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Fluoride Effected Villages Ground Water Analysis

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Abstract: Metallic compounds are called minerals. All the minerals are present in the earthcrust. Some of the minerals are dissolved in water. When diggings wells, borewells, mines on the water the salts are dissolved and contaminate the water. Some of the minerals contaminate the water will causes diseases especially from fluoride contamination. The fluoride contaminated water in Rajupalem mandal villaes are analysed. From those results we found that some of water cann't be used for drinking purpose.

Key Words: Fluoride ions, Water analysis.

1. Introduction

Metals are not available in earthcrust. They are present in the form of their compounds. The metallic compounds are called minerals. All the minerals are present in the earthcrust. Some of the minerals causes pollution. They are Calcium salts (Clourospar CaF_2), Fluoro Spite ($\text{CaF}_2, 3 \text{Ca}_3(\text{PO}_4)$), Aluminium salts (Cryolite Na_3AlF_6).

Fluorine is the 13th most abundant element on earths crust. Fluoride is important for bones and teeth formation. The main source of fluoride for the human body is usually drinking water. The concentration of fluoride in ground water is principally governed by the climate, the composition of the host rock, and the hydrogeology. Bereau of Indian standard/ specification for drinking water (BIS: 10500199) classified the permissible limit of fluoride in water as 1.50ppm which is 1.5mg/1. Fluoride beyond desirable amounts in ground water is a major problem in many parts of the world. Fluoride is a common geo-genic contaminant of drinking water, and it effects on human beings have been recognized in both the industrialized and developing countries of the world. Areas with semiarid climate, crystalline rocks and alkaline soils are mainly affected (Kunduet at 2001). Fluoride is released to the soil and ground water by the proc ess of weathering of the primary rocks.

The major sources of fluoride in ground water are fluoride-bearing rocks such as flourspar, cryolite, flourspatite and hydroxyl apatite etc. it is mainly industrial operations, atmospheric deposition during coal burning or mining or the natural sources that causes the dissolution of fluoride-bearing minerals that are responsible for occurrence of fluoride in drinking water. During weathering and circulation of water in rocks and soil, fluorine is leached out and dissolved in ground water.

Ingestion of excess fluoride, most commonly in drinking water, can cause fluorosis which effects the teeth (Dental fluorosis) and bones (Skeletal fluorosis) especially children and pregnat women. This is a result of the destruction of metabolic calcium and phosphorous, inhibition of active enzymatic process in the human body.

Thus the function of the endocrine system gets interrupted, leading to fluorosis (Khandare et al 2005).

Acute high-level exposure to fluoride causes immediate effects of abdominal pain, excessive saliva, nausea and vomiting. Seizures and muscle spasms may also occur. The Guntur district with a geographical area of 11,328 sq.kms falling between Latitudes 15 44 and 16 47 North and Longitudes 79 10 and 80 55 East and is one of the central coastal districts of Andhra Pradesh. It comprises 57 mandals under administrative control of 4 divisions namely Narasarao rao pet, Guntur, Tenali and Gurajala. The district has 729 villages and 1036 hamlets. Rajupalem mandal villages have high fluoride. These villages in Rajupalem mandal mainly contain rocks of cryolite which is the main cause of fluoride.

After the year 2003, there are no major studies on fluoride in groundwater of Guntur District, Andhra Pradesh. Considering this factor and keeping an account of the importance of public health, this study was designed to understand the present status of fluoride in ground water of a part of Guntur District, Andhra Pradesh, India.

2. Methodology

Water samples from drinking and irrigation wells(Open, dug wells and hand pumps) is collected from all the affected villages of Rajupalem mandal. Ground water level in the wells is recorded and pH ground water samples is measured in the field using a portable pH meter. Water samples are collected in clean polyethylene bottles of 600 ml capacity. The sampling bottles are soaked in 1:1 diluted HCl solution for 24 hours, washed with distilled water, and are washed again prior to each sampling the filtrates of sample. In the case of bore wells, water samples are collected after pumping the water for 10 min. in the case of open wells, water samples are collected 30cm below the water level using a depth sampler. Samples collected are transported to the laboratory and filtered using 0.45 μm Millipore filter paper. The fluoride concentration of ground water samples is determined using Specific Ion Electrode method(APHA, 1998).

Specific Ion Electrode method (Direct potentiometry): Direct potentiometry is the measurement

of electrical potential (voltage) between two dissimilar chemical electrodes under the condition of zero external current flow to give the concentration of particular ionic analyte (the “sensed ion”) in solution. The most important and common example of direct potentiometry is the pH meter where [H⁺] (hydrogen ion concentration) is measured. Using sophisticated design, electrodes can be created that display selectivity for a particular ion to the exclusion of others to a certain and quantifiable degree. Through the combination of such an Ion Selective Electrode (ISE), a suitable reference electrode and a sensitive voltmeter (a millivoltmeter) a very sensitive, direct non-destructive method can be devised.

3. Evaluation

The problem of high fluoride increased up within the last few decades, its origin involved prevalence of a more arid climate and recent exploitation of groundwater recharged during the past arid climatic phases. High fluoride in drinking water has resulted in dental fluorosis and skeletal fluorosis among people mostly in children exists. Many of the villages in Rajupalem mandal are found below the potable level. Rajupalem mandal

rajupalem, anupalem Gangi reddy palem devampade kota memalipuri villages and many villages nearby are in the fluoride zone. People from several generations suffered from fluoride water because of lack of alternatives. People who use this water for drinking purpose face many problems related to their health and environment. We have also come across complaints of the male infertility with an abnormality in sperm morphology and low testosterone levels are said to involve fluoride toxicity. It will also cause an early development of cataract in human eyes due to excess consumption of fluoride. Apart from the health aspect, the villagers are facing some aesthetic and social problems. No one is ready to make matrimonial relationship with the females of this area. Mostly villagers suffer from enamel fluorosis and bow legs and deformity in muscle and bones. Around 30% of the people in these villages were disabled because of the high intakes of fluoride, causing symptoms similar to polio.

4. Results and Discussion

The results of various parameters for the determination of fluoride in various samples are presented in the below table.

Table: 1. Variation of fluoride in different months at different stations

Sample No	Covered area	February		March		April	
		Fluoride %	pH	Fluoride %	pH	Fluoride %	pH
S1	Rajupalem	0.92	7.0	0.98	7.0	0.97	7.0
S2	Anupalem	1.60	6.9	1.52	6.9	1.62	6.9
S3	Gangireddy plaem	2.00	6.9	2.01	6.9	2.13	6.9
S4	Deveampadu	0.95	7.0	0.96	7.0	1.13	7.0
S5	Upplapadu	1.08	7.0	1.12	7.0	1.15	7.0
S6	kotanemalipuri	2.01	6.9	2.12	6.9	2.17	6.9

The major sources of fluoride in ground water are fluoride bearing rocks such as fluorite, fluorapatite, fluorapatite excess fluoride consumption affects plants and animals. Out of six sampling stations studied in all most three samples fluoride concentration remained within the permissible limits for drinking water (S1, S4, S5). On the other hand in three samples the fluoride content is (exceeded 1.5 mg/liter) above the permissible limits prescribed by ICMR standards.

5. Conclusion

The present status of ground water in parts of Rajupalem mandal, Guntur District was assessed in this study, the use of ground water for drinking purpose from these wells has to be considered. The rocks of this area possess fluoride content higher than the world average. Weathering of rocks and leaching of fluoride bearing minerals are the major reasons which contribute to elevated concentration of fluoride in ground water. The

other important natural phenomenon that contributes to high fluoride is evaporation. Suitable measures such as defluorinating the ground water before use and recharging the ground water by rain water harvesting need to be practiced to improve the ground water quality in this area.

6. References

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