

Ground water pollution in the Prakasam district, A.P.

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Abstract- Ground water is considered safe for drinking and other needs, if the fluoride level does not exceed 1.0 ppm (parts per million) only. Excess fluoride levels in water causes neck, spinal and neurological problems along with skeletal disorders. This affects not only human beings but also cattle, sheep and poultry populations. In the present study an attempt is made to study the fluoride levels of ground water in Prakasam district. A.P. The data reveals that majority villages in the Prakasam district contained excess fluoride levels than the admissible limits. High alkalinity of water along with decreased bicarbonate concentration is recorded in this water. The calcium content is very low in the fluoride infested area. Abatement of fluoride pollution is a difficult phenomenon. Various ways and means were suggested to control fluorosis in villages of Prakasam district. Among them, defluoridation water, supply of surface running waters rather than the ground water, supplementation of calcium and removal of bicarbonate ions in drinking water are important. The seriousness of fluoride pollution problem in Prakasam district was discussed.

Keywords – Fluorosis; Prakasam district; control measures

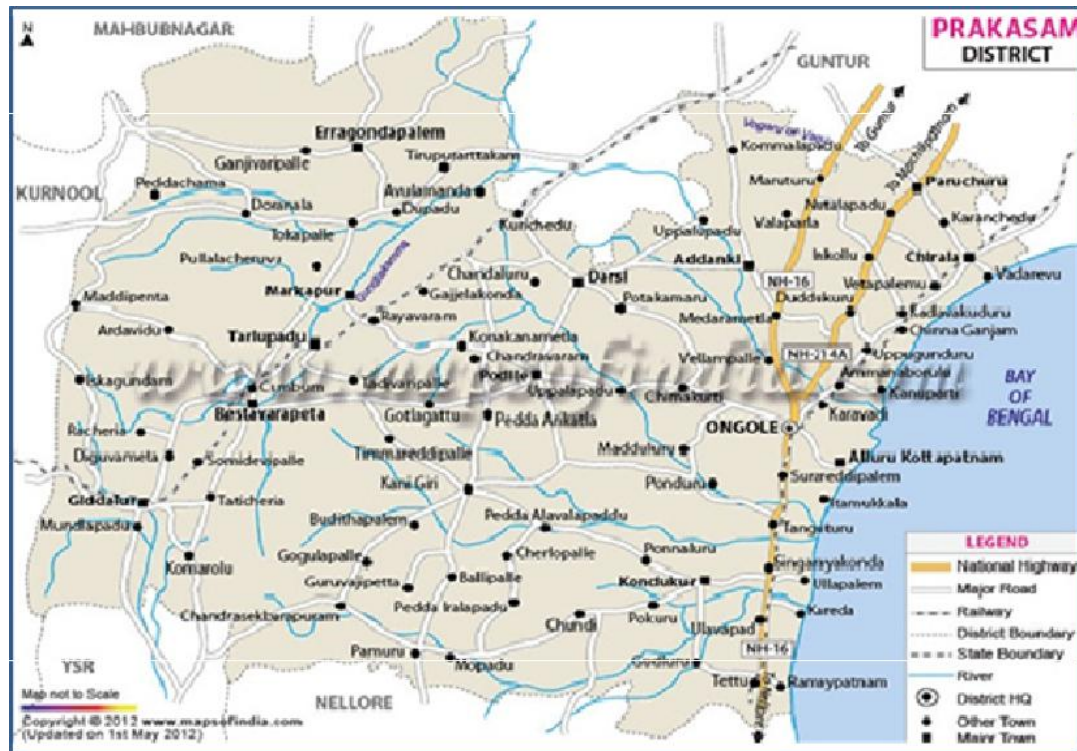
I. INTRODUCTION

Ground water is the most important source of drinking water in urban as well as in rural areas. Chemical composition of ground water is one of the prime factor on which its suitability depends for various purposes.(Brian 2007). Previously they use to think that the fluoride has both +ve and -ve effects on human health, but there is a narrow range between intakes that are associated with some adverse effects. Previously dentists believed that fluoride was a “nutrient.” A nutrient is a vitamin or mineral that is necessary for good health. Dentists believed that fluoride ingestion during childhood was necessary for strong, healthy teeth. A “fluoride deficiency” was thus believed to cause cavities, just like a deficiency of calcium can cause osteoporosis, or a deficiency of vitamin-D can cause rickets. It is now known that fluoride is not a nutrient. The fluoride content of a tooth has little bearing on formation of dental cavities. It is estimated that the 788 habitations of the 2,342 in Prakasam district are affected by the fluoride-content in water. Most of the villages are in Kanigiri, Giddalur, Chimakurti, Kondapi, Darsi and Kandukur mandals of the district. The low calcium content of the rocks and soils and high bicarbonate levels in earth materials like granite in the region is the main cause of the fluoride problem. A sample survey of 19,779 patients in the affected mandals showed that 16,020 had suffered from dental fluorosis, 2,026 from skeletal fluorosis and 1733 from kidney diseases in Prakasam district (Raghava rao 2015). However there are no reports on the latest ground water fluoride content in Prakasam district. Taking these things into consideration a study has been conducted in selected villages of Prakasam district of Andhra Pradesh to understand the intensity of the problem. The ways and means to ameliorate fluoride problem are discussed.

II. STUDY AREA

A. Prakasam District occupies an area of 17626 km². It is the largest in area among the coastal districts. This district lies between 140 50' 27.725" to 160 17' 21.168" north latitude and 780 31' 1.298" to 80 30' 22.62" east longitude. The average elevation is 10m (30ft). It has a population of above 3054940 as per 2001 census. Many areas in this district depends on ground water for drinking and other purposes. The base map representing

the boundaries of 56 mandals are collected from collector office, Ongole. The collected map has been digitized by Arc Map 9.2 software. Map of the study area are shown in the following figure 1.



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B. Methods

The study has been carried out in Giddalur, Kanigiri, Chimakurthy, Kondapi, and Kandhukur mandals of Prakasam district in the year of 2014-15. From each mandal five villages have been selected and water samples from hand pumps were collected. These ground water samples were analyzed in the laboratory according to standard procedure (APHA-1998). Water quality parameters such as Turbidity, PH, EC, TDS, Nitrate, Fluoride and Iron were done.

III. RESULTS

The Data regarding various water quality parameters were presented in Table 1. These ground water samples have no specific colour and odor except a little bit sweaty. The pH of the water samples ranged from 6.33 to 9.93 which indicate that the water is alkaline. The turbidity values ranged from 6.3 to 15.5TNT. Lowest concentration was found in chimukuripdu and highest in Guttavaripalli. The conductivity values ranged from 290-1530 $\mu\text{mhos/cm}$. Iron recorded higher values at all most all villages in five mandals.

Nitrate values are also higher in Veligandla village. The higher nitrate concentrations may be attributed to anthropogenic activities. Out of the 30 villages under study 27 were recorded higher concentrations of fluoride. In all the villages taken for the present study the fluoride content in ground water is more than 1 ppm and not suitable for drinking. The highest concentration was found in Pamur (8.55 ppm) Village and lowest content was in Kammavari palem (12.ppm) of Kandukuru mandal.

Table 1: Physico-Chemical Analysis of water samples of selected villages of Prakasam District
(Values are mean of ten observations.)

Name of the Revenue Mandal	Name of the village	Water Quality Parameters						
		Water level	p ^H	Turbidity	Conductivity	Fe	NO ₃	F
		M		NTU	µmhos/cm	mg/l	mg/l	mg/l
KANDUKUR	Kammavaripalem	10.12	6.32	9.3	692	1.05	182	1.22
	Chirrikurapadu	12.9	8.15	6.3	592	1.1	67	3.33
	Balijapalem	20.1	7.10	9.0	315	1.06	174	3.78
	Pandalapadu	7.35	9.06	8.6	720	1.27	86	2.55
	Vikkiralapeta	11.4	9.44	8.2	361	3.21	89	3.3
KANIGIRI	Veligandla	26.8	9.44	8.6	559	8.43	302	1.64
	C.S.puram	7.54	7.24	9.5	652	4.47	166	2.38
	Pamuru	652	9.12	11.5	849	1.66	247	8.25
	Hanumantunipadu	76.5	8.26	8.9	778	3.08	67	4.8
	Yadavalli	11.1	8.88	14.5	775	1.65	287	3.4
GIDDALUR	Chettireddypalli	14.6	9.41	12.6	458	1.8	190	5.75
	Mittamedipalli	4.8	8.62	11.6	952	1.61	183	6.75
	Uppalapadu	16.8	8.51	7.9	476	2.12	82	4.13
	Uppalapadu	21.2	8.5	14.5	592	1.03	90	6
	Adimurthipalle	18.8	6.33	13.6	652	2.03	143	2.5
BESTAVARIPETA	Bestavaripeta	17	7.64	9.9	692	3.07	60	2.05
	Akkapalli	38.1	7.67	8.9	640	3.13	90	1.5
	Chetticherla	25.4	9.34	7.9	665	2.11	189	1.47
	Khajipuram	12.4	9.61	7.5	664	2.08	75	1.7
	Pandillapalli	30.3	8.44	8.6	1530	1.22	102	2.07
CHIMAKURTI	Peddacherlapalli	32	8.97	7.2	512	6.9	148	2.15
	Chandrasekharapuram	16	7.64	14.6	290	1.21	74	2.75
	Guttavaripalli	18.4	9.91	15.3	772	1.26	224	3.4
	Bandlamudi	29.4	7.87	14.7	597	1.47	196	1.75
	Bhusurapalle	36.7	9.5	9.2	344	4.02	180	2.19
TANGUTURU	Tanguturu	30.7	8.31	11.5	652	1.48	189	1.9
	Ananthavaram	25.6	7.64	10.5	654	1.58	143	1.44
	Jayavaram	24.5	7.64	10.2	487	1.26	248	1.5
	Kandukuru	14.5	6.52	10.7	377	1.25	246	1.6

IV. DISCUSSION

Fluoride concentration and the severity of fluorosis are directly related to the alkalinity of water which may be one of the deciding factors for the high incidence of fluorosis in many cases. If this alkaline water remains in contact with the fluoride deposit for a longer period, then there is a definite possibility of progressive leaching of fluoride resulting in the increase in fluoride content. The main source of fluoride in ground water is fluoride-bearing rocks such as fluor spar, fluorite, cryolite, and fluorapatite and hydroxyl apatite. Ground water quantity is also influence fluoride concentration. Velocity of flowing water, p^H, temperature, concentrations of calcium and bicarbonate ions

in water. Due to strong electro negativity, fluoride is attracted to positively charged calcium in teeth and bones. Major health problems caused by fluoride are dental fluorosis, teeth mottling, skeletal fluorosis and deformation of bones in children, adults as well animals.

V.CONCLUSION

Most of the water samples, collected from the five mandals of Prakasam district of Andhra Pradesh do not meet the water quality standards for fluoride concentration (Sudhakar et al 2014). Hence it is not suitable for consumption without any prior treatment. High oral intake of fluoride rich drinking water results in physiological disorders, skeletal and dental fluorosis, thyroxin changes and kidney damage in humans (WORLD HEALTH ORGANIZATION 2011). Fluoride contamination may be prevented or minimized by using alternate water sources include surface water, rainwater and low-fluoride groundwater. Apart from this poor nutrition also plays an important role in aggravating endemic fluorosis. Defluoridation of drinking water is the only practicable option to overcome the problem of excessive fluoride in drinking water, where alternate source is not available. During the years following the discovery of fluoride as the cause of fluorosis, extensive research has been done on various methods for removal of fluoride from water. Cost effective and low maintenance Defluoridation technologies may immediately be introduced in these villages to stop further degradation.

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