



## Prevalence of Dental Caries among 13 and 15-Year-Old School Children in an Endemic Fluorosis Area: A Cross-sectional Study

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### ABSTRACT

**Aim:** To assess the prevalence of dental caries and dental fluorosis among 13- to 15-year-old school children in Panyam, Andhra Pradesh, India.

**Materials and methods:** The cross-sectional study was conducted among 202 school children and were examined for dental fluorosis and dental caries.

**Results:** This study shows that male students have a decrease in DMFT (Decayed, missing, filled, teeth) index and increase in Dean's index when compared with females. Among students with 13 to 15 years of age, 13-year-old student has increase in DMFT score when compared with other age groups and 14-year-old students has increase in Dean's score when compared with other age group students.

**Conclusion:** The prevalence of dental caries decreased with the increase of fluorosis among the students examined.

**Clinical significance:** Patients with dental fluorosis show a decreased prevalence of dental caries.

**Keywords:** Dental fluorosis, Fluoride concentration, Dental caries, Pit and fissure lesions.

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### INTRODUCTION

Fluoride ingested through water has been found to have both positive (prevention of dental caries) as well as negative (dental fluorosis) effect on oral health. Fluoride is considered as a double-edged weapon. Excess fluoride ingestion is a major health problem. The effects of fluoride in human health have been the center of a lot of dental public health research. Fluorosis is considered endemic in 15 states of India.<sup>1</sup>

The recommended safety dosage of fluoride in water is 1 ppm. Ingestion of water with a fluoride concentration two or three times greater than the recommended amount, leads to dental fluorosis which appears as white flecks and chalky opaque areas on the tooth enamel. Consumption of water containing four times the recommended amount of fluoride, causes a brown pitted corroded appearance on the enamel surface. Additional to it, use of fluoride dentifrices, mouth rinses, self-applied gels and fluoride level in food may also lead to dental fluorosis. The appearance is due to optical properties of a subsurface or surface porous layer with lower mineral content. The prevalence of dental fluorosis appears to be on the increase. Fluorosis also represents cosmetic problems. Although in its mild form the condition is not considered to be of cosmetic significance, the more severe forms can cause great psychological distress to the affected individual.<sup>2,3</sup>

The risk of enamel fluorosis is lowest when exposure takes place only during the secretory stage, but highest when exposure occurs in both secretory and maturation stages. In its milder form, enamel fluorosis is characterized clinically by diffuse opacities.<sup>4</sup> Several studies have shown that the prevalence and severity of dental caries has declined while dental fluorosis prevalence has increased. While the caries decline can be largely attributed to widespread use of fluoride dentifrice, as well as many other sources of fluoride.<sup>5,6</sup> Most studies have shown that fluoride is most effective in preventing dental caries especially on smooth surface lesions but less on pit and fissure lesions. Many studies have shown an increase in fluorosis with decreasing caries.

India is a country with diverse culture, ethnicity with 70% of the population residing in rural areas. Source of water has varying concentration of fluoride and studies have

demonstrated that concentration of fluoride in well water to be high endemic areas in India, are Rajasthan, Andhra Pradesh, few areas of Tamil Nadu, Karnataka, Uttar Pradesh and Punjab.<sup>7,8</sup>

A study has been attempted to know the prevalence of dental fluorosis, concentration of fluoride in water and correlation with dental caries among 13 to 15-year-old children in Panyam, Nandyal district in Andhra Pradesh, India.

## MATERIALS AND METHODS

### Sample Size

The cross-sectional epidemiological study was conducted among 202 government school children (in which 106 students were boys and 96 students were girls) of age group 13 to 15 years from Government Matriculation Higher Secondary School, Panyam, Andhra Pradesh. Official permission was obtained prior to the survey from the school principal. The clinical examination was carried by a single examiner. The intraexaminer variability and Kappa value was 0.85. The data was collected during the month of August 2011.

### Study Design

The demographic status—name, age, sex and address was obtained from the proforma and the subjects were examined for Dean's and DMFT index. Students were examined in their classrooms, where the natural lightening conditions were adequate. Dental fluorosis was assessed by Dean's index and scores were given accordingly as, 0—normal, 0.5—questionable, 1—very mild, 2—mild, 3—moderate, 4—severe using sterile mouth mirror and explorer. The instruments were later carried in a steel bin for autoclave.

### Inclusion and Exclusion Criteria

The study included children aging from 13 to 15 years. Consumed water from same borewell from birth was included in the study.

#### Exclusion Criteria

Children who had:

- Mixed dentition,
- Orthodontic appliances,
- Shifted to this area recently.

The fluoride estimation in the water was done by collecting 500 ml water from the bore wells used by the children around their school and near their residences. A total of eight samples was taken from the eight bore wells used for drinking. The water was then analyzed for the fluoride concentration.

## Data Analysis

The collected data were entered, into spread sheets. Chi-square test was applied and statistical analyses were carried out using SPSS version-15.

## RESULTS

This study showed that there were a total of 202 students in which 106 (52.4%) were boys and 96 (47.6%) were girls. Out of this, 62(30.6%) were in the age of 13 years, 71 (35.5%) were in the age of 14 years and 69 (34.1%) were 15 years.

### Fluoride Concentration

The fluoride concentration in the borewell was found to be 0.4, 0.7, 0.9, 1.2, 2.0 2.2, 2.4 and 2.7 ppm.

### Prevalence of Fluorosis

The prevalence of dental fluorosis was 41% (n = 83) out of which 38.7%, (n = 24) was in 13 years, 43.6% (n = 31) was in 14 years and 40.5% (n = 28) was in 15 years. The highest Dean's fluorosis score observed among the study population was score 2 (mild form).

For the age of 13 years 38 (61.2%) had score 0, 2 (3.2%) had score 0.5, 8 (12.9%) had score 1, 14 (22.7%) had score 2. For the age of 14 years 40 (56.3%) had score 0, 3 (4.2%) had score 0.5, 15 (21.1%) had score 1, 13 (21.4%) had score 2. For the age of 15 years 41 (59.4%) had score 0, 3 (4.3%) had score 0.5, 9 (13%) had score 1, 16 (23.3%) had score 2 (Table 1).

### DMFT Scores (Caries Prevalence)

The mean DMFT score for 13 years boy was 1.7 and 2.2 for girls. For fourteen years it was 1.3 for boys and 1.4 for girls while for 15 years it was 1.1 for boys and 1.9 for girls. There was a statistically significance between the groups ( $p < 0.04$ ).

The mean DMFT value of 13-year-old student is 1.95, 14-year-old student is 1.35 and 15-year-old student is 1.5. This shows 13-year-old students has the highest score when compared to other group of children. The mean Dean's value of 13-year-old student is 0.74, 14-year-old student is 0.84 and 15-year-old student is 0.81. Among them, 14-year-old students had the highest score when compared to other group of student and there was no statistically significance among the genders for fluorosis (Table 2).

## DISCUSSION

Fluorosis is endemic in most parts of India, Andhra Pradesh is considered a state with maximum number of districts

**Table 1:** Dean's fluorosis score among study population

Age	0		0.5		1		2		3		4		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
13	38	61.2	02	3.2	08	12.9	14	22.7	0	0	0	0	62	100
14	40	56.3	03	4.2	15	21.1	13	21.4	0	0	0	0	71	100
15	41	59.4	03	4.3	09	13.0	16	23.3	0	0	0	0	69	100

**Table 2:** Age-wise distribution of the mean DMFT and mean Dean's score

Age	Mean DMFT	Mean Dean's score
13	1.95*	0.74
14	1.35	0.84
15	0.50*	0.81

\* p &lt; 0.04

affected by fluorosis and it is seen that people in Nalagonda district in Andhra Pradesh are suffering from skeletal fluorosis. About 62 million population in India are at a risk of developing dental fluorosis. It has been noted that 1.5 lakh villages are endemic to fluorosis in India.

In the present study, it was found that the mean DMFT was 1.3 among boys and 1.83 among girls. This shows that there is increase in the prevalence of dental caries in females when compared with males. A study by Megas BF, Athanassouli TN, had also shown that females had an increased trend of dental caries when compared with males. He also stated that dental caries increases along with increase in age.<sup>9</sup>

The present study shows that there is increase in trend of dental fluorosis with decrease in dental caries and this had varied in different age groups. Among 13-year-old students, the mean Dean's values is 0.74 and mean DMFT score is 1.95 whereas in 14-year-old students the mean Dean's value is 0.84 and mean DMFT 1.35. The study also shows that there is decrease in dental caries in students of the same age group. This trend of increasing fluorosis with decreasing dental caries was also shown in a study done by Heller KE; Eklund SA; Burt BA<sup>10</sup> and Shashidhar Acharya.<sup>11</sup> Pit and fissure lesions are more commonly seen than smooth surface lesions. These pit and fissure lesions decreases due to increase in fluorosis.

The source of water being bore wells, it was seen in the present study that is more than 50% of sample who drank the water, which had concentrations between 1.2 to 2.7 ppm, the severity of fluorosis increased with the increase in the concentration of fluoride in water and this was in accordance with the study conducted by Bardsen et al<sup>12</sup> in Norway.

In the present study, the commonly affected tooth by mild form of fluorosis was premolars and molars. While the incisors and canines did show questionable from of mild fluorosis. Similar pattern was seen in the study conducted by Van Palenstein et al.<sup>13</sup>

In the present study, dental fluorosis revealed no significant difference between boys and girls, which was similar to studies conducted by Singh AA,<sup>14</sup> Dahiya S,<sup>15</sup> Chandrashekar J, Anuradha KP<sup>16</sup> and Galdys NO.<sup>17</sup>

The prevalence of dental fluorosis was found to be 41% in the present study which was slightly higher when compared to the studies conducted by Veeresh DJ<sup>18</sup> 31.4% and Nanda RS<sup>19</sup> 29.35%. The reason could be the variation in the climatic condition and water consumption by the study subjects.

The fluoride concentration in the our study ranged from 0.4 to 2.7 ppm which was similar to the range of fluoride concentration 0.9 to 2.9 in Veeresh DJ.<sup>18</sup>

## LIMITATION AND CONCLUSION

The role of diet and other sources of fluoride are not recorded in the present study. Climatic conditions in the area, where the study was conducted, which could have an influence on water consumption, were not recorded.

Dental fluorosis still exists as a major dental public health in India; measures need to be taken to control this by introducing defluoridation plants in various parts of the country. Though the caries experience in the present study is not so high, still provision should be made to render treatment to the children affected by caries. The is great need for introducing various small scale methods of defluoridation in the present study area to prevent dental fluorosis.

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