Original Article

STUDY OF PREVALENCE OF FLUOROSIS IN ENDEMIC VILLAGE OF KANKAR DISTRICT OF CHHATTISGARH STATE, INDIA

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ABSTRACT

Background: Endemic fluorosis is an important public health problem in certain pockets of Chhattisgarh. Fluorosis is caused by exposure to a continuous high level of fluoride for a long time leads to dental and skeletal deformities.

Objectives: Objective of the study is to find out the prevalence of dental and skeletal fluorosis among the population and to assess its relation to the drinking water fluoride level.

Methods: Cross sectional survey was undertaken in Domarpali Village, of the Kanker district, of Chhattisgarh state in May 2013. The survey covered 1359 (85%) individuals, including 824 males and 769 females. The prevalence of dental and skeletal fluorosis was assessed by clinical examination of individuals undertaken by house to house visits. Water fluoride levels of drinking water sources were determined.

Results: The prevalence of dental fluorosis was 24.8 % and skeletal fluorosis was 6.0%. Both the types were more common in males. Dental fluorosis was higher in the age group of 13 to19 years. The prevalence of skeletal fluorosis increased with increasing age. Common skeletal deformities were genu varum (12.2%) and genu valgum (0.7 %). Water fluoride levels in different localities ranged from 0.5 to 2.8 ppm.

Conclusions: This study has shown the relation of fluorosis to high fluoride levels of prime water sources. Change in water source from deep tube well and a hand pump with health education to the community is needed to reduce in order to reduce the problem.

Key Words: Dental fluorosis, skeletal fluorosis, Genu varum, Genu vulgam

INTRODUCTION

Fluorosis is an important public health problem in 24 countries across the globe. [1] Fluoride in water and eatables is mostly of geological origin. [2] A continuous levels of fluoride more than 1.5 ppm and above in drinking water is considered hazardous for the health.[1, 2] India lies in a geographical fluoride belt, which extends from Turkey up to China and Japan through Iraq, Iran and Afghanistan.[3] In India, the disease is endemic in about 275 districts of 20 states and UT's, with 66 million people, at risk. [3] In Chhattisgarh state, Durg and Dantewada districts have endemic pockets.[4] Clinically, the disease manifests in dental and skeletal forms.[2] Dental fluorosis is mostly seen in children when the exposure is between 1 to 4 years of age and mostly occurs in children below 12 years of age.[5] Skeletal fluorosis clinically manifests in the form of various deformities viz. Genu varum, Genu valgum and Kyphosis.[6, 7,8] The disease severity depends on many factors like age, nutritional status and response of the

individual to exposure. [9] Children, adolescent and adults are found to be the main victims by some researchers. [5,10] The aim of the survey was to assess the burden of fluorosis, identify types of deformity and to assess the fluoride concentration in prime drinking water sources with the aim of initiating suitable interventions.

METHODOLOGY

A cross sectional survey of the Domarpali village of Kanker district was undertaken in May 2013. The survey teams, each consisting of three members, headed by a doctor, were prepared and imparted a brief training about survey technique and methodology. House to house survey of the whole village was undertaken by these two teams simultaneously on the first and second day to cover the entire population. A follow-up visit was made to those houses which were found locked and individuals who were found absent on the days of the survey. During house to house visits, all available house members were clinically examined. The information was filled in the pre-designed proforma. The scheduled were filled in consent of head of Household. Operational case definitions were used for labelling the cases of dental fluorosis, genu valgum, genu varum and kyphosis. Sources of drinking water were also identified. Water samples were taken from most commonly used water sources from each para, collected in a clean bottle and labelled, coded and sent to Public Health Engineering laboratory at district headquarter, for estimation of water fluoride levels. The data were retrieved and analyzed using MS excel to calculate frequencies, proportions and whenever applicable statistically test were applied.

RESULTS

The Domarpali village is located in a Narharpur block of Kanker district with population 1593. The survey covered 85% (1364) of the population of the village. Surveyed population included 47.9% of males and 52.1% females. The numbers of children surveyed below 12 were 99 (7.2%) and adolescents (13 to 19years) were 134 (9.8%). Those above 65 years constituted only 16 (1.1%) individuals.

Occupant of Neecha para, Ramna and Rehna Para was poor and low wage earners. Staple food was mainly rice and limited pulses for majority of residence. No other specific food items were consumed regularly from the checklist of probable food items with high fluoride level. The village had 41 hand pumps and the majority of inhabitants of villages were relying solely on own hand pump. The majority of villagers were also changing the sources of drinking water as per their convenience and need. The overall prevalence of fluorosis in surveyed population was 30.5% as showed in Table 1. The highest prevalence (44.0%) was recorded in Bandha Para followed by Neecha para (39.7%) with a high fluoride concentration in the prime water source. The fluoride level of prime drinking water sources of 41 surveyed para which ranged from 0.5 ppm to 2.86 ppm. As shown in table 2, prevalence of dental fluorosis was more among 16-45 years of males while in females. The prevalence of skeletal fluorosis was more common above 45 years of age both in males (5.5%) and females (2.7%). Dental fluorosis was the commonest (81.2%) followed by genu varum (12.2%) and genu valgum (0.7%). Multiple deformities were noted in 5.2% of the population surveyed with two persons has kyphosis.

Table 1: Para wise Prevalence of fluorosis and prime drinking water fluoride levels Domarpali Village of Chhattisgarh

Hamlets	Population	Fluorosis cases	Prevalence	Mean Fluoride level of water (ppm)	Min-max	SD
Bandha para	125 (9.1)	55 (13.1)	44.0	2.36	1.0-2.5	0.2
Neecha para	141 (10.3)	56 (13.4)	39.7	2.51	2.5-2.5	0.0
Ramna para	22 (1.6)	7 (1.6)	31.8	2.30	2.3-2.3	0.0
Rehna para	74 (5.4)	23 (5.5)	31.0	2.63	1.6-2.7	0.3
Ramnagar para	230 (16.8)	67 (16.0)	29.1	2.24	1.0-2.5	0.4
School para and Bajar Chwok	436 (31.9)	125 (29.9)	28.6	2.05	0.5-2.8	0.5
Kaaspara	171 (12.5)	49 (11.7)	28.6	2.02	1.6-2.6	0.4
Tariya para	165 (12.0)	35 (8.3)	21.2	2.20	1.5-2.3	0.2
Total	1364 (100)	417 (100)	30.5	2.19	0.5-2.8	0.4

(Figure in parenthesis indicate percentage)

Table 2: Prevalence of fluorosis as per age and sex

Type of fluorosis*	Sex	6-12 Yrs	13-19 Yrs	20-45 Yrs	45-65 Yrs	Prevalence of Fluorosis
Dental Fluorosis	**Female**	55(7.7)	67(9.3)	38(5.4)	13(1.9)	173(24.3)
	Male	44(6.7)	65(9.9)	61(9.3)	18(2.8)	188(28.7)
Skeletal Fluorosis	**Female**	3(0.4)	2 (0.2)	4(0.5)	20(2.9)	29(4.0)
	Male	0(0.0)	4(0.6)	19(2.9)	26(3.9)	49(7.4)

(Figure in parenthesis indicate prevalence percentage)
*22 persons having both dental and skeletal type of fluorosis

DISCUSSION

The relationship between level of fluoride in drinking water and the prevalence of fluorosis has been found to vary from region to region. [11,12, 13] In the present survey, the resident of Bandhapara, constituting about 9.1% of the surveyed population, showed higher prevalence (44%) of fluorosis, which is related well with high fluoride levels of their prime drinking water source.

In the present study the prevalence of fluorosis was not found to be related to water fluoride level concentrations in all the paras. This may be also possible due to the habit of frequently changing the drinking water sources by the villagers among the paras. It may be also possible be due to the difference in occupation that may affect the amount of drinking water consumption by inhabitants of different paras. Moreover, possible contribution of other factors related to the host like nutrition, concomitant worm infestation etc. cannot be ruled out. [9] A detailed follow up investigation is required to explore the role of specific factors. The study results also show the prevalence of dental fluorosis as 23.9%. Other studies, mostly been undertaken among the school children, had reported higher prevalence. [14, 15, 16, 17]

Further, in the present survey, the prevalence of dental fluorosis was higher in individual between 10-19 of age compared to higher age groups, which is not in line with the available scientific information which states that the dental fluorosis occurs when exposure is less than 4 years of age and those above 8 years are not at risk. [18,19] However, researchers from rural Tamil Nadu [3] and Haryana [20] have reported a higher prevalence in the latter age group, like the present survey. Our findings do not say anything about the period of fluoride ingestion in the studied population. These findings have been attributed to greater body size, increased physical activities and difference in food consumption pattern in the older age group. Further a cumulative effect of earlier exposure may also contribute to higher prevalence in the higher age groups. We also found a higher prevalence of dental fluorosis among males, which is similar to observations made in Uttar Pradesh, India. [21] This was in contrast to findings from Kerala where higher prevalence was reported among girls [22].Some authors have found no significant gender differences in dental fluorosis. [23, 24, 25] Higher physical activities among boys, the difference in food pattern and drinking water habits as well as higher mobility of the boys might have exposed them to water sources with higher fluoride levels.

The prevalence of skeletal fluorosis was about 6.0% in the present survey. Males reported higher prevalence (7.4%) as compared to female (4.0%). The findings are in accordance with the other observers in Andhra Pradesh [6], Karnataka [10, 26] and southern China.[27] Prevalence also increased with increasing age. Other authors have also reported similar pattern. [6, 10, 28] This may be due to the cumulative effect of long term exposure to higher fluoride levels. In the present survey, genu varum (16.5 %) genu valgum (1.6%) were the commonest skeletal deformities, similarly reported by other authors. [6, 10]Our enquiries, about the food was restricted to the recording of general dietary pattern of the community and use of specific food items by them, as per structured list. We failed to find any significant factor in diet contributing to fluorosis. Detailed chemical examination of the food item has not been done. Thus, present findings are mainly attributed to exposure to water with higher fluoride levels. Same finding has been identified as a major factor by several other studies also. [6, 8, 10, 14, 18] It can be summed up that the study reports higher prevalence of dental fluorosis in school children and young adults. The prevalence of skeletal fluorosis increased with increasing age. The prevalence of both dental and skeletal fluorosis was higher in males. Common skeletal deformities were genu varum and genu vulgum. Multiple deformities were also reported in younger age group.

CONCLUSION

The study relates the occurrence of dental and skeletal fluorosis to high levels of fluoride in prime drinking water sources, mainly deep tube wells of paras. An immediate change in water supply to common water source along with health education to the community is highly desirable. Possibility of other measures to decrease the water fluoride level of tube well may also be explored i.e. installation of defluoridation plants.

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