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Study of Fluoride Contamination in Ground Water Mandawa Town and Surrounding Villages of Jhunjhunu District (Rajasthan)

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***Abstract*— Fluoride contamination of underground water of Mandawa town and surrounding villages of Jhunjhunu District of Rajasthan, India have been studied. Water samples of the Mandawa town and surrounding from Jhunjhunu District of Rajasthan were collected and analysed for fluoride parameter. The result were compared with the drinking water standards of WHO and IS(10500-2012).The study indicates the need for monitoring of underground water for fluoride characteristics in study area.The study reveals that the concentration fluoride is high in many areas. The result of this study helps in getting awareness of health hazards of contaminated water. Overall, the quality of water is unsatisfactory for drinking purpose in the investigated area.**

***Index Terms*— Groundwater, Mandawa, Fluoride.**

I. INTRODUCTION

Ground water is a main source of water supply throughout the world and it is the main source of drinking water in the most of the rural areas. The quality of ground water is continuously changing as a result of nature and human activities. During last decade, this is observed that ground water get polluted drastically because of increased human activities1,2. Hydrological aspects, human activities and characteristics of recharged water influence the quality of groundwater. Groundwater is most sensitive topic which has importance not only at local level, but also at global level 3,4,5. Fluoride accounts for about 0.3 g/kg of the Earth's crust and exists in the form of fluorides in a number of minerals. The most important source of fluoride in drinking water is naturally occurring. In areas with relatively high concentrations, particularly in groundwater, drinking water becomes increasingly important as a source of fluoride. Many studies of possible adverse effects of fluoride via drinking water have been carried out. These studies establish that fluoride produces effects on skeletal tissues (bones and teeth). Low concentrations provide protection against dental caries, especially in children. The pre- and post-eruptive protective effects of fluoride (involving the incorporation of fluoride into the matrix of the tooth during its formation, the development of shallower tooth grooves, which are consequently less prone to decay, and surface contact with enamel) increase with fluoride concentration up to about 2mg/litre of drinking water. The minimum concentration of fluoride in drinking-water required to produce it is approximately 0.5 mg/litre. Elevated fluoride intakes can also have more serious effects on skeletal tissues 6,7 . Fluoride characteristic of ground water of different parts of countries have been studied by many authors 8,9,10 . In Rajasthan state out of 27 districts; 16 districts, have been confirmed as fluoride affected area and have more than permissible limit concentration of fluoride 11,12,13 . Study Area

Mandawa is a small town in the Jhunjhunu district, known for its Forts and Havelis. It is situated 190 km off Jaipur in the north. The town lies between latitude 28°.06' in the north and longitude 75°.20' in the east.

II. EXPERIMENTAL

A survey was conducted in Mandawa town and surrounding villages of Jhunjhunu district, Rajasthan. Samples were collected from tubewells and open wells present in this area. Samples were collected in clean polythene bottles and rinsed three to four times with the water samples before the samples were before analysis in the laboratory. Many methods have been suggested for the determination of fluoride ion in ground water sample. The calorimetric and electrode method are the most satisfactory methods, used in the present time 14 .

Fluoride ion-selective electrode method

Principle: The fluoride ion selective electrode was used with Orion 720 Ion Meter (USA). Ion selective electrode develops emf due to the selected ion which is proportional to its concentration. The ion meter gives direct values of fluoride concentration in water samples.

III. RESULTS AND DISCUSSION

The concentration of fluoride in the studied Water samples varies from 0.1 to 6.7 mg/lt. The analyzed fluoride concentration of the sites shows that around 43% samples have the fluoride levels higher than 1.5 mg/l. Taking into account the IS recommended fluoride concentration (1.5 mg/l) in drinking water, people in these localities should be advised to adopt some defluoridation technique prior to use of groundwater for drinking purposes. On the other hand, in about 6% samples F- content was lesser than (0.7 mg/l) recommended fluoride concentration for caries control. The range of various villages of ground water for fluoride concentration is summarized in the table given below.

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S. N0.	Village/ Nagarpalika	Fluoride	No. of samples	Range of fluoride (Mg/L)
1	BAS DARIYA KA	1.1	3	1.1 to 1.2
2	BAS KUHAROO	2.0	2	0.8 to 2.0
3	BHADARWAS	1.0	14	0.4 to 2.5
4	BHAROO	0.7	17	0.5 to 2.1
5	BHOJASAR	1.5	17	0.1 to 2.1
6	CHAKWAS	1.4	4	0.8 to 1.6
7	CHANDRAPURA	0.8	2	0.8 to 1.5
8	CHOORI AJEETGARH	2.3	6	1.0 to 2.3
9	CHURI CHATARPURA	0.6	2	0.6 to 1.8
10	DEENWA	1.2	5	1.0 to 1.5
11	DHANI JOSHIYAN	1.2	5	1.00 to 1.7
12	GODOO KA BAS	2.3	5	1.8 to 2.5
13	GOVINDPURA	1.1	3	0.9 to 1.3
14	HAMEERWAS	1.3	4	0.8 to 1.3
15	HANUMAN PURA	1.7	12	0.6 to 6.2
16	HARNATHPURA	1.0	8	0.7 to 1.4
17	HETAMSAR	1.5	8	0.8 to 1.8
18	JAISINGHPURA	1.3	5	0.7 to 1.7
19	JEETAS	2.9	10	1.5 to 2.9
20	JUHARPURA	0.8	4	0.7 to 1.3
21	KAMAL NAGAR	0.7	3	0.7 to 1.1
22	KHALSI	1.8	3	1.5 to 2.0
23	KISARI	2.1	3	1.8 to 2.1
24	KOLALI	0.6	2	0.6 to 2.0

25	KUHAROO	2.2	10	1.4 to 3.7
26	KUMAS	2.2	3	1.6 to 2.2
27	LADSAR	0.6	9	0.6 to 1.8
28	LOOMAS	1.4	11	0.6 to 2.2
29	MAHRADASI	1.6	11	0.6 to 6.7
30	MEETHWAS	1.6	5	1.1 to 1.7
31	MOJAS	5.9	3	1.9 to 5.9
32	MORSARA KA BAS	1.9	4	1.0 to 1.9
33	MOTISAR	2.3	1	2.3
34	MUKHWAS	0.8	4	0.6 to 1.9
35	NOOAN	1.3	21	0.6 to 4.7
36	PHOOSKHANI	1.6	7	1.0 to 2.2
37	PIPAL KA BAS	3.0	1	3
38	RANJEETPURA	1.6	13	0.5 to 3.3
39	ROONAGAR	0.9	5	0.9 to 5.3
40	SANJAY NAGAR	1.0	6	0.7 to 2.0
41	SEEGRA	6.3	8	1.2 to 6.3
42	SEEGRI	1.5	9	0.8 to 2.2
43	SESWAS	1.6	7	1.1 to 1.6
44	SHEKHSAR	2.0	4	1.3 to 2.0
45	SHYAMPURA	0.6	6	0.6 to 1.1
46	SHYOPURA	1.1	6	0.6 to 1.5
47	TETARA	2.4	6	1.4 to 3.8
48	TODARWAS	1.4	2	1.4 to 1.6
49	TOLIYASAR	2.3	3	1.1 to 2.3
50	WAHIDPURA	0.7	3	0.7 to 2.3
51	WAJIDSAR	1.6	3	1.3 to 2.2
52	MANDAWA	1.8	28	0.8 to 3.7

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