

# Comparative Study of Dental Health Status and Its Determinants among Children Attending Government and Private Schools in Kanpur City

Neha Singh<sup>1</sup>, Shashank Gaur<sup>2</sup>, Manish Kumar<sup>3</sup>, Neeraj S Chauhan<sup>4</sup>, Tanveer Akhtar<sup>5</sup>, Shaili Agarwal<sup>6</sup>, Rinku Mathur<sup>7</sup>

## ABSTRACT

The purpose of this study was to evaluate the prevalence of dental caries and gingivitis and its relation to various determinants like dietary habits, habits related to oral health, and oral hygiene practice among private and government school children of age 6–12 years in Kanpur City. A total of 1,550 children (775 from government school and 775 from private school) were selected. Overall, 60% children presented with caries. Prevalence of caries was significantly more associated with government school children (63.1%) compared with private school children (56.9%). The mean deft scores were high in government school children ( $1.08 \pm 1.91$ ) compared with private school children ( $0.93 \pm 1.53$ ). This was statistically significant ( $p < 0.05$ ). The DMFT scores were also high among government school children ( $0.84 \pm 1.25$ ) compared with private school children ( $0.67 \pm 1.19$ ). This was statistically significant ( $p < 0.05$ ). On the whole, out of 1,550 children only 17.8% children presented with gingivitis, in which majority had mild form of gingivitis when compared with moderate and severe forms. The prevalence of gingivitis was relatively high among government school children (55%) compared with private school children (45%). This was statistically significant ( $p < 0.05$ ). Summing up, a conclusion could be drawn that the prevalence of both dental caries and gingivitis depends on the state of the oral hygiene habits and practices, correspondingly, due to schoolchildren's knowledge of individual oral hygiene and skills.

**Keywords:** Dental caries, Gingival growth, Prevalence.

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## INTRODUCTION

"Prevention is better than cure"—if this motto is taught to all the children, all over the world, surely dental diseases would be checked and controlled at a very early stage. General health and well-being cannot be attained in absence of good oral health, which significantly affects the quality of life. Among the various prevalent but preventable oral diseases, dental caries and gingivitis are the most commonly encountered dental problems among school-going children. The most predominant factors among them are an accumulation of plaque, dietary habits, and susceptibility to host factors.<sup>1</sup> Other factors like socioeconomic status, education level, and habits related to oral health and oral hygiene practices play a role to a certain extent, either in the development or progression of dental disease, sometimes there is a positive correlation between dental caries and gingivitis with these contributory factors.<sup>2</sup>

This study had been done to evaluate the dental health status, so that it gives a better idea about the oral health status of the schoolchildren of age 6–12 years attending government and private schools in Kanpur city, Uttar Pradesh.

## AIMS AND OBJECTIVES OF THE STUDY

- To assess the prevalence of dental caries and gingivitis among private and government school children of age 6–12 years in Kanpur city.
- To find out the possible association between the prevalence of dental caries and gingivitis in relation to dietary habits, habits related to oral health, and oral hygiene practices.
- To plan out appropriate preventive measures and to recommend accordingly.

<sup>1,2</sup>Department of Pediatric and Preventive Dentistry, Bhabha College of Dental Sciences, Bhopal, Madhya Pradesh, India

<sup>3</sup>Department of Dentistry, Government Medical College, Ratlam, Madhya Pradesh, India

<sup>4</sup>Department of Public Health Dentistry, Bhabha College of Dental Sciences, Bhopal, Madhya Pradesh, India

<sup>5</sup>Department of Ministry of Health, Najran Regional Specialty Dental Center, Najran, Kingdom of Saudi Arabia

<sup>6</sup>Department of Prosthodontics, Pacific Dental College and Research Center, Udaipur, Rajasthan, India

<sup>7</sup>Department of Pediatric and Preventive Dentistry, RUHS College of Dental Sciences, Jaipur, Rajasthan, India

**Corresponding Author:** Manish Kumar, Department of Dentistry, Government Medical College, Ratlam, Madhya Pradesh, India, Phone: +91 8952879519, e-mail: drmanishagarwalmds@gmail.com

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## MATERIALS AND METHODS

The epidemiological cross-sectional survey was carried out on representative and randomly selected samples of 6–12 years age group of children attending government and private schools in Kanpur city.

**Sample Size**

A pilot study was conducted among 120 private and government school children (totally 4 schools were taken out of which 2 were private and 2 were government schools) of 6–12 years of age in Kanpur city, with the objective to estimate the prevalence of dental caries and gingivitis and their possible association with dietary habits, habits related to oral health, and oral hygiene practices.

From the pilot study, it was found that the overall prevalence of dental caries was 50%, using this, the sample size was calculated as 1,550.

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

Where:

Z = Z value (e.g., 1.96 for 95% confidence level).

p = Percentage picking a choice, expressed as decimal (0.5 used for sample size needed).

c = Confidence interval, expressed as decimal (e.g., 0.04 = ±4).

Using the above formula, the sample size was estimated to be 1,537 (closer to 1,550) with a 5% margin of error (high precise) for 95% confidence interval and for 50% prevalence.

**Method of Collection of Data**

A total of 30 schools of which 15 private and 15 government schools were selected by simple random sampling method to achieve the sample size of 1,550 and the children were equally divided between the two school groups.

**Survey Design**

The survey was carried out using a specific proforma, which consisted of two parts.

The first part consisted of general information of schoolchildren regarding the main staple food, diet, sweet consumption, oral hygiene practices, and other information which were recorded through an interview.

The second part consisted of the clinical oral examination. Oral examination of schoolchildren was carried out under natural light using plane mouth mirror, explorer, CPI (621) probe.

**Clinical Examination**

The recording was noted down by the House surgeons who were trained and calibrated before the start of the survey. The sterilization of instruments was done by chemical method. No radiographs were taken.

**Study Variables Used in Survey Design**

Age-groups: The children were divided among 6–7, 8–9, 10–11, and 12 years of age-groups.

Sex: Male/Female.

Caries: Prevalence and severity of dental caries were measured through deft and DMFT index in both primary and

permanent dentition according to the World Health Organization criteria (1997).<sup>3</sup>

Gingival status was assessed using Gingival Index by Loe and Silness, 1963.<sup>4</sup>

**Statistical Analysis**

Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on mean ± SD (Min–Max) and results on categorical measurements are presented in number (%). Significance is assessed at 5% level of significance. Chi-square/Fisher's exact test has been used to find the significance of study parameters on categorical scale between two or more groups. 95% confidence interval has been computed to find the significant features.

**RESULTS**

The study group comprised 1,550 schoolchildren, out of which, 775 students were from 15 government schools and 775 students were from 15 private schools.

Out of 1,550, 620 (40.0%) children were caries-free (deft/DMFT = 0) and 930 (60.0%) children presented with caries (deft/DMFT > 0).

Table 1 presents out of 775 children in the government school, 286 (36.9%) children were caries-free and 489 (63.1%) children presented with caries. Whereas in private schools, out of 775 children, 334 (43.1%) were caries-free and 441 (56.9%) children presented with caries.

Figure 1 shows prevalence of caries was more associated with government school children compared to private school children. This was seen as statistically significant ( $p < 0.05$ ).

Figure 2 shows the mean deft score for the overall group was  $1.01 \pm 1.73$ . The mean deft score in government school children was  $1.08 \pm 1.91$  and in private school children, it was  $0.93 \pm 1.53$ . These values were statistically significant ( $p < 0.05$ ). Out of which the mean of d(t) component in a government school was  $0.97 \pm 1.75$  and in private school, it was  $0.72 \pm 1.32$ , which were statistically significant ( $p < 0.05$ ). The mean of e(t) component in government school children was  $0.04 \pm 0.24$  and in private school children, it was  $0.05 \pm 0.21$ , which was not statistically significant ( $p > 0.05$ ). Whereas, the mean of f(t) component in government school children was  $0.08 \pm 0.39$  and in private school children it was  $0.15 \pm 0.57$ , which were statistically significant ( $p < 0.05$ ).

Figure 3 indicates the mean DMFT score for overall group was  $0.76 \pm 1.22$ . The mean DMFT score in government school children was  $0.84 \pm 1.25$  and in private school children it was  $0.67 \pm 1.19$ . These values were statistically significant ( $p < 0.05$ ). Out of which the mean of D(T) component in government school was  $0.64 \pm 1.01$  and in private school it was  $0.54 \pm 1.03$ , which were statistically significant ( $p < 0.05$ ). The mean of M(T) component in government school children was  $0.06 \pm 0.23$  and in private school children it was  $0.03 \pm 0.16$ , which were statistically significant ( $p < 0.05$ ). Whereas, the mean of F(T) component in government school children was

**Table 1:** Incidence of caries

Caries status	Govt school		Pvt school		Total	
	No.	%	No.	%	No.	%
Caries present	489	63.1	441	56.9	930	60.0
Caries-free	286	36.9	334	43.1	620	40.0
Total	775	100.0	775	100.0	1550	100.0
Inference	Incidence of caries present is significantly more associated with Government school children with $\chi^2 = 6.194; p = 0.013^*$					

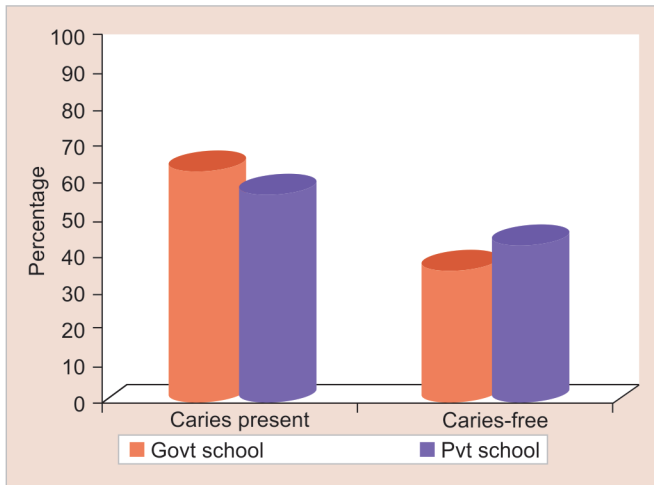


Fig. 1: Caries status

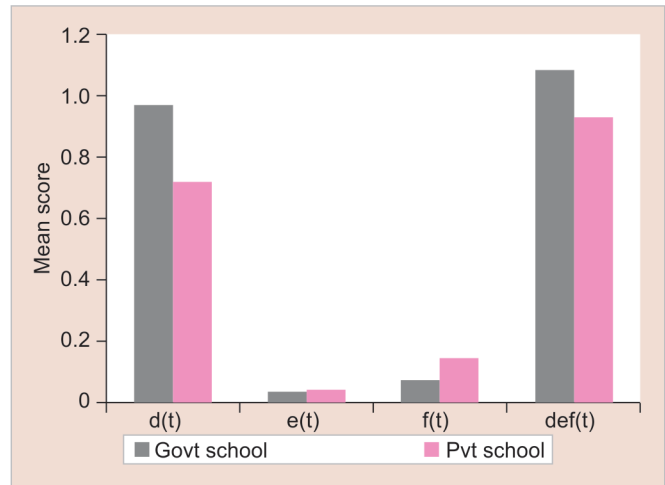


Fig. 2: Mean deft score

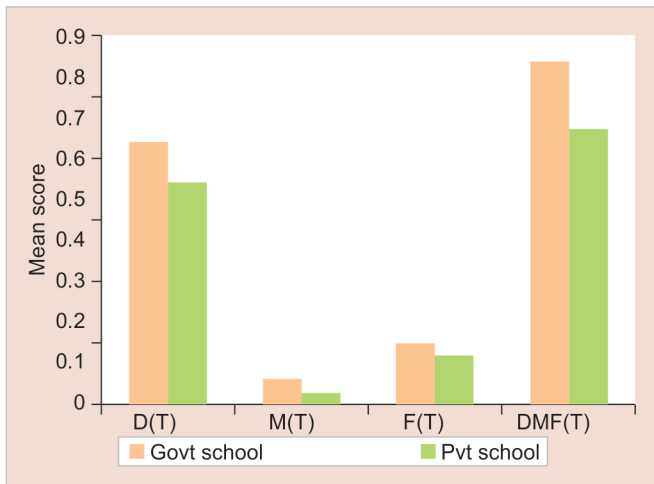


Fig. 3: Mean DMFT score

0.15 ± 0.46 and in private school children it was 0.12 ± 0.44, which were not statistically significant ( $p > 0.05$ ).

The mean deft and DMFT scores in government schools were higher when compared with private schools.

Tables 2(A) and 3(A) show the mean deft score was high among 6–7 years age children and the mean DMFT score increased with age from 6 to 12 years, with peak score being among 12 years age group, showing the cumulative effect of dental caries with age. This was seen statistically significant in both government and private schools.

Tables 2(B) and 3(B) present in private school the mean deft score were high among females (1.00) compared with males (0.87) but the difference between the groups was not statistically significant ( $p > 0.05$ ) whereas, the mean DMFT score were similar among public school males as well as females (0.84) and the difference between the groups was not statistically significant ( $p > 0.05$ ).

Tables 2(C) and 3(C) show the mean caries score both in deciduous and permanent dentition, increased with increase in frequency of sweet consumption and maximum caries was seen among children who consumed sweets more than three times a day or those who had them irregularly both in public and private schools. The difference was statistically significant ( $p < 0.05$ ).

Tables 2(D) and 3(D) determine the mean deft score was high among both private and government school children (1.37 and 1.45) who used tooth powder to clean their teeth than the children who used toothpaste (0.93 and 0.85) and other materials (1.33 and 0.93) and the difference was statistically significant ( $p < 0.05$ ). Whereas, no significant difference between caries status and frequency of toothbrushing in government school children was noted.

In the present study, out of 1,550 children examined (Table 4 and Fig. 4), number of children with healthy gingiva was 1,274 (82.2%) and the number of children who had gingivitis was 276 (17.8%). Out of 276 children who had gingival inflammation, 152 (55.0%) children belonged to government school and 124 (45.0%) children belonged to private school. Gingivitis is significantly more associated with government school children.

Tables 5(A) and 6(A) present that prevalence of gingival inflammation increased with the age. This was not statistically significant among government school but it was statistically significant in private school children. Depending upon the degree of severity, mild form of gingivitis predominated over moderate and severe forms. The difference was statistically significant ( $p < 0.05$ ).

Tables 5(B) and 6(B) show that in government school more females were affected (55.5% with mild and 57.6% with moderate gingival inflammation) than males (44.5% with mild and 42.4% with moderate gingival inflammation) whereas, in private school more males (57.3% with mild and 52.4% with moderate gingival inflammation) were affected than females (42.7% with mild and 47.6% with moderate gingival inflammation) but this was not statistically significant.

Tables 5(C) and 6(C) show the correlation of prevalence and intensity of gingivitis with the oral hygiene habits in both the schools. This was statistically significant. More students presented with gingivitis who followed finger and other method to clean their teeth. This was seen statistically significant in government school but not in private school. Similarly, more gingivitis cases were seen associated with toothpowder or other material for teeth cleaning and were more prevalent among children attending government schools. These values were statistically significant in both the schools. 87.4% government school children and 78% children from private school cleaned their teeth once a day presented with mild gingivitis. These values were not statistically significant in government school but seen statistically significant in private school.

**Table 2:** Mean  $d(t)$ ,  $e(t)$ ,  $f(t)$ , and  $def(t)$  according to age, gender, frequency of sweet consumption (SCF), method of toothbrushing (method), material for toothbrushing (MTC), and frequency of toothbrushing (FTC) in government school

Variables	deft				DMFT				p value	
	$d(t)$	$e(t)$	$f(t)$	$def(t)$	$D(T)$	$M(T)$	$F(T)$	$DMF(T)$		
(A) Age										
• 6-7	2.09	0.10	0.09	2.27	0.13	0.01	0.06	0.20	<0.001**	
• 8-9	1.51	0.07	0.13	1.72	0.24	0.02	0.03	0.28		
• 10-11	0.21	0.00	0.04	0.25	0.94	0.08	0.17	1.17		
• 12	0.07	0.00	0.07	0.10	1.26	0.12	0.35	1.73		
(B) Gender										
• Male	0.95	0.04	0.07	1.07	0.62	0.06	0.17	0.84	0.981	
• Female	0.98	0.04	0.09	1.09	0.66	0.05	0.14	0.84		
(C) SCF										
• Irregular	1.40	0.06	0.15	1.59	0.89	0.06	0.24	1.19	<0.001**	
• Once	0.86	0.04	0.07	0.96	0.80	0.08	0.17	1.04		
• Twice	0.02	0.00	0.00	0.02	0.01	0.00	0.00	0.01		
• Thrice	1.89	0.06	0.10	2.05	0.79	0.08	0.20	1.06		
(D) Oral hygiene practices										
Method										
• Finger	1.73	0.05	0.11	1.89	0.32	0.05	0.05	0.41	0.004**	
• Brush	0.90	0.04	0.08	1.01	0.67	0.06	0.16	0.88		
MTC										
• Paste	0.82	0.04	0.08	0.93	0.72	0.07	0.17	0.96	0.003**	
• Powder	1.28	0.03	0.10	1.37	0.50	0.03	0.11	0.62		
• Other	1.18	0.07	0.04	1.33	0.46	0.04	0.16	0.66		
FTC										
• Once	0.98	0.04	0.07	1.08	0.63	0.05	0.15	0.83	0.014*	
• Twice	0.86	0.05	0.14	1.03	0.81	0.07	0.18	1.06		
• Thrice	1.25	0.08	0.08	1.42	0.00	0.00	0.00	0.00		

\*\* non significant

\* significant

**Table 3:** Mean d(t), e(t), f(t), and def(t) according to age, gender, frequency of sweet consumption (SCF), method of toothbrushing (method), material for toothbrushing (MTC), and frequency of toothbrushing (FTC) in private school

Variables	def(t)				DMFT				p value	
	d(t)	e(t)	f(t)	def(t)	D(T)	M(T)	F(T)	DMF(T)		
(A) Age										
• 6-7	1.14	0.12	0.27	1.55	0.04	0.00	0.05	0.09	<0.001**	
• 8-9	1.24	0.07	0.23	1.58	0.22	0.03	0.11	0.36		
• 10-11	0.50	0.00	0.11	0.61	0.93	0.02	0.06	0.92		
• 12	0.00	0.00	0.00	0.00	1.98	0.06	0.26	1.30		
(B) Gender										
• Male	0.69	0.03	0.14	0.87	0.54	0.04	0.14	0.71	0.300	
• Female	0.75	0.06	0.17	1.00	0.55	0.02	0.10	0.62		
(C) SCF										
• Irregular	0.67	0.11	0.11	1.59	0.72	0.04	0.20	0.93	<0.001**	
• Once	0.70	0.03	0.14	0.96	0.57	0.03	0.10	0.68		
• Twice	0.76	0.06	0.12	0.02	0.55	0.02	0.12	0.66		
• Thrice	0.75	0.06	0.34	1.15	0.24	0.00	0.05	0.29		
(D) Oral hygiene practices										
Method										
• Finger	1.96	0.10	0.35	2.40	0.21	0.04	0.12	0.37	0.004**	
• Brush	0.63	0.04	0.14	0.83	0.57	0.02	0.12	0.69		
MTC										
• Paste	0.67	0.04	0.12	0.85	0.57	0.03	0.13	0.69	0.003**	
• Powder	1.06	0.09	0.30	1.45	0.40	0.01	0.08	0.50		
• Other	0.56	0.07	0.29	0.93	0.59	0.05	0.07	0.71		
FTC										
• Once	0.97	0.06	0.21	1.26	0.75	0.04	0.16	0.91	0.014*	
• Twice	0.01	0.01	0.00	0.03	0.00	0.00	0.00	0.00		
• Thrice	2.67	0.00	0.00	2.67	0.33	0.00	1.00	1.33		

\*\* non significant

\* significant

**DISCUSSION**

Epidemiological studies can be used as an incentive to increase community consciousness about oral health and to promote community participation in preventive actions and make the

reorientation of oral health services toward prevention and oral health promotion easier.

This study has been designed to find out the prevalence of dental caries and gingivitis among 6–12 years age government and private school children in Kanpur city and its relation to various determinants like age, sex, dietary habits, habits related to oral health, and oral hygiene practice and to compare in which group the prevalence of above-mentioned conditions are more.

The present study showed, out of 1,550 children examined on the whole 40.0% of children were caries-free and 60.0% of children presented with caries. These findings are quite similar to the results conducted by Dash et al.<sup>5</sup> which showed that total percentage of caries prevalence were 64.3% among 5–15 years of age group children in Cuttack, Karunakaran et al.<sup>6</sup> found the prevalence of caries to be 69.57% in Namakkal district Tamil Nadu, Kalaskar et al.<sup>7</sup> surveyed and found caries prevalence was 65.70% in school going children of Vidarbha region.

In the present study, the mean deft scores in a government school were  $1.08 \pm 1.91$  and in private school, it was  $0.93 \pm 1.53$  and the mean DMFT score was high among government school children ( $0.84 \pm 1.25$ ) when compared with private school ( $0.67 \pm 1.19$ ) which pointed that government school scores were higher as compared to private school and this was statistically significant ( $p < 0.05$ ). The reason being low socioeconomic status, lack of

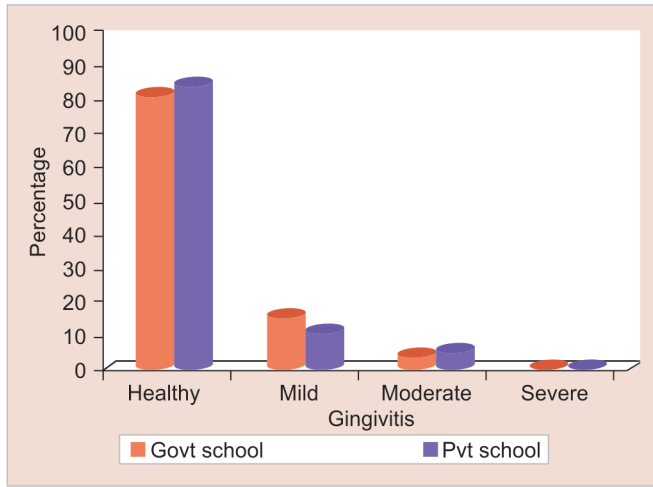


Fig. 4: Gingivitis status

Table 4: Incidence of gingivitis

Gingivitis	Govt school		Pvt school		Total	
	No	%	No	%	No	%
Healthy	623	80.4	651	84.0	1274	82.2
Mild	119	15.4	82	10.6	201	13.0
Moderate	31	4.0	40	5.2	71	4.6
Severe	2	0.3	2	0.3	4	0.3
Total	775	100.0	775	100.0	1550	100.0
Inference	Gingivitis is significantly more associated with government school children with $\chi^2 = 8.567$ ; $p = 0.036^*$					

Table 5: Association demographic, habits, and clinical variables with gingivitis in government school children

Variables	Criteria	Gingivitis						Significance	
		Healthy (n = 623)		Mild (n = 119)		Mod-severe (n = 33)			
		No	%	No	%	No	%		
(A) Age	6–7	160	25.7	29	24.4	3	9.1	$\chi^2 = 8.129$ ; $p = 0.229$	
	8–9	161	25.8	27	22.7	7	21.2		
	10–11	152	24.4	29	24.4	13	39.4		
	12	150	24.1	34	28.6	10	30.3		
(B) Gender	Male	320	51.4	53	44.5	14	42.4	$\chi^2 = 2.640$ ; $p = 0.267$	
	Female	303	48.6	66	55.5	19	57.6		
(C) Oral hygiene practices	Type of teeth cleaning	Finger	38	6.1	22	18.5	3	9.1	$\chi^2 = 20.574$ ; $p < 0.001^{**}$
	Brush	585	93.9	97	81.5	30	90.9		
Materials used for teeth cleaning	Paste	460	73.8	41	34.5	5	15.2	$\chi^2 = 111.11$ $p < 0.001^{**}$	
	Powder	115	18.5	48	40.3	21	63.6		
	Other	48	7.7	30	25.2	7	21.2		
Frequency of teeth cleaning	Once	535	85.9	104	87.4	30	90.9	$\chi^2 = 3.260$ $p = 0.515$	
	Twice	80	12.8	12	10.1	2	6.1		
	Don't clean everyday	8	1.3	3	2.5	1	3.0		

**Table 6:** Association demographic, habits, and clinical variables with gingivitis in private school children

Variables	Criteria	Gingivitis						Significance	
		Healthy (n = 651)		Mild (n = 82)		Mod-severe (n = 42)			
		No	%	No	%	No	%		
(A) Age	6–7	169	26.0	19	23.2	6	14.3	$\chi^2 = 12.357; p = 0.054+$	
	8–9	170	26.1	17	20.7	6	14.3		
	10–11	162	24.9	19	23.2	14	33.3		
	12	150	23.0	27	32.9	16	38.1		
(B) Gender	Male	319	49.0	47	57.3	22	52.4	$\chi^2 = 2.110; p = 0.348$	
	Female	332	51.0	35	42.7	20	47.6		
	Mixed	433	66.5	52	63.4	26	61.9		
(C) Oral hygiene practices	Type of teeth cleaning	Finger	44	6.8	6	7.3	2	4.8	$\chi^2 = 0.305; p = 0.858$
		Brush	607	93.2	76	92.7	40	95.2	
	Materials used for teeth cleaning	Paste	549	84.3	56	68.3	22	52.4	$\chi^2 = 40.714 p < 0.001^{**}$
		Powder	77	11.8	15	18.3	15	35.7	
		Other	25	3.8	11	13.4	5	11.9	
	Frequency of teeth cleaning	Once	460	70.7	64	78.0	38	90.5	$\chi^2 = 11.174 p = 0.025^*$
		Twice	189	29.0	17	20.7	4	9.5	
		Don't clean everyday	2	0.3	1	1.2	0	0.0	

awareness, poor oral hygiene habits, and less accessibility to oral healthcare workers. This finding was similar to the study conducted by Reddy et al.<sup>8</sup> and Moses et al.<sup>9</sup>

Our data also showed the mean deft score increased with age with the peak age at 6 years and DMFT peak score at 12 years of age.

It was also noted that more deft n DMFT values were observed in females as compared to males. The reason could be the early eruption pattern among females. Consumption of sweets and its frequency had more mean caries score in both primary and permanent teeth among both the schools' children. This difference was statistically significant. Similar findings were reported by Shetty and Tandon<sup>10</sup> and Reddy et al.<sup>8</sup>

This was supported by data on various populations including people with genetic defects that preclude sucrose from their diets, primitive societies with changing dietary habits, institutionalized populations, and subjects consuming sugar substitutes.

The present study showed the mean deft score was high among both private and government school children (1.37 and 1.45) who used tooth powder to clean their teeth than the children who used toothpaste (0.93 and 0.85) and other materials (1.33 and 0.93) and the difference was statistically significant ( $p < 0.05$ ). The present study showed no significant difference between caries status and frequency of toothbrushing in government school children. Similar results were seen in the study has done by Kuriakose et al.<sup>11</sup> among preschool children in Kerala.

The explanation given was, frequent toothbrushing does not necessarily lead to freedom from plaque if the brushing is inefficient, and the subjects may have exaggerated the frequency of brushing.

The present study showed the overall prevalence of gingivitis among 6–12 years age group children was 17.8%. This was relatively lesser when compared with the studies done by Sharva et al.,<sup>12</sup> who reported 59% and Naseer et al.,<sup>13</sup> who reported 41.28% of gingivitis cases among Chennai school children.

Several epidemiological studies are conducted around the world concerning the oral health of 12 years old children.<sup>14</sup>

According to World Health Organization 2013,<sup>15</sup> the importance given to this age is because it is the age that children leave primary schools.

In both the schools, 72.8% of children had mild gingivitis, 25.7% had moderate gingivitis and only 0.01% had a severe form of gingivitis. The present study showed that the prevalence of gingival inflammation increased with the age. This was not statistically significant among government schools but it was seen statistically significant in private school children.

In a government school, more females were affected than males. Whereas, in private school, more males were affected than females. The present study showed the correlation of prevalence and intensity of gingivitis with poor oral hygiene habits. This was statistically significant. Summing up, a conclusion could be drawn, that the prevalence of gingivitis depends on the state of the oral hygiene habits, correspondingly, due to schoolchildren's knowledge of individual oral hygiene and skills. Prevalence and severity of gingivitis were reduced by improving oral hygiene. Similar results were presented internationally by Rajab et al.<sup>16</sup> and Sayegh et al.<sup>17</sup> in their studies.

## SUGGESTIONS AND RECOMMENDATIONS

- Proper dietary control with restricted sugar consumption through a school dental health education program is advocated.
- Plaque control by promoting a daily regimen of toothbrushing, preferably with a fluoridated toothpaste will be effective in preventing and controlling dental caries and gingivitis.
- Good brushing techniques with the appropriate use of fluoridated toothpaste should be promoted in the prevention of dental caries.
- School-based fluoride mouthrinsing programs should be initiated both in government and private schools for effective control of dental caries.
- School dental health education programs should be undertaken on regular basis involving parents and school teachers along

with children. In this program, diet and nutritional counseling and advocacy for use of fluoridated dentifrice should be undertaken, especially for pregnant and lactating mothers.

- It should be encouraged for parents to see that lunch boxes of their children should consist of fewer confectionery items and more of vegetables and fruits—“Safe for the teeth/Tooth friendly”.
- There should not be any provision for the sale of confectioneries within the school premises. In this regard, school authorities should undertake responsibility.
- It is ideal to have a school dental clinic to be set up at school premises only, to carry out comprehensive and incremental dental care.
- However, to implement an effective preventive program we need more detailed data on the prevalence of dental diseases covering all factors and parameters from a larger sample size.

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