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Dental Fluorosis In Nanded District: An Overview

Motekar Shrinivas C.

Dept. of Chemistry, Sunderrao Solanke Mahavidyalaya, Majalgaon, Dist:Beed, affiliated to Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (M.S.) India. Email: shrimotekar@rediffmail.com

Abstract: The objective of this study is to assess the fluoride exposure through drinking water. Assessment of fluoride exposure was completed through the SPANDS technique. Dissolution of fluoride-containing rock minerals is the source of naturally occurring fluorides in groundwater. Fluoride concentrations exceeding the standards cause dental and skeletal fluorosis. Drinking water is the largest contributor of fluoride in daily intake of Nanded people. A total of 20 samples were collected from 20 villages of Nanded district. 80% of the samples contain fluoride below 1.5 mg/l. The results indicate that the fluoride content in all the sampling stations was found within the permissible levels as per WHO standards. This paper presents a review, which focuses on the sources of fluoride in drinking water, its impacts on health and different control measures.

Keywords: Groundwater, Fluoride, Dental Fluorosis, Skeletal Fluorosis,

1. Introduction

In nature Fluorine is the most abundant and near about 96% of fluoride in the human body is found in bones and teeth. Fluorine is required for the normal mineralisation of bones and formation of dental enamel [1]. We get Fluoride mostly from drinking water and food such as sea fish, cheese and tea [2]. The prescribed level of fluoride in potable water in India is 0.5 to 0.8 mg/l [3,4].

Dental Fluorosis is serious problem in all over Nanded district. Out of the 85 million tons of fluoride deposits on the earth's crust, 12 million are found in India [5]. Hence it is quite natural that fluoride contamination is widespread, intensive and alarming in all over Nanded district. Endemic fluorosis is prevalent in Nanded district [6]. It has been estimated that the total population consuming drinking water containing elevated levels of fluoride is over 70 percentages. Endemic fluorosis resulting from high fluoride concentration in groundwater is a public health problem in Nanded district [7]. From literature survey it is clear that 15 States in India are endemic for fluorosis (fluoride level in drinking water >1.5 mg/l), and about 62 million people in India suffer from dental, skeletal and non-skeletal fluorosis. Of these; 6 million are children below the age of 14 years [8,9]. Groundwater is considered as the major source of drinking water in most places on earth. People in villages think that groundwater is safe for drinking purposes and majority of people in Nanded district region use groundwater for drinking purposes.

Hence Nanded district is one of the worst fluorosis affected regions, with large number of people suffering. This is because a large number of people rely only on groundwater for drinking purposes and water at many places is rich in fluoride [10]. In India 62 million people and about 6 million children are estimated to have serious health problems due to consumption of fluoride contaminated

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groundwater [11]. No serious survey has been done in Nanded district region. Though World Health Organization (WHO) has laid down the upper limit of fluoride concentration in drinking water at 1.5 mg/l [12], the Bureau of Indian Standards, has set Indian standards as 1.0 mg/l as maximum permissible limit of fluoride. [13]. Consumption of fluoride contaminated water higher than the optimum level is the major reason for dental and skeletal fluorosis. After meeting with dentists and doctors it has been found that many children in Nanded region suffer from Dental fluorosis. Fluoride in groundwater is from the rocks which are rich in fluoride. Most of the people affected by high fluoride concentration in groundwater live in the villages as they strongly believe that consumption of groundwater is safer for drinking purposes.

2. Materials and Methods

The water quality parameters estimated by the standard methods given by APHA (14). For the Fluoride contamination checkup groundwater samples were collected every month during the study year from January 2017 to December 2017 from 20 different sampling stations of Nanded district region. The water samples were collected in pre-cleaned polyethylene bottle. The fluoride is estimated by SPANDS method. A calibration standard ranging from 0 to 1.4 mg F^-/L was prepared by diluting an appropriate volume of standard F^- solution. To 50 mL of standard solution, 10.0 mL the SPADNS reagent was added and mixed well. The spectrophotometer was set at wavelength of 570 nm, and a calibration graph was prepared from different standard concentrations.

3. Result and discussion

A total of 20 samples were collected from 20 villages of Nanded district region as shown below in Table 1. Among these villages, 4 drinking water samples from four locations contain above 1.5 mg/l of fluoride. 80% of the samples contain fluoride below 1.5 mg/l. The results indicate that the fluoride content in all the sampling stations was found within the permissible levels as per WHO standards. The drinking water fluoride levels of all locations in selected villages of Nanded district region are shown in figure below

Table 1: Different villages in Nanded District showing Fluoride Concentration

Sample No.	Village	Fluoride content in the sample (mg/L	Sample No.	Village	Fluoride content in the sample (mg/L)
1	Kinwat	0.4	**11**	Himayatnagar	0.3
2	Bhokar	0.4	**12**	Nanded	1.7
3	Mudkhed	0.5	**13**	Chinchala	0.3
4	Umri	1.7	**14**	Amdari	0.5
5	Dharmabad	1.6	**15**	Seetakhandi	0.7
6	Kandhar	0.3	**16**	Borgaon	0.9
7	Biloli	0.1	**17**	Pandharwadi	0.4
8	Barad	0.1	**18**	Ritha	0.8
9	Bhosi	0.2	**19**	Halda	1.7
10	Pandurna	0.2	**20**	Mogali	0.4

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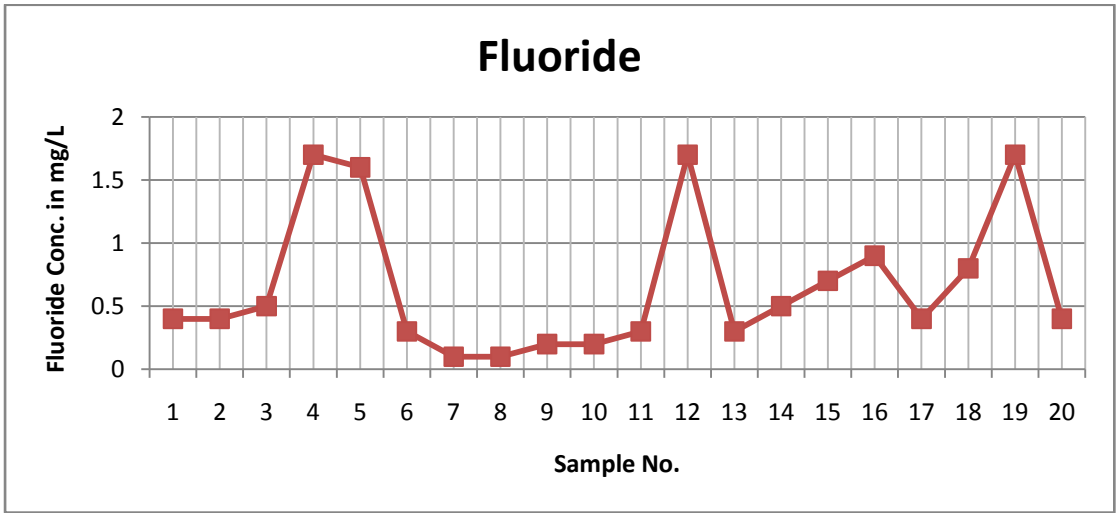

Fig: Drinking water fluoride levels

Prolonged administration of fluoride through drinking water in excess of the daily requirement is associated with dental and skeletal Fluorosis. Similarly, less intake of fluoride than required in drinking water is associated with dental caries [15]. Hence Fluorine is often called as two-edged sword.

Fluorosis of dental enamel takes place when excess Fluoride enters in the body during the years of tooth calcification-essentially during the first 7 years of life. It is characterised by mottling of dental enamel, and it has been reported at the levels of 1.5 mg/L intake and above [16]. If this process is continued for long time the teeth become hard and brittle. This is called dental fluorosis. In the initial stages of Dental fluorosis tooth become yellow to brown to black coloured. If the situation is severe, it may result into discolouration of the teeth or formation of pits in the teeth. The colouration on the teeth occurs in the form of spots or as streaks. Dean's classification of dental fluorosis is given in Table-2.

4. Conclusion

The survey and study tried to find the corelation between the fluorosis and the fluoride levels in the drinking water in the Nanded area. The results of the present study shows no corelation between the fluoride content in water and the levels of fluorosis as only four samples show upper limit of fluoride. But we do not negate the well documented fact that fluorosis is caused by ingestion of high levels of fluoride. Further studies to assess the serum fluoride level might help to know if the fluoride consumption is still high and if so, may point to some other source than the water or infant formulas. Thorough study of taking into account other variables like drug intakes, artificial feeding formulas may help to know the development of fluorosis in these areas. Since, any fluorosis is irreversible; its prevention is necessary, using various intervention measures. Fluoride poisoning can be controlled or reduced by using alternative water sources, by removing excessive fluoride from drinking water. It can also be reduced by better nutrition to children. The simple way is provision of surface water, rainwater and consumption of Low-fluoride groundwater [18]. Defluoridation of water through flocculation and adsorption also controls fluorosis. Health education and better nutrition are the some of the cost-effective intervention measures [18].

Table 2: Criteria for Dean's Fluorosis Index [17] Score Criteria

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Score	Criteria
Normal	The enamel represents the usual translucent semivitriform type of structure. The surface is smooth, glossy, and usually of a pale creamy white colour.
Questionable	The enamel discloses slight aberrations from the translucency of normal enamel, ranging from a few white flecks to occasional white spots. This classification is utilized in those instances where a definite diagnosis of the mildest form of fluorosis is not warranted and a classification of "normal" is not justified.
Very Mild	Small opaque, paper white areas scattered irregularly over the tooth but not involving as much as 25% of the tooth surface. Frequently included in this classification are teeth showing no more than about 1-2 mm of white opacity at the tip of the summit of the cusps of the bicuspids or second molars.
Mild	The white opaque areas in the enamel of the teeth are more extensive but do not involve as much as 50% of the tooth.
Moderate	All enamel surfaces of the teeth are affected, and the surfaces subject to attrition show wear. Brown stain is frequently a disfiguring feature.
Severe	Includes teeth formerly classified as "moderately severe and severe." All enamel surfaces are affected and hypoplasia is so marked that the general form of the tooth may be affected. The major diagnostic sign of this classification is discrete or confluent pitting. Brown stains are widespread and teeth often present a corroded-like appearance.

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