FLUORIDE ANALYSIS OF GROUNDWATER AND ITS APTNESS FOR DRINKING IN NATIONAL CAPITAL REGION, HARYANA

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Abstrac: ***India is a developing country and more than 80 percent of the population lives in rural area. In the rural area the ground water is utilized for Industrial and household purposes. The area that is used to take the sample is NCR, Haryana. The water samples were taken from the bore well. The ten samples were collected from four diverse locations in the district of Sonipat. The primarily samples were taken to check the fluoride range in groundwater in the NCR of Haryana. The results show that the there is a lot of variation in the fluoride level at different level. The range of fluoride varies from 0.88 to 1.71 mg/liter. This shows that the level of fluoride in the samples are very high than the drinking water standards design by the World Health Organization (WHO). It is also concluded from the results that the standard general water values that is used for drinking is unacceptable. The level of fluoride present in more than 30% of samples is higher than permissible value recommended by WHO. From this study it can be observed that vastly industrialized area and anthropogenic activities lead to contamination of natural resources.***

Keywords: ***Fluoride level; World Health Organization; permissible value***

I. INTRODUCTION

Most of the population in India is dependent on ground water for drinking purpose. Jha (2008) observed that more than 85% and 50% of the domestic water requirements in rural and urban area are fulfilled by ground water. Similarly the 50 percent of its irrigation requirements have a dependence on groundwater resources.

Short et al., (1937) was the first researcher who analyzed the fluoride content in the water in 1937, in the Andhra Pradesh State situated in the Southern part of India. Susheela (1999) found in her research that around 62 million citizens in India are suffering from the disease known as fluorosis and the reason behind this was the consumption of highly floriated water. The level of fluoride in groundwater samples is very high and some measures must be taken to decrease the fluoride content in water. The main reason behind the high level of fluoride content in ground water is the rocks present under the crust. These rocks are having Fluorspar, Cryolite, Hydroxylapatite and Fluorapatite. According to Bureau of Indian Standard (BIS) the permissible value of fluoride content for drinking water should not be more than 1.5 mg/liter. But, according WHO standard (WHO, 1971) the value of fluoride should not be greater than 1.0 mg/liter. There is a significant difference between the two levels. Inspite of that the three samples out of ten samples fail due to high level of fluoride content in water sample. It is also observed that in some site, Fluoride level is less than 0.5 mg/liter. Whereas, on some sites the level of Fluoride in water samples is 30mg/Liter. This reports shows that in some places it is under the prescribed limit and in other places Fluoride level is much higher than Indian as well as WHO standards (Handa, 1975). This research is done to check the quality of ground water at four sites in the district of Sonipat. It is the part of National Capital Region and state of Haryana (India).

1.1 EFFECT OF FLUORIDE

In halogen group, fluorine is highly reactive element. Consequently, it does not present in free state in the atmosphere. Fluorine is very extremely electronegative element. Fluoride come into the body of living beings through eating food, water drinking, industrial exposure, cosmetics, drugs, etc., drinking water is the most important donor (85% of daily intake) . (K. Sarala, P.R. Rao, 1993)

In ground water, fluoride enters though infiltration of fertilizers in agricultural areas, liquid waste from industries, sewage treatment discharge and breakdown of rocks. In drinking water fluoride causes both negative and positive health impacts. Excess quantity of fluoride causes teeth mottling, dental fluorosis, skeletal fluorosis and deformation of bones (Maheshwari R, Bansal N.). Drinking of fluoride level higher than 1.0 mg/litre may causes dental fluorosis (Maheshwari R, Rani B, Gupta).

1.2 GROUND WATER STATUS IN NCR OF HARYANA

Central Ground Water Board, examining of groundwater class of all states of India. In India, 19 states have been identified having fluoride level in groundwater higher than the permissible limit. Haryana is one of the states where problem of fluorosis is common. In Haryana such as Mahendragarh, Bhiwani, Gurgaon, Jhajjar, Faridabad, Jind, Sonepat, Panipat Rewari, and Rohtak, have fluoride range more than 1.5 mg/litre permissible value approved by Bureau of Indian Standards (BIS)) in groundwater wells (CGWB, 2010).

2.RESEARCH METHODOLOGY

2.1 The Research Area

The samples were taken in the Haryana State. This state came in existence in 1 November 1966. It has an area of 44, 212 sq km. The capital of Haryana is Chandigarh. Haryana is located in the north between 27 deg 37' to 30 deg 35' latitude and between 74 deg 28' to 77 deg 36' longitude. Utter Pradesh is situated in the Eastern border and Western boundary is surrounded by Punjab. Whereas the Northern border of Haryana is surrounded by Uttaranchal, Himachal Pradesh and Shivalik Hills and on its Southern boundary Delhi and Rajasthan are located. (FIG. 1)

2.2 GEOGRAPHICAL DETAILS OF SONIPAT

The district of Sonipat is bounded by 28048'15" to 29017'10" North latitude and 76028'40" to 77012'45" East longitude. It falls in the survey of India Topo sheets no.53C, 53D, 53G & 53H covering an area of 2260.53 sq.km. Sonipat is one of the smallest district in Haryana State and covers 5.11 % area of the state. Panipat district is situated in north side of Sonipet. Its western and southern border is surrounded by Jind and Delhi respectively Whereas, Rohtak is situated in south west direction. Sonipat district is connected by metalled roads with the important cities of the state and to Delhi. It is also connected by broad gouge railway line with Delhi and Chandigarh. Ganaur, Rai & Kundli are the other important towns in the district.

FIG. 1 LOCATION OF HARYANA IN INDIA

2.3 WATER SAMPLING

Groundwater samples were collected indiscriminately from ten borewells at different sites at NCR. Cleaned plastic bottles of one Liter capacity were used for the sample collection. The collected samples were stored at low temperature in icebox. American Public Health Association (APHA) methodology was used to analyze the various physicochemical parameters. The analyzed parameters are pH, Total Dissolved Salts (TDS), Electrical Conductivity (EC), Total Hardness, Chloride, and Fluoride.

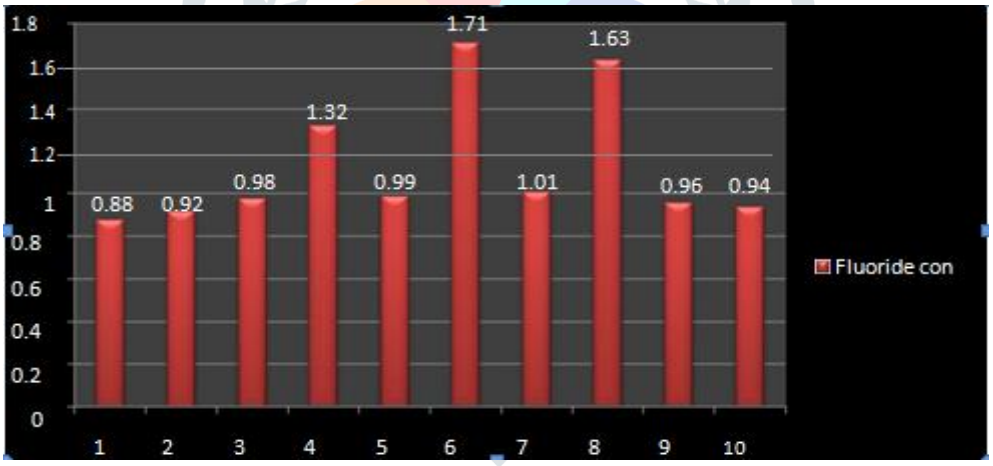

Figure 2 Fluoride concentration in Collected Samples in NCR

2.4 METHODOLOGY

Indiscriminately collected samples of ground water were investigated for following parameters:

1.Standard pH meter used for pH determination.
2.Electrical conductivity was determined by conductivity meter.
3.Chloride was determined by titration method.
4.Total Dissolved Solid (TDS) was determined by TDS meter.
5.Analytical Spectro Photo Meter used for Fluoride determination.
6.EDTA Titration technique is used to determine Hardness.

The fluoride concentration in groundwater was examined spectrophotometrically using "Analytical spectrophotometer". To find out the Fluoride concentration in groundwater samples standard SPANDS solution is used. During the research analytical rank chemicals were used. Double distilled water was used for making overall reagents and standards. Each ground water sample was analyzed thrice and the results were found reproducible with ± 3% error with WHO standard.

Table 1 Chemical characteristics of ground water (Samples)

Sample No.	Sampling Site	Location (Nearby)	PH (mg/l)	Conductivity	TDS (mg/l)	Total Hardness	Alkalinity	Chloride (mg/l)	Fluoride (F)
A1	Bharhi	Plot Number 525	7.21	2.12	530	490	130	155	0.88
A2	Bharhi	Plot Number 41	7.91	1.69	445	476	120	94	0.92
A3	Kundli	Near Nova Industry	7.73	2.82	768	365	240	284	0.98
A4	Kundli	Bansal Glass & Alum.	7.76	3.06	894	430	274	314	1.32
A5	Kundli	Solid Waste Industry	7.83	4.48	1320	715	280	590	0.99
A6	Murthal	Grand Trunk Road	7.68	4.82	1450	980	95	640	1.71
A7	Murthal	Munish Poly Products	7.71	6.48	2120	780	90	1099	1.01
A8	Murthal	Near G.T Road	7.74	2.82	848	515	92	295	1.63
A9	Rai	SSIMA. Plot1736	7.24	1.32	370	350	65	65	0.96
A10	Rai	SSIMA Plot1664	7.22	1.30	360	355	74	75	0.94

Table 2 Water Values of Collected Samples Vs Water Quality Standard (Drinking) as per BIS and WHO

Parameters	Minimum	Maximum	Indian standard (BIS)	WHO
PH (mg/l)	7.2	7.9	7.0-9.2	6.5-9.2
Conductivity	1.30	6.48	0.5-0.8	0.5-0.8
TDS (mg/I)	360	2120	500-1500	500
Total hardness	350	980	200-600	500
Chloride	65	1099	200-1000	500
Total Alkinity	65	280	200-600	-
Fluoride (mg/l)	0.88	1.71	0.5-1.5	1

3.RESULTS AND DISCUSSION

The water samples have no colour and turbidity. The values of various physico-chemical parameters for the selected sites are given in Table 1 and Table 2. During the study, it was found that the quality of groundwater significantly vary from site to site. The pH value varies from 7.21 to 7.91. pH values show that water is almost neutral. The analysis further demonstrates that all groundwater samples are present within the permissible limits as per the standards set by WHO and BIS. Fluoride range in groundwater shows that only two samples go beyond the BIS drinking water standard (1.5 mg/L,) and one sample go above the WHO instruction (1 mg/L, WHO 1971). Geological factors like mineral weathering, rock dissolution and decomposition containing fluoride leaching into ground water for water pollution with fluoride. Industrial manufacturing processes release large amount of Fluoride into environment which is responsible for groundwater contamination. The range of fluoride in the ground water samples vary from 0.88 mg/liter to 1.71 mg/ liter. But the BIS suggest that fluoride should not be greater than 1.5 mg/l in drinking water. These results shows that, people in localities like Bansal Glass & Aluminium (Kundli) , Grand Trunk Road (Murthal), & Near G.T road (Murthal) to give advice to adopt several defluoridation methods previous to utilize groundwater for drinking reason.

4. CONCLUSION

It is also observed that Fluoride concentration varies from site to site. This may be due to the fluctuations in water table at those locations. The research demonstrates the followings:

1. The consumption of fluoride more than the permissible value suggest by the WHO and BIS in drinking water leads to many dental and bone problems like dental and skeletal fluorosis diseases in the NCR, Haryana. The same problem can be confirmed by the number of patients in this region.
2. Industrial processes are the foremost source of Fluoride contamination in groundwater.
3. Defluoridation practice according to sight can be implemented to remove the percentage of fluoride present in NCR, Haryana.
4. If we decrease the Fluoride content in this region the health of the people living this region can be improved and we recommend that public health department should take necessary action to decrease the Fluoride level in his region.

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