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Assessment of Physico-Chemical Parameters with Emphasis on Fluoride Content in Ground Waters of Narketpally Mandal, Nalgonda District, Telangana State, India

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ABSTRACT: Collection of groundwater samples was done from Narketpally village, Narketpally Mandal, Nalgonda District, Telangana state India. The collected samples were analyzed for their physico-chemical characteristics. The Parameters analyzed are PH, Colour, Odour, Temperature, TDS, Oil & Grease, COD, BOD, Chlorume, Nitrogen, Phosphate, Arsenic, Lead, Chromium, Copper, Zinc, Sulphide, Iron, Manganese and Fluoride importantly. A special emphasis on the fluoride levels was done because of the history of the Nalgonda District for prevalence of the high fluoride content in the ground waters. The values were compared with the WHO standards for the water Quality index, by testing on analysing these Parameters' an attempt was made to determine whether the water quality is suitable for human consumption.

KEYWORDS: Ground water quality, fluoride content Narketpally Mandal, Physico-chemical characteristics.

I. INTRODUCTION

It is a major cause of concern in Telangana state where people mostly depend on groundwater for drinking and cooking as rural areas are without protected drinking water supply.

Fluorosis is a disease caused by excessive intake of fluorides through water beverages like tea and food and is further aggravated by malnutrition, over a long period of time. An alarming number of 66 million people across the country from 21 states are at a high risk of contracting fluorosis.

Most of the lands in Telangana have sheets of granite underneath and are rich in fluoride content since the groundwater is in contact with these rocks fluoride dissolves in water resulting in a rise in the concentration of fluoride in it.

Of the total land area in Telangana 80% has granite rocks. So there is heavy fluoride content beyond permissible limits in ground waters. So in order to assess the fluoride content as well as other physico-chemical characteristics of Narketpally Mandal the groundwater samples were analyzed.

Study area: Narketpally is a village in Nalgonda District of the Telangana state India. The total geographical area of the village is 2559 hectares. Narketpally has a total population of 10,390 people. In Narketpally Mandal of the Nalgonda district, Telangana, Fluorosis is prevalent for six decades.





II. LITERATURE REVIEW

Without water there is no life, yet across the world over 1 billion people are deprived of safe drinking water. Groundwater contamination with fluoride in India is one of the serious problems. It is a cause of major concern in Telangana state, India, where people in rural areas depend on groundwater for drinking and cooking. Even the agricultural fields and soil are contaminated by the presence of fluoride. Nalgonda district is one of the fluorosis endemic district in Telangana. Narketpally village has had a fluorosis prevalence for six decades. The common health issues due to fluorosis are bone fractures and skeletal fluorosis, effect on neurological function, on metabolism of glucose, endocrine functions and prevalence and severity of dental fluorosis as cited from the literature review.

III. EXPERIMENTS AND METHODOLOGY

Analytical methods followed for estimation of physico-chemical parameters of water samples.

Sl.No	Parameters	Test methods
1	pH	IS-3025/11:1983 Electrometric
2	Odour	IS 3025 /05: 1983, Physical Qualitative
3	Turbidity (NTU)	Nephelo Turbidity Meter
4	Total Hardness (as CaCO_3) - mg/l	IS 3025 Part-21 EDTA Method : 2014
5	Chlorides (as Cl) - mg/l	Argentometric Method
6	Residual Chlorine - mg/l	APHA, 22nd Edition DPD
7	Fluoride (as F) - mg/l	APHA, 22nd Edition SPADNS(Titration)
8	TDS - mg/l	Gravimetric Method
9	Calcium (as C) - mg/l	IS 3025 Part-40 :2014
10	Magnesium (as Mg) - mg/l	APHA (23rd Ed.) 3500 B, Calculation Method : 2017
11	Sulphate (as SO_4^{2-}) - mg/l	APHA, 22nd Edition Methylene blue
12	Nitrates (as NO_3) - mg/l	APHA, 22nd Edition UV-Spectrophotometric
13	Total Chromium - mg/l	IS 3025 (Part 52): 2003 AAS- Flame
14	Boron (as B) - mg/l	APHA, 23rd Edition 4500 B-C Carmine Method 2017
15	Alkalinity - mg/l	IS 3025 Part-23 :2014
16	Oil & Grease - mg/l	IS-3025/39 : 1991 Partition Gravimetric
17	Dissolved Oxygen - mg/l	IS -3025 : 38 1989 Winkler Azide
18	BOD (3 days at 27°C) - mg/l	IS 3025 (Part -44) 1993
19	Hexavalent chromium - mg/l	APHA,22nd Edition 1.5 Diphenylcarbohydrazide
20	Nitrate Nitrogen - mg/l	APHA, 22nd Edition UV-Spectrophotometric
21	Colour (Hazen)	APHA,22nd Edition Platinum Cobalt
22	Temperature	IS 3025 (Part 9) : 1984, Thermometric
23	Chemical oxygen demand (COD)	APHA,22nd Edition Closed Reflux



IV. EXPERIMENTAL RESULTS

List of physical and chemical properties of ground water in comparison with WHO Standard Values.

S.No	Parameters	Test methods	Standard value (WHO, BIS)	Sample A	Sample B
1	pH	IS-3025/11:1983 Electrometric	6.5-8.5	5.5 to 9.0	7.5
2	Odour	IS 3025 /05: 1983, Physical Qualitative	Unobjectionable	Unobjectionable	Unobjectionable
3	Turbidity (NTU)	Nephelo Turbidity meter	-	5	5
4	Total Hardness (as CaCO_3) - mg/l	IS 3025 Part-21 EDTA Method : 2014	200 ppm	679	688
5	Chlorides (as Cl^-) - mg/l	Argentometric Method	<250	405	404
6	Residual Chlorine - mg/l	APHA, 22nd Edition DPD	5	0.04	0.03
7	Fluoride (as F^-) - mg/l	APHA, 22nd Edition SPADNS(Titration)	<1.5	48	46
8	TDS - mg/l	Gravimetric Method	200 ppm	1753 ppm	1744 ppm
9	Calcium (as Ca^{2+}) - mg/l	IS 3025 Part-40 :2014	-	194	192
10	Magnesium (as Mg^{2+}) - mg/l	APHA (23rd Ed.) 3500 B, Calculation Method : 2017	150 ppm	54	51
11	Sulphate (as SO_4^{2-}) - mg/l	APHA, 22nd Edition Methylene blue	250 ppm	266	260
12	Nitrates (as NO_3^-) - mg/l	APHA, 22nd Edition UV-Spectrophotometric	50	13	12
13	Total Chromium - mg/l	IS 3025 (Part 52): 2003 AAS-Flame	0.05	<0.02	<0.03
14	Boron (as B^{3+}) - mg/l	APHA, 23rd Edition 4500 B-C Carmine Method 2017	0.5	<0.001	<0.002
15	Alkalinity - mg/l	IS 3025 Part-23 :2014	-	249	240
16	Oil & Grease - mg/l	IS-3025/39 : 1991 Partition Gravimetric	-	1.2	1.2
17	Dissolved Oxygen - mg/l	IS -3025 : 38 1989 Winkler Azide	-	4.4	4.5
18	BOD (3 days at 27°C) - mg/l	IS 3025 (Part -44) 1993	6	6	6
19	Hexavalent chromium - mg/l	APHA,22nd Edition 1.5 Diphenylcarbohydrazide	0.05	0.005	0.005
20	Nitrate Nitrogen - mg/l	APHA, 22nd Edition UV-Spectrophotometric	3	3.8	3.7
21	Colour (Hazen)	APHA,22nd Edition Platinum Cobalt	-	4	4
22	Temperature	IS 3025 (Part 9) : 1984, Thermometric	-	5°	6°
23	Chemical oxygen demand (COD)	APHA,22nd Edition Closed Reflux	10	250	256

V. CONCLUSION

From the above tables we can conclude that only some parameters are in acceptable range set by WHO while our point of interest the fluoride content was beyond permissible limit. Which is not at all advisable for human consumption Presence of fluoride is high concentrations leads to fluorosis problems. From literature studies also it is evident that the



Narketpally Mandal ground waters and soils show heavy fluoride contents. The fluoride concentrations are the reason for the dental and bone fluorosis in their lifetime.

Generally the TDS level between 50 - 150 ppm is considered as the most suitable and acceptable level. If TDS level is above 1000 ppm it is unsafe and unfit for human consumption. From the analysis, it was found that the TDS values are very high for samples I and II as 1753 ppm and 1744 ppm respectively, which is a clear indication of unsafeness and unfitness of groundwater for human consumption.

It is recommended not to use the ground waters but use piped water supply by the government Ground water fluoride concentrations can be reduced by following rain water harvesting as one of the methods to dilute the fluoride content.

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