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Research Article

MONITORING THE FLUORIDE LEVEL IN THE DRINKING WATER OF NAHARKATIA CIRCLE OF THE DIBRUGARH DISTRICT, ASSAM

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ABSTRACT

It is very essential to know the concentration of chemical contaminants like fluoride, arsenic etc. in the drinking water. We collected and estimated the water samples of Naharkatia circle, one of the circle of the Dibrugarh district, Assam. The water samples were analyzed for pH, Conductivity, TDS, TH, fluoride, calcium and magnesium. Total 25 water samples were collected from different locations. The sources of all the water samples were hand tube wells, well and river water. Drinking water of the region was found slightly acidic in nature. Fluoride level varies from .0109 mg/L to .2976 mg/L. Hardness, Calcium and magnesium concentration were found quite low.

Keywords: Fluoride, Fluorosis, Ground-water, Drinking water.

INTRODUCTION

Water is essential for sustaining life. Therefore drinking water should be free from microbial or chemical contamination. Fluoride is one of the chemical species present in natural water which may affect the human health. The permissible level [1] of fluoride in drinking water is 1.5 mg/L. Fluoride concentration excess of this value can cause dental as well as skeletal Fluorosis.

Fluorine is the most electronegative of all the elements and therefore, in the solution it is present as F^{-1}. While 75% of total amount of chlorine is present as chloride in solution in the ocean, fluoride is, on the other hand, almost all tied up in rock minerals and a very small percentage of the total is contained in sea water [2]. Some of the fluorides bearing minerals are fluorspars, rock phosphate, cryolite, apatite, mica, hornblende, and others [3]. Leaching of these minerals released fluoride into the ground water. Some of the man-made activities are also responsible for the released of fluoride in the environment. For example, extensive use of some chemical fertilizers and pesticides containing fluoride as impurity; manufacturing processes [4] like steel, copper, glass, brick etc. can increase the fluoride level in the ground water. Extensive use of fertilizers and pesticides in the agricultural field is of particular importance because in this study area there are numbers of small and big tea gardens which use huge amount of fertilizers and pesticides in every year. Moreover, there are numbers of brick industries in this study area.

Many countries of the world like India, China, Pakistan, Sri Lanka, Ethiopia, South Africa, Spain, etc., are known as Fluorosis endemic. In India, 65 million people including 6 million children are suffering from Fluorosis [5]. The severely affected states are Assam, West Bangle, Rajasthan, Gujarat, Kerala, Karnataka, Andhra Pradesh, Delhi, Madhya Pradesh, Haryana, Jammu and Kashmir, Orissa, Punjab, Tamilnadu, Maharashtra, and Uttar Pradesh.

Ground water of several districts of Assam is found quite high level of fluoride. Man-made activities and natural process – both are responsible for high level of fluoride in ground water. D. Chakraborti et al. [6] reported that the ground water of two districts - KarbiAnglong and Nagaon has high level of fluoride. People of these areas are suffering from dental as well as skeletal Fluorosis. Fluoride level in the ground water of several districts of Assam viz. Sunitpur [7], Guwahati [8], Morigaon and Golaghat [9], Tinsukia [10], [11] is also studied extensively.

Study Area:

The study area is situated in $95^0 20'$ longitude and $27^0 17'$ latitude in the Dibrugarh district of Assam. The average annual temperature of the region is 23.9^0 and average annual rainfall is 276 cm. People of this area experienced a good annual rainfall. Loose unconsolidated sands with gravels, silts and minor clays characterized the study area [12]. Many small and big tea gardens are present in this area. Few brick

industries are also present. Many areas are covered by paddy fields.

MATERIALS AND METHODS

Sample collection:

The samples were collected directly in the pre-rinsed good quality polythene bottles without adding any preservatives. Total 25 water samples were collected from different locations of the circle. The samples were collected from hand tube wells, well and river. These analyses were done in the month of February and March of 2011.

Analytical:

Fluoride concentration of the water samples were measured by ELICO ion analyzer (Model Li 126) using the fluoride electrode ORION 9609BNWP. The instruction given in the manual of the analyzer is followed for fluoride measurement. The buffer and the standards were prepared according to APHA. A pocket pH meter (HANNA made) was employed for measuring the pH of the samples at the time of collection. Conductivity and TDS of the samples were measured with the help of a soil and water analysis kit (LT 61). Hardness, calcium and magnesium concentrations were measured by EDTA Titrimetric method. Procedures and calculations of all the parameters were followed that described in APHA [13].

Sl. No.	Name of locations	Nature of sources	Depth (ft)	pH	EC (µS/cm)	TDS (ppm)	TH (mg/L)	F (mg/L)	Ca (mg/L)	Mg (mg/L)
1	Jaipur Birla road	TW	26	5.0	153	77	82	.0594	35	15
2	Jaipur Thana road	TW	32	5.3	123	68	43	.0109	40	19
3	Jaipur Daily Bazar	TW	36	5.4	198	91	62	.0109	30	17
4	Baghmara	TW	46	5.8	230	129	58	.1379	20	14
5	Near Naharkatia College	TW	50	5.7	102	55	257	.1563	15	12
6	Naharkatia (AmulapattiTinali)	TW	46	5.3	445	230	125	.1429	25	18

7	Naharkatia (Police station)	TW	65	5.3	540	281	135	.0222	55	16
8	NagaonTinali	TW	46	5.2	413	201	130	.0269	45	15
9	South Bank	TW	46	5.8	212	110	109	.0360	30	9
10	BangaonDilligha t	Spring		7.6	312	161	126	.0268	32	32
11	Namrup Station	TW	65	6.8	503	275	156	.0254	9	30
12	PrajaBasti	TW	46	6.7	210	125	59	.0259	50	27
13	Nigam	TW	65	6.6	114	62	65	.0231	40	29
14	Dighala-pother	Motor pump	65	5.3	225	121	42	.0292	38	15
15	Dighala-pother(near Hospital)	TW	45	5.1	309	156	60	.0292	40	18
16	Bamuni bill	TW	46	5.8	251	105	50	.2903	26	23
17	DighaliTinali	TW	46	6.7	270	157	116	.2831	31	21
18	Merbill	TW	25	6.3	251	161	155	.2564	26	16
19	Shantipur	Mark TW	100	5.7	210	123	133	.2976	29	19
20	Gajpuria	TW	46	6.5	151	104	132	.2694	36	20
21	Hudupara	TW	100	6.5	161	121	140	.2830	21	23
22	Langarijan Tea State	TW	40	5.6	312	161	59	.0231	12	9
23	Disam Tea state	TW	60	6.0	355	189	63	.0263	33	22
24	Tridip Brick factory	TW	46	5.9	375	200	285	.1620	40	46
25	Sankar Brick factory	TW	46	6.7	159	135	120	.1827	55	18

Table: Concentration of fluoride some other parameters of the water samples of Naharkatia circle

RESULTS AND DISCUSSION

The measured values of different parameters are given in the table. It is clear from the table that groundwater of the study area is slightly acidic in nature. pH varies from 5.0 (Jaipur Birla road) to 7.6 (BangaonDillighat). The study area is characterized by low level of fluoride with the range .0109 mg/L to .2976 mg/L. It may be due to the absence of fluoride containing minerals. Moreover, heavy rainfall in the region may accelerate the dilution of fluoride concentration. Calcium and magnesium concentrations of the samples are also found quite low. The Maximum concentrations of calcium and magnesium are found as 55 mg/L and 46 mg/L respectively. No cases of dental Fluorosis or skeletal Fluorosis are observed in this region.

CONCLUSION

Absence of fluoride bearing minerals, acidic soil and heavy rainfall may be the causes of low level of fluoride in this area. Because of the low level of fluoride concentration in the ground water, there is a possibility of occurring dental caries among the children.

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