

Prevalence of Dental Fluorosis among Primary School Children in Rural Areas of Lucknow, Uttar Pradesh, India

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ABSTRACT

In preventive dentistry fluoride plays an essential role due to its cariostatic potential. However, excessive intake of fluoride leads to dental and skeletal fluorosis. Millions of people in India suffer from dental, skeletal and non-skeletal fluorosis. The objective is to find the prevalence of dental fluorosis among primary school children in rural areas of Lucknow, Uttar Pradesh India. A total of 1072 school children, residing in since childhood and consuming the groundwater, in the age group of 6–13 years were selected from various schools situated at different villages of the selected areas. Children were categorized in two age groups and were examined for dental fluorosis. Dean's criteria for assessment of dental fluorosis were used, and observations were recorded on a study specific Performa. Among the 1072 children examined, 376 (35%) were found to be having dental fluorosis, among which number of males 198 (52%) was more than females 178 (47%). Among the different grades of fluorosis observed, very mild dental fluorosis was observed in most of the cases (214). It was observed that the villages at Sitapur road had a maximum number of cases of dental fluorosis (48.9%). The rural areas near Lucknow city had a good number of cases of

dental fluorosis and the fluoride in groundwater of most of the area were in optimal level except in one village. There is a need to evaluate the other risk factors associated with the condition and optimal range of fluoride level (0.7-1.2 ppm) in water should come down.

Keywords: Dental Fluorosis, Prevalence, School Children, Rural, Lucknow, Uttar Pradesh.

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INTRODUCTION

Most of the oral diseases are preventable, but still they are a cause of suffering to millions of individuals worldwide. Moreover, if a disease can be prevented or intercepted at an early stage, it will minimize the impact on the cost of treatment. India is a developing country and is struggling to eradicate many medical and dental diseases.

Fluorine, a member of the halogen family, is an element essential for normal growth, development and maintenance of human health. In preventive dentistry fluoride plays an essential role due to its cariostatic potential. However, excessive intake of fluoride leads to dental and skeletal fluorosis. Approximately, 62 million people in India suffer from dental, skeletal and non-skeletal fluorosis out of which, six million are children below the age of 14 years.¹ 17 states have been found to be endemic for fluorosis in India where fluoride level in drinking water was found to be more than 1 ppm.² In the State of Uttar Pradesh Unnao, Sonebadra, Varanasi, Kanpur, Agra and Mathura encore the areas of concern for fluorosis.³⁻⁷

During Oral screening programs in primary schools of rural areas near Lucknow we came across many clinical cases of dental fluorosis. Since clinical dental fluorosis is the most convenient biomarker of fluoride exposure, it evoked the attention to find the prevalence of dental fluorosis in rural areas of Lucknow.

OBJECTIVES

- To assess the prevalence and severity of dental fluorosis among primary school children in rural area of Lucknow.
- To analyse fluoride content in drinking water of rural area in Lucknow.
- Comparison of dental fluorosis categories with various level of fluoride concentration in drinking water.

MATERIALS & METHODS

Study Design: After obtaining Ethical approval from Research cell, King George's Medical University, a Cross - sectional study was conducted at Primary school children of age group 6-13

years, in the rural areas of Lucknow. Schools from the villages were selected by dividing the geographical area of Lucknow into 5 major directions. Kanpur road, Sitapur road, Raibareilly road, Sultanpur road, Faizabad road. The villages from the respective areas were Dadupur, Narera, Beti, Pahadpur at Kanpur road, Gosaigang and Malauli at Sultanpur road, Rasoolpur and Mohammadpur at Sitapur road, Chinhhat at Faizabad road, Mohanlalganj at Raibareilly road. A list of primary schools in these rural areas was prepared from the list of directorate of education. Schools with an adequate number of children were selected from these four zones.

Ethical Approval, Permission and Consent: Ethical approval taken from ethical committee, King George Medical University, Lucknow. Permission to conduct study was taken from the School Principal and informed consent was obtained from each participant before data collection.

Clinical Examination: Oral examination was performed by two trained and calibrated dentists. All subjects were examined with autoclaved mouth mirror and explorer under adequate light. Data was recorded on a Performa using Dean's index (1942) based on the World Health Organization oral health assessment form, 1997.⁸ It consisted of two parts, first consisted of information on demographic data, source of drinking water and 2nd part consisted of table for recording fluorosis using the Dean's Fluorosis Index.⁹

Training and Calibration: The examiners had undergone a two-day training and clinical calibration exercise. Forty-eight school children were examined by each of the two investigators to assess inter-examiner & intra-examiner reliability.

Inclusion Criteria: According to criteria 1072 students were included in study.

- a) Children of selected schools in the age group of 6–13 years.
- b) The children who were residents of that particular region since birth.
- c) The children who were using groundwater as a source of drinking water from birth.
- d) Children having teeth with at least more than 50% of the crown erupted and no restoration.
- e) Children who were present on the day of examination.

Exclusion Criteria

- a. Those who did not get consent forms signed from their parents
- b. Children above the age of 13 years or below 6 years.
- c. Children who did not reside in that particular area since birth.

Sources and Fluoride Estimation of Drinking Water: All villages studied had hand pump water supply system. Water samples were collected in 500-ml sterile plastic bottles. They were labelled, coded and sent to laboratory for fluoride estimation on

the same day. Fluoride analysis was done by using electrode ion meter. Statistical Analysis were done using SPSS 18 version.

RESULTS

Among 1083 primary school children, 1072 were included in the study as the remaining were absent on the day of examination or did not fall in the inclusion criteria. The Subjects were divided into 2 groups, Group A (6-9 yrs) which consisted of 702 (65.5%) children and Group B (10 -13 yrs) which had 370 (34.5%) children. Amongst 584 (54.5%) male, group A had 365 (34%) males and group B had 220 (20.5%) males. Whereas out of 488 (45.5%) female, group A had 338(31.5%) females and group B had 150 (14%) females. [Table 1].

Prevalence of dental fluorosis among school children is 35% and the prevalence was more in males 198 (52%) than in females 178 (47%) [Table 2]. The number of children having dental fluorosis also varied according to the grades of fluorosis [Table 3]. In males, out of a total of 198 (52%) children, 102 children (17.5%) had very mild fluorosis, 80 children (13.7%) had Mild fluorosis, 16 children (2.7%) had moderate fluorosis. On the other hand in females, out of a total of 178 (47%) children, 112 children (22.9%) had very mild fluorosis, 58 children (11.9%) had Mild fluorosis, 8 girls (1.6%) had moderate fluorosis. None of the subjects fell into questionable & severe categories of fluorosis [Table 3].

Graph 1 shows severity of dental fluorosis in form of a pie chart which tells that 64.9 % of the subjects belonged to normal category, 20% to very mild, 12.9% to mild, 2.20% to moderate and 0% to severe kind of dental fluorosis.

Tables 4 shows prevalence of dental fluorosis in each area. At Sitapur road, out of 278 children examined, 136 (48.9%) had dental fluorosis and the level of fluoride in water was between 0.6-1.0 ppm. Out of 100 at Raibareilly road 36 (36%) had fluorosed teeth when the fluorosis level in water had been 0.5ppm. At Sultanpur road out of 226 children examined 68(30.3%) were suffering with dental fluorosis and the fluoride content in water had been in the range of 0.6- 0.9 ppm. Amongst 112 subjects at Faizabad road 32 (28.5%) had some or the other grade of dental fluorosis on drinking water having fluoride level between 0.5 and 1.1. And at Kanpur road, though the level of fluoride was between 0.6-1.0 ppm of 358 students 104 (29%) children were detected with fluorosed teeth. The level of fluoride in drinking water in different villages is shown in [Table 5].The villages at Kanpur road, Dadupur, Narera, Beti , Pahadpur had fluoride level 1ppm, 0.8 ppm, 0.6 ppm, 0.7 ppm respectively. Gousaiganj and Malauli at sultanpur road had fluoride level of 0.6ppm and 0.9ppm correspondingly. Chinhhat at Faizabad road had the highest level of fluoride in water 1.1ppm while Mohanlalganj at Raibareilly road had the least fluoride content of 0.5ppm in its drinking water.

Table: 1 Distribution of sample by Age and Gender

Group	Age	Gender		Total
		Male (%)	Female (%)	
Group A	6-9 yr	364 (34)	338 (31.5)	702 (65.5)
Group B	10-13 yr	220 (20.5)	150 (14)	370 (34.5)
Total		584 (54.5)	488 (45.5)	1072

Table: 2 Prevalence of Fluorosis according to Gender

Gender	No of children	No of children affected with Fluorosis	Percentage of children affect with fluorosis
Male	584	198	52%
Female	488	178	47%
Total	1072	376	35%

Table: 3 Distribution of Fluorosis on severity according to Gender

	No of children	No of children affected Fluorosis	Very mild (%)	Mild (%)	Moderate (%)
Gender Male	584	198	102 (17.5%)	80 (13.7%)	16 (2.7%)
Gender Female	488	178	112 (22.9%)	58 (11.9%)	8 (1.6%)
	1072	376	214	138	24

Note: No subjects in questionable & severe categories of fluorosis

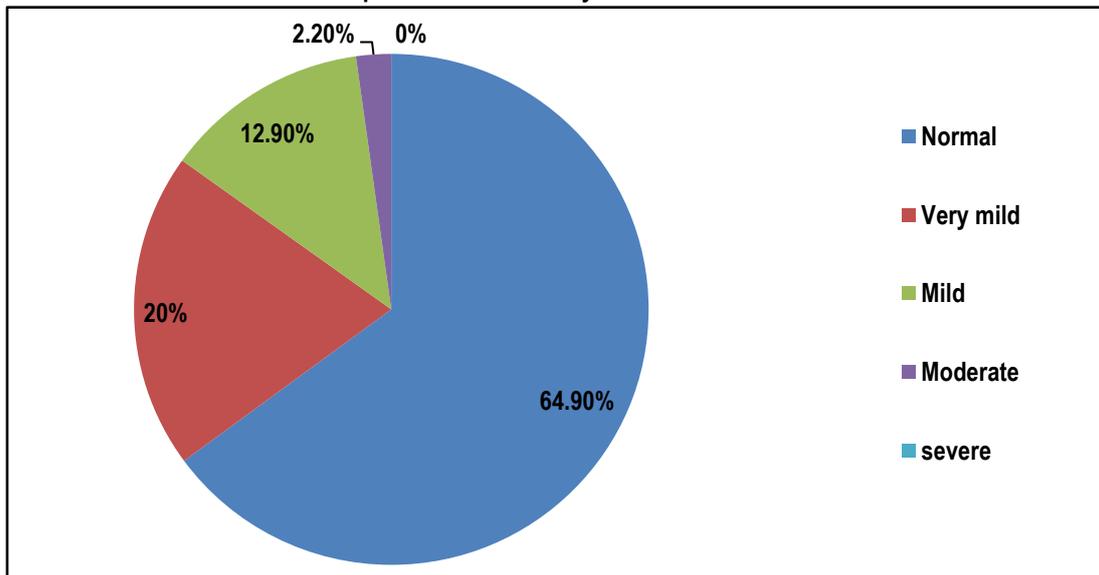
Tables 4: Prevalence of dental fluorosis and fluoride level in different areas

Area	Number of children examined	Number of children having dental fluorosis	Fluoride level (ppm)
Sitapur road	278	136 (48.9%)	0.6-1.0
Raibareilly road	100	36 (36%)	0.5
Sultanpur road	224	68 (30.3%)	0.6-0.9
Faizabad road	112	32 (28.5%)	0.5- 1.1
Kanpur road	358	104 (29%)	0.6-1.0
Total	1072	376 (35%)	

Tables 5: Fluoride level (ppm) in different Villages

S. No	Area	Lucknow Village	Fluoride level (ppm)
1.	Kanpur Road	Dadupur	1.0
		Narera	0.8
		Beti	0.6
		Pahadpur	0.7
2.	Sultanpur Road	Gosaiganj	0.6
		Malauli	0.9
3.	Sitapur Road	Rasoolpur, BKT	1.0
		Mohammadpur	0.6
4.	Faizabad Road	Chinhat village	1.1
5.	Raibareli Road	Mohanlalganj	0.5

Graph 1: Level of severity of dental fluorosis



DISCUSSION

Many researchers have stated the prevalence of fluorosis at areas near to Lucknow like Unnao, Sonebadra, Varanasi due to high fluoride content in water in these areas.^{3,10,11} The increasing number of cases of dental fluorosis during regular screening camps short distance between these places and Lucknow, led to the curiosity of this study. Our study was aimed to find out the prevalence of dental fluorosis among primary school children in rural areas of Lucknow.

The prevalence of fluoride - rich areas and fluorosis in Uttar Pradesh has been reported in the literature since long.¹²⁻¹⁵ In a study conducted in the year 1981 and 1975 in Varanasi and Lucknow city, result showed prevalence of 28.21% and 24% of dental fluorosis respectively.¹³⁻¹⁴ Even in the recent studies conducted in a different part of the same state, the graph shows a rise in number of cases. In the result of studies conducted in areas of Barabanki,¹⁶ Meerut,¹⁷ Raebareli,¹⁸ Rampur,¹⁹ Sonbhadra,³ Agra,¹⁹ Unnao,¹⁰ it has been shown that these areas have high fluoride content in the water.

In our study, the prevalence rate of dental fluorosis was 35% in primary school children which is more than what shown in previous study, reason would be the study conducted in rural area school children where most of the community dependent on hand pumps and wells. As reported by Srivastava et al., the prevalence of dental fluorosis, in the adjacent area of Unnao, is 28.6%.¹⁰ Study conducted by Bhalla et al shows 18% dental fluorosis prevalent in school children.²⁰

In Our study prevalence of dental fluorosis amongst male (52%) was more than females (47%) which supports the study done in 2016 by Maya Ramesh et al²¹ in which males (59%) were more commonly affected than females (55%). Bhalla et al²⁰ found a similar finding in 2015 where as 53.9% males and 46% females had dental fluorosis.

Among the different grades of fluorosis observed, very mild dental fluorosis was observed in most of the cases in our study and none of the subjects fell into questionable & severe categories of fluorosis which is similar to the findings of Jarvis et al study done in 2013 in Tanzania where he did not find any evidence of severe form of dental fluorosis in children.²²

In our data Faizabad road had the highest level of fluoride in water (1.1ppm) while Raibareli road had the least fluoride content of 0.5ppm in its drinking water. But the villages at Sitapur road had maximum number of children suffering with dental fluorosis (48.9%) where the level of fluoride was 0.6- 1.0 ppm. Since, no study has been conducted among school children in the area for the estimation of dental fluorosis, there is a shortage of data to compare and to link. Hence, further studies in this regard are required, as the results of our study show a significant number of children affected with dental fluorosis.

CONCLUSION

It was evident from the results that the rural areas near Lucknow city had a good number of cases of dental fluorosis and the fluoride in groundwater of most of the area were in optimal level except in one village. These findings make us curious to evaluate the other risk factors associated with the condition and a need to minimize the standardized optimal range of fluoride level (0.7-1.2 ppm) in water.

IMPLICATIONS OF THE PRESENT STUDY

- Groundwater samples collected at different locations showed optimum (1.0 ppm) level except in one village (1.1 ppm) but fluorosis cases has been found (35%).
- This work acts as a pointer to public health physicians, dentists, chemists, planners, administrators, engineers and water supply authorities of Lucknow.
- The information furnished can be utilized as preliminary data, and a well-designed epidemiological investigation can be undertaken to evaluate the other risk factors associated with the condition in the study region or optimal range of fluoride level (0.7-1.2 ppm) in water should come down as in this study many fluorosis cases has been detected at the level of 0.5 Or 0.6 ppm in water.

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Conflict of Interest: None Declared.

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