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Estimation of fluoride in the drinking water of Tengakhat circle of the Dibrugarh district, Assam

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ABSTRACT

It is very essential to know the concentration of fluoride in drinking water. In this study, fluoride concentration and some other parameters of the ground water of Tengakhat circle of Dibrugarh district, Assam was measured. 35 water samples were collected from different villages of the circle. The sources of all the water samples were hand tube wells, motor pumps and deep tube wells. Ground water of the region was found slightly acidic in nature. Fluoride level varies from .0785 mg/L to .8152 mg/L. Calcium and magnesium concentration were found quite low.

Key Words: Fluoride, Fluorosis, Ground-water, Drinking water

INTRODUCTION

Natural water contains different types of compounds in dissolved and in suspended form. Some of them have detrimental effect on human. Fluoride is such type of species, which has different effect on human at different concentrations. The maximum permissible level[1] of fluoride in drinking water is 1.5 mg/L. Lower concentration of it (<0.6 mg/L) causes dental caries whereas higher concentration (>1.2 mg/L) causes Fluorosis[2]. Fluoride concentration between the limits 0.6 mg/L to 1.2 mg/L is associated with a substantial resistance to tooth decay.

Fluorine is a reactive element. It is the most electronegative of all the elements and therefore, in the environment its more common form is F^{-1} . Fluoride is found in wide varieties of minerals including fluorospar, rock phosphate, cryolite, apatite, mica, hornblende, and others [3]. Leaching of these minerals released fluoride into the ground water. Some of these minerals are widely used in industries. For example, rock phosphate is used for the production of fertilizers; cryolite is used for the production of aluminium and pesticides. Some manufacturing processes such as steel, copper, glass, brick, are also released fluoride in the environment [4]. Compounds like fluorosilicic acid, sodium hexafluorosilicate and sodium fluoride are used in municipal water for fluoridation schemes. Fluoride may be released in air in the burning of coal containing fluoride impurities.

Several countries of the world like India, China, Pakistan, Sri Lanka, Ethiopia, South Africa, Spain, etc., are facing the problem of Fluorosis. Fluorosis is endemic in several states of India. 65 million people including 6 million children are suffering from Fluorosis in India [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, Maharastra, and Uttar Pradesh.

Ground water of several districts of Assam is found quite high level of fluoride. D. Chakraborti et al. [6] reported that the ground water of two districts - Karbi Anglong and Nagaon has high level of fluoride. Fluoride concentration in one water sample collected from Ramsapather (Karbi Anglong) showed 20.6 mg/L. Dental Fluorosis and skeletal Fluorosis are common among the people of Karbi Anglong who lived in the villages having higher concentration of

fluoride in ground water. Fluoride level in the ground water of several districts of Assam viz. Sunitpur [7], Guwahati [8], Morigaon and Golaghat [9] are also studied extensively.

MATERIALS AND METHODS

Sample collection

For sample collection, good quality polythene bottles (half litre) were used. The samples were collected directly in the rinsed bottles without adding any preservatives. Total 35 water samples were collected from different locations of the circle. Since all the people of the study area have been used ground water as drinking water, therefore, only ground water was collected for analysis. This analysis was done during May, 2010 to July, 2010.

Study area:

The area of the present study is situated between 95°9' latitude and 27°22' longitude in the Dibrugarh district of Assam. The study area is about 500 km away from Guwahati, the state capital of Assam, and with a height of 500 m from the sea level. The average annual temperature of the region is 23.9° and average annual rainfall is 276 cm. Loose unconsolidated sands with gravels, silts and minor clays characterized the study area [10]. 95% of the people of this area are lived in villages. Majority of them are not aware of the different types of contaminants that may be present in drinking water. Moreover, the level of fluoride in the ground water of this area is not measured earlier and if it was measured by someone or by some agencies, these are not accessible to common people.

Analytical

For measuring fluoride concentration, Ion selective method was employed. This method has proved to be simple, efficient and reliable. For this purpose, the electrode ORION 9609BNWP was used in ELICO ion analyzer (Model Li 126). Fluoride Concentration of the water samples were measured according to the instruction given in the manual of the analyzer. 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 [11].

RESULTS AND DISCUSSION

Analytical results of the different water samples are given in the table. From the table it is clear that groundwater of this area is slightly acidic in nature. pH varies from 5.5 (Hukuta) to 7.1 (1 No. Mahmari). Fluoride level was found in the range from 0.0785 mg/L to 0.8152 mg/L. Because of low level of fluoride concentration in ground water there is a possibility of occurring dental caries among the children. No cases of dental Fluorosis or skeletal Fluorosis are observed in this region.

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

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	4 No. Sapatali	TW	20	6.1	245	130	98	.5123	29	10
2	2 No. Karekani	TW	20	5.9	112	61	55	.6752	30	15
3	2 No. Bokuloni	TW	31	6.6	310	143	65	.2034	33	19
4	Dhekiajan Tinali	TW	32	5.8	155	90	79	.1213	24	14
5	2 No. Borpothor	TW	26	6.4	376	200	110	.0893	29	31
6	1 No. Karekani	TW	32	5.6	109	88	150	.0965	40	24
7	Modhuting	TW	65	6.1	340	150	90	.0829	44	27
8	Nauhalia	TW	65	6.4	267	144	101	.6789	20	16
9	Hukuta	TW	65	5.5	189	139	75	.5320	27	17
10	Kumud Nagar	TW	65	6.5	178	82	76	.3564	54	35
11	Tipling	TW	110	6.6	220	110	98	.0876	35	30
12	Modhuban	TW	65	6.6	98	52	44	.8152	21	29
13	1 No. Mahmari	TW	65	7.1	198	95	77	.0983	18	12
14	Kathalguri	Motor pump	100	6.3	330	159	115	.5016	34	32
15	Panchuti	TW	45	6.7	320	200	169	.2873	50	35
16	1 No. Kheramia	TW	110	6.9	455	280	102	.6826	13	14
17	Tingrai charali	TW	46	6.7	210	120	60	.5856	46	28
18	Tiwarigola	TW	45	6.5	232	102	89	.5242	37	25
19	Kachari pother	Mark TW	120	6.5	112	70	120	.5012	22	19
20	Kopouhua	TW	46	6.3	200	98	150	.3345	26	21
21	Pandhua	TW	36	5.9	297	120	95	.2089	38	22
22	Tengakhat	TW	40	6.3	423	309	177	.6436	40	31
23	Bhasani	TW	60	5.9	155	76	94	.6055	29	17

24	Tamulikhath	TW	46	6.2	370	208	112	.0986	20	19
25	Abhaipuria	TW	46	6.3	150	95	165	.7829	30	20
26	Chirapotti	TW	40	6.2	234	132	145	.7761	17	17
27	Joyanagar	TW	100	5.7	176	90	189	.5567	33	29
28	Pavajan	TW	65	6.1	198	112	164	.2367	20	25
29	Tipling	TW	65	6.1	321	167	200	.2905	43	34
30	Majgaon	TW	65	6.2	410	250	178	.5956	26	27
31	Udaipur	TW	86	5.9	178	100	96	.0785	45	17
32	Ukhapur	TW	46	6.8	250	133	87	.3453	27	19
33	Hatibandha	TW	46	6.7	123	66	66	.4125	27	32
34	Kamalabari	TW	46	5.8	143	87	175	.8012	39	27
35	Duliajan RL. station	TW	65	6.5	517	300	120	.7010	10	25

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