



Prevalence of dental caries and Clinical sequel of untreated dental caries evaluated with PUFA index among school going children in the rural Mysuru Taluk, Karnataka

Raghavendra Shanbhog^{*1}, Srilatha K T¹, Madhushree B², Manjunatha S N³, Chanchala H P¹

¹Department of Pediatric and Preventive Dentistry, JSS Dental College and Hospital, JSSAHER, Mysuru, Karnataka, India

²Department of Public Health and Preventive Medicine, JSS Medical College and Hospital, JSSAHER, Mysuru, Karnataka, India

³Department of Public Health and Preventive Medicine, Mysuru Medical College and Hospital, Mysuru, Karnataka, India

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ABSTRACT



In literature real time monitoring of dental caries in rural parts of India are lacking. This warrants periodic prevalence studies to plan and implement oral health programs. So the present study aims at evaluating the dental caries status among rural population in Mysuru Taluk, of Karnataka. A cross-sectional study was conducted among 1800 children with recruited populations at varying age levels of three population groups 4-6, 8-10 and 12-14 years. Data regarding oral health status (DMFT, deft, PUFA, pufa) were collected by type-III clinical examinations. The collected data were administered statistically. In 8-10 years children permanent teeth caries prevalence was found to be 54.3% which increased to 67.8 % in 12-14 years. Among 4-6 years children primary teeth caries prevalence was found to be 47.4% which increased to 73.2% in 8-10 years. Among 4-6 and 12-14 years children percentage prevalence of PUFA was 32.2% which increased to 52.3% in 8-10 years. No clinically significant variation was observed in Caries prevalence among gender. The study outcome revealed oral health condition in children of rural Mysuru was neglected. High prevalence of dental caries was observed among Children with low dental care utilization.

*Corresponding Author

Name: Raghavendra Shanbhog
Phone: +91-9945112080
Email: dr raghu.kiddoc@gmail.com

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INTRODUCTION

Dental caries is a biofilm based, diet controlled, multifactorial, non-communicable, active disease resulting in gross mineral loss of dental hard tissues. It is mediated by factors like biological, behavioral, psychosocial, and environmental (Fejerskov, 1997; Pitts *et al.*, 2017). Un-treated dental caries with related discomfort will impact quality of life, the cognitive development and growth parameters in young children (Ratnayake and Ekanayake, 2005; Elice and Fields, 1990).

In past 25 years the trends of dental caries in Indian children revealed average pooled caries prevalence of 56.7%, 48.9%, 69.1%, and 52.1% for 2-5, 6-10,

and 11–15 year, of age-group, correspondingly. It is also observed that one out of two children in India are affected by dental caries with weighed mean caries experience of 2.3 (Mehta, 2018).

Urban and rural population of India showed a vast difference in health status both General and oral health Rural Indian oral health care facilities are inadequate due to shortage of manpower, financial confines and the lack of perceived need and knowledge among rural population (Khera *et al.*, 1984; Gangwar *et al.*, 1990). A critical analyses done on ample dental literature which is available about caries levels in the Indian population showed maximum data have been acquired from the metro cities and cosmopolitan areas. However, there is no appropriate and satisfactory data as yet regarding the dental caries status in the rural areas of India (Saha and Sarkar, 1996). Also in literature a large number of surveys have been conducted reporting the prevalence of dental caries among schoolchildren in India, but the data on severity and clinical sequel of untreated dental caries are relatively unknown.

Lack of real time monitoring of dental caries in rural parts of India warrants an urgent need to assess the prevalence for planning and execution of oral health programs. The present study aims at evaluating the dental caries prevalence among the rural population in Mysuru Taluk, of Karnataka.

Methodology

Ethical clearance

The study protocol was reviewed and approved by the Institutional Research Ethics Committee. After explaining the study procedure permission was obtained from concerned government and school authority. Written informed consent was acquired from the parents of children who participated in the study.

Study design and location

The present study was a cross-sectional survey conducted in Mysuru of south India falling in the survey of India degree sheet Nos. 48P, 57D, 57H and 58A. Mysuru is bound by north latitudes 11045' - 12040' and east longitudes 75059' -77005' covering 6269 Sq. km. The present study was undertaken in 35 villages of Mysuru Taluk.

Study sample

Study sample comprised of consented children (4-6, 8-10 and 12-14 years), free of systemic illness, attending anganwadi centers and government schools along with parents. Schools children were targeted for high, anticipated levels of cooperation

and low population mobility. Subjects were selected with a view to recruiting children at varying age levels of three population groups 4-6, 8-10 and 12-14 years. Equal number of subjects between the subject groups with the configuration of recruitment was scrutinized to reduce imbalance between the subject groups.

Sample and Sampling Technique

Based on literature search Caries Prevalence of rural India shows the caries prevalence of 40 to 80% in rural India (Khera *et al.*, 1984; Gangwar *et al.*, 1990; Saha and Sarkar, 1996; Chatufale and Goyal, 2002). The sample size was calculated based on the prevalence rate of dental caries to be 60% with 4% type I error and 90% power of the study the sample size was estimated to be 576 children which were rounded off to 600 in each age group. As we had recruited populations at varying age levels of three population groups 4-6, 8-10 and 12-14 years total sample size will be 1800 child along with parent.

Clinical examination

Children were examined in the school sites with the students seated. Natural day light was used for illumination. Oral clinical examination was accomplished by three trained and calibrated pediatric dentists. Caries was analyzed as per the criteria established by the World Health Organization (World Health Organization, 1997) using a mouth mirror and a community periodontal index (CPI) probe. Caries was recorded for both permanent and primary teeth in terms of decayed, missing and filled teeth index (DMFT and dmft), as per World Health Organization recommendations for oral health surveys (1997) (World Health Organization, 1997) and untreated caries was assessed using PUFA/pufa index according to the standard procedure protocol recommended by Monse *et al.* (2010).

Training and calibration of examiners

Before the actual survey, all the examiners participated in clinical calibration training workout. Following this 180 school children were inspected by each of the three examiners to assess inter-examiner reliability. The inter-examiner calibration for caries experience between 1 and 2, 2 and 3 and 1 and 3 resulted in Kappa values of 0.82 ($P < 0.001$), 0.88 ($P < 0.001$) and 0.81 ($P < 0.001$), respectively. Intra-examiner reproducibility was evaluated by reassessing 10% of the samples. There was good agreement amongst the examinations by the same examiner.

Statistical analysis

The data were entered in EXCEL and analysed using SPSS Version 23. Data was presented using, calculated mean values and standard deviations to

Table 1: Distribution of study subjects according to age and sex

Age in years		Gender		Total
		Male	Female	
4-6	N	300	300	600
	%	50.0%	50.0%	100.0%
	% of Total	16.7%	16.7%	33.3%
8-10	N	302	298	600
	%	50.3%	49.7%	100.0%
	% of Total	16.8%	16.6%	33.3%
12-14	N	282	318	600
	%	47.0%	53.0%	100.0%
	% of Total	15.7%	17.7%	33.3%
Total	N	884	916	1800
	%	49.1%	50.9%	100.0%
	% of Total	49.1%	50.9%	100.0%

Pearson Chi-Square-1.618, p-0.445

Table 2: Distribution of study subjects according to Socio-demographic variable

Education	N	%
Primary (1-IX)	1102	61.2
Secondary(X)	410	22.8
Higher secondary(XII)	288	16.0
Graduate	0	0
Postgraduate and higher	0	0
Total	1800	100.0
Occupation	N	%
White collar	0	0
Pink collar	381	21.2
Blue collar	1419	78.8
Total	1800	100.0
Socioeconomic Status	N	%
BPL card holder	1075	59.7
Non-BPL card holder	725	40.3
Total	1800	100.0

express the dmft/DMFT values. Data analysis was performed using the chi-square test to find the association of the prevalence of dental caries with gender and age.

RESULTS

Distribution of study subjects according to age and sex was presented in Table 1. Equal number of subjects between the subject groups with the pattern of enrollment was scrutinized to reduce imbalance between the subject groups. Of 1800 children examined 49.1% were male and 50.9% were females.

Socio demographic variables of parents of children examined showed 61.2% were with primary, 22.8%

were with secondary and 16% were with higher secondary education levels. 78.8% parents were with blue collar jobs. Evaluated socioeconomic status showed 59.7% parents were having BPL card and classified as below poverty line and 40.3% parents without BPL card and classified under lower middle class (Table 2).

In 8-10 years children permanent teeth caries prevalence was found to be 54.3% which increased to 67.8 % in 12-14 years. This percentage increase of caries prevalence observed across the age was found statistically significant (p-0.001). Among 8-10 years Mean DMF was 1.71 which increased to 2.57 among 12-14 years. Permanent teeth caries

Table 3: Distribution of study subjects according DMFT to age and Gender

Age in years		Permanent Teeth Decay Component							Total
		0	2.00	3.00	4.00	6.00	7.00	8.00	
4 to 6	N	599	1	0	0	0	0	0	600
	%	99.8%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
8 to 10	N	274	127	85	94	0	20	0	600
	%	45.7%	21.2%	14.2%	15.7%	0.0%	3.3%	0.0%	100.0%
12 to 14	N	193	88	108	143	12	50	6	600
	%	32.2%	14.7%	18.0%	23.8%	2.0%	8.3%	1.0%	100.0%
Total	N	1066	216	193	237	12	70	6	1800
	%	59.2%	12.0%	10.7%	13.2%	0.7%	3.9%	0.3%	100.0%
Gender		Permanent Decay Component							Total
		0	2.00	3.00	4.00	6.00	7.00	8.00	
Male	N	527	110	101	105	8	31	2	884
	%	59.6%	12.4%	11.4%	11.9%	0.9%	3.5%	0.2%	100.0%
Female	N	539	106	92	132	4	39	4	916
	%	58.8%	11.6%	10.0%	14.4%	0.4%	4.3%	0.4%	100.0%
Total	N	1066	216	193	237	12	70	6	1800
	%	59.2%	12.0%	10.7%	13.2%	0.7%	3.9%	0.3%	100.0%

Age - Pearson Chi-Square- 704.604, p-0.001 Gender - Pearson Chi-Square-6.052, p-0.417

Table 4: Comparison of the mean DMFT and deft with respect to age and gender

Age in years	Permanent teeth		Primary teeth	
	Mean	SD	Mean	SD
4 to 6	0.03	0.08	1.30	2.06
8 to 10	1.71	1.83	2.99	2.66
12 to 14	2.57	2.21	0.05	0.23
Gender	Permanent teeth		Primary teeth	
	Mean	SD	Mean	SD
Male	1.38	1.92	1.38	2.27
Female	1.47	2.01	1.50	2.30

prevalence among boys was 40.4% and in girls was 41.2%. The variation observed between the genders was found to be statistically non-significant. Among boys Mean DMF was 1.38 and among girls it was 1.47 (Tables 3 and 4).

Among 4-6 years children primary teeth caries prevalence was found to be 47.4% which increased to 73.2% in 8-10 years. This percentage increase of caries prevalence observed across the age was found statistically significant (p-0.001). Among 4-6 years Mean def was 1.30 which increased to 2.99 among 8-10 years. Primary teeth caries prevalence among boys was 42.2% and in girls was 41%. The variation observed between the genders was found to be statistically non-significant. Among boys Mean def was 1.38 and among girls it was 1.50 (Tables 4 and 5).

Among 4-6 and 12-14 years children percent-

age prevalence of PUFA+ pufa was 32.2% which increased to 52.3% in 8-10 years. The percentage increase observed in PUFA across the age was found to be statistically significant. Prevalence of PUFA+pufa to Gender showed 36.2% PUFA prevalence in male children and 41.5% PUFA prevalence in female children. The difference observed in prevalence of PUFA across the gender was found to be statistically significant (Table 6).

Mean PUFA in children showed a mean of 0.98 among 4-6 years, 1.87 among 8-10 years and 1.00 in 12-14 old. This variation across the age group was found to be statistically significant (p=0.001). (Table 7) Mean PUFA in boys was 1.10 and 1.44 in girls. The difference observed across gender was found statistically significant (p=0.001) (Table 8).

Table 5: Distribution of study subjects according deft toage and Gender

Age in years		Primary Teeth Decay Component													Total
		0	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	
4 to 6	N	316	87	135	1	1	4	5	46	4	0	1	0	0	600
	%	52.7	14.5	22.5	0.2	0.2	0.7	0.8	7.7	0.7	0.0	0.2	0.0	0.0	100.0%
		%	%	%	%	%	%	%	%	%	%	%	%	%	%
8 to 10	N	161	57	77	59	81	44	49	33	27	4	5	2	1	600
	%	26.8	9.5	12.8	9.8	13.5	7.3	8.2	5.5	4.5	0.7	0.8	0.3	0.2	100.0%
		%	%	%	%	%	%	%	%	%	%	%	%	%	%
12 to 14	N	574	24	2	0	0	0	0	0	0	0	0	0	0	600
	%	95.7	4.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0%
		%	%	%	%	%	%	%	%	%	%	%	%	%	%
Total	N	1051	168	214	60	82	48	54	79	31	4	6	2	1	1800
	%	58.4	9.3	11.9	3.3	4.6	2.7	3.0	4.4	1.7	0.2	0.3	0.1	0.1	100.0%
		%	%	%	%	%	%	%	%	%	%	%	%	%	%
Gender		Primary Teeth Decay Component													Total
		0	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	
Male	N	511	112	91	37	32	24	24	22	21	2	5	2	1	884
	%	57.8	12.7	10.3	4.2	3.6	2.7	2.7	2.5	2.4	0.2	0.6	0.2	0.1	100.0%
		%	%	%	%	%	%	%	%	%	%	%	%	%	%
Female	N	540	56	123	23	50	24	30	57	10	2	1	0	0	916
	%	59.0	6.1	13.4	2.5	5.5	2.6	3.3	6.2	1.1	0.2	0.1	0.0	0.0	100.0%
		%	%	%	%	%	%	%	%	%	%	%	%	%	%
Total	N	1051	168	214	60	82	48	54	79	31	4	6	2	1	1800
	%	58.4	9.3	11.9	3.3	4.6	2.7	3.0	4.4	1.7	0.2	0.3	0.1	0.1	100.0%
		%	%	%	%	%	%	%	%	%	%	%	%	%	%

Age Pearson Chi-Square- 940.370, p-0.001 Gender Pearson Chi-Square- 56.662, p-0.001

Table 6: Distribution of study subjects according PUFA+pufa to age and Gender

Age in years		PUFA											Total
		.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	10.00	12.00	
4 to 6	N	407	87	46	1	2	2	6	45	3	1	0	600
	%	67.8%	14.5%	7.7%	0.2%	0.3%	0.3%	1.0%	7.5%	0.5%	0.2%	0.0%	100.0%
8 to 10	N	286	56	28	49	113	36	17	4	8	1	2	600
	%	47.7%	9.3%	4.7%	8.2%	18.8%	6.0%	2.8%	0.7%	1.3%	0.2%	0.3%	100.0%
12 to 14	N	407	58	12	34	59	13	9	3	5	0	0	600
	%	67.8%	9.7%	2.0%	5.7%	9.8%	2.2%	1.5%	0.5%	0.8%	0.0%	0.0%	100.0%
Total	N	1100	201	86	84	174	51	32	52	16	2	2	1800
	%	61.1%	11.2%	4.8%	4.7%	9.7%	2.8%	1.8%	2.9%	0.9%	0.1%	0.1%	100.0%
Gender		PUFA											Total
		.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	10.00	12.00	
Male	N	564	87	47	40	89	32	16	4	5	0	0	884
	%	63.8%	9.8%	5.3%	4.5%	10.1%	3.6%	1.8%	0.5%	0.6%	0.0%	0.0%	100.0%
Female	N	536	114	39	44	85	19	16	48	11	2	2	916
	%	58.5%	12.4%	4.3%	4.8%	9.3%	2.1%	1.7%	5.2%	1.2%	0.2%	0.2%	100.0%
Total	N	1100	201	86	84	174	51	32	52	16	2	2	1800
	%	61.1%	11.2%	4.8%	4.7%	9.7%	2.8%	1.8%	2.9%	0.9%	0.1%	0.1%	100.0%

Age Pearson Chi-Square- 320.222, p-0.001 Gender Pearson Chi-Square- 51.608, p-0.001

Table 7: Comparison of the mean PUFA+pufa with respect to age

Age in years	N	Mean	SD	F	P
4 to 6	600	0.98	2.04	37.86	0.001
8 to 10	600	1.87	2.21		
12 to 14	600	1.00	1.77		
Total	1800	1.28	2.06		

Table 8: Comparison of the mean PUFA+pufa with respect to age

Gender	N	Mean	SD	MD	t	P
Male	884	1.1097	1.80045	0.34	-3.458	0.001
Female	916	1.4443	2.26886			

DISCUSSION

The present study was carried out among school going children in the age group between 4–14 years, due to ease of accessibility. It gave us a comprehensive picture of dental caries in primary, mixed, and permanent dentition. Another reason for the inclusion of such a wide age range was that caries in the primary dentition is a robust interpreter of caries in the permanent dentition and a strong indicator of the forthcoming disease. Twelve year being an important WHO index age group and also the global monitoring age for caries assessment in children was included to facilitate comparison with other published research (Rao *et al.*, 1999; Shetty and Tandon, 1988; Gaikwad and Indurkar, 1993).

Present study results showed 47.4% of Primary teeth caries prevalence in 4-6 years. Study by Gaikwad and Indurkar (1993); Sohi *et al.* (2012); Kundu *et al.* (2015) reported almost similar prevalence in their studies (Saravanan *et al.*, 2005; Gupta *et al.*, 2015).

Sudha *et al.* (2005); Mehta and Bhalla (2014); Karunakaran *et al.* (2014) reported a higher prevalence ranging between 65 to 90% in their studies.

Present study results showed among 8-10 years old children prevalence of caries increased to 73.2%. Studies by Singhal and Singla (2018); Dash *et al.* (2002); Kumar *et al.* (2009) reported similar findings as ours. However studies by Rao *et al.* (1999) and Sudha *et al.* (2005) reported a higher prevalence of 82% in their studies. In contrary Dhar *et al.* (2007) reported a lower prevalence of 49% among 8-10 years old children.

Present study results showed at 4-6 and 12-14 years 32.2% children were having one or more PUFA in oral cavity. At 8-10 years the prevalence of PUFA increased to 52.3%. Mehta and Bhalla (2014) reported similar PUFA prevalence in 4-6year old

children however Sekhar *et al.* (2015) reported 53% in 4-6 years and 41% I 12-14 years. Singhal and Singla (2018) reported 47.3% PUFA prevalence among 8-10 years. Murthy *et al.* (2014); Singhal and Singla (2018) reported very less 18-19% PUFA prevalence in their studies contrast to present study results of 32.2%.

Present study results showed that no statistically significant variation in the caries prevalence amongst the gender in all three age groups. Shetty and Tandon (1988) found similar results. In conflicting Vacher, Vacher (1952); Aukland and Bjelkaroey (1982); Gaikwad and Indurkar (1993) reported a higher caries experience among boys than in girls. Conflicting, girls were found to have higher caries prevalence by Mishra and Shee (1979); Saimbi *et al.* (1983); Singh *et al.* (1985).

Owing to lack of awareness, motivation, accessibility, dental neglect and/or unaffordability of dental care, (Chopra *et al.*, 1983) present study results showed that nearly 80-90 percent of children in rural Mysore had untreated caries. The call for preventive care was found to be higher after 9yrs of age and it increased as the age advanced.

Hence we recommend for the given population a constant monitoring for prevalence of oral diseases, at regular intervals to recognize the burden and spread of the disease, and ascertain the need of preventive and restorative care to help the population to be disease free (Gaubha *et al.*, 1986).

As most of the parents of rural school children were employed as daily wage workers or migrant laborers and may not find time to visit the dentist as that would lead to loss of a day's earnings, on site fluoride and pit fissure sealant application program can be initiated by utilizing the services of mobile dental van for the specific protection of high-risk patients. Suggested systematic oral health promotion program for Rural India is, recruiting teach-

ers as initial information propagators for educating and motivating the school going children as teachers have a great impact on their developing minds and act as role models. Oral health professionals can train and up-skill the Teachers for early detection of oral diseases helping to initiate rapid intervention by early referral (Damle and Patel, 1994). Also the putting into practice of community-based oral health program is a matter of urgency. One such program could be commenced through oral health promoting school schemes in Rural Mysore while identifying the significant caries risk factors in children.

CONCLUSION

In 8-10 years children permanent teeth caries prevalence was found to be 54.3% which increased to 67.8 % in 12-14 years. Among 4-6 years children primary teeth caries prevalence was found to be 47.4% which increased to 73.2% in 8-10 years. Among 4-6 and 12-14 years children percentage prevalence of PUFA was 32.2% which increased to 52.3% in 8-10 years. No clinically significant variation was observed in Caries prevalence among gender.

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Conflict of interest

The authors declare that they have no conflict of interest for this study.

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