ISSN 2348-313X (Print)
International Journal of Life Sciences Research ISSN 2348-3148 (online)
Vol. 7, Issue 2, pp: (199-201), Month: April - June 2019, Available at: www.researchpublish.com

FLUORIDE DISTRIBUTION IN THE UNDERGROUND WATERS OF KORBA INDUSTRIAL TOWNSHIP

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Abstract: **An exploratory qualitative survey was conducted of the community regarding fluoride and related health problems in Korba industrial township (22°-23°5' N latitude and 82°5'-83°E longitude) of eastern Chhattisgarh. The study indicated that, except at one sampling station viz. Kusmunda, the fluoride level v ~s within the prescribed limit of WHO standards for drinking waters, Kusmunda water showed marginal levels of fluoride contents(1.4mg/L). The study revealed the heterogeneous fluoride distribution in the underground water and the result of these analyses are concluded that proper defluoridation measures seems to be desirable to protect the habitants of Chattisgarh from the problems of fluorosis.**

Keywords: **fluoride distribution, underground water, health problems, drinking waters.**

1. INTRODUCTION

Study area is positioned in the eastern part of Chhattisgarh and it has been explored for fluoride distribution in the underground water (Achari and Krishnamurthy, 2015: Achari and Krishnamurthy, 2019). These distributions have been conducted in various seasons of the years from March 2018 to February 2019 within the significant biodiversified territory of Chattisgarh located in the eastern part of Chattisagrh, positioned at 22°-23°5' N latitude and 82°5'-83°E longitude. Temperature varies from 28° C to 46°C. People of this region have divergent way of life and civilization, enriched as it is with Bharat Aluminium Company Limited, National thermal power of corporation and very diverse population comprising to a number of tribes. The individual of Korba district be desperate to commence agriculture, sericulture and horticulture. Life here is governed by urban 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 one third of the population of study area is illiterate, not at all aware of the water borne diseases affecting their health. Several people all over the world are suffering with fluorosis due high concentration of fluoride in the drinking water (Achari and Krishnamurthy, 2015; Achari and Krishnamurthy, 2019; Chuah *et al* 2016; Junyong *et al* 2016; Mohammadi *et al* 2017). When the fluoride level cross the optimum concentration i.e., 1.5 mg/L, then it exhibit the toxic effects in the human body. Long-term exposure to high level of fluoride can caused several adverse effects on human health including dental and skeletal fluorosis (Mohammadi *et al* 2017).

The Indian districts such as Bihar, Jharkand, Uttar Pradesh, Odissa, Delhi,Andhra Pradesh, Tamilnadu, Karnataka, Kerla, Rajasthan, and Jammu Kashmir have been reported to contain high fluoride levels (Rammamohan, 1964; Rao, 1974; 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 (Achari and Krishnamurthy, 2015; Achari and Krishnamurthy, 2019). Moreover fluoride in the water, other factors contribute to the endemic fluoride problem such as nutritional deficiencies, high ambient temperature, high water alkalinity, low calcium and vitamin C intake. Moreover, there has also been large increase in the use of fluoride-containing sachets of *pan masala*, *gutka* (containing tobacco), and mouth washes and mouth rinses in Chhattisgarh.

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2. MATERIAL AND METHODS

Korba district exhibit 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 Chhattisgarh. Seven sampling stations were selected at various locations in the area study with a view to cover most of the urban segments. These sampling stations were S^1 = Korba Railway stations S^2 = Korba old bus station; S^3= Kusmunda; S^4= Balco city; S^5= Balco outer, S^6 = Gevara and S^7 = Deepka. 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 sample were taken to laboratory and subsequently analysed for their fluoride contents. The analysis of fluoride contents were performed spectro photometrically using SPADNS method. The decolorisation of SPADNS Zitconyl complex was found to follow a linear relationship with fluoride contents**.**

3. RESULT AND DISCUSSION

An exploratory qualitative survey reveals the different fluoride distribution in the underground water of the study area and the results of these analyses are descriped (Table 1). 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 S^3 Kusmunda characterized by relatively higher concentration (Table 1). These groups exhibit nearly equal to maximum permissible limits (1.5 mg/L) recommended by WHO (WHO guidelines, 1984). 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 (Achari and Krishnamurthy, 2015; Achari and Krishnamurthy, 2019; Mohammadi *et al* 2017). Similarly Mohammadi and his colleque (2017) worked on river and well water by SPANDS method and suggested for the de-fluoridation from the immediate effects. Further 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 (Achari and Krishnamurthy, 2015; Chuah *et al* 2016; Junyong *et al* 2016). Subsequently when about 10 mg/L, fluoride in the drinking water confirm the 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 Belha and Gourella area from the problems of fluorosis. The removal of fluoride from drinking water is common now, Junyong *et al* (2016) used Freundlich model based on ultralong hydroxyapatite nanowires which is a thermodynamic parameters suggest that the adsorption of fluoride in a spontaneous endothermic phenomenon. The maximum of adsorption capacity of this model is 40.65 mg/g at pH 7.0 when the fluoride concentration is 200 mg/L. Similarly other models are also available for the removal of fluoride from drinking water (Zheng *et al* 2016).

TABLE 1: FLUORIDE DISTRIBUTION IN KORBA INDUSTRIAL TOWNSHIP

		FLOURIDE CONCENTRATIONS (mg/L)											
S.No	SAMPLING	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19
1	S^1 Korba RLY Station	1.09	1.22	1.24	1.19	1.02.	1.08	1.18	1.08	1.15	1.2	1.22	1.1
2	S^2 Korba OLD Bus Station	1.2	1.24	1.26	1.21	0.86	1.16	1.2	1.16	0.98	0.86	1	0.96
3	S^3 Kusmunda	1.38	1.41	1.43	1.45	1.22	1.28	1.38	1.48	1.41	1.44	1.4	1.36
4	S^4 BALCO City	1.22	1.26	1328	1.24	0.99	1.15	1.2	1.24	1.31	1.24	1.28	1.2
5	S^5 BALCO Outer	1.16	120	1.25	1.21	1.03	1.17	1.22	1.21	1.1	1.06	1.09	1.18
6	S^6 Gevra	1.1	0.96	1.14	1.18	1.02	1.21	1.29	1.22	1.22	1.3	1.2	0.9
7	S^7 Deepka	1.02	0.89	1.1	1.16	0.89	1.08	1.16	1.21	1.15	1.24	1.2	0.88

ACKNOWLEDGEMENTS

Authors are thankful to the Principal, Govternment Madan Lal Shukla College Seepat, Bilaspur CG and Principal, Government G B College, Hardi Bazar, Korba - 495446 India for providing necessary facilities.

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