

Impact of Fluoride Content in Bore-well Drinking Water at Jafrabad City Dist. Jalna (M.S.) India.

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Abstract

Water pollution, like other types of pollution result when an overwhelming amount of waste comes from different sources of pollutant which harmfully disrupts the balance of the ecosystem; This work aimed to analyze the fluoride concentration in bore-well drinking water. Fluoride content was estimated from bore-well drinking water of Jafrabad region of Jalna District (M.S.) in the year 2018. From this area 20 bore-well water samples were collected for checking fluoride contents. The concentration of fluoride content was found in between 0.2 to 2.3 mg/lit. In some bore-well drinking water samples, the fluoride content was more than the permissible range (0.5 to 1.5 mg/ lit) affecting the yellowing of teeth in the children and causing dental and skeletal fluorosis in different age group of people of Jafrabad area.

Keywords: Fluoride content bore well drinking water, Jafrabad city, and fluorosis.

Introduction

Water is fundamental to life on our planet, but this precious resource is increasingly in demand and under threat. Water is most important resource on the earth. In India, the main sources of drinking water are rivers, lakes, storage dams, well, bore wells etc. All these resources are more or less polluted. Only 20% people get clean drinking water and rest 80% satisfy their thirst from polluted water [1]. In water, numbers of organic and inorganic compounds are found in dissolved condition in various proportions, those which are useful as well as harmful to the human being and also to the plants.

Fluoride is an important trace element in human life. It is useful in preventing tooth decay and maintaining the bone structure. Deposition of calcium phosphates in matrix vesicles is initiated by fluoride and thus help in facilitating the nucleation process prior to bone mineralization. It also plays an important role in the formation of dental enamel. Normal metabolism of bones and teeth require fluoride in some amount. Fluorides also reduce the chlorophyll pigments and protein contents in the plants [2]. It is estimated that up to 0.34 mg/L of fluoride can be contributed by the use of superphosphate fertilizers in agricultural land [3]. Areas nearby brick oven productions also show a higher concentration of fluoride in groundwater [4]. Clay used in the manufacture of bricks contains several hundred ppm of fluoride [5].

Methodology

The study area is situated on the bank of the Purna river in 50 km away from Jalna district (M.S.). The average maximum temperature is about 36.43°C and minimum 11.14°C with average rainfall is about 78 to 98 cm. The level of fluoride in bore well water of this area is not measured earlier. Therefore the present investigation is made. The water samples were collected from 20 borewells from different colonies for the detail study of fluoride content in Jafrabad from East, West, North, and South zone. A total 20 samples were collected in polythene bags which were cleaned and finally washed with acid water, followed by rinsing twice with distilled water. The water samples collected were chemically analyzed. The analysis of water was done using procedure of standard method prescribed by BIS and WHO [6, 7]. The samples of water for the analysis were collected during the months of June 2018 to January 2019.

Results and Discussions

High concentration of fluoride in ground water beyond the permissible limit of 0.5 to 1.5mg/L is a major health problem in India. Studies show that India has become

one of the worst fluorosis affected countries. This is because a large number of people rely on groundwater for drinking purposes and water at many places is rich in fluoride. Sometimes fluorosis may occur due to the inhalation of fluoride dusts/fumes in the industry and also from drinking tea. Nearly 90% of rural population of the country uses ground water for drinking and domestic purposes and due to excess fluoride in ground water. A huge rural population is threatening with health hazards of fluorosis. The high fluoride concentration in ground water in Nalgonda district reported by many researchers [8-10]. In the present study, fluoride in different concentrations was found in all the water samples which were collected from different areas of Jafrabad. The fluoride percentage was found in the range between 0.2 to 2.3 mg/lit. The permissible limit set by WHO as well as Bureau of Indian Standards (BIS) for fluoride in drinking water is 1.5 mg/L. But Teotia and Teotia[11] suggested that the maximum permissible limit of fluoride as 0.5 mg/lit. They also reported that more than 0.5mg/lit fluoride in drinking water causes 'Yellowing of Teeth' in human beings. The high fluoride content in water is generally associated with low concentration of calcium, magnesium and high concentration of bicarbonates and nitrates ions [12]. In the present investigation, the concentration of fluoride exceeded the permissible limit in 11 samples. In 6 samples, fluoride content was found more than 0.5mg/lit. The two samples from Killa Region and Dhanagarwada were with extremely high concentration of 1.98 mg/lit and 2.3 mg/lit, respectively. Similarly, Shaik Arshad et.al. [13] observed the fluoride content in the samples ranged from as low as 0.5mg/L to 5mg/L. Yellowing of teeth was observed in Dhanagarwada region in most of the children, which is a major public health problem in this region. The people who use the water for drinking purposes from the sampled bore-wells having fluoride content more than permissible limit may suffer from dental and skeletal fluorosis because higher concentrations of fluoride present in water.

In the present work, all six water samples of East zone were examined. The fluoride percentage was found in between 0.20-2.30mg/lit. Out of six samples, two

samples were found fluoride percentage more than 1.5 mg/lit. while one sample i.e. Dhangarwada was with extremely high concentration i.e. 2.30 mg/lit.(Table1). From the West zone, total five samples, from colonies were examined. Out of these, one sample was found with fluoride percentage more than permissible limit (Table 2). From the North zone of Jafrabad city, total 5 samples were examined. The ranges of fluoride percentage were 0.2-1.16 mg/lit. Out of five samples, all samples were found within permissible limit (Table 3) and from south zone four water samples were estimated. One sample i.e. Killa region indicated percentage more than permissible limit (Table 4). It is

evident from the above observations data; it is obvious that in some areas, the fluoride concentration is more than the limits for drinking purpose. Fluoride content of 1.5 mg/lit in drinking water has no biological side effects. Studies in these areas revealed that, fluoride level is more than the permissible level in drinking water and consumed for a period of 9 to10 years caused dental fluorosis. Similar type of observation reported by Galagon[14] in drinking water to produce severe form of dental and mild form of skeletal fluorosis consumed for a period of 15-20 years. Health status of the people is varied in different colonies of Jafrabad city because of severity of fluorosis.

Table 1: Fluoride content in drinking water from the borewell from East zone of Jafrabad city and respective colonies

S.N.	Name of the sampling Site	Month of sampling	Percentage (%) offluoride (mg/lit.)
1	Shivaji Nagar	June 2018	0.22
2	Sambhaji Nagar	June 2018	0.26
3	Vitthal Nagar	June 2018	1.63
4	Aadarsh Colony	July 2018	0.68
5	Civil Colony	July 2018	0.55
6	Dhangarwada	July 2018	2.30

Table 2: Fluoride content in drinking water from the borewell from West zone of Jafrabad city And their respective colonies

S.N.	Name of the sampling Site	Month of sampling	Percentage (%) offluoride (mg/lit.)
1	Aref Colony	Aug 2018	0.75
2	Samata Nagar	Aug 2018	0.42
3	Gokul Nagar	Aug 2018	0.34
4	Vrundavan Colony	Sep 2018	0.40
5	Morandi Mohalla	Sep 2018	1.83

Table 3: Fluoride content in drinking water from the borewell from North zone of Jafrabad city And their respective colonies

S.N.	Name of the sampling Site	Month of sampling	Percentage (%) offluoride (mg/lit.)
1	Bheem Nagar	Oct 2018	0.25
2	Parvati Nagar	Oct 2018	0.39
3	Sahyog Colony	Oct 2018	0.98
4	Siddharth Colony	Nov 2018	1.16
5	Barad Area	Nov 2018	0.65

Table 4: Fluoride content in drinking water from the borewell from South zone of Jafrabad city And their respective colonies

S.N.	Name of the sampling Site	Month of sampling	Percentage (%) of fluoride (mg/lit.)
1	Killa Region	Dec 2018	1.98
2	Police Colony	Dec 2018	0.42
3	Pratik Nagar	Jan 2019	0.31
4	Pralhad Colony	Jan 2019	0.22

Conclusion

It is concluded from the present study that, the Jafrabad city is under threaten of fluoride content in bore well water in some areas. Fluorosis is the growing problem in the city. To combat the growing problem of fluorosis, it is very important to understand the distribution and occurrence of fluoride in ground water and workout strategies for its migration and management. Some of the option available for removal of fluoride from drinking water are like, adsorption by activated alumina, ion exchange, reverse osmosis, electro dialysis, and alternate fluoride free aquifer.

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