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SCREENING HIGH FLUORIDE DRINKING WATERS AND SURVEYING ENDEMIC FLUOROSIS IN SADAR BLOCK OF RAEBARELI DISTRICT

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ABSTRACT

The objectives of this study were to screen high fluoride drinking water, to evaluate the effectiveness of fluoride and to assess the present condition of endemic fluorosis in Sadar block of Raebareli district. For screening high-fluoride drinking water, two water samples were collected from each source which is used for drinking purpose, where dental fluorosis patients were detected in the age group of 14- 25 years. Fluoride concentration in water samples were measured by SPANDS methods. Skeletal fluorosis in the adults was detected by the clinical diagnosis of skeletal fluorosis. The result showed that the fluoride level of water samples was 0.94 to 2.32 mg/l.

Keywords: SPANDS methods, Ground water, Sadar block, Fluoride, Fluorosis

INTRODUCTION

India is one among the 23 nations around the globe where health problems have been reported due to excessive fluoride in drinking water. An estimated 62 million people in India i.e. 17 out of 28 states are affected with dental, skeletal and/or non skeletal fluorosis[1-5]. In U.P. the problem of fluoride contamination of ground water is confined mainly to Agra, Allahabad, Varanasi, (Chandra, 1991)[3] , and Sonebhadra (2006).

Fluorosis is also called villian because it is easy to detect the disease. It has also been found at some places of Sadar block in Raebareli district of Uttar Pradesh [6-10]. Almost entire population is suffering from stiffness in body and joint pain. The teeth of almost the entire population have turned yellow or emerson red [11-13].

EXPERIMENTAL

Sample Collection

The drinking water samples were collected from fifteen different stations of Sadar block in Raebareli district (Figure 1). The bore well ranges in depth from 60 to 120 feet. In most of the cases the samples were collected from bore wells which were pumped for several hours prior to sampling. The drinking water samples were collected in plastic bags after rinsing with sample water.

The sample bottles were immediately sealed using rubber stoppers. The international standard for drinking water with respect to total drinking solids recommended by WHO, is 1500 mg/l as maximum permissible level. The same standard is used to classify the drinking water quality in aquifers.

Materials and Equipments

The six parameters that were analyzed including fluoride in the water samples were color, pH, Alkalinity, Total Dissolved Solids and Total hardness. The parameters mentioned above were analyzed as per the procedure mentioned in the "Standard Methods for the Examination of water and Waste water," American Public Health Association (17^{th}). The fluoride content in the ground water samples was determined by the "SPANDS" methods. The SPANDS colorimetric method is based on the reaction between fluoride and zirconium dye-lake and formation of colorless complex between anion and the dye takes place. As the amount of fluoride increases, the color produced becomes progressive.

Fluoride standards from 0 to 1.40 mg/L were prepared and were diluted to 50 ml with double distilled water. SPANDS and zirconil acid reagent each 5.00 ml is mixed with each standard and spectrophotometer is set to zero absorbance with the reference solution. Absorbance is measured spectrophotometrically at 570 nm employing Shimadzu 260 spectrophotometer. Standard curve for fluoride determination is shown in figure 2. Fluorides in water samples were determined with the help of the standard curve.

Level of fluoride in drinking water:

The level of fluoride in drinking water was determined in which a total of 60 water samples were examined by two mean value of each parameters and have been depicted in table 1. The fluoride level in drinking water is in the range 0.94 to 2.32 mg/L. The average fluoride levels in Nirala Nagar, Indira Nagar, RDA Colony, Nehru Nagar, District Jail, Kailaspuri, Indira Nagar A Block, Berkhapur, Kaharo ka Adda, Fursatganj Udan Academy Campus were all above the National permissible limit of India (1.50 mg/l).

RESULTS AND DISCUSSION

96.67 percent of the drinking water samples had fluoride concentrations above the desirable limit. The concentration of fluoride in the bore-wells varied from a minimum of 0.94 mg/L to a maximum of 2.32 mg/L. 3.33 percent (1 sample) of samples showed fluoride below 1.00 mg/L. 16.67 percent (5 samples) of the samples showed fluoride between 1.00-1.50 mg/L. 66.67 percent (20 samples) of samples showed fluoride between 1.50-2.00 mg/L. 13.33 % (4 samples) of the samples showed fluoride above 2.00 mg/L. The pH of the water samples from the bore-wells varied between 6.93 and 8.30, which is more or less neutral and within the drinking water specification of 6.50 to 8.50 (IS: 1050:1991). The total Dissolved Solid (T.D.S.) of water samples from the bore-wells were found to be between 850 ppm to 1560 ppm. Fluoride concentration increases with increase in concentration of total dissolved solid. These may be taken as rough measure for fluoride concentration in water.

The alkalinity, which is also a major factor responsible for fluoride concentration in water, was detected between 448 ppm to 852 ppm,. This parameter can be conveniently used for prediction of fluoride and hence fluorosis.

The total hardness of the water samples varied for different bore-wells ranging between 214 ppm to 540 ppm. No significant correlation could be obtained between hardness and fluoride concentration in water samples.

Signs and Symptoms:

During the survey people complained of body pain, back pain, and pain in knee. Numbness, itching, laziness premature ageing, cold and cough were the other not so common complaints during the survey. When correlated with the analysis reports, the health complaints from the survey indicated that the most common complaints viz; body pain, knee pain and back pain were prevalent among people who consumed water containing fluoride at high concentration. This may be due to the chronic toxicity effect of fluoride.

CONCLUSION

This study provides latest study information for better understanding of high fluoride drinking water problems in Sadar block of Raebareli district of Uttar Pradesh. The wide distribution of high fluoride drinking waters contributes to the prevalence of dental and skeletal fluorosis in Sadar block. Since there are no industries in the vicinity of these stations, the fluoride in the water is probably from the earth's crust.

REFERENCES

1. A. Arulantham, T.V. Ramkrishan and N Balasubramaniam, *Indian J. Env. Prot.*, **12**, 531 (1992).
2. T.S. Bhakuni and M.V.Bepardiker, *Indian J. Env. Health*, **4**, 74 (1962).
3. H. Chandra, *Indian J. Env. Prot.*, **11(7),** 487 (1991).
4. R. Chandrashekar, M. Tech. Dissertation. I.I.T, Kanpur (1974).

5. T.S. Bhakuni, *Fluoride in waters and removal*, Symposium on Problems in water treatment. National Environment Engineering Research Institute, Nagpur (1965).
6. Bjorvatn, C. Reimann, S. H. Ostvold, R. Tekle-Haimanot, Z. Melaku and U. siewers, *Oral Health Prevent Dentist*, **1**, 141 (2003).
7. J.A. Cauley, P.A. Murphy, T.J. Riley, A.M. Buhari, *J. Bone Miner Res*, **10(7)**, 1076 (1995).
8. L. Ekanayake, W. VanDer Hoek, *Carries Research*, 36, 398 (2002).
9. S.R. Grobleri, *International Journal of Paediatric Dentistry*, **11(5)**, 372 (2001).
10. Meenakshi, V.K. Garg, Kavita, Renuka and A. Malik, *J. Hazardous Materials*, **106,** 85 (2004).
11. C.G Pandit,., T.N.S. Raghavachari and D. Subba Rao, *Indian. Med. Res.*, **28**, 533 (1940).
12. A. Singh, *Indian J. Med. Res*., **50**, 387 (1962).
13. K. Singh, *Yojana Eng*., **48 (6)**, 47 (2004).

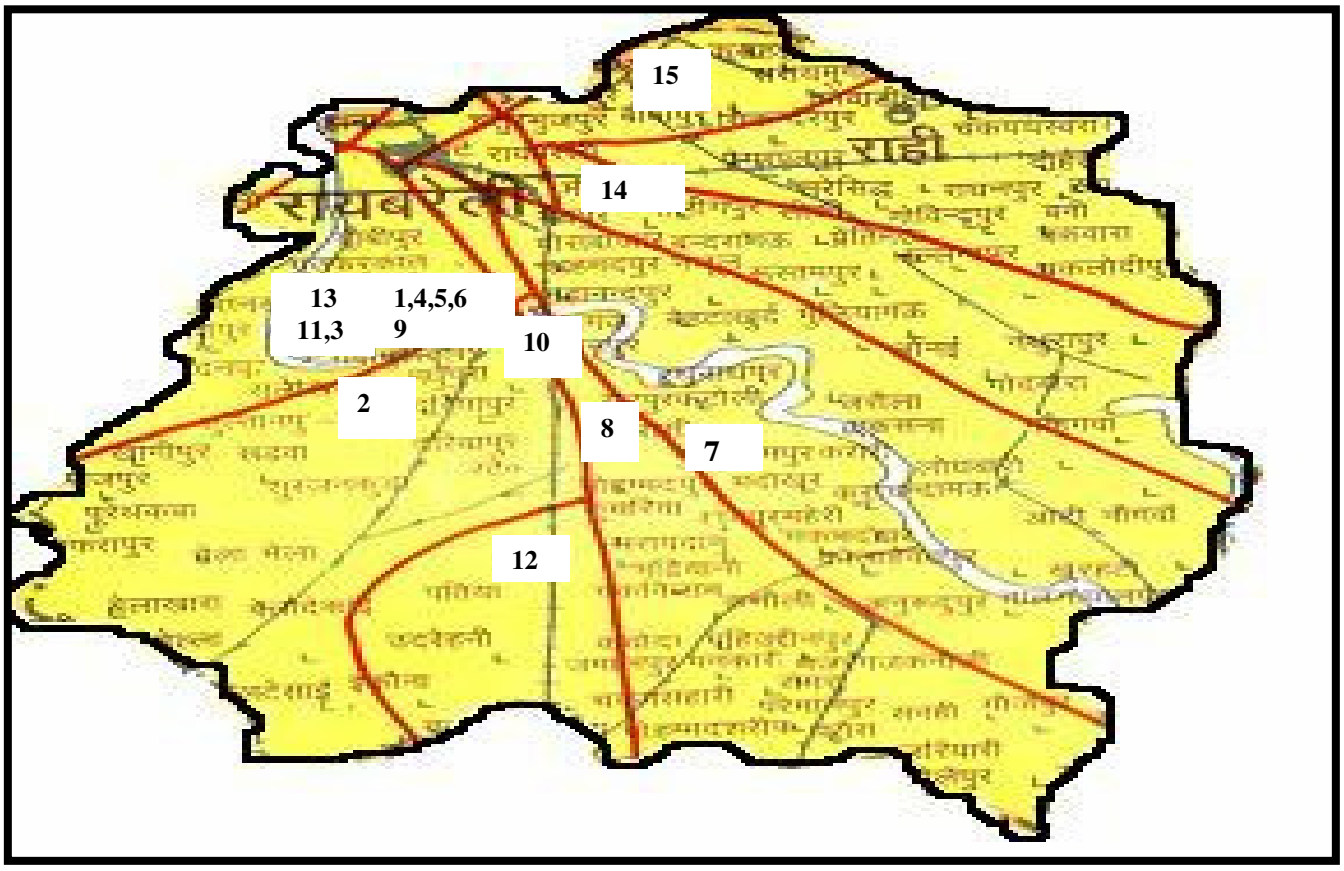

Fig.-1: Location of Selected stations in Sadar block of Rae Bareli Districts

Where,

1 – District jail	2- Munshiganj	3-kailashpuri
4- Indira Nagar A	5- Indira Nagar RDA Colony	6- Nehru Nagar
7- Berkhapur	8-Jawahar Vihar Colony	9- Nirala Nagar
10- Malikmau Colony	11-Police Line	12- Bastepur
13- Kaharo ka Adda	14-Fursat ganj Udan Ac.Campus	15- Jayas

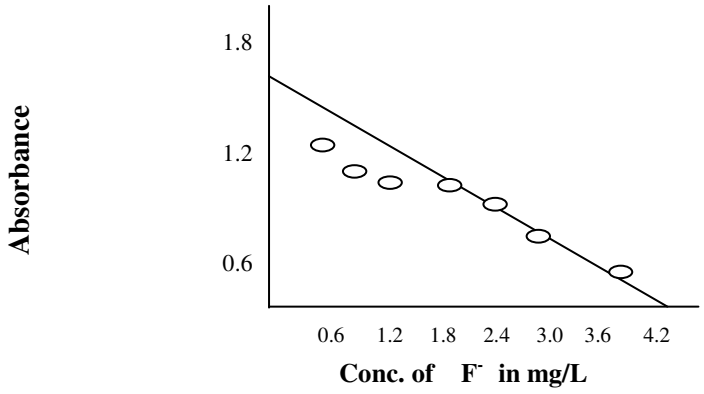

Fig.-2 : Calibration curve for fluoride determination by SPANDS method

Table-1: Concentration of fluoride with respect to pH, T.D.S., Alkalinity, and Total hardness of water

S.No.	Locality Stations	Sample Code	pH	T.D.S. ppm	Alkalinity ppm	Fluoride Mg/l	Total hardness
1	District jail	S_1(i) S_1(ii)	8.22 8.15	1440 1500	566 585	1.84 1.92	214 225
2	Munshiganj	S_2(i) S_2(ii)	7.93 7.70	1350 1165	658 614	1.73 1.40	400 388
3	Kailashpuri	S_3(i) S_3(ii)	7.75 7.60	1150 1260	495 510	1.55 1.80	330 320
4	Indira Nagar a block	S_4(i) S_4(ii)	7.90 7.74	1475 1518	505 490	1.80 1.80	354 360
5	Indira Nagar RDA Colony	S_5(i) S_5(ii)	7.80 8.00	1060 1240	850 852	1.65 1.42	450 450
6	Nehru Nagar	S_6(i) S_6(ii)	7.60 7.95	965 1000	460 492	1.34 1.65	472 483
7	Berkhapur	S_7(i) S_7(ii)	7.72 7.87	1533 1455	554 518	1.85 1.60	236 227
8	Jawahar Vihar Colony	S_8(i) S_8(ii)	7.95 7.90	1130 1080	500 500	1.75 1.73	360 360
9	Nirala Nagar	S_9(i) S_9(ii)	6.93 7.05	1210 1330	590 566	1.12 0.94	540 518
10	Malikmau Colony	S_{10}(i) S_{10}(ii)	8.12 7.96	994 969	465 448	2.13 1.89	314 328
11	Policeline	S_{11}(i) S_{11}(ii)	7.70 7.91	1510 1560	560 584	1.90 2.00	230 252
12	Bastepur	S_{12}(i) S_{12}(i)	7.90 8.30	1130 1130	485 473	2.14 2.22	350 333
13	Kaharo ka Adda	S_{13}(I) S_{13}(ii)	8.04 8.10	1000 994	513 509	2.32 2.00	444 482
14	Fursatganj Udan Academy Campus	S_{14}(i) S_{14}(ii)	7.52 7.45	1400 1400	570 585	1.85 1.58	390 400
15	Jayas	S_{15}(i) S_{15}(ii)	8.00 7.75	1230 850	640 605	1.73 1.47	291 309

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