

## Original Article

### Dental caries in relation to socio-behavioral factors of 6-year-old school children of Udaipur district, India

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#### ABSTRACT

**Background:** Based on the previous national oral health survey in India, some variation was observed in oral health status and behavior between the urban and rural population. Thus, the present study aimed to assess the dental caries experience in deciduous dentition of 6-year-old urban and rural schoolchildren of Udaipur district and to evaluate the influence of socio behavioral characteristics on dental caries experience.

**Materials and Methods:** A combination of multi stage and cluster sampling procedure was executed to collect a representative sample of 875, 6-year-old school children. Clinical examination for caries was conducted using dmft (decayed, missing and filled teeth) index. Socio - demographic information was collected prior to clinical examination in addition to information on oral health behavior by personal interviews.

**Results:** Only 7.8% children reported of brushing their teeth twice or more than twice daily. Rural children visited the dentist less often than the urban children ( $P < 0.05$ ). Greater proportion of boys (62.2%) experienced caries than girls (55.1%), decayed component constituted a major contribution for dmft. Multivariate analysis demonstrated the influence of gender, urbanization, tooth brushing frequency, dental visits, parent's education and occupation on caries occurrence.

**Conclusions:** Rural children and boys experienced greater caries than their urban and girl counterparts. Caries experience was related to the parent's occupation and education. Moreover, caries occurrence was influenced by brushing frequency and dental visiting habits.

**Key Words:** Dental caries, education of parent, occupation of parent, urbanization

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## INTRODUCTION

India, a developing country, faces many challenges in rendering oral health needs. Majority of Indian population resides in rural areas, of which more than 40% constitute children.<sup>[1]</sup> Dental caries is the single most prevalent chronic childhood disease

worldwide,<sup>[2]</sup> and it causes significant economic loss due to heavy expenses of dental treatment.<sup>[3]</sup>

During the past two decades many industrialized countries have experienced a dramatic reduction in the prevalence of dental caries and this is ascribed to improved changing living conditions, adoption of healthy lifestyles, improved self-care practices, effective use of fluorides and establishment of preventive oral care programs<sup>[4]</sup> while increasing levels of dental caries has been observed in developing countries.<sup>[5]</sup>

Petersen has observed<sup>[6]</sup> that at the population level, oral health outcomes are related to distal socioenvironmental factors and characteristics of

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the oral health services available. In addition to the use of oral health services, proximal modifiable risk behaviors such as oral hygiene practices, dietary habits, tobacco use and excessive consumption of alcohol were found. Across countries and oral health systems, the existence of a social gradient (economic characteristics and educational background) in dental caries prevalence was found.

The prevalence of dental caries in 5-year-old children in India has been reported to be 50%<sup>[7]</sup> which is comparatively lower than many other parts of Asia.<sup>[8]</sup> It has been reported that few developing countries recently introduced school based oral health education and preventive programmes aimed at improving oral health behavior and status of the child population and inspiring results were observed from such health projects that have been conducted in Indonesia, Brazil, Madagascar and China.<sup>[9]</sup>

In India, unlike other developing countries no oral health education or preventive programs are in action, the only attempt in the field of oral health at national level was the national oral health survey that has been conducted in different states. Based on the results, some variation was observed in oral health status and behavior between the urban and rural population along with variation among the states where population of Rajasthan presented better oral health status than other states.

Thus, the present study intended to assess the dental caries experience in deciduous dentition of 6 year old urban and rural schoolchildren of Udaipur district and to evaluate the influence of socio behavioral characteristics on dental caries experience.

## MATERIALS AND METHODS

The target population constituted 6-year-old school children of Udaipur district. Ethical approval for conducting the present cross sectional survey was obtained from ethical committee of Darshan Dental College and hospital. Prior permissions were taken from the District Education Officer for conducting the survey in selected schools. Verbal consent was obtained prior to examination from each subject and parent (mother or father) provided the proxy informed written consent on behalf of school children.

This survey is part of a large survey conducted on 6 and 12-year-old schoolchildren of Udaipur district. To facilitate collection of representative sample,

a combination of multistage and cluster sampling procedure was executed. At first stage, four rural areas and four urban areas were selected randomly from 8 rural and 4 urban panchayat samithis, respectively. Later at second stage, four schools (two primary schools and two upper primary schools) in the each selected location were selected randomly (two each for boys and girls). In regions where there were no separate schools for boys and girls, co-education schools were included. At third stage, a cluster of first and sixth standard children were selected. Thus a total sample of 875 first standard children participated in the study, selected from a total of 16 primary schools. Subjects present on the days of the survey were included while physically challenged and systemically ill children were excluded.

Clinical examination was conducted by a single investigator under adequate illumination and dmft (decayed, missing, and filled teeth) index<sup>[10,11]</sup> was used to evaluate dental caries. In order to minimize the intra examiner variability, 10% subjects who underwent the clinical examinations were randomly selected in each school by the recorder for repeated examinations. Kappa co-efficient for intra-examiner reliability was found to be 92% for dmft.

Socio-demographic information such as name, age, gender, place of residence, occupation and education of the parents in addition to information on oral health practices (tooth cleaning practices, use of oral hygiene aids, use of tooth paste and dental visiting habits) was collected prior to clinical examination by personal interviews carried out by investigator himself.

Occupation and education status of parents was classified according to occupation and education components of Kuppuswamy scale.<sup>[12]</sup>

Statistical Package for Social Sciences (SPSS 15.0, Inc., Chicago, IL) was used for statistical analysis of data. Fisher exact test was used to assess statistical difference in proportions between two groups. Unpaired t-test and one way ANOVA were used to evaluate the significant differences in means between two and three or more groups respectively. Binomial multiple logistic regression analysis was executed to assess the influence of various independent variables on the dental caries occurrence. The dependent variable dental caries was dichotomized as presence or absence of dental caries.

The independent variables that were significant in bivariate analysis were categorized as; gender (boys and girls), location (rural and urban), parent's occupation (professional or semi professional,

unskilled or unemployed and other occupations), parent's education (>10 years of education, 1-10 years of education and illiterate), brushing frequency (sometimes or never and more than once a day) and dental visit (never been and had been to dentist at least once during lifetime). The effect of each independent variable was assessed adjusting for all other variables in the model. Odds ratio was calculated for all the variables with 95% confidence intervals.

## RESULTS

Among the selected sample of 875 school children, 461 and 412 belonged to urban and rural locations respectively while 463 were boys and 412 were girls.

The caries prevalence and mean caries experience of 6-year-old children was found to be 58.9% and 1.69 (1.99) respectively as illustrated in Table 1. There was a significant difference for the caries prevalence between the genders with greater proportion of boys (62.2%) experiencing caries than girls (55.1%), decayed component constituted a major contribution in the total caries experience.

Statistical analysis revealed significant differences for mean number of filled teeth between the locations of

residence. Though insignificant, mean dmft among rural subjects (1.79) was greater than the urban individuals (1.60) while it was greater in boys (1.77) than girls (1.60).

Tables 2 and 3 display the caries experience in relation to parent's occupation and education respectively. Children whose fathers were professionals (1.25) experienced the lowest caries in contradiction to skilled (2.50). Children of semi-professional (1.00) and unskilled (2.23) mothers had lowest and highest caries experience, respectively. When parent's level of education was considered highest caries experience was observed among children of fathers (2.92) and mothers (2.82) who completed primary school education. Lowest mean dmft was among children of fathers who had a professional or honors degree and graduate or post-graduate mothers. One way ANOVA revealed significant differences between the parent's occupation and level of education for filled component of dmft.

Table 4 documents the frequencies of oral health practices and statistically significant differences were observed by location and gender for most of the practices.

Among the urban children, 75% reported that they cleaned their teeth at least once daily against 63.7% of

**Table 1: Dental caries prevalence and experience of 6-year-old schoolchildren according to location of residence and gender**

dmft	Location		Gender		Total
	Urban	Rural	Boys	Girls	
Prevalence <sup>†</sup> % (n)	56.8 (262)	61.1 (253)	62.2 (288)*	55.1 (227)	58.9 (515)
dt <sup>‡</sup> Mean (SD)	1.49 (1.96)	1.69 (1.90)	1.66 (1.96)	1.50 (1.90)	1.59 (1.93)
mt <sup>‡</sup> Mean (SD)	0.08 (0.39)	0.10 (0.37)	0.09 (0.38)	0.09 (0.38)	0.09 (0.38)
ft <sup>‡</sup> Mean (SD)	0.02 (0.19)*	0.00 (0.00)	0.01 (0.17)	0.01 (0.09)	0.01 (0.14)
dmft <sup>‡</sup> Mean (SD)	1.60 (2.05)	1.79 (1.98)	1.77 (2.05)	1.60 (1.99)	1.69 (2.02)

<sup>†</sup>Fisher exact test, <sup>‡</sup>Unpaired t-test, \*P<0.05, SD: Standard deviation, dmft: Decayed, missing, and filled teeth

**Table 2: Mean caries experience in primary dentition of 6-year-old children according to parent's occupation**

dmft	Professional	Semi-professional	Clerical, shop owner, farmer	Skilled	Semi skilled	Unskilled	Unemployed/ house wife	Do not know
Father's occupation	n=4	n=10	n=350	n=154	n=118	n=224	n=0	n=15
d Mean (SD)	1.0 (1.41)	1.47 (1.94)	1.74 (2.07)	2.30 (2.71)	1.62 (1.91)	1.42 (1.68)	-	1.00 (1.41)
m Mean (SD)	0.00 (0.00)	0.09 (0.33)	0.07 (0.37)	0.20 (0.63)	0.15 (0.46)	0.09 (0.38)	-	0.00 (0.00)
f* Mean (SD)	0.25 (0.50)	0.01 (0.08)	0.01 (0.14)	0.00 (0.00)	0.03 (0.27)	0.00 (0.00)	-	0.00 (0.00)
dmft Mean (SD)	1.25 (1.89)	1.56 (2.01)	1.83 (2.14)	2.50 (2.83)	1.80 (2.08)	1.51 (1.78)	-	1.00 (1.41)
Mother's occupation	n=0	n=19	n=54	n=10	n=6	n=45	n=726	n=15
d Mean (SD)	-	0.80 (1.39)	1.74 (2.20)	2.00 (1.99)	2.00 (1.89)	1.60 (1.98)	1.56 (1.92)	1.40 (1.88)
m Mean (SD)	-	0.00 (0.00)	0.05 (0.22)	0.15 (0.45)	0.33 (0.51)	0.11 (0.38)	0.09 (0.38)	0.00 (0.00)
f* Mean (SD)	-	0.20 (0.63)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.01 (0.13)	0.00 (0.00)
dmft Mean (SD)	-	1.00 (1.94)	1.79 (2.25)	2.15 (2.14)	2.23 (2.25)	1.71 (2.04)	1.66 (2.01)	1.40 (1.88)

One way ANOVA, \*P<0.05, dmft: Decayed, missing, and filled teeth

**Table 3: Mean caries experience in primary dentition of 6-year-old children according to parent's level of education**

dmft	Professional or honors	Graduate or post graduate	Intermediate or post high school diploma	High school certificate	Middle school certificate	Primary school certificate	Illiterate	Do not know
Father's education	n=2	n=86	n=59	n=50	n=28	n=13	n=167	n=468
d Mean (SD)	1.00 (1.41)	1.51 (1.96)	1.78 (2.62)	1.72 (2.23)	2.07 (1.98)	2.77 (2.35)	1.59 (1.78)	1.49 (1.78)
m Mean (SD)	0.00 (0.00)	0.12 (0.59)	0.00 (0.00)	0.14 (0.45)	0.25 (0.70)	0.15 (0.37)	0.12 (0.43)	0.08 (0.32)
f*** Mean (SD)	0.25 (0.50)	0.12 (0.49)	0.00 (0.00)	0.02 (0.14)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
dmft Mean (SD)	1.25 (1.89)	1.75 (2.36)	1.78 (2.62)	1.88 (2.29)	1.88 (2.29)	2.92 (2.36)	1.71 (1.88)	1.57 (1.85)
Mother's education	n=0	n=75	n=28	n=62	n=22	n=11	n=185	n=492
d Mean (SD)	-	1.29 (1.74)	1.21 (1.71)	1.82 (1.99)	1.97 (2.89)	2.64 (2.90)	1.65 (1.76)	1.53 (1.81)
m Mean (SD)	-	0.14 (0.75)	0.11 (0.40)	0.14 (0.46)	0.00 (0.00)	0.18 (0.60)	0.12 (0.46)	0.08 (0.33)
f*** Mean (SD)	-	0.07 (0.26)	0.02 (0.12)	0.00 (0.00)	0.08 (0.42)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
dmft Mean (SD)	-	1.50 (2.16)	1.34 (1.82)	1.95 (2.08)	2.05 (2.99)	2.82 (2.78)	1.77 (1.86)	1.62 (1.89)

One way ANOVA, \*\*\* $P < 0.001$ , dmft: Decayed, missing, and filled teeth

**Table 4: Percentage distribution of 6-year-old school children according to various oral health practices in relation to location and gender**

Oral health practices (%)	Location		Gender		Total (%)
	Urban (%)	Rural (%)	Boys (%)	Girls (%)	
Frequency of cleaning teeth (n)					
Once a day	75 (346)***	63.7 (264)	66.0 (306)*	73.8 (304)	69.7 (610)
Twice a day	5.4 (25)	8.9 (37)	6.9 (32)	7.3 (30)	7.1 (62)
More than twice day	0.2 (1)	1.2 (5)	0.6 (3)	0.7 (3)	0.7 (6)
Several times a week	17.6 (81)	24.9 (103)	24.2 (112)	17.5 (72)	21.0 (184)
Do not know	1.8 (8)	1.2 (5)	2.2 (10)	0.7 (3)	1.5 (13)
Mode of cleaning teeth (n)					
Tooth brush	61 (281)***	44.4 (184)	53.0 (245)	53.4 (220)	53.2 (465)
Finger	20.8 (96)	23.7 (98)	19.9 (92)	24.8 (102)	22.2 (194)
Neem stick	2.2 (10)	2.7 (11)	2.2 (10)	2.7 (11)	2.4 (21)
Others	13.4 (62)	28.3 (117)	22.5 (104)	18.2 (75)	20.5 (179)
Do not know	2.6 (12)	20.5 (179)	2.6 (12)	1.0 (4)	1.8 (16)
Use of tooth paste (n)					
Tooth paste	60.5 (279)***	56.4 (196)	53.6 (248)***	55.1 (227)	54.3 (455)
Tooth powder	17.6 (81)	16.2 (67)	14.9 (69)	19.2 (79)	16.9 (148)
Charcoal	5.2 (24)	2.4 (10)	4.5 (21)	3.2 (13)	3.9 (34)
Others	13.2 (61)	31.6 (131)	23.5 (109)	20.1 (83)	21.9 (192)
Do not know	3.5 (16)	2.4 (10)	3.5 (16)	2.4 (10)	3.0 (26)
Dental visits (n)					
Never been	92.0 (424)*	94.7 (392)	93.3 (432)*	93.2 (384)	93.3 (816)
Had been to dentist 1-2 times in last 12 months	5.4 (25)	5.1 (21)	5.8 (22)	5.8 (24)	5.3 (46)
Had been to dentist >2 times in last 12 months	0.7 (3)	0.0 (0)	0.2 (1)	0.5 (2)	0.3 (3)
Do not remember	2.0 (9)	0.2 (1)	1.7 (8)	0.5 (2)	1.1 (10)

Chi square test, \* $P < 0.05$ , \*\*\* $P < 0.001$

rural children. Barely half (53.2% and 54.3%) of the 6-year-old children said that they used toothbrush and toothpaste when they cleaned their teeth and only 7.8% children claimed of brushing twice or more than twice daily. Among the urban children who cleaned their teeth, 61% used tooth brush in comparison to 44.4% of rural children. There was significant difference between genders and location of residence for tooth paste usage, 60.5% of urban against 56.4% rural and 53.6% boys

against 55.1% girls. Rural children visited the dentist less often than the urban children ( $P < 0.05$ ) and 93.3% of children had never been to dentist.

Logistic regression analysis was employed to determine the influence of various socio-behavioral variables on dental caries [Table 5]. Only those independent variables that had a significant influence on the dental caries occurrence are presented in the table. Boys were more likely to experience caries than their girl

**Table 5: Logistic regression analysis with presence or absence of caries as dependent variable and various socio-behavioral predictors as independent variables among 6-year-old schoolchildren of Udaipur district**

Independent variable	B	S.E	P	Odds ratio	C.I
Gender*					
Males	0.31	0.14	0.038	1.36	1.01-1.82
Females	-	-	-	-	-
Father's occupation*					
Clerical, shop-owner, farmer, skilled, semi-skilled	0.53	0.59	0.037	1.70	1.52-1.98
Unskilled, unemployed	0.71	0.47	0.013	2.05	2.02-2.82
Professional, semi-professional	-	-	-	-	-
Mother's occupation*					
Clerical, shop-owner, farmer, skilled, semi-skilled	1.07	0.47	0.024	1.34	1.09-1.97
Unskilled, house wives	1.81	0.58	0.044	1.30	1.13-1.87
Professional, semi-professional	-	-	-	-	-
Father's level of education*					
1-10	0.42	0.55	0.044	1.53	1.16-1.80
Illiterate	0.59	0.44	0.017	1.18	1.05-1.88
>10	-	-	-	-	-
Mother's level of education*					
1-10	0.91	0.44	0.034	1.40	1.16-1.97
Illiterate	0.95	0.56	0.049	1.38	1.12-1.75
>10	-	-	-	-	-
Brushing frequency**					
Sometimes or never	0.231	0.106	0.004	1.43	1.13-1.81
More than once a day	-	-	-	-	-
Dental visit*					
Never been	0.52	0.35	0.048	1.49	1.17-1.89
Had been to dentist	-	-	-	-	-

\*  $P < 0.05$ , \*\*  $P < 0.001$ 

counterparts. Parent's occupation and level of education also played an important role, children of professional or semi professional parents and those who have completed at least 10 years of education were less likely to demonstrate caries. The association between oral hygiene practices and caries occurrence was evident, subjects who cleaned their teeth at least once a day were less likely to have caries than those who cleaned their teeth rarely or never (OR = 1.43; CI-1.13-1.81). Moreover, children those who never visited a dentist were almost one half times more likely to have dental caries than those who had been to dentist sometime in their life (OR = 1.49, CI-1.17-1.89).

## DISCUSSION

The present study provides epidemiological data regarding dental caries experience in primary dentition

of 6-year-old urban and rural schoolchildren of Udaipur district, which helps in planning preventive programmes for this population. In addition, emphasis was given to assess the effect of socio-behavioral risk factors on dental caries experience.

The survey was not conducted on a national scale and therefore, the data are not representative of the whole country. However, the sample is considered to be representative of the school children from whole district as the study population was randomly recruited from all the divisions of the district. The study sample was collected only from the schools as it was feasible. Thus, future studies are recommended for assessment of dental caries and its related factors among non-school going children of the district.

School children of first standard have been selected for the present study considering that the children of the first grade would be 6 or 7 years of age. The WHO recommended index age is 5 and the reason for recommending 5 years is that it is the age of interest in relation to caries in the primary dentition, which may exhibit changes over a shorter time span and it is the age when children begin primary school. However, it has been suggested by WHO that ages 6 or 7 can be used in countries where school entry is late.<sup>[13]</sup>

The mean dmft accounted to 1.69 approximating the mean dmft value of 5-year-old children of the whole nation<sup>[7]</sup> (1.8) but is greater than caries experience observed by a previous survey in Udaipur region (0.4) and Rajasthan state<sup>[14]</sup> (0.7), however it is much lesser than the mean dmft of 3.51 among Chennai school children.<sup>[15]</sup>

There was a significant difference for the caries prevalence between the genders with greater proportion of boys experiencing caries than girls, similar results were observed in previous studies from India and this difference had been attributed to parents' exhibiting preferential behavior towards boys in India.<sup>[16-18]</sup>

Though insignificant, caries experience was higher in children living in rural than urban areas in harmony with the previous studies.<sup>[19,20]</sup> and this may be explained by differences in dental care habits, social norms and dental attitudes. However, urban school children had significantly greater filled teeth in contrast to no filled teeth in their rural counterparts. This is in accordance to a recent study from North Russia where urban school children had significantly

greater filled teeth than rural ones.<sup>[21]</sup> This difference in filled teeth between the regions might be due to the greater accessibility of dental care in urban than the rural areas.

Parent's occupation significantly altered caries status with children of those parents in better occupations experienced lesser caries and comparable results were observed in a past study.<sup>[22]</sup> Moreover, similar findings were observed among 5 to 15-year-old school going children of Chidambaram in India where children of low socioeconomic status experience greatest caries.<sup>[23]</sup>

Parent's level of education significantly influenced the caries experience, a review of risk factors for dental caries in young children associated low father's and mother's education with high caries prevalence.<sup>[24]</sup>

The proportion of children claiming of brushing twice or more than twice daily was 7.8% which is very less when compared to children of Jordan<sup>[25]</sup> and Portugal.<sup>[19]</sup> Very few children paid dental visits and 93.3% had never been to a dentist, which is worse than 58% among Chinese children.<sup>[26]</sup> Rural children visited the dentist much less often than the urban children ( $P < 0.05$ ) in agreement with 6-year-old children of Portugal.<sup>[19]</sup>

Varenee, *et al.*, suggested that urban centers facilitate access to toothbrushes and toothpaste and the use of these hygiene measures are considered a sign of modern life style.<sup>[27]</sup> Consequently, 6-year-old urban children used tooth brush and tooth paste significantly more than rural individuals. The proportion of 6-year-old children with caries was 58.9% in the present study which is in accordance to the 50% of the national data.<sup>[7]</sup>

The most important predictors for caries occurrence were place of residence, gender, parent's level of education and brushing frequency. Additionally, visits to dentist significantly influenced caries status in 6-year olds. Thus, caries was related to many socio-behavioral factors in agreement with the previous studies.<sup>[28-30]</sup>

## CONCLUSIONS

Rural children and boys experienced greater caries than their urban and girl counterparts. Caries experience was related to the parent's occupation and education. The present study population exhibited poor oral hygiene habits. Furthermore, caries occurrence was influenced by brushing frequency and dental visiting habits.

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