To Assess the Quality of Groundwater and its Implication on Human Health in Niwai Tehsil, Tonk, Rajasthan, India

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There is a severe fluoride problem is Niwai Tehsil of Tonk district. Populaces are suffering from dental fluorosis and skeletal fluorosis. So that physico-chemical study of 80 villages was done. The ground water samples collected in clean polyethylene bottles were analyzed for different parameters such as pH, Total Alkalinity, Fluoride (F^-), Nitrate (NO_3^-), Total Dissolved Solids (TDS), Chloride (Cl^-), Total Hardness (TH), Electrical Conductivity (EC), Ca-H, Mg-H by using standard techniques. Results showed that fluoride was found even up to the alarming limit of 14.62ppm. Minimum (1.10ppm) and maximum (14.62ppm) concentration of Fluoride was observed from Khendewat and Seepura villages respectively.

Key words: Dental fluorosis, Skeletal fluorosis, Total Dissolved Solids (TDS).

1. INTRODUCTION

Water is one of the five elements described in the “Hindu Scriptures” to form life. The search of life in universe is with the search of water. Ground water is the most appropriate and widely used source for drinking purpose. India is among the many countries in the world, where fluoride contaminated groundwater is creating health problems. Fluoride concentration in 17 States was 1 to 48 mg/L. About 62 million people including 6 million children are affected with dental, skeletal and non-skeletal fluorosis [1]. Trace amount of fluoride intake is reported to be beneficial for human health, as it is required for resistant dental enamel to maintain and mineralise the hard tissues [2]. Fluoride is among the substances for which there are both lower (0.06 mg/L) and upper (1.2mg/L) limits of concentration in drinking water [3]. Low concentration of fluoride below 0.5ppm causes dental caries and higher concentration beyond 1.5ppm causes dental and skeletal fluorosis. High concentration of fluoride in ground water is a considerable health problem in several regions of the world, considerable part of India has fairly good distribution of fluoride contaminated ground water [4].

The fluoride level studies of ground water have been carried out in various countries. Awadia *et al.* [5] and N cube *et al*. [6] conducted study to identify areas of high fluoride concentration in ground of South Africa and reported dental fluorosis. Webber [7] studied pollution in drinking water with fluoride. Alvarado *et al.* [8] have studied Fluoride and dental fluorosis in student of Tula de Allende Hidalgo of Merxico. Farfan *et al.* discussed fluoride consumption and its impact on oral health.

Various workers of our country have carried out widespread studies in the related field. Susheela [10] have been studied on fluorosis management programmed in India. In this study some point involves such as present status of fluorosis in India, types of fluorosis, remedies and recommendations. Bhujangalah and Nayak [11] studied Ground water quality of Shimoga city of Karnataka. Omkar *et al.* [12] studied water quality aspects of some wells, springs and rivers in parts of the Udhampur districts (J&K). Pandit and Foram [13] studied physico-chemical and bacteriological studies of ground water in Bhavnagar city, Gujrat. Jadeja *et al.* studied the physico-chemical and bacteriological characterstics of ground water Dharmpur Industrial Area Porbandar city, results show that the ground water of Dharmpur Industrial area, is suitable for drinking purpose, subject to proper disinfection to ensure health of population. Dutta *et al.* [15] studied monitoring of fluoride concentration in ground water of small tea gardens in Sohitpur district of Assam. Sharma et al.[16] studied fluoride contamination in ground water in Agra district (U.P.), using fluoride ion-selective electrode method.

Different workers in Rajasthan have carried out extensive studied on fluoride also. Sharma *et al.* [17] studied ground water quality of an industrial town Bhilwara. Jain [18] studied on chemical analysis of drinking water of villages of Sanganer Tehsil, Jaipur district, Rajasthan, the results revealed that the quality of drinking water of Sanganer is very poor, water is highly deteriorated as it is polluted with high amount of fluoride, nitrate and alkalinity. Seth *et al.* [19] studied geo-chemical of fluoride in ground water of Rajasthan. Batheija *et al.* [20] were analyzed nitrate and fluoride contaminations in ground water of Churu Block, Rajasthan. Tailor and Chandel [21] were studied quality of ground water of Malpura Tehsil of Tonk district, Rajasthan. Yadav and Khan [22] reported fluoride and flurosis status in ground water of Todaraisingh of Tonk district, Rajasthan. Most of people of Niwai area are suffer from dental and skeletal flurosis such as mottling of teeth.

2. METARIALS AND METHODS

2.1. Study Area

Niwai Tehsil is located in the south of Tonk district and is surrounded by Ajmer, Bhilwara, Bundi districts. The Tehsil head quarter Deoli is connected by NH-12 and is situated at 167 km from the Jaipur.Niwai is located at 25°35 ′ N 73°37 ′ E, 25.58°N 73.62°E. It has an average elevation of 296 metres (971 feet) above mean sea level. The total area of the Tehsil is 153969 hectares (Map). The terrain is marked by mostly flat hills in between near the Bisalpur dam. The climate of the Niwai tehsil is hot and dry. Therefore the present study of ground water of the fluoride affected area has been carried out. The objective of the present study has been to render and facilitate ground water exploration more precisely in the fluoride free zone, based on characteristic and distinct ground water quality of area. It further provides avenues for developing more effective, economically, affordable and practicable defluoridation technology at village level.

2.2 EXPERIMENT

160 Samples were collected from fluoride affected villages of Niwai Tehsil in clean polyethylene bottles from different sources viz. hand pumps, open wells, tube wells and PHED water supply. Samples were analyzed by using standard techniques [23].

2.3. Fluoride Ion-Selective Electrode Method

Apparatus: Ion-Selective Meter, Fluoride Electrode, Magnetic Stirrer.

Reagent: Fluoride Standards of various ranges (0.2-20ppm), Fluoride Buffer (TISAB-Total ionic strength adjustment buffer).

Procedure: After calibrating the instrument, take 10ml sample in a beaker at 10ml buffer solution. Put stirring bar into the beaker immerse electrode and start the magnetic stirrer and wait until reading is constant, now withdraw electrode and rinse with distilled water.

3. RESULTS AND DISCUSSION

The fluoride content of ground water ranged from 1.10 to 14.62 ppm as shown in Figure 1. Permissible limit for F^- concentration is 1-1.5ppm according to WHO (1996) [24]. The data revealed that 89% villages are affected with high concentration of Fluoride, However 11% villages contained optimum limit of F^- concentration as given in Table 1.

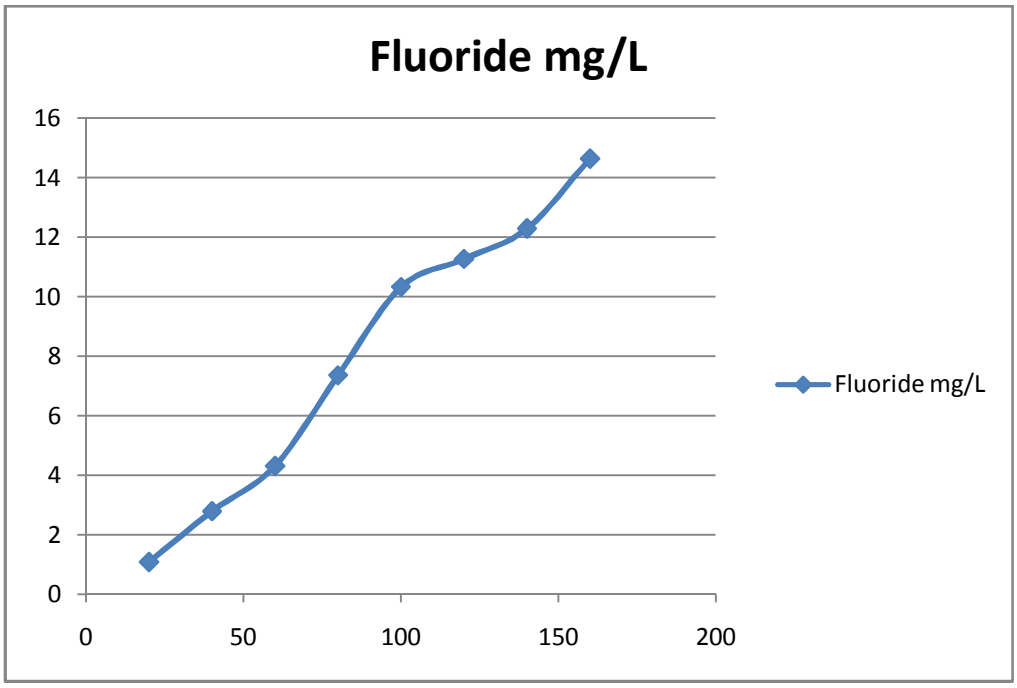

Fig. 1: The fluoride content of ground water in 160 samples.

Table 1: Showing WHO permissible limit and percentage of water quality of villages Niwai Tehsil.

Parameters	Permissible limit	Villages		
		Below	Optimum	Higher
pH	6.9-9.2	-	81%	19%
TDS mg/L	500-1500	-	11%	89%
EC umho/cm	300	-	-	100%
Chloride mg/L	200-600	19%	36%	45%
Calcium mg/L	100	-	-	100%
Magnesium mg/L	150	54%	18%	28%
Hardness mg/L as $CaCO_3$	100-500	27%	18%	55%
Alkalinity mg/L	200	-	-	100%
Fluoride mg/L	1-1.5	-	11%	89%

The data showed that concentration of F^- was found even up to the alarming limit of 14.62ppm.

The highest fluoride (14.62) concentration was reported from Seepura village and minimum was observed from khandewat village. The populace of study area was suffering from skeletal fluorosis as shown in Figure 2 and 3.

Fig. 2: Skeletal fluorosis.

Fig. 3: Skeletal fluorosis.

Dental fluorosis is shown in Figure 4 and 5. In study area villages are dangerously affected with fluoride concentration having fluoride more than 1.5ppm.

Fig. 4: Dental fluorosis.

Fig. 5: Dental fluorosis.

These villages are follows; Dr.K.N Modi university campus, Seepurs, Surajpura, Banasthali vidhyapeeth, Sidra, Niwai bus stand, Karanpura, Girdharipura, Gangapura, Khandewat etc. People become old in short age. Their joints are almost finished after 30-40 age. They are using belts and bandages for their joints. Most of the persons above 50 year are knelt down on their kness. There teethes are in sympathetic conditions.

4. CONCLUSION

The populace of study area was also found affected with skeletal fluorosis, bone fluorosis and dental fluorosis. The presence of excessive quantity of fluoride in drinking water is accompanied by a characteristic sequence of changes in teeth, bone and periarticular tissues. Therefore drinking water of Niwai Tehsil is not potable, proper treatment of groundwater is suggested prior to its use for drinking purpose. Removal of fluoride from drinking water is suggested through various defluoridation techniques are available including quick reverse osmosis, electrodialysis and hit and trial method. The Nalgonda technique is an economical way for defluoridation. Activated alumina technology may be used which is based on ion exchange resin. Public awareness and health education are most important measure to be widely adopted. This can be done by using audio-visual aids, seminars, conferences, symposium and training N.G.O's. must be encouraged in such programmed for public welfare.

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