prev Dent 2003;21(4):147–151.
14. Moses J, Rangeeth BN, Gurunathan D. Prevalence of dental caries, socio economic status and treatment needs among 5 to 15 year old school going children of Chidambaram. J Clin Diagn Res 2011;5(1):146–151.
15. Ferraro M, Vieira AR. Explaining gender differences in caries: a multifactorial approach to a multifactorial disease. Int J Dent 2010;2010:649643. DOI: 10.1155/2010/649643
16. Swaminathan K, Anandan V, H S, et al. Correlation between body mass index and dental caries among three- to 12-year-old schoolchildren in India: a cross-sectional study. Cureus 2019;11(8):e5421. DOI: 10.7759/cureus.5421
17. Abbass MMS, Mahmoud SA, El Moshy S, 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. F1000Res 2019;8:8. DOI: 10.12688/f1000research.17047.1
18. Willerhausen B, Blettner M, Kasaj A, et al. Association between body mass index and dental health in 1,290 children of elementary schools in a German city. Clin Oral Investig 2007;11(3):195–200. DOI: 10.1007/s00784-007-0103-6
19. Sales-Peres SH, Goya S, Sant'Anna RM, et al. Prevalence of overweight and obesity, and associated factors in adolescents, at the central west area of the state São Paulo (SP, Brazil). Cien Saude Colet 2010;15 Suppl 2:3175–3184. DOI: 10.1590/s1413-81232010000800022
20. Prada I. Prevalence of dental caries among 6–12 year old schoolchildren in social marginated zones of Valencia, Spain. J Clin Exp Dent 2020;12(4):e399–e408. DOI: 10.4317/jced.56390
21. Jessri M, Rashidkhani B, Kimiagar SM. Oral health behaviours in relation to caries and gingivitis in primary-school children in Tehran, 2008. East Mediterr Health J 2013;19(6):527–34.
22. Reddy KS, Reddy S, Ravindhar P, et al. Prevalence of dental caries among 6–12 years school children of Mahbubnagar District, Telangana State, India: a cross-sectional study. Indian J Dent Sci 2017;9:1–7. DOI: 10.4103/0976-4003.201641
23. Tudoroniu C, Popa M, Iacob SM, et al. Correlation of caries prevalence, oral health behavior and sweets nutritional habits among 10 to 19-year-old Cluj-Napoca Romanian adolescents. Int J Environ Res Public Health 2020;17(18): DOI: 10.3390/ijerph17186923
24. Joshi N, Rajesh R, Sunitha M. Prevalence of dental caries among school children in Kulasekharam village: a correlated prevalence survey. J Indian Soc Pedod Prev Dent 2005;23(3):138–140. DOI: 10.4103/0970-4388.16887
25. Elger W, Kiess W, Körner A, et al. Influence of overweight/obesity, socioeconomic status, and oral hygiene on caries in primary dentition. J Investig Clin Dent 2019;10(2):e12394. DOI: 10.1111/jicd.12394
26. Mathur MR, Tsakos G, Millett C, et al. Socioeconomic inequalities in dental caries and their determinants in adolescents in New Delhi, India. BMJ Open 2014;4(12):e006391. DOI: 10.1136/bmjopen-2014-006391
27. Reisine ST, Psoter W. Socioeconomic status and selected behavioral determinants as risk factors for dental caries. J Dent Educ 2001;65(10):1009–1016.
28. Piovesan C, Mendes FM, Ferreira FV, et al. Socioeconomic inequalities in the distribution of dental caries in Brazilian preschool children. J Public Health Dent 2010;70(4):319–326. DOI: 10.1111/j.1752-7325.2010.00191.x
29. Pieper K, Dressler S, Heinzel-Gutenbrunner M, et al. The influence of social status on pre-school children's eating habits, caries experience and caries prevention behavior. Int J Public Health 2012;57(1):207–215. DOI: 10.1007/s00038-011-0291-3
30. Nabipour AR, Azvar K, Zolala F, et al. The prevalence of early dental caries and its contributing factors among 3-6-year-old children in Varamin/Iran. J Health Dev 2013;2:12.
31. Sreebny LM. Sugar availability, sugar consumption and dental caries. Community Dent Oral Epidemiol 1982;10(1):1–7. DOI: 10.1111/j.1600-0528.1982.tb00352.x
32. Goyal A, Gauba K, Chawla HS, et al. Epidemiology of dental caries in Chandigarh school children and trends over the last 25 years. J Indian Soc Pedod Prev Dent 2007;25(3):115–118. DOI: 10.4103/0970-4388.36559
33. Gupta P, Gupta N, Pawar AP, et al. Role of sugar and sugar substitutes in dental caries: a review. ISRN Dent 2013;2013:519421. DOI: 10.1155/2013/519421
34. Cheng R, Yang H, Shao MY, et al. Dental erosion and severe tooth decay related to soft drinks: a case report and literature review. J Zhejiang Univ Sci B 2009;10(5):395–399. DOI: 10.1631/jzus.B0820245

35. Chi DL, Scott JM. Added sugar and dental caries in children: a scientific update and future steps. Dent Clin North Am 2019;63(1):17–33. DOI: 10.1016/j.cden.2018.08.003
36. Arya G, Mishra S. Effects of junk food and beverages on adolescent's health–a review article. IOSR J Nursing Health Sci 2013;1(6):26–32.
37. Docimo R, Costacurta M, Gualtieri P, et al. Cariogenic risk and COVID-19 lockdown in a paediatric population. Int J Environ Res Public Health 2021;18(14): DOI: 10.3390/ijerph18147558