

The effect of oral health education and treatment on dental caries prevalence among primary schoolchildren in Nagrota Bagwan Block of Kangra, Himachal Pradesh, India: A school-based cross-sectional study

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ABSTRACT

Background: The study was taken up with the aim to study the prevalence of dental caries to improve oral health through health education, early diagnosis and treatment, and to evaluate the impact of intervention (treatment and oral health education) on oral health in the schoolgoing children of Nagrota Bagwan Block of Kangra district, Himachal Pradesh, India. **Materials and Methods:** A total number of 3,069 schoolchildren in the age group of 5-12 years studying in 96 government primary schools of the study area were surveyed to find out dental caries using dentition status and treatment need index [World Health Organization (WHO) diagnostic criteria, 1997]. Oral health education and treatment were provided and the data were collected again after 6 months of intervention. **Results:** The overall caries prevalence of subjects decreased from 58.4% at the baseline to 45.4% after 6 months following intervention with high caries prevalence in females as compared to males and in the 9-12 years age group as compared to the 5-8 years age group. The mean decayed, missing, and filled teeth (dmft/DMFT) was 2.05 ± 4.13 and 2.56 ± 4.20 at the baseline, 2.04 ± 2.9 and 2.51 ± 2.97 at 6 months in 5-8 years age group and 9-12 years age group, respectively. **Conclusion:** The findings of the study demonstrated that schoolchildren in Nagrota Bagwan Block of Kangra district, Himachal Pradesh, India suffer from high prevalence of dental caries. Oral health education and intervention conducted after 3-month intervals were effective in reducing dental caries experience in schoolchildren.

Key words: Dental caries, decayed, missing, and filled teeth (dmft/DMFT), oral health education

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INTRODUCTION

Oral diseases continue to have high prevalence despite the decline in dental caries in developed countries. The observation of the various studies shows the increasing levels of dental caries in children and adolescents in developing countries, in contrast to developed countries.^[1,2] The National Oral Health Survey and Fluoride Mapping - 2003 reported that 72.5% of 12-year-old children and 75.4% of 15-year-old children had dental caries.^[3] As it is the most common dental disease with a high prevalence among children, it is important to control the disease process by rendering the required treatment and by increasing awareness regarding its preventive measures. Knowledge of dental health and treatment needs of schoolchildren is important for developing appropriate preventive approaches. To overcome the high prevalence of oral diseases in developing countries, the need for community-oriented preventive program is emphasized.^[4] Oral health education is an integral part of these programs. Oral health education is believed to be a cost-effective method for promoting oral health if done through schools where all children irrespective of their socioeconomic status or ethnicity can be reached.^[5]

The study was taken up with the aim to study the prevalence of dental caries, to improve the oral health through health education, early diagnosis, and treatment, and to study the impact of intervention (treatment and oral health education) on the prevalence of dental caries in the schoolgoing children of the field practice area in the medical college in Kangra district of Himachal Pradesh, India. While doing this project, the priority was given to oral health education program to promote awareness regarding various oral health problems and to improve oral hygiene practices through oral health education in schoolchildren.

MATERIALS AND METHODS

This school-based interventional cross-sectional study was conducted in Nagrota Bhagwan Block of Kangra district, Himachal Pradesh, India, which is a field practice area of the Department of Community Medicine, Dr. Rajendra Prasad (R.P.) Government Medical College, Kangra (Himachal Pradesh, India). Nagrota Bhagwan Block has a population of 1,10,039, which inhabits a total number of 213 rural villages and 7 urban wards. A total number of 3,096 schoolchildren in the age group of 5-12 years studying in 96 government primary schools of the block were recruited for the study. The sample size, calculated on the basis of the prevalence of dental caries of 50%^[6,7] and absolute precision of 2, was 2,401. Assuming a nonresponsive rate of approximately 10%, we aimed to enroll 2,641 individuals from the community. A total of 96 primary schools were randomly selected using random number table. All the schoolchildren with in the age group of 5-12 years studying in 96 primary schools of the study area were included in

the study. It comprised approximately 12-13% of the total population of the block.

Collection of data

Each school was visited a maximum number of 3 days in a week or less till all children were examined. If it required more than 3 days, then the remaining children were covered in the subsequent week.

Oral health examination of each subject was performed in their respective schools by seating each one on a chair in daylight with the subject facing away from direct sunlight using the required instruments. All the children were examined by two field investigators. Each field investigator was handed over separate age groups of schoolchildren (one 5-8 years and another 9-12 years). Data were collected regarding the prevalence of dental caries [using dentition status and treatment need index as described by World Health Organization (WHO)-oral health survey manual, 1997]. Using WHO diagnostic criteria, the number of decayed, missing, and filled teeth (dmft/DMFT)^[3] were recorded. For the analysis, subjects were categorized according to their caries experience, those without caries experience (dmft/DMFT=0; absence of decayed, missing tooth/teeth due to caries or filled tooth/teeth) or those with caries experience (dmft/DMFT≥1; presence of one or more decayed, missing tooth/teeth due to caries or filled tooth/teeth).^[8]

Ethical issues

Ethical clearance was obtained from the concerned authorities of the institution. The study participants were given a clear explanation about the objective of the study. Voluntary informed consent was obtained from the parents of selected schoolchildren and school teachers before administering the questionnaire.

Implementation of oral health interventional measures

Oral health educational kit

- a. Teaching material: Oral health education was delivered during the same visit using standardized oral health educational material available in the form of models, charts, manuals, audiovisual aids, and albums with colored photographs as well as short stories in Hindi for children aged 5-12 years. A 3-day workshop of the field investigators, health educators, and experts was conducted for the development of information, education, and communication material with their sensitization regarding the promotion of oral health before implementation of the project. Oral health education was provided to both children and teachers in their respective schools on the day of examination. Weekly oral hygiene record was maintained by teachers on a daily basis. Oral hygiene instructions were repeated and reinforced at a 3-month interval.

- b. Demonstrations of tooth brushing using 2% mercurochrome, super soft toothbrush, spandex (cheek retractor), and a looking mirror was given.
- c. Application of fluoride varnish using combination technique, i.e., topical povidone (PVP)-iodine (1% active iodine) and fluoride varnish (Duraphat — 5% sodium fluoride varnish) was done.

Treatment of schoolchildren

The service was provided for 3 days in 1 week in the Department of Dentistry, Dr. R.P. Government Medical College, Tanda, Uttar Pradesh, India for the treatment of dental caries. At the time of oral examination in the schools, referral cards were issued to the schoolchildren suffering from dental caries for their treatment. The referral cards were cross-checked monthly in the dental department and those not reporting were contacted by the field investigators.

Treatment for the cases of dental caries was done using atraumatic restorative treatment approach, pit and fissure sealants, pulp space therapy, fluoridated varnishes, and toothpastes, etc.

Assessment of impact of interventional strategies (treatment and oral health education) on the oral health

The data were collected again after 6 months of oral health education and treatment regarding the prevalence of dental caries using the same diagnostic criteria as used for baseline data collection.

Statistical analysis

Data were entered into an electronic database (Epi info software). Categorical variables were compared using the chi-square test. A level of $P \leq .05$ was considered to be statistically significant and $P \leq 0.001$ was noted as highly significant. The accuracy of data entry was checked by range check, logic check, and reentering 10% of the data and the consistency of the data was compared.

RESULTS

A total number of 3,069 schoolgoing children in the age group of 5-8 years and 9-12 years were enrolled in the study. Among the age group of 5-8 years, 54.7% were males and

45.3% were females. In the age group of 9-12 years, 45.3% were males and 50.3% were females.

At the follow-up dental examination of 6 months, the dropout rate was 7.7%. The final analysis therefore, included 2,831 students. Among the age group of 5-8 years, 55.0% were males and 45.0% were females. In the age group of 9-12 years, 58.3% were males and 41.7% were females [Table 1].

Dental caries assessment at baseline examination

The prevalence of caries subjects in the study population was 58.4%. High caries prevalence was seen in the age group of 9-12 years (61.2%) as compared to the age group of 5-8 years (56.8%). Higher caries subjects were found among females as compared to males. However, the difference was not significant. Females had a significantly high prevalence of dental caries in the age group of 5-8 years as compared to males in the same age group [Table 2].

Mean dmft/DMFT scores were 2.05 ± 4.13 and 2.56 ± 4.20 in 5-8 years age group and 9-12 years age group, respectively. The decayed component accounted for more than 85% of these values. There were significant differences in the means of decayed component (D+d) among both the age groups, with the highest mean (D and d) scored by 9-12 years age group (1.37 and 1.17, respectively). The females had a significantly higher mean dmft/DMFT as compared to males in 9-12 years age group [Tables 3 and 4].

Dental caries assessment at 6 months following intervention

The overall prevalence of caries subjects in the study population was 45.4%. Higher caries subjects were found among females compared with males. The caries prevalence

Table 1: Distribution of sample

Age group (years)	Gender	Number of subjects			
		At the baseline		At 6 months	
		No.	%	No.	%
5-8	M	1,027	54.7	968	55.0
	F	851	45.3	790	45.0
	Total	1,878	61.2	1,758	62.0
9-12	M	591	49.6	626	58.3
	F	600	50.3	447	41.7
	Total	1,191	38.8	1,073	38.0
		3,069		2,831	

Table 2: Prevalence of dental caries

Age group (years)	Gender	At the baseline			At 6 months			At the baseline vs 6 months	
		No.	%	P value	No.	%	P value	P value	
5-8	M	561	54.7	0.03	396	41.0	0.008		
	F	505	59.3		373	47.2			
	Total	1,066	56.8		769	43.7			
9-12	M	349	59.2	0.14	271	43.2	0.68	1.6	
	F	379	63.1		248	55.4			
	Total	728	61.2		519	48.3			
		1,794	58.4	2.4	1,288	45.4	1.32	1.1	

Table 3: dmft/DMFT and its components scores (mean ± SD)

dmf/DMF teeth	5-8 years			9-12 years		
	Baseline	After 6 months	P value	Baseline	After 6 months	P value
d(mean±SD [†])	0.92±1.85	0.09±0.149	0.03*	1.17±1.99	0.10±0.178	0.02*
m(mean±SD)	0.007±0.157	0.02±0.05	0.51	0.004 ±0.096	0.03±0.05	0.32
f(mean±SD)	0.00±0.00	0.83±0.965	0.001*	0.00±0.00	1.04±1.17	0.01*
dmft(mean±SD)	0.93±1.91	0.94±1.50	1.64	1.17±2.003	1.17±1.29	1.72
D(mean±SD)	1.11 ±2.06	0.11±0.233	0.04*	1.37±2.20	0.13±0.290	0.02*
M(mean±SD)	0.012±0.195	0.02±0.093	0.57	0.0117±0.171	0.04±0.073	0.61
F(mean±SD)	0.00±0.00	1.02±1.122	0.049*	0.00±0.00	1.17±1.322	0.02*
DMFT(mean±SD)	1.12±2.07	1.1±1.42	0.54	1.39±2.20	1.34±1.66	0.81
dmft/DMFT	2.05±4.13	2.04±2.9	1.3	2.56±4.2003	2.51±2.97	2.1

[†]P < 0.05, [†]SD: Standard deviation

Table 4: dmft/DMFT and its components scores (mean ± SD) by age and gender distribution

Age group	Males			Females		
	Baseline	After 6 months	P value	Baseline	After 6 months	P value
5-8 years	1.01±2.02	1.01±1.32	1.6	1.05±2.09	1.03±1.58	2.3
9-12 years	1.25±2.11	1.14±1.52	2.1	1.31±2.15	1.37±1.45	1.9

was higher in the 9-12 years age group as compared to the 5-8 years age group (48.3 vs 43.7) but the difference was nonsignificant.

The females had significantly high caries prevalence as compared to males in the 5-8 years age group ($P = 0.008$) [Table 2].

Mean dmft/DMFT scores were 2.04 ± 2.9 and 2.51 ± 2.97 in the 5-8 years age group and 9-12 years age group, respectively ($P = 0.43$). There was no significant difference in mean dmft/DMFT scores among the males and females in both the age groups [Tables 3 and 4].

The overall caries prevalence decreased from 58.4 to 45.4. However, the difference was nonsignificant ($P > 0.5$). The caries prevalence decreased from 56.8 to 43.7 and 61.2 to 48.3 in the 5-8 years age group and 9-12 years age group, respectively. However, the difference was nonsignificant ($P > 0.5$) [Table 2].

There was no statistically significant difference between mean dmft/DMFT in both the age groups at the baseline and after 6 months. However, there was a significant decrease in the mean decayed component and a significant increase in the mean filled component at 6 months following intervention.

DISCUSSION

The results of the study at the baseline showed that the prevalence of dental caries was high among females as compared to males, and in 9-12 years age group as compared to the 5-8 years age group. The mean dmft/DMFT was 2.05 ± 4.13 and 2.56 ± 4.20 in the 5-8 years age group and in the 9-12 years age group, respectively. The values of this study were higher as compared to values reported in the studies by

Shailee *et al.* (2012),^[9] Grewal *et al.* (2011),^[10] and Bajoma *et al.* (2004).^[11] However, the values were almost similar to DMFT of 2.4 reported by the National Oral Health Survey.^[12] The major component was decayed components, which was significantly higher in the 9-12 years age group compared to the 5-8 years age group. Females had a significantly higher mean DMFT value than males, which was in line with the findings of other studies.^[13-19] This finding may have been due to the fact that teeth erupt earlier in females than males, which means that females' teeth would have been exposed to the oral environment for a longer period than males of the same age. The reason for the higher prevalence of dental caries in 9-12 years age group as compared to the 5-8 years age group may be that caries being a continuous and cumulative process had obviously increased over a span of years; moreover, the number of teeth is more as the age increases.

During postintervention phase, the overall caries prevalence decreased from 58.4% to 45.4%. Studies have shown that as the frequency of brushing increased, the prevalence of dental caries decreased.^[20,21] The decrease in caries experience could be due to change in oral health practices. There was a significant decrease in the mean decayed component and a significant increase in the filled component of dmft/DMFT at 6 months following intervention.

This could be attributed to the effect of oral health education and intervention, which led to an increase in the awareness regarding oral health and moreover, increased visits to the dentist resulted in a decrease in the caries experience. School age is an influential stage in people's lives, a time when lifelong sustainable oral health-related behaviors as well as beliefs and attitudes are developed.^[22] Children are particularly receptive to health messages during this period and the earlier the good habits are established, the longer the impact of these habits will

last. Moreover, the messages can be reinforced regularly throughout the school years.^[23]

The findings of the study demonstrated that schoolchildren in Nagrota Bagwan Block of Kangra district, Himachal Pradesh, India suffer from a high prevalence of dental caries. This study showed that oral health education and intervention conducted after 3-month intervals was effective in reducing the dental caries experience in schoolchildren.

This study gives an overview of the existing dental caries experience in schoolchildren and can help in implementing programs to achieve optimal health for children. Information provided by the present study can be used as preliminary data and further large scale epidemiological studies can be undertaken at a district level to access and confirm various dental diseases and associated risk factors in the region. School dental health programs should be conducted at regular intervals because children in this rural area do not have access to qualified dental care.

The limitations of the study are that predicting variables such as oral health knowledge and attitudes, patterns of sugar consumptions, oral hygiene behavior, social habits, and fluoride intake have not been included in the study, which influence the oral health of the individual.

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Conflicts of interest

There are no conflicts of interest.

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