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Dentistry Setion

Evaluation of Oral Health Status among 5-15-Year-old School Children in Shimoga City, Karnataka, India: A Cross-sectional Study

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ABSTRACT

Introduction: Oral health is an integral part of general health. Dental problems can be avoided if identified at an early stage. There is no data on oral health status of school going children in Karnataka state's Shimoga city.

Aim: To evaluate oral health status of school going children among 5-15-year-old in Shimoga city.

Materials and Methods: A cross-sectional study was conducted among 1458 government and private school children aged 5-6, 9-10 and 14-15 years. Dental caries (DMFT and deft Index), oral hygiene status (OHI-S Index) and dental fluorosis (Dean's Fluorosis Index) according to WHO diagnostic criteria (1997) were assessed. Data was evaluated using ANOVA and t-test by SPSS (IBM statistical software version 21.0.) at a level of 5% significance.

Results: The deft among 5-6-year-old children was 3.36±3.511, deft and DMFT among 9-10-year-old was 2.55±2.497 and 0.45±0.996 respectively and DMFT among 14-15-year-old was 1.34±1.832. The caries prevalence among 5-6-year-old was 68.8%, 9-10-year-old was 77.2% and 14-15-year-old was 48.9% and overall prevalence of dental caries was 65.3% which was statistically significant. Among 9-10-year-old oral hygiene was good in 85.4%, fair in 13.5% and poor in 1% of school children and among 14-15-year-old oral hygiene was good in 77.4%, fair in 22.2% and poor in 0.4%. Overall 81.7% of children had good oral hygiene. The prevalence of dental fluorosis was 14.5%.

Conclusion: The children from government school were found to be less caries free than the private school children, but the difference was not significant. Oral hygiene status is found to be good among both the private and government school children. So the dental awareness is required among children of government school.

Keywords: Tooth decay, Dental fluorosis, Oral hygiene

INTRODUCTION

Oral health is an essential component of general well being. Essential nutrients for the body is obtained to an individual by the ability to chew and swallow which is a critical function and provides the building blocks for general health (American Dietetic Association 1986) [1]. Dental caries and periodontal diseases are the two globally leading oral afflictions, according to the World Oral Health Report 2003 [2].

Children frequently have serious general health problems, significant pain, interference with eating, and lost school time if oral disease is left untreated [1].

Decline in the dental caries reported in most developed nations, mainly attributed to the use of fluorides in different forms, it is still existing in many underdeveloped and developing countries of Africa and Asia including India due to lack of public awareness, motivation and inadequate resources for dental treatments and changing dietary habits according to recent reports [3]. The use of fluorides recognised as most successful measures for caries, but, "fluoride is often termed a double edged weapon". The optimal and judicious use of fluoride offers maximum caries protection, whereas injudicious and excessive systemic consumption may lead to chronic fluoride toxicity, which manifest as dental and skeletal fluorosis [3].

Several prevalence studies have been reported but not much recent data is available on the oral health status of school children of Karnataka particularly in Shimoga. Hence the present study was undertaken to evaluate the oral health status of school going children aged between 5-15 years in Shimoga city.

MATERIALS AND METHODS

The cross-sectional study was conducted between December 2015 to March 2016. The study population consisted of children aged 5 to 15 years who were attending the school in Shimoga city. The sample size was calculated by the formula, $n=4pq/L^2$, where n is the sample size, p is the approximate prevalence rate of the disease, q is 1-p and L is the permissible error in the estimation of p [4]. A total of 50% prevalence, sample estimation in each group was 400. The study sample comprised of 1458 children.

Shimoga city was arbitrarily divided into four geographical zones corresponding to the four administrative areas (wards) of the city. Children from both private and government schools were included. The lists of school were prepared according to the information supplied by Directorate of Education, Shimoga. Two stage sampling procedure was adopted to select the sample. Among primary, higher primary and high schools in the four zones of Shimoga city, eight schools were selected by using simple random sampling procedure in the first stage. Among the eight schools, the study subjects were selected by using systematic random sampling procedures. A total of 175 school children were examined in each selected school. The age groups of 5 to 15 years were selected to screen the primary dentition, mixed dentition and permanent dentition except the third molar and the early status of dental caries that could not be diagnosed positively were excluded. Informed written consent was obtained from school authorities and parents of participating children. Ethical approval was obtained from Institution Ethical Committee of SDC College, Shimoga.

All children enrolled at the school were given a parent introduction letter with an attached consent form. Visit to the school was made on predecided dates and all the students present on the day were examined. Children with the consent to participate in the survey were examined within their school premises. Oral examination was done for all participating children for caries, plaque and fluorosis using a mouth mirror and a probe (WHO Type III criteria) [4] and using deft, DMFT, OHI-S and Dean's fluorosis indices [5] according to the WHO oral health assessment (1997) [5] by a single trained examiner and codes were entered on the survey form.

Data were tabulated and statistically evaluated using the statistical software SPSS (version 21.0. by IBM Corporation) and ANOVA and students t-test was used.

RESULTS

Epidemiological survey was conducted on 1458 children of age group 5-15 years. Out of the study population, 425 (29.15%) were in government school and 1033 (70.85%) in private school. According to age, 369 (25.30%) were of 5-6-year-old, 584 (40.05%) were of 9-10-year-old and 505 (34.63%) of 14-15-year-old [Table/Fig-1].

506 (34.7 %) of the study participants were caries free (dmft/DMFT=0) and 952 (65.3%) had caries (dmft/DMFT>0). Percentage of school children with dental caries was higher among government school (67.8%) compared to private school (64.3%) but the difference was not statistically significant (p-value=0.204) [Table/Fig-2].

Percentage of school children with dental caries was higher among boys (66.7%) than in girls (63.5%), which was not statistically significant (p-value=0.193).

Among the 5-6 years out of 369, 254 (68.83%) had dental caries, in 9-10 years, out of 584, 451 (77.22%) had dental caries and in 14-15 years, out of 505, 247(48.91 %) had dental caries. Percentage of school children who had dental caries was high in 9-10 years (77.22%) which was statistically significant [Table/Fig-3].

The mean def (t) among boys (3.26±3.115) was high as compared to girls (2.41±2.697). The mean DMF (T) score of girls (0.95±1.697) was higher as compared to boys (0.79±1.352). The mean def (t) of 5-6 years (3.36±3.511) was higher as compared to 9-10 years (2.55±2.497) school children [Table/Fig-4]. The mean DMFT score of 9-10 years school children was the lowest (0.45±0.996) whereas the DMFT score of 14-15 years was the highest (1.34±1.832) and was statistically significant (p-value<0.001) [Table/Fig-5].

Percentage of school children with good oral hygiene was higher among private school (82.2%) compared to government school (80.9%) (p-value=0.82 which is not significant) [Table/Fig-6]. Percentage of school children with good oral hygiene was higher among the 9-10 years school children (85.4%) compared to 14-15 years school children (77.4%) [Table/Fig-7]. Percentage of school children with good oral hygiene was higher among boys (82.8%) compared to girls (80.3%) (p-value=0.508 which is not significant).

Among the 14-15 years age school children out of 505, in 73 children (14.5%) fluorosis was present and 432 children (85.5%) fluorosis was absent [Table/Fig-8]. Percentage of school children, who had dental fluorosis, was high among government school as compared to private school.

Shimoga city (n=1458)	Age (years)			Gender	
	5-6 (n =369)	9-10 (n =584)	14-15 (n =505)	Boys (n =809)	Girls (n =649)
Government (n=425)	13.88% (59)	44.70% (190)	41.41% (176)	55.8% (237)	44.2% (188)
Private (n=1033)	30.00% (310)	38.14% (394)	31.84% (329)	55.4% (572)	44.6% (461)
TOTAL (n=1458)	25.30% (369)	40.05% (584)	34.63% (505)	55.5% (809)	44.5% (649)

[Table/Fig-1]: Distribution of study participants according to age and gender.
n=Number, %=Percentage,

Variables			Caries Status		Total
			Caries Free	Dental Caries	
School	Private	Frequency	369	664	1033
		%	35.7%	64.3%	70.9%
	Government	Frequency	137	288	425
		%	32.2%	67.8%	29.1%
Total		Frequency	506	952	1458
		%	34.7%	65.3%	100.0%

[Table/Fig-2]: Comparison of study participants in regard to caries status and schools.
Chi-square test
p-value = 0.204 which is not significant, %=Percentage

Variables			Caries Status		Total
			Caries Free	Dental Caries	
Age Groups	5-6 Years	Frequency	115	254	369
		%	31.2%	68.8%	25.3%
	9-10 Years	Frequency	133	451	584
		%	22.8%	77.2%	40.1%
	14-15 Years	Frequency	258	247	505
		%	51.1%	48.9%	34.6%
Total		Frequency	506	952	1458
		%	34.7%	65.3%	100.0%

[Table/Fig-3]: Comparison of study participants with regard to caries status and age groups.
Chi-square test
p-value<0.001 which is significant, %=Percentage

Variables	Mean±SD		p-value
	5-6 years (n=369)	9-10 years (n=584)	
def (t)	3.36 ± 3.511	2.55±2.497	p<0.001
d (t)	3.22±3.408	2.42±2.434	0.25
e (t)	0.08 ±0.399	0.11±0.475	0.075
f (t)	0.06±0.378	0.02±0.169	p<0.001

[Table/Fig-4]: Comparison of study participants with mean d (t), e (t), f (t) and def (t) according to age.
Independent student t-test,
def(t) – statistically significant
SD=Standard Deviation, n=Number, d(t)=decayed deciduous tooth, e(t)=extracted deciduous tooth, f(t)=filled deciduous tooth

Variables	Mean+SD		p-value
	9-10 years (n=584)	14-15 years (n=505)	
DMF (T)	0.45±0.996	1.34±1.832	p<0.001
D (T)	0.45±1.022	1.27±1.792	p<0.001
M (T)	0.01+0.072	0.01+0.133	p=1
F (T)	0.00±0.058	0.07±0.359	p<0.001

[Table/Fig-5]: Comparison of study participants with mean D (T), M (T), F (T) and DMF (T) according to age.
Independent student t-test,
DMF(T) - statistically significant
SD=Standard Deviation, n=Number, D(T)=Decayed Tooth, M(T)=Missing Tooth, F(T)=Filled Tooth, T(T)=Tooth

DISCUSSION

Dental caries is an irreversible microbial disease of the calcified tissues of teeth, characterised by demineralization of the inorganic portion and destruction of the organic substance of the tooth, which often leads to cavitation. Although dental caries prevalence has declined worldwide in the past few years, it still affects children the most [4]. Dental caries is the most common of the oral disease in childhood that is from the first through the twelfth year of life. In this crucial period, the primary teeth erupt, function and are exfoliated,

Variables			OHIS			Total
			Good	Fair	Poor	
School	Private	Frequency	594	124	5	723
		%	82.2%	17.2%	0.7%	66.4%
	Government	Frequency	296	67	3	366
		%	80.9%	18.3%	0.8%	33.6%
Total		Frequency	890	191	8	1089
		%	81.7%	17.5%	0.7%	100.0%

[Table/Fig-6]: Comparison of study participants with oral hygiene status and school.
Chi-square test
p-value=0.82 which is not significant, OHIS=Oral Hygiene Index-Simplified, %=Percentage

OHIS		Mean±SD	
		9-10 years (n=584)	14-15 years (n=505)
Good	Frequency	499	391
	%	85.4	77.4
Fair	Frequency	79	112
	%	13.5	22.2
Poor	Frequency	6	2
	%	1.0	0.4

[Table/Fig-7]: Comparison of study participants with oral hygiene status and age.
Chi-square test
OHIS=Oral Hygiene Index-Simplified, SD=Standard Deviation, n=Number, %=Percentage

School	Dental Fluorosis					Total (n = 505)
	Normal	Questionable	Very Mild	Mild	Moderate	
Government	136 (77.3%)	19 (10.8%)	9 (5.1%)	12 (6.8%)	0 (0.0%)	176 (34.85%)
Private	296 (90.0%)	8 (2.4%)	16 (4.9%)	8 (2.4%)	1 (0.3%)	329 (65.14%)
Total (n = 505)	432 (85.5%)	27 (5.3%)	25 (5.0%)	20 (4.0%)	1 (0.2%)	505 (100.0%)

[Table/Fig-8]: Comparison of study participants with dental fluorosis and school.
p<0.001 – which is significant

and the permanent teeth, exclusive of third molars, are formed and erupt into a functional pattern [4].

The findings of several investigators indicate that at one year of age approximately 5% of the children exhibit dental caries. The percentage increases upto 10% at two years of age. The trend continues and at the age of five, three out of four preschool children have carious primary teeth [6].

A considerable number of surveys have been done on dental caries experience in the permanent dentition. These studies are in general agreement that 20% of the children at age six have experienced tooth decay in their permanent teeth. A rapid increase follows and 60% at the age of eight and 85% at the age of ten are affected by dental caries. At age twelve, when most of the permanent dentition has erupted, over 90% of school children have experienced dental caries [6].

The number of children with caries in industrialised countries is currently estimated to exceed 80% of the population and in underdeveloped countries the caries rate is thought to be much higher [7].

Dental fluorosis is a developmental defect affecting the teeth before calcification. The exposure to higher fluoride concentrations after the calcification might not increase the severity of dental fluorosis [8].

Many studies has evaluated oral health status of school children in many parts of Karnataka state and also other places from India [Table/Fig-9] [1,3,8-37], but there is no reported studies on oral health status of Shimoga city children, hence the present cross-sectional study was conducted among 1458 school going children of both private and government sector.

The present study was designed to assess the prevalence of dental caries, oral hygiene and dental fluorosis among 5-15-year-old school going children in Shimoga city of Karnataka state.

The age groups: 5-6, 9-10 and 14-15 years were selected to assess the primary dentition, mixed dentition and permanent dentition except the third molar according to Moses J et al., and Batwala V et al., [8,38].

The present study showed that 65.3% of school going children had dental caries and 34.7% were caries free. The dental caries status among government school children and private school going children was not significant (p>0.001). The caries experience was higher among the children attending government schools compared to private school children. This difference was attributed to lack of awareness, affordability, or under utilisation of dental care facilities by the children in the government schools. This finding is in line with the findings of Sukhbhogi JR et al., who found that dental caries was more among government school children [22].

In our study, there was no significance difference in prevalence of dental caries in regard to gender (p>0.05). Similar results were found in study conducted by Poornima P et al., and Ndanu TA et al., [24,39]. But this is not in line with findings of Shekar C et al., [3], wherein, prevalence of dental caries was significantly more among boys than girls.

In the present study, 9-10 years age group shows higher prevalence of caries than the age group of 14-15 years which is in agreement with study done by Ndanu TA et al [39]. A 5-6 years age group had high caries prevalence than 14–15 years age group which is similar to Batwala V et al., results [38]. This could be due to increased resistance to caries process in permanent teeth than primary teeth and implementation of oral hygiene practices is not satisfactory in younger children according to Basha S and Swamy HS [13].

In the present study, the mean def (t) score was higher in boys as compared to girls (p<0.001) similar results observed in Kalaskar RR et al., study [25]. The mean DMF (T) score was high in girls as compared to boys but it was not statically significant. This was similar to studies by Babu MSM et al., and Poornima P et al., [11,24]. Girls had a significantly higher mean DMFT value than boys. This may be due to the fact that teeth erupt earlier in girls than boys which lead to prolonged exposure of the teeth to the oral environment in females [20].

Oral hygiene status is an indication of the cleanliness of the mouth. The clinical level of oral hygiene was good in about 81.7%, fair in 17.5% and 0.7% poor; this is in line with Sharma S et al., [16]; in private school about 82.2% good, 17.2% fair and 0.7% poor and in government school 80.9% good, 18.3% fair and 0.8% poor oral hygiene. There was no significant difference between government and private school children in oral hygiene status. In contrast to our result Ndanu TA et al., [39] observed poorer oral hygiene in private school children than in government school children.

Among girls, about 80.3% had good, 19% had fair and 0.6% had poor oral hygiene. And among boys, 82.8% had good, 16.4% had fair and 0.8% had poor oral hygiene. There is no significant difference between boys and girls in oral hygiene status. This is in accordance to the findings of Jipa IT and Amariei CI as the study region was economically poor and had limited access to dental services [40].

Among 9-10 years age group, about 85.4% had good, 13.5% had fair and 1.0% had poor oral hygiene. And among 14-15 years age group, 77.4% had good, 22.2% had fair and 0.4% had poor oral hygiene. There is no significant difference between 9–10 and 14–15 school children in oral hygiene status. But this is not in line with findings of Ojahanon PI et al., as the study group had inadequate oral care. There was poor oral health education and limited access to services [41].

Author and year	Reference number	Place	Age group	Dental caries prevalence	Oral hygiene	Fluorosis
Mahesh Kumar P et al.	[9]	Chennai	5 years 12 years	3.51±2.96 3.94±3.23	80% good oral hygiene	5 years <1% 12 years 2.5%
Mahejabeen R et al.,	[10]	Hubli and Dharwad city, Karnataka	3-5 years	54.1%	----------	-----
Das UM et al.,	[1]	Bangalore city, Karnataka	6 years 12 years	57.21% 49.25%	----------	-----
Babu MSM et al.,	[11]	Nellore District, Andhra Pradesh	7-12 years	65.6%	----------	-----
Moses J et al.,	[8]	Chidambaram, Tamil Nadu	5-15 years	63.83%	----------	-----
Shekar C et al.,	[3]	Nalgonda district, Andhra Pradesh	12 and 15 years	56.3%	----------	71.5%
Sonika R et al.,	[12]	Chandigarh	3 to 6 years	48.3%	----------	-----
Basha S and Swamy HS	[13]	Davangere, India	6 years and 13 years	26.75% 25.25%	----------	-----
Shingare P et al.,	[14]	Rural area of Uran, Raighad District, Maharashtra	3 – 14 years	80.92%	----------	-----
Kotecha P V et al.,	[15]	Vadodara district, Gujarat, India	All ages	----------	----------	61.30% 12-24 years – 1.83%
Sharma S et al.,	[16]	Urban Meerut	9 to 12 years	60.1%	Good oral hygiene -34.3%	-----
Naidu GM et al.,	[17]	Prakasham district of South India	15 years	----------	----------	42.3%
Joshi N et al.,	[18]	Vadodara City, Gujarat	6-12 years	69.12%	----------	-----
Praveena S et al.,	[19]	Sullia Taluk, Karnataka, South India	5 years 12 years 15 years	31% 32.8% 37%	----------	-----
Shailee F et al.,	[20]	Shimla city, Himachal Pradesh	12 years 15 years	32.6% 42.2%	----------	-----
Kadanakuppe S and Bhatt PK	[21]	Ramanagara District	1–80 years	7.52%.	Gingival bleeding - 4.22%, calculus - 57.9% shallow pockets (4–5 mm) - 22.0% and deep pockets (≥ 6 mm) - 3.67%.	63.65%
Sukhabogi JR et al.,	[22]	Hyderabad, Andhra Pradesh, India	12 years 15 years	41.4%	Good oral hygiene -39.1%	-----
Singh G et al.,	[23]	Rural area of Jammu	6-12 years	18.01%	----------	-----
Poornima P et al.,	[24]	Davanagere city, South India	8–9 years	Permanent dentition - 13.8% Primary dentition - 60.1%.	----------	-----
Kalaskar RR et al.,	[25]	Vidarbha Region, Maharashtra, Central India	6–16 years	65.70%	----------	-----
Bansal R et al.,	[26]	Meerut, Uttar Pradesh	5-18 years	30.9%	----------	-----
Poudyal S et al.,	[27]	Puttur, Dakshina Kannada district, Karnataka	12 years	95.48%	----------	-----
Arora G and Bhateja S	[28]	Mathura city	12- years	57%	84% - good oral hygiene 16% - fair oral hygiene	-----
Rajesh SS and Venkatesh P	[29]	Malur, Tumkur district	3-5 years 6–10 years 11-15 years	13.6% 49.7% 25.6%	----------	-----
Mehta A and Mansoori S	[30]	Delhi, India	5 years 12 years 15 years	20% in primary dentition 36.5% in permanent teeth.	59.3%	36.1%
Behal R et al.,	[31]	Kashmir	6–12 years	45.48%	42.8% good oral hygiene	-----
Sivakumar V et al.,	[32]	Bylakuppe, Karnataka, India	11-13 years	71% and 53.9%	----------	-----
Handa S et al.,	[33]	Gurgaon, Haryana	5 years 12 years 15 years 35-44 65-74	DMFT of 1.61	Periodontal diseases - 65%	46%
Shireen N and Ranganath TS	[34]	Bengaluru city, India	14.2+0.57 years	45.2%	----------	-----
Prasad MG et al.,	[35]	West Godavari district, Andhra Pradesh, India	11–14 years	63.5%	Periodontal diseases 13.6%	-----
Hiremath A et al.,	[36]	Belgavi District, Karnataka, India	6-11 years	78.9%	----------	-----
Abraham A et al.,	[37]	Malappuram, Kerala, India	12-13 years	71.4%	----------	-----
Present study		Shimoga district	5-15 years	65.3%	Good oral hygiene - 81.7%	14.5%

[Table/Fig-9]: Other studies from india on oral health status [1,3,8-37].

The dental fluorosis prevalence was 14.5%. There was significant difference between government and private school children. Some children studying in Shimoga city schools were from surrounding rural area, where central water supply is not available and using ground water for drinking. Flouride content is observed to be present in excess in the district (Flouride content more than 1.5 ppm) confined to a small patch in northwestern part of Sorab taluk [42].

This study was conducted to evaluate the prevalence of dental caries, oral hygiene status and fluorosis among school children in government and private sector. The children from government school were found to be less caries free than the private school children, but the difference was not significant. Oral hygiene status is found to be good among both the private and government school children. So the dental awareness is required among children of government school. Regarding fluorosis the prevalence was 14.5%.

LIMITATION

Less than five-year-old children were not included (limited age group). Few school children were included in entire Shimoga city or district (smaller sample size).

RECOMMENDATIONS

It is recommended that in children under the age of six years, brushing with fluoridated toothpaste should be supervised in order to prevent systemic ingestion.

Regarding the preventive program, most of the children need Pit and Fissure sealant application. But the feasibility of Pit and Fissure sealants in Indian scenario is questionable. However, on priority basis for selected group of school children Pit and Fissure sealant application can be taken as preventive measures.

A good protocol for dental and oral care should be mandatory and professional dental follow up should be integrated in the medical follow up.

CONCLUSION

The awareness regarding the Oral Health was very minimal among the study participants. It may be due to ignorance, lack of knowledge or the lack of motivation. The ideal and the affordable strategy to tackle the problem at the primary level itself is necessary. Proper and effective health education to prevent the problems at primary level is absolutely needed. Dental health education should be made as an integral part of school curriculum.

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