

Prevalence of Dental Caries Among Primary School Children of India – A Cross-Sectional Study

ANAND HIREMATH¹, VIKNESHAN MURUGABOOPATHY², ANIL V ANKOLA³, MAMATA HEBBAL⁴, SUGANYA MOHANDOSS⁵, PRATIBHA PASTAY⁶

ABSTRACT

Introduction: In India, the trend indicates an increase in oral health problems especially dental caries, which has been consistently increasing both in prevalence and in severity. Children of all age groups are affected by dental caries. It becomes imperative to collect the data on prevalence of dental caries and treatment needs to provide preventive care.

Aim: To assess the prevalence of dental caries and treatment needs of 6-11years old Indian school children.

Materials and Methods: This was a cross-sectional study. Sampling frame consisted of 6-11years old primary school children. Study sample consisted of 13,200 children selected from 10 talukas of Belgavi District, Karnataka, India. Clinical examination for dmft and DMFT was carried out in the school premises by five teams, each consisting of one faculty, three

postgraduate students and five interns from the KLE VK Institute of Dental Sciences, Belagavi, Karnataka, India. The examiners were trained and calibrated by the principal investigator. Statistical analysis was done using Chi-square and t-test.

Results: The overall caries prevalence was 78.9%, mean dmft was 2.97 ± 2.62 and mean DMFT was 0.17 ± 0.53 . The decayed teeth component was the principal component in both dmft and DMFT indices. The mean dmft in boys was higher compared to girls and it was found to be statistically significant ($p < 0.05$).

Conclusion: This study provided us with the baseline data, using which treatment was provided to all the children screened. The children were provided treatment at the camp site/dental hospital/satellite centers and primary health care centers according to the facilities available.

Keywords: Child, DMF index, Epidemiology, India, Tooth

INTRODUCTION

Oral health is defined as a state of the mouth and its associated structures, where there is no disease or pain and able to function well to masticate food and state of teeth which are of a socially acceptable appearance [1]. Oral health is integral to general health and essential for well-being. Dental caries are most common among the spectrum of oral diseases and are still a major public health burden in developing countries, affecting 60%-90% of school children and a number of adults [2].

There is a recent trend of increasing levels of dental caries in most of the developing countries. This reason could be largely due to the increased consumption of sugars and reduced exposure to fluoride. Thus, emphasizing that dental caries is a disease of children has only been reduced to certain extent, and substantial improvement in reduction of the disease is not achieved [2].

In India, the trend indicates an increase in oral health problems especially dental caries, which has been consistently increasing both in prevalence and in severity over last five decades [3]. Children of all age groups are affected by dental caries and its treatment is restorative care, which may even include pulp therapy. As these treatment options are not only expensive, but also demanding for the child. The best option, which is more acceptable and economical for the children is – Prevention. Thus, it becomes imperative to collect the data on prevalence of dental caries and treatment needs to determine the course of action for preventive care.

Various studies report varying levels of caries prevalence in India [3-10]. In the National Oral Health Survey conducted in 2002 [11], the caries prevalence in the 12-year-old school children was

52.5%. In 2005 WHO reported DMFT in the 12 year old Indian children to be in the lower category [2]. However, various studies across different states reported varying levels of caries prevalence. Belagavi is one of the major districts in Karnataka, India, comprising of 10 talukas. No data is available on the current caries status of the school children.

The present study was conducted to assess the dental caries status and treatment needs of the 6-11years old school children of Belagavi district. The data were collected to provide information and a basic knowledge about dental caries and its treatment needs. They were also used for planning preventive and restorative oral health programs in the population studied.

MATERIALS AND METHODS

The present cross-sectional study was a part of District Oral Health Mission project undertaken by KLE VK Institute of Dental Sciences, Belagavi, Karnataka, India. Administration of Belagavi District was divided into 11 talukas or peri-urban areas namely- Belgaum urban, Khanapur, Saudatti, Athani, Gokak, Nippani, Bailhongal, Hukkeri, Ramdurg, Raibag and Chikkodi. This multidimensional project included screening for dental caries, gingival disease, dental trauma, malocclusion and treatment needs of about 85,000 primary government school children of Belagavi District and all talukas. However, for this study, only the data on dental caries and treatment needs of 1200 randomly selected children from each taluka was analyzed, thus forming a total sample of 13,200 children. Stratified random sampling was followed, age group and gender was stratified. Sample size was calculated based on our pilot study where the caries prevalence was 77% using the formula $n = Z^2Pq/d^2$, where $z = 1.96$, p (prevalence of caries) = 77%, q

(1-p) and d - allowable error = 2.5. Based on this calculation, the sample size required was 1133, which was rounded off to 1200 per taluka.

Each taluka of Belagavi district have 200-300 primary schools. A complete list of primary schools in each taluka was obtained from the Deputy Director of Public Instructions (DDPI), Belagavi and Chikkodi. Ethical clearance was obtained from the institution. Permission to conduct the study was granted by the regional, district educational authorities while consent from the parents and children was obtained through the head of schools.

A detailed schedule was prepared for screening and treatment of the government school students. School authorities and parents were notified in advance about the examination dates so that maximum number of students can avail the opportunity. A public notice was given in the local newspaper to maximize attendance.

The dental examination was carried out by five work teams consisting of one faculty, three postgraduate students and five interns. The examiners were trained and calibrated by the principal investigator. The consistency of the examination criteria was measured by a pre-test done in 50 school children. These children were not part of the final sample. Inter and intra examiner agreement was checked using kappa statistics. Intra –examiner reliability was evaluated by two examinations performed on the same school children 15 days apart. The results obtained ranged from 0.79 and 0.85, for the worst and best agreement respectively. Similarly, inter-examiner reliability yielded a Kappa value of 0.73 and 0.80, for the worst and best agreement respectively.

A self-designed screening form based on WHO oral health assessment form was prepared and was tested for validity and reliability in the pilot study. The survey form was divided in four parts: Socio-demographic data; Chief complaint; Soft tissue status (gingiva, mucosa and lips); Hard tissue status (caries and malocclusion).

All the children from the primary schools who were present on the day of visit were examined. Informed consent from the parents was obtained by the school teachers and child's assent was obtained before the examination. The children were examined on site by 10 examiners who were trained in the use of the examination methods. Clinical examinations were carried out in the classroom under natural light with the patient seated on a stool and the examiner seated on a chair behind the subject. Children were interviewed by examiners who knew local language, recorded the socio-demographic data. The WHO method and criteria were used for recording caries prevalence, dmft, DMFT and treatment needs of both primary and permanent teeth [12].

All the survey sheets were bundled according to respective schools and the bundles were numbered. These bundles were further segregated according to talukas. A total of 10-12 bundles from each taluka were randomly selected using a table of random numbers till the required number of 1200 children was obtained. Thus, the final sample consisted of 13200 children from 11 talukas. This data were entered into the excel sheets and analyzed using SPSS for windows, Version 17; SPSS Inc. Chicago, IL, USA. The means and percentages were calculated and comparison was done using Chi-square test to find the difference in proportion and Student t-test to find the difference in mean values.

RESULTS

The present study was conducted to assess the caries status and treatment needs of the school children of Belagavi district. The overall mean dmft of the study population was 2.67 and mean DMFT was 0.16. [Table/Fig-1] shows taluka wise distribution of dmft and DMFT. The highest dmft and DMFT was found in Khanapur taluka.

S.no	Taluka wise	dmft	DMFT
1.	Belagavi	(3567/1200) 2.98	(211/1200) 0.17
2.	Bailhongal	(2554/1200) 2.12	(300/1200) 0.25
3.	Khanapur	(3774/1200) 3.14	(324/1200) 0.27
4.	Gokak	(3625/1200) 3.02	(236/1200) 0.19
5.	Nippani	(3196/1200) 2.63	(208/1200) 0.17
6.	Athani	(3025/1200) 3.04	(199/1200) 0.16
7.	Saudatti	(2414/1200) 2.01	(207/1200) 0.17
8.	Hukkeri	(3504/1200) 2.92	(267/1200) 0.22
9.	Raibag	(2785/1200) 2.32	(213/1200) 0.17
10.	Chikodi	(2998/1200) 2.49	(246/1200) 0.20
11.	Ramdurg	(3347/1200) 2.78	(311/1200) 0.25

[Table/Fig-1]: Distribution of subjects according to dmft and DMFT taluk-wise.
* Proportion and mean DMFT/dmft

The prevalence of dental caries in the primary and permanent dentition is presented in [Table/Fig-2]. Caries prevalence in primary dentition was high in the 8-9years old school children. Caries prevalence in permanent dentition was high in 10-11years old school children.

[Table/Fig-3] represents the dmft and DMFT indices by age and gender. The decayed teeth were the principal component in both dmft and DMFT indices. The mean dmft was high in the 6-7years age group and mean DMFT was high in the 10-11years age group.

[Table/Fig-4] shows treatment needs of the children by age and gender. Treatment need was higher in the boys of 10-11year old children. The need for one surface filling was frequent in all the age groups and the entire treatment requirement increased slowly with age.

DISCUSSION

In the present study, the population was selected from about 300 primary schools, comprising of all the strata like urban, peri-urban and rural areas. Thus, it can be claimed that this study population is representative of all school children in this age group.

Among the 10 talukas covered, Khanapur had the highest caries prevalence. However, caries prevalence was not too deviating from other talukas as almost all had similar prevalence rates. This could be attributed to lack of awareness about oral health among the people in these areas.

The present study revealed the overall prevalence of dental caries among 6-11year school children in primary teeth was 78.9%. This is higher when compared to caries prevalence in other countries like Sri Lanka (65.3%), China (41%), South Africa (39.7%) and United States (41%) [13-16]. This was similar to the studies conducted in different parts of India [9,10-19]. The 8-9years old school children had higher caries prevalence in primary teeth, because caries is a cumulative process and children were observed to have preference to caries prone foods available near the school premises. The overall prevalence of dental caries in the permanent teeth was 44.3%, this was found to be on the higher side compared to the study conducted in Tamil Nadu and lower compared to another study where the prevalence was 65.8% [9,20]. The 10-11years age group mainly contributed to this higher overall prevalence, which is a sign of continued negligence of oral health, which was also evident in the caries status of primary teeth as it followed the trend shown in primary teeth. Varying level of prevalence of caries is reported among 12years old children from different places of India 34.3% in Ambala and Bharatpur city around 53%, 41.4% in Hyderabad and 32.6% in Shimla [21-24]. This indicates other factors like availability of dental services and awareness level could be the reason for wide variation in level of disease in same age group.

Age and Gender n=13200	Sample		Primary tooth				Permanent tooth			
	n	%	n	%	Chi-square	p-value	n	%	Chi-square	p-value
6-7 years Boys Girls Total	2503	47.1	1853	74.1	15.3(2)	<0.0001*	478	19.0	0.72(2)	0.39
	2821	52.9	2217	78.5			513	18.1		
	5324	100	4060	76.3			991	18.6		
8-9 years Boys Girls Total	1749	48.9	1451	82.9	0.35(2)	0.55	824	47.1	0.32(2)	0.56
	1835	51.1	1536	83.7			882	48.0		
	3584	100	2987	83.3			1706	47.6		
10-11 years Boys Girls Total	2260	52.7	1789	79.1	10.51(2)	0.001*	1542	68.2	1.16(2)	0.28
	2032	47.3	1524	75.0			1355	66.6		
	4292	100	3313	77.1			2897	67.4		

[Table/Fig-2]: Caries prevalence in primary teeth and permanent teeth according to age and gender.
*Statistical significance p<0.05 using Chi-square test

Indices	6-7years			8-9years			10-11years		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
d	2.72±1.93	2.53±1.87	2.62±1.90	2.89±1.89	2.49±2.13	2.69±2.01	2.47±2.73	2.14±2.91	2.30±2.82
m	0.41±0.46	0.37±0.41	0.39±0.43	0.18±0.24	0.27±0.64	0.22±0.44	0.51±0.71	0.42±0.86	0.46±0.78
f	0.10±0.21	0.08±0.32	0.09±0.27	0.08±0.51	0.18±0.59	0.13±0.55	0.11±0.43	0.16±0.61	0.13±0.52
dmft	3.23±2.60	2.98±2.60	3.10±2.60**	3.15±2.64	2.94±2.56	2.99±2.58*	3.09±2.86	2.72±2.58	2.83±2.67**
D	0.09±0.34	0.12±0.41	0.10±0.37	0.12±0.38	0.14±0.41	0.13±0.39	0.24±0.58	0.19±0.61	0.21±0.59
M	0.01±0.09	0.02±0.08	0.01±0.08	0.02±0.11	0.01±0.12	0.02±0.11	0.05±0.21	0.05±0.31	0.05±0.26
F	0.00±0.03	0.00±0.06	0.00±0.04	0.00±0.03	0.00±0.06	0.00±0.04	0.01±0.07	0.00±0.11	0.00±0.09
DMFT	0.10±0.40	0.14±0.45	0.12±0.43*	0.14±0.44	0.15±0.51	0.15±0.49	0.30±0.66	0.24±0.64	0.26±0.64**

[Table/Fig-3]: Distribution of dmft and DMFT according to age and gender.
**Statistical significance p<0.001 using t-test, *Statistical significance p<0.05 using t-test

Age and Gender	Treatment needs						
	No treatment	Pre-ventive	Fissure sealant	1 surface filling	2 or more surface filling	Pulpal care	Extraction
6-7 years Boys Girls Total	28.3	14.5	12.2	22.6	8.2	8.3	3.5
	32.1	15.1	10.2	24.4	9.2	6.1	5.7
	30.2	14.6	11.2	23.5	8.7	7.2	4.6
8-9 years Boys Girls Total	19.3	15.1	11.6	26.5	9.1	10.1	6.1
	17.5	15.8	14.8	28.9	9.9	8.3	7.1
	18.4	15.4	13.2	27.7	9.5	9.2	6.6
10-11 years Boys Girls Total	9.8	15.6	17.7	35.1	8.3	10.9	10.3
	11.6	13.2	14.5	27.3	7.5	9.3	8.9
	10.7	14.4	16.1	31.2	7.9	10.1	9.6

[Table/Fig-4]: Treatment needs by age and gender.

The overall mean dmft was 2.97 in this study population and DMFT was 0.17. The mean dmft in girls were 2.88 and boys were 3.15. A study by Ingle et al., found a higher mean DMFT of 7.61 [22]. Similar results were found in studies conducted in India [9,10]. The explanation for boys having higher mean dmft was due to parental preference to feed sons for a longer time compared to girls [10]. The mean dmft decreased as the age increased and was also evident within the sex. This is natural as the deciduous tooth exfoliates and it also explains why the dmft is lower in the 10-11 years old age group. The decayed component was the major contributor to the dmft. The ratio of dt:dmft, mt:dmft and ft:dmft was 85%, 11.7% and 3.3% respectively. This reveals the high unmet treatment needs among the subjects. This could be attributed to poor knowledge and awareness towards oral health and also due to lack of dental facilities to avail treatment.

The mean DMFT was lower compared to the reports from other states of India, which examined 12years old. This comparison can be argued to be valid as there may not be much difference between the 11years old and 12years. Similar trend of increasing DMFT with age was observed as seen in dmft. This is due to the

irreversibility and accumulative nature of the disease. The mean DMFT was higher in females compared to males and similar in all the age groups. This could be explained by the fact that teeth in girls erupt earlier and thus, contact the disease earlier than boys. However, there is recently some evidence to suggest that the higher caries susceptibility among females may also be attributable to changes in salivary rates and composition induced by hormonal fluctuations among females [25]. The ratio of DT:DMFT, MT:DMFT and FT:DMFT was 82.3%, 11.7% and 5.8% respectively, following similar trend like primary counterpart.

Future prospects: Such major projects may be effective in treating the dental caries of only particular geographical region and limited coverage; the underlying problem should be addressed by emphasizing on prevention of dental caries, which could save lot of resources from a public health perspective. Community based preventive oral health programs on practices of adequate oral hygiene should be implemented. School program should be promoted through integration into the school curriculum and oral health care preventive services to target the growing problem of dental caries among school children.

LIMITATION

The limitation of this study includes our inability to investigate the other factors contributing to caries like oral hygiene practices, sugar consumption and attitude toward dental services. These factors along with the fluoride level in the water consumed by these children could have provided us with a thorough data regarding dental caries.

CONCLUSION

The present study showed decayed component constituting the major part both in caries prevalence of primary and permanent teeth. Thus, the need for restorative care like filling and pulpal care formed the bulk of treatment needs. The treatment needs also increased with age similar to the pattern of increasing caries with age and also involvement of permanent teeth in older age-group children. This study provided us with the baseline data,

using which we had planned out an extensive treatment program for all the children examined. Treatment was provided to all these children screened, through various satellite centers and also in collaboration with government hospitals.

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PARTICULARS OF CONTRIBUTORS:

1. Senior Lecturer, Department of Public Health Dentistry, PMNM Dental College, Bagalkot, Karnataka, India.
2. Reader, Department of Public Health Dentistry, Indira Gandhi Institute of Dental Sciences, Pondicherry, India.
3. Professor and Head, Department of Public Health Dentistry, KLE VK Institute of Dental Sciences, Belagavi, Karnataka, India.
4. Professor, Department of Public Health Dentistry, Princess Nora University, Riyadh, Kingdom of Saudi Arabia.
5. Senior Lecturer, Department of Pedodontics and Preventive Dentistry, Indira Gandhi Institute of Dental Sciences, Pondicherry, India.
6. Reader, Department of Public Health Dentistry, KLE VK Institute of Dental Sciences, Belagavi, Karnataka, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Vikneshan Murugaboopathy,
Reader, Department of Public health Dentistry, Indira Gandhi Institute of Dental Sciences, Pondicherry, India.
E-mail: drvikneshan@gmail.com.

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