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Short Communication

FLUORIDE ION CONCENTRATION OF GROUND WATER FROM DHARMABAD, DISTRICT NANDED, MAHARASHTRA

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ABSTRACT: Most of the people in rural areas depend on bore well, hand pumps and wells for drinking water. The present investigation was undertaken to study the level of fluoride ions in the groundwater of Dharmabad collecting two samples of the groundwater from different locations and fluoride ion concentration was studied every month during November 2009 to October 2010. The fluoride ion varies form 1.4 to 2.4 mg/lit. The maximum permissible limit is 1.2 mg/l

Keywords: Fluoride ion, Groundwater, Dharmabad town, Pollution,

INTRODUCTION

Water is essential natural resource for sustaining life and environment which we have always thought to be available in abundance and free gift of nature. However, chemical composition of surface or subsurface, geothermal or non – thermal, is one of the prime factors on which the suitability of the water for domestic, industrial or agriculture purpose depends. Groundwater forms a major source of drinking water in urban as well as in rural areas. Most of the population lacks drinking water and sanitation. Major problems are being faced due to the presence of excess fluoride, arsenic and nitrate in groundwater in certain parts of country.

Fluoride is known to contaminate groundwater reserves globally. Sporadic incidence of high fluoride content in groundwater has been reported from India, China, Sri Lanka, West Indies, Spain, Holland, Italy, Mexico, and North and South American countries. Abnormal level of fluoride in water is common. The main source of fluoride in the water is fractured hard rock zone with pegmatite veins. The veins are composed of minerals like topaz, fluorite, flour-apatite, villuamite, cryolite and fluoride-replaceable hydroxyl ions in ferromagnesium silicates. Fluoride ions from these minerals leach into the groundwater and contribute to high fluoride concentrations.

At low concentrations fluoride can reduce the risk of dental cavities. Exposure to somewhat higher amounts of fluoride can cause dental fluorosis. In its mildest form this results in discolorations of teeth, while severe dental fluorosis includes pitting and alteration of tooth enamel. Even higher intakes of fluoride taken over a long period of time can result in changes to bone, a condition known as skeletal fluorosis. This can cause joint pain, restriction of mobility, and possibly increase the risk of some bone fractures.

It is not good for health if the fluoride ion (F-) concentration is excess than the desirable limit given by International Standards. Due to its high electronegativity, it forms only fluorides and no other oxidation states are found (Hem 1992). Fluoride ions have dual significance in water supplies.

High concentration of fluoride causes dental fluorosis (disfigurement of teeth), bending of vertebral column, deformation of knee joints, and other bones of the body, and even paralysis. At the same time concentration less than 0.6 ppm results in dental caries and dental motling (Rao and Venkateshwarulu 2000) . Hence it is essential to maintain fluoride concentration between 0.6 to 1.2 ppm in drinking water (ISI 1983 and WHO 1994).

MATERIALS AND METHODS

The groundwater samples were collected every month during the study year from November 2009 to October 2010 from two different sampling stations of Dharmabad town of Nanded district, Maharashtra. The water samples were collected in pet bottles of one liter capacity and before filling, bottles were rinsed with water understudy. Water samples were analyzed by using the Sodiaum-2-parasulphophenylazo-1-8-dihydroxy-3, 8 naphthalene disulphonate (SPADNS) colorimetric 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 (Perkin Elmer model LAMBDA 40) was set at wavelength of 570 nm, and a calibration graph was prepared from different standard F– concentrations.

RESULTS AND DISCUSSION

The monthly values of fluoride ion concentration are tabulated in the Table: I The fluoride concentration values are variable during the study year. The higher concentration is found in the month of September, October and November 2009 which is 2.3mg/L to 2.4mg/L. The lower concentration is during summer in February and March 2010. All the values are above the range of ISI 1983 and WHO 1994.

If a groundwater supply is found to have fluoride concentrations higher than the drinking water guidelines, use water from an alternate source, such as a municipal system, or a nearby well that has been tested and found to be safe, install an effective, in-home water treatment system or use bottled water. Boiling water or using pitcher-type carbon filtration devices will not reduce fluoride concentrations. Activated alumina filtration, distillation, ion exchange or reverse osmosis treatment methods can reduce the concentration of fluoride in drinking water but are expensive for use in small water systems or households. If water tests indicate a fluoride concentration greater than 1.5 mg/L but less than 4 mg/L, retesting is recommended prior to considering costly treatment options.

High profile of fluoride in shallow zone groundwater is due to the geochemical disposition in the vicinity of the groundwater extraction structures. The toxicity of fluoride is also influenced by high ambient temperature, alkalinity, calcium and magnesium contents in the drinking water. Most of the fluoride found in groundwater is naturally occurring from the breakdown of rocks and soils or weathering and deposition of atmospheric volcanic particles. Fluoride can also come from runoff and infiltration of chemical fertilizers in agricultural areas, septic and sewage treatment system discharges in communities with fluoridated water supplies liquid waste from industrial sources.

Fluorine values useful for our body are very close to toxic values, so a dispense not aimed and personalized can cause high risk of overdosing and chronicle poisoning, with consequent skeleton deformation, spots on tooth enamel, osteosclerosis, neurological disorders, damages on the thyroids and even tumors. According with some research 10% of fluoride doesn't deposit in teeth and bones, but in organisms such as kidneys. Fluorine has negative effects on the central nervous system, determining behavior alterations, cognitive deficit, influencing on the foetus development even in concentration not harmful for the mother.

Table: I Fluoride ion concentration

Month	Fluoride Ion Concentration	
	Station A mg/L	Station B mg/L
November 2009	2.3	2.3
December 2009	1.8	2.0
January 2010	1.4	1.6
February 2010	1.5	1.6
March 2010	1.5	1.4
April 2010	1.6	1.7
May 2010	1.5	1.6
June 2010	1.7	1.8
July 2010	1.8	1.6
August 2010	2.0	1.8
September 2010	2.2	2.3
October 2010	2.3	2.4

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