International Journal of Global Science Research ISSN: 2348-8344 (Online)
Vol.2, Issue 4, October 2015, pp. 239-242
Available Online at www.ijgsr.com

Research Paper

Fluoride distribution in the underground water of Northern Chhatissgarh India

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Received: 16/08/2015
Revised: 06/09/2015
Accepted: 23/09/2015

Abstract*:* An attempt has been made to analyze the public hand pump water from seven different locations of northernmost Chhattisgarh. The study indicated that, except at one sampling station viz. Trisuli, the fluoride levels v~s within the prescribed limit of WHO standards of drinking waters. Trisuli water showed marginal levels of fluoride contents (1.4 mg/L). The study revealed the heterogenous fluoride distribution in the underground water and the result of these analyses are concluded that proper de-fluoridation measures seems to be needed to protect the habitants of Trisuli area from problems of fluorosis.
Keywords: Hand pump water, fluoride, Trisuli, northern Chhattisgarh, de-fluoridation

INTRODUCTION

Study area is situated in Balrampur-Ramanujganj district of Chattisgarh and it has been explored for fluoride distribution in the underground water. These distributions have been conducted in various seasons of the years from March 2013 to February 2014.

Ramachadrapur block is a significant biodiversified territory of Chattisgarh located in the northernmost part of Chattisagrh, positioned at 26.05°N latitude and 74.02°E longitude. Temperature varies from 10° C to 45°C. People of this region have divergent way of life and civilization, enriched as it is with dense forests and a very diverse population comprising to a number of tribes. They prefer animal husbandry and small industries as additional income-generating activities and are keen to take these up. The individual of sanawal be desperate to commence apiculture, sericulture and lac culture. The Kanhar River is the principal river near the sanawal. Life here is governed by tribal customs, culture and traditions. In the rural areas of the region, people are dependent largely on agriculture and minor forest produce. Further groundwater is a major source of drinking water in urban and rural areas. Near about ninety percent of the rural population uses groundwater for household purposes. Nearly half the population of study area is illiterate, not at all aware of the water borne diseases affecting their health. Millions of people all over the world, including India is suffering with fluorosis due high concentration of fluoride in the drinking water. When the fluoride level cross the optimum concentration i.e., 1.5 mg/L, then it exhibit the toxic effects in the human body.

International Journal of Global Science Research **ISSN: 2348-8344 (Online)**
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The Indian districts such as Andhra Pradesh, Tamilnadu, Karnataka, Kerla, Rajasthan, Delhi, Bihar, Jharkand, Uttar Pradesh, Orrisa, Jammu Kashmir have been reported to contain high fluoride levels (Rammamohan, 1964; Rao, 1974; Rao *et. al.*, 1993; Susheela, 1993; WHO, 1994) rendering these areas of the contrary as either affected areas from fluorosis to various extends or to the risk of the same. Near about one lack people of Assam (Karbi Anglong district) affected by excessive fluoride levels in ground water in June 2000. The symptoms were anemia, stiff joints, painful and restricted movement, mottled teeth and kidney failure.

MATERIALS AND METHODS

Northern Chhattisgarh with its variety of ecosystems ranging from mountains supporting thick forests, coastal plains, we were selected seven sampling station at various locations in the study area with view to cover most of the segment of the block. These sampling stations were A_1 = Sanawal, A_2 = Pachawal, A_3 = Kameshwar Nagar, A_4 = Trisuli, A_5 = Jhara, A_6 = Idravatipur, A_7 = Dhauly. Water samples were collected from the public hand pumps situated at these sampling sites on monthly basis over a period of one calendar year. These samples were taken to laboratory ande subsequently analyses for their fluoride cor~ents. The analysis of fluoride contents were performed spectrophotometrically using ALPHA, AWWA and APCF (1985) Standard Method for Examination of Water and Wastewater. The de-colorization of SPANDS Zitconyl complex was found to follow a linear relationship with fluoride contents.

RESULTS AND DISCUSSION

The study reveals the heterogenous fluoride distribution in the underground water of the area and the results of these analyses are reported in table.

Table: Fluoride distribution in Northern Chhattisgarh

SN	Sampling Site	Fluoride Concentration (mg/L)											
		March	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**	**January**	**February**
G_1	Sanawal	1.19	1.22	1.24	1.19	1.02	1.08	1.18	1.08	1.15	1.20	1.22	1.1
G_2	Pachawal	1.20	1.24	1.26	1.21	0.86	1.16	1.20	1.16	0.98	0.86	1.00	0.96
G_3	Trisuli	1.38	1.41	1.43	1.45	1.22	1.28	1.38	1.48	1.41	1.44	1.40	1.36

G_4	Kameswar Nagar	1.22	1.26	1.32	1.24	0.99	1.15	1.20	1.24	1.31	1.24	1.28	1.20
G_5	Jhara	1.16	1.20	1.25	1.21	1.03	1.17	1.22	1.21	1.10	1.06	1.09	1.18
G_6	Indrawatipur	1.10	0.96	1.14	1.18	1.02	1.21	1.29	1.22	1.22	1.30	1.20	0.90
G_7	Dhauly	1.02	.89	1.10	1.16	0.89	1.08	1.16	1.21	1.15	1.24	1.20	0.88

All the groups of sampling station the fluoride level was within permissible fluoride limits for drinking water as recommended by WHO (WHO,1970; National research, 1977; WHO guidelines, 1984). The frequency distribution of fluoride was different in the G_3-Trisuli group characterized by relatively higher concentration i.e., 1.48 mg/L. Group G_3-Trisuli exhibit nearly equal to maximum permissible limits (1.5 mg/L) recommended by WHO (WHO guidelines, 1984; 1994). The effect of fluoride in human body differs individually, but the common person is evidence for prevention of tooth decay, strengthening of skeleton in 0.8–1.2 mg/L fluoride concentration. When the concentration exceeds more than 1.5 mg/l, Fluorosis occurs in which pitting of tooth enamel and deposits in bones are common phenomenon. Above about 10 mg/L, show signs of Crippling skeletal fluorosis (Deshmukh and Malpe, 1996). Therefore, it is remarkable that proper de-fluoridation measures seem to be needed to protect the populations of Trisuli area from the problems of fluorosis.

Acknowledgement: Authors are thankful to the Principal, Govt. College Sanawal, Balrampur CG for providing necessary facilities. Authors are also thankful to CCOST Raipur sanctioned the MRP to do accomplish the project.

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