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Assessment of Caries-Prevalence, Unmet Dental Treatment Needs and Barriers to Care as Perceived by Parents of Private and Government Aided-School Children of Gandhinagar-An Epidemiological Study

Running Title: School Based Epidemiological Research

Rupal Vadher[1,*], Megha Patel[1], Rohan Bhatt[1], Lilavanti Vaghela[2], Foram Patel[1]

[1]Department of Pediatric and Preventive Dentistry, Karnavati School of Dentistry, Karnavati University, India
[2]Pediatric Dentist, Jamnagar, Gujarat, India

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Abstract Epidemiological studies could be useful in determining disease prevalence and identifying potential factors influencing disease patterns. Hence, present study was aimed to assess dental caries prevalence, unmet dental treatment needs and perceived parental barriers among 6-12-year-old school children of Gandhinagar, Gujarat. A total of 750; 6-12-year-old, Private and Government school attending children of Gandhinagar were selected through stratified random sampling methodology. Data was collected using WHO1997 survey methodology. Questionnaires including 10 close ended questions were distributed for assessment of parental barriers. Children were examined for caries prevalence using deft, DMFT index and modified treatment needs index was used to assess the required treatment needs. Chi square, Kruskal Wallis and Mann-Whitney U tests at 5% level of significance were used for statistical analysis. Prevalence of dental caries in government school was 81.60% whereas in private school it was 77.33 % (P=0.1987). Majority of the children had untreated decayed component. Major treatments needed were oral prophylaxis, one surface filling. Overall high cost of dental treatment and lack of awareness of dental diseases were potential barrier for parents in utilizing dental services for children. According to study results, Gandhinagar city has high dental caries prevalence and untreated caries indicates higher preventive and restorative treatment needs. Hence, to overcome above mentioned parental barriers, specialized educational programme to raise parental awareness along with Mobile dental-clinics, dental-camps and dental outreach initiatives may be effective ways to raise accessibility. School and community-based promotional, educational and preventative programme will indeed serve to improve existing situation immensely.

Keywords Epidemiology, Dental Caries, COVID-19, Public Health, Dental Care

1. Introduction

Oral health is a fundamental component of public health system that has an enormous impact on individual standards of life, particularly children as it can influence child's functional, psychological and social well-being. Unfortunately, due to a lack of concern from parents as well as children, dental diseases occur more frequently than it might. Teeth are essential for child's growth and development which is directly proportionate to functional unit of organism, according to functional-matrix theory [1]. In addition to unique function of mastication, teeth have a primary role of phonation that contributes in socialization of child.

Dental caries is one of the most common and frequent of various childhood disorders and is almost 5 times as common as asthma [2] and affects around 2.4 billion people worldwide [3]. The comprehensive review and meta-analysis 2021 predicted caries prevalence of 54.16% for people aged 3 to 75 years, with 52% in age group 3-18. Mixed dentition has highest percentage (58%) followed by primary dentition (54%). Western India has highest incidence (72%) [4].

Children who have dental problems are 12 times higher probable to have restricted activity. Every year, more than 50 million school hours are ruined due to oral health issues that have an influence on academic performance and future achievement [5]. Maintenance of oral health is significantly influenced by socioeconomic status, education, income and parental attitude-beliefs towards dental treatment. Poor oral health is still the most prevalent health care need in India, despite advancements in science and technology. Despite the availability of free dental care in most government clinical setups, number of school children seeking dental care is relatively low.

Various prevalence studies on dental caries and treatment needs of different populations in different districts of Gujarat have been done and reported in past. However, according to existing literature, precise base line data on burden of dental caries, unmet dental treatment needs and barriers perceived by parents to seek dental treatment were unattainable for Gandhinagar city particularly in mixed dentition for both government and private school children aged 6-12 years.

Data on caries serves as a foundation for determining the type of treatment needed for a population which can be very useful at local level in planning and executing appropriate preventive and therapeutic initiatives for dental diseases and for implementation of school based oral health programs for early intervention and prevention of oral diseases.

1.1. Aim

In an attempt to fill these disparities in the database, present study was aimed to evaluate the caries prevalence, unmet dental treatment needs and perceived barriers to care by parents among 6–12-year-old school children of Gandhinagar city.

1.2. Objectives

1) To assess and compare caries prevalence according to school in 6-12 years old school children of Gandhinagar city.
2) To evaluate and compare distribution of unmet dental treatment needs according to school in 6-12 years old school children of Gandhinagar city.
3) To evaluate and compare barriers to care perceived by parents according to school and socioeconomic status in 6-12 years old school children of Gandhinagar city.

2. Materials and Methods

2.1. Study Design and Place of Study

Epidemiological descriptive cross-sectional study was conducted to assess the caries prevalence, unmet dental treatment needs and barriers perceived by parents to seek the dental treatment among 6–12-year-old school children of Gandhinagar. Gandhinagar district is an administrative division and state capital city of Gujarat. It has an area of 2140 km^2 with urban population of 6.3 million out of which 3.3 million are males and 3 million are females. Children form 9.74% (20,071) of total population of Gandhinagar. There were total 37 government and 45 private schools in Gandhinagar city. Present study was conducted in 4 Government aided and 4 private schools of Gandhinagar, Gujarat.

2.2. Ethical Clearance

Before commencing the survey, study protocol was reviewed and approved by Institutional Ethical committee.

2.3. Sampling, Selection of Children and Randomization

The stratified random sample method was used for sampling process where whole Gandhinagar city was stratified according to geographic location into 4 strata i.e., east, west, north and south. From each stratum 1 government and 1 private school were selected by simple random sampling (lottery) method from a list obtained from district educational office of Gandhinagar city. After obtaining ethical clearance, written permission and list of schools from District Educational Officer, total 4 government and 4 private schools were randomly selected to collect the study samples. The number of children from each school was decided by using proportional allocation method as estimated sample size was 750, total number of subjects to be selected from each school was kept between 95-100. From each of 8 selected schools, children who

submitted filled parental-questionnaires and were willing to participate in study were randomly selected and examined.

Children age between 6-12 years and without any systemic illness were included whereas presence of any systemic condition, facial asymmetry, SHCNs, children undergoing orthodontic treatment and who refused to participate were excluded.

2.4. Data Collection

Before conducting survey, school children and teachers were informed regarding the objective of study and its importance for planning and executing dental health programmes in future. A questionnaire comprised of (i) Sociodemographic details of children and parents including their SES (As per Kuppuswammy scale 2021) [6], (ii) 10 close-ended questions (related to parental barriers) and (iii) For caries assessment, DMFT -deft index and modified treatment needs index were performed. The validity of questionnaire was reviewed by conducting a pilot study among parents visiting Department of pediatric and preventive dentistry for treatment of their children. Questionnaires were distributed to the teachers of selected schools 7 days prior to examination day and teachers handed over forms to parents. 2 Gentle reminders were given to teachers for collecting parental forms from the parents /children.

2.5. Oral Examination

After collecting filled parental questionnaire forms, dental examination of children was carried out in school premises by seating on an ordinary chair, in broad day-light facing away from direct sunlight with dental mirror and CPI probe as mentioned by WHO(1999) and ADA examination type-3 [7]. Examination was carried out by a single qualified, calibrated investigator (principal investigator) and calibrations were carried out in dental teaching institution prior to the commencement of the study. Primary dentition-deft Index (Grubbel, 1944) and permanent dentition -DMFT index (WHO modification1997) were carried out, followed by the recording of treatment needs for individual teeth using the Modified treatment needs index.

Oral health education was given to children by trained interne.

2.6. Statistical Analysis

Data was analysed with IBM SPSS VERSION 20.0 (IBM Corporation, Chicago, USA), Shapiro-Wilk test for continuous variable, Chi-Square test for the association between two categorical variables, Mann-Whitney U and Kruskal Wallis test for independent samples. For all statical analysis, probability level of $P<0.05$ was considered statistically significant and that of $P<0.001$ as highly significant.

3. Results

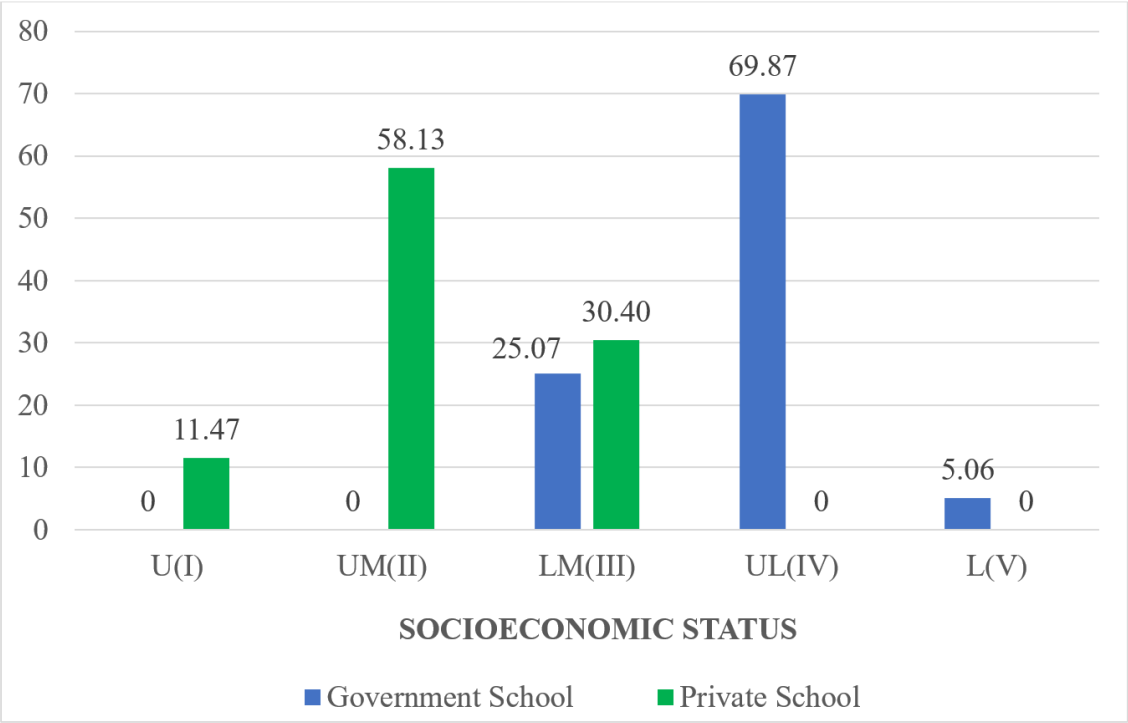
The distribution of study population (school children) according to demographic characteristics -Age, Gender and School was illustrated in **Table 1** and distribution of parents according to SES was illustrated in **Graph 1**.

3.1. Dental Caries

Government school children (81.60%) compared to private school children (77.33%) were found more affected with dental caries but the difference was statistically insignificant. (P=0.1987) (**Table 2)**.

Table 1. Distribution of study population according to demographic characteristics-Age, Gender and School

Age	Government School (n=375)		Total	Private School (n=375)		Total
	Male	Female		Male	Female	
6(n=96)	25(12.08)	21(12.50)	46(12.27)	24(13.26)	26(13.40)	50(13.33)
7(n=107)	26(12.56)	22(13.10)	48(12.80)	29(16.02)	30(15.46)	59(15.73)
8(n=98)	23(11.11)	21(12.50)	44(11.73)	23(12.71)	31(1598)	54(14.40)
9(n=107)	29(14.01)	27(16.07)	56(14.93)	26(14.36)	25(12.89)	51(13.60)
10(n=112)	34(16.43)	27(16.07)	61(16.27)	26(14.36)	25(12.89)	51(13.60)
11(n=120)	33(15.94)	25(14.88)	58(15.47)	34(18.78)	28(14.43)	62(16.53)
12(n=110)	37(17.87)	25(14.88)	62(16.53)	19(10.50)	29(14.95)	48(12.80)
Total (750)	207	168	375	181	194	375



Graph 1. Distribution of parents in SES category according to School

Table 2. Prevalence of dental caries according to School

School	Children Examined	Children with caries	Caries in Male (n=310)	Caries in Female (n=286)	P-value
Government	375	306(81.60)	167(54.58)	139(45.42)	0.1987
Private	375	290(77.33)	143(49.31)	147(50.69)	

Analysis done using: Chi-Square test *Significant ($p<0.05$) **Highly significant ($p<0.001$)

3.2. Treatment Needs

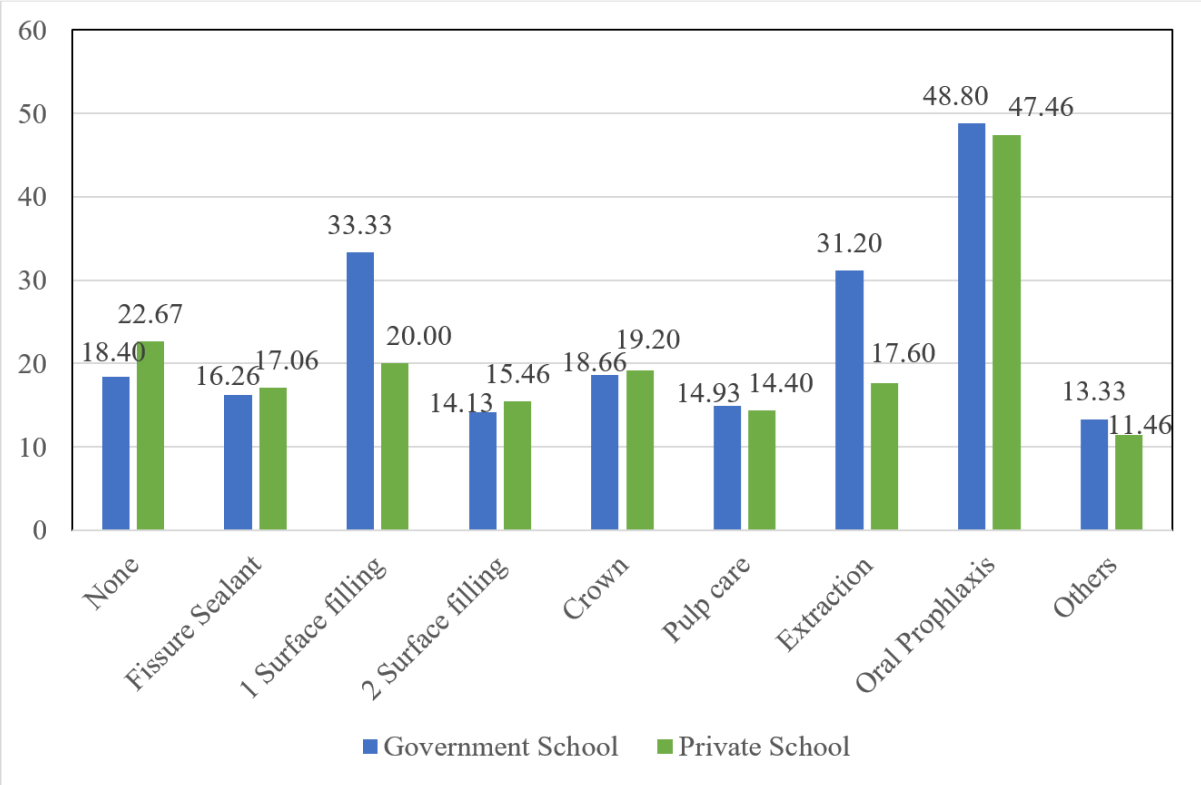
Majority of subjects were in need for oral prophylaxis and one surface filling.

Significantly a greater number of children attending government schools were in need for prophylaxis and one surface filling compared with children attending private schools. ($P<0.001$) **(Graph 2)**.

3.3. Parental Barriers

On assessment of parental barriers: In Government school, major parental barriers observed were lack of awareness (62.13%), higher cost (58.13%) of dental treatment, less importance to treat deciduous teeth (50.93%). Whereas, for private school, major parental barriers were - job hours of parents (36.27%), multiple appointment (35.47%) and child's school schedule (29.07%) **(Table 3)**.

62.8 % parents from both schools did not seek the dental treatment due to ongoing pandemic COVID-19. There were various reasons for not seeking treatment during COVID-19. Among all those, main reason was fear of transmission of disease (61.14 %).



Graph 2. Unmet dental treatment needs according to School

Table 3. School wise distribution of Parents for assessment of barriers

Parental Questions	Response	Government School (n=375)	Private School (n=375)	P- value
Are you aware that your children need dental treatment?	Yes	142(37.87)	192(51.20)	0.000†
	No	233(62.13)	183(48.80)	
Do you have any previous bad dental experience (parent/child)?	Yes	47(12.53)	62(16.53)	0.120
	No	328(87.47)	313(83.47)	
Do you have difficulty in keeping up with appointments due to child's school schedule?	Yes	85(22.67)	109(29.07)	0.045*
	No	290(77.33)	266(70.93)	
Do you have difficulty in keeping appointments for your child's treatment due to job hours?	Yes	154(41.07)	136(36.27)	0.177
	No	221(58.93)	239(63.73)	
Do you have difficulty in keeping multiple appointments for your child's dental treatment?	Yes	120(32.00)	133(35.47)	0.315
	No	255(68.00)	242(64.53)	
Is dental treatment affordable to you?	Yes	157(41.87)	342(91.20)	0.000†
	No	218(58.13)	33(8.80)	
Is dental clinic accessible to you?	Yes	218(58.13)	343(91.47)	0.000†
	No	157(41.87)	32(8.53)	
Are you able to communicate with doctor easily?	Yes	312(83.20)	298(79.47)	0.230
	No	63(16.80)	77(20.53)	
Do you believe that deciduous teeth are not important, so they don't need treatment?	Yes	191(50.93)	141(31.60)	0.002*
	No	184(49.07)	234(68.40)	

Analysis done using: Chi-Square test *Significant ($p<0.05$) † Highly significant ($p<0.001$)

4. Discussion

One of the most important pediatric health concerns is maintaining healthy teeth in oral cavity till the eruption of permanent successors. Dental caries is a pervasive oral disease which is more prevalent during childhood [8]. The incidence of dental diseases and need for treatment in community is one of the important elements and it must be considered in evaluating necessary improvements for dental healthcare. However, rise in caries prevalence is mostly attributed to inaccessibility of an oral health care system, as these systems are primarily focused on curative care, with no systematic implementation of community health prevention and oral health promotion [9].

The information reported here is the first baseline data on prevalence of caries and need for treatment along with perceived parental barriers amongst government and private school children of Gandhinagar. Obtaining an appropriate representation of intended population has always been a hard task for epidemiological research.

School-aged children from affected areas have historically been regarded as a useful sample source for undertaking such research in children. In an attempt to provide an accurate representation of children from all social, economic and cultural communities and to give a true depiction of state of dental health of target studied population, the current study sample was comprised of students from both government and private schools. The present research was conducted on students aged 6 to 12 since there were comparatively less studies found in literature concerning the incidence of dental caries along with unmet dental treatment needs and parental barriers among children particularly during the mixed dentition period in this geographic distribution. Also, it represents caries status in both primary and permanent dentition.

Our study observed 79.46% of total caries prevalence which is in accordance with systemic review and meta-analysis of caries prevalence in western India (72%) by Pandey P et al. [4] whereas higher than that reported (53.8%) in National Oral Health Survey [10]. This suggests a trend towards increase in dental caries prevalence, which could be related to rapidly changing dietary and lifestyle patterns in young individuals.

On assessment of school wise caries prevalence, out of 750 children, 306 (81.60%) government and 290 (77.33%) private school children had caries. Mean deft and mean DMFT were high in government compared to private school. Higher rate of dental caries among students in government schools may be caused by lack of parental awareness or prioritizing of dental care, cost and time constraints, subjects of child neglect, etc. which was comparable with study performed by Moses et al. [11] and Reddy et al. [12]. Boys had slightly higher prevalence of caries (1%) than girls, which was statistically insignificant. This minor difference could be related to dietary factors such as increased consumption of foods and beverages with added sugar, such as candy, chips, and cookies which exposes children to high calories, enhances likelihood of developing cavities, and deprives from essential nutrients required for normal growth and development [13].

On assessment of treatment needs among government and private schools, treatment needs were higher in government school. Needs of extraction and one surface filling were significantly higher in government than private school. Possible reasons could be inadequate oral hygiene habits, lack of awareness, ignorance of condition, poor diet and familial situation that affect timely treatment of carious teeth.

To assess SES of parents "Updated Modified Kuppuswamy SES, 2021" was utilized. Among the different scales for determination of SES, it is most commonly utilized scales for urban regions as it considered all important parameters like total income, educational status, and occupation of head of the family [14]. Same scale was also utilized by Kumar AV et al. [15] and Shyam R et al. [16].

In government school, majority of parents (69.87%) belonged to upper-lower class (Class IV), where as in private school 58.13% parents belong to upper-middle class (Class II) which was highly statistically significant. As SES status has a direct relation with education and income, it plays a major role in satisfying treatment needs of children. In comparison to parents with lower educational level, parents with higher educational qualifications can provide better assistance on their children's health-related behaviors [17].

In present study, overall high cost of dental treatment and lack of awareness of dental diseases were a potential barrier for parents in utilizing dental services for children. Hence, to overcome these parental barriers- educational program for society about deciduous teeth, their importance and the necessity of visiting dentist regularly [18] and preventive programs, focusing on good oral hygiene through school and community-based programmes can be incorporated into school curriculum which will aid in establishment of more effective preventive measures and lowering financial burden. Besides that, during any dental program planning, priority should be given to lower class people having higher prevalence of diseases and unmet treatment needs. Dental health insurance policy should be developed which provides good encouragement to patients to visit dentist on a regular basis, which serves as a cost-effective measure. National Oral Health Policy model [19] incorporates activities to specific age-groups. In which for 6–16-year age group, tooth brushing program with fluoride toothpaste along with mid-day meals scheme should be initiated at school level with active participation of teachers-parents and first level of intervention must be instigated in school premises during examination.

This study was conducted post COVID-19 era. Barriers faced by parents during that period were also taken into consideration. Major reason was–fear of transmission of disease (61.14%) followed by transportation problem (46.70%). This was due to restrictions, public

transportations and lockdown situation during COVID-19. Similar finding was also reported by Farsi D et al. [20], Meenapriya M et al. [21]. These factors may lead to development of new carious lesions in high-risk children and/or progression of already established lesions.

Future research is essential to correlate dental caries risk factors and oral hygiene behaviors with prevalence of dental caries in this subpopulation.

4.1. Limitations

- Efforts of authors to record missing, filled components may deviate depending on children's recollection and reasoning capacity. As a result, prevalence and severity of caries were probably underestimated.
- Assessment of food habits, oral hygiene habits and other predisposing factors for caries development were not within scope of our study.

4.2. Recommendations

Though published research indicates- dental caries prevalence in adults has been decreasing internationally, caries prevalence in young children has not demonstrated a substantial decline.

- This emphasizes an urgent need for a public awareness campaign to promote preventive dental health behaviours and attitudes that are favourable which can be accomplished by educating parents about dental health as part of school-based dental health programme.
- Regular interval screening programmes should be implemented to evaluate the oral health and treatment needs of children and appropriate care should be provided.
- Preventive services should be prioritized and implemented early in order to target primary dentition and avoid potential caries in permanent dentition.
- Strategies should be implemented in order to cope with the inventory of patients who have yet to be seen since the pandemic.

5. Conclusions

According to the findings of epidemiological survey, dental caries prevalence was 79.46% in 6-12-year-old schoolchildren of Gandhinagar with higher caries prevalence and unmet dental treatment needs among government school in contrast to private school. Major parental barriers faced by parents were higher cost of dental treatment and lack of awareness. Hence, to reduce diseases burden, it is imperative to introduce primary prevention, restorative care and confronting parental barriers through parental awareness program and early implementation of Dental health insurance policy.

Declarations

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- Conflict of interest: None

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