



A Study On The Fluoride Content Of The Groundwater In The Gurazala Division Of The Palnadu District, Andhra Pradesh, India

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Article History	Abstract
Received: 22 January 2024 Revised: 19 February 2024 Accepted: 16 March 2024	<p>Water available for human consumption is very limited, as major percentage of water is in oceans which cover around 70% of the earth's surface and merely 3% of this precious resource is considered fresh water. Major share of fresh water is locked in the polar icecaps leaving humanity with approximately 0.4 percent of the earth's water which is usable and needs to be shared among the 7 billion population (Worldatlas.com). In recent decades, there has been a growing fear over the possibility of Fluoride (F⁻) in groundwater and the potential adverse health effects related to F⁻ exposure. So, this study assessed the amount and trend of groundwater F⁻ distribution at the level of the region. The present study was taken up to ascertain the water quality Gurazala division of Palnadu District in Andhra Pradesh with reference to its domestic usage criteria by doing the Fluoride (F⁻) ion are presented. And the Sampling was carried out during Pre-monsoon season at 10 mandals of 60 locations in Gurazala division and in addition to discover the relative treatment methods to make groundwater for usage.</p>
CC License CC-BY-NC-SA 4.0	Keywords: Groundwater, Fluoride (F ⁻), Pollution, Water Quality, Heavy metal.

1. INTRODUCTION

Water available for human consumption is very limited, as major percentage of water is in oceans which cover around 70% of the earth's surface and merely 3% of this precious resource is considered fresh water. Major share of fresh water is locked in the polar icecaps leaving humanity with approximately 0.4 percent of the earth's water which is usable and needs to be shared among the 7 billion population (Worldatlas.com). In their 2017 study, Kaur et al. gave an alert over a decline in Punjab's ground water quality, mainly as an effect of citizen interfering. They focus their search on the Malwa region in the southwest of the region. The main reason

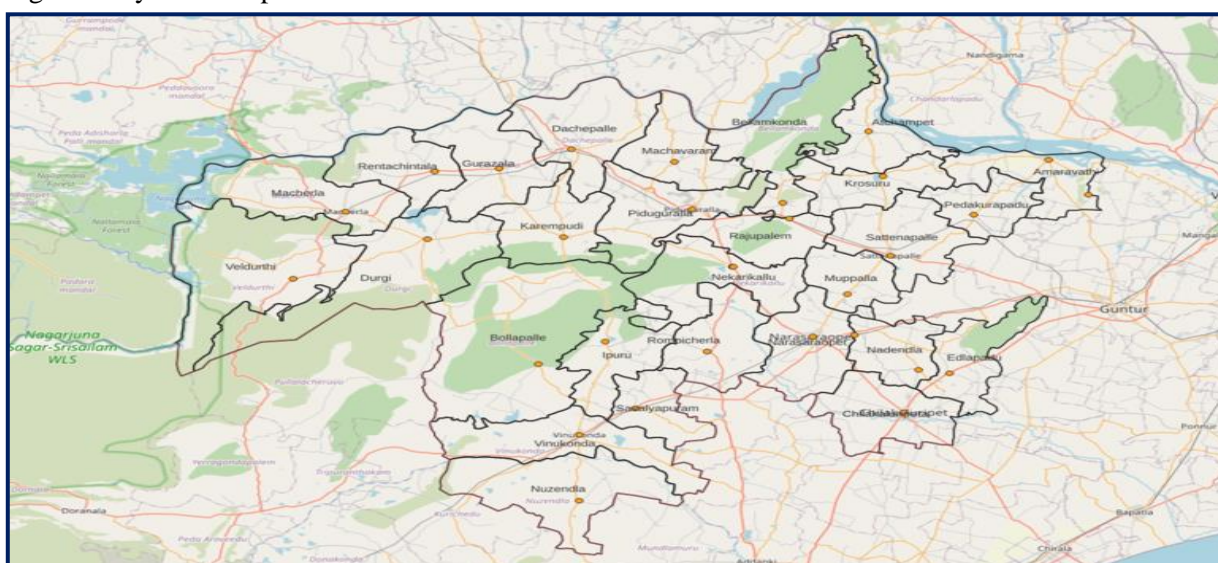
of the 24 samples that were studied and found to be unfit for household and agricultural use was the excessive use of chemical pesticides and fertilizers. They came to the view that developing plans for water management requires efficient monitoring of the quality of the water in parts that are based on crops.

2. DISCRPTION OF THE STUDY AREA:

The Palnadu district, located in 7,30,123 hectares of land in the state of Andhra Pradesh, has 1,50,759 hectares of forest cover. There have been 3,15,650 hectares sown net area. The district's total land under cultivation is 3,47,114 hectares. 31,464 Hectares are the sown area more than once in a year (ap.gov.in). The present study has been taken up to study the water Fluoride (F⁻), quality in selected divisions of Palnadu district, so as to assess its suitability for drinking purposes. The Fig.1 has shown The study area of Gurazala division of Palnadu District. And samples locations have shown in Table 1.

3. OBJECTIVES OF THE STUDY:

Fig.1: Study Area Map i.e. Gurazala division of Palnadu Area



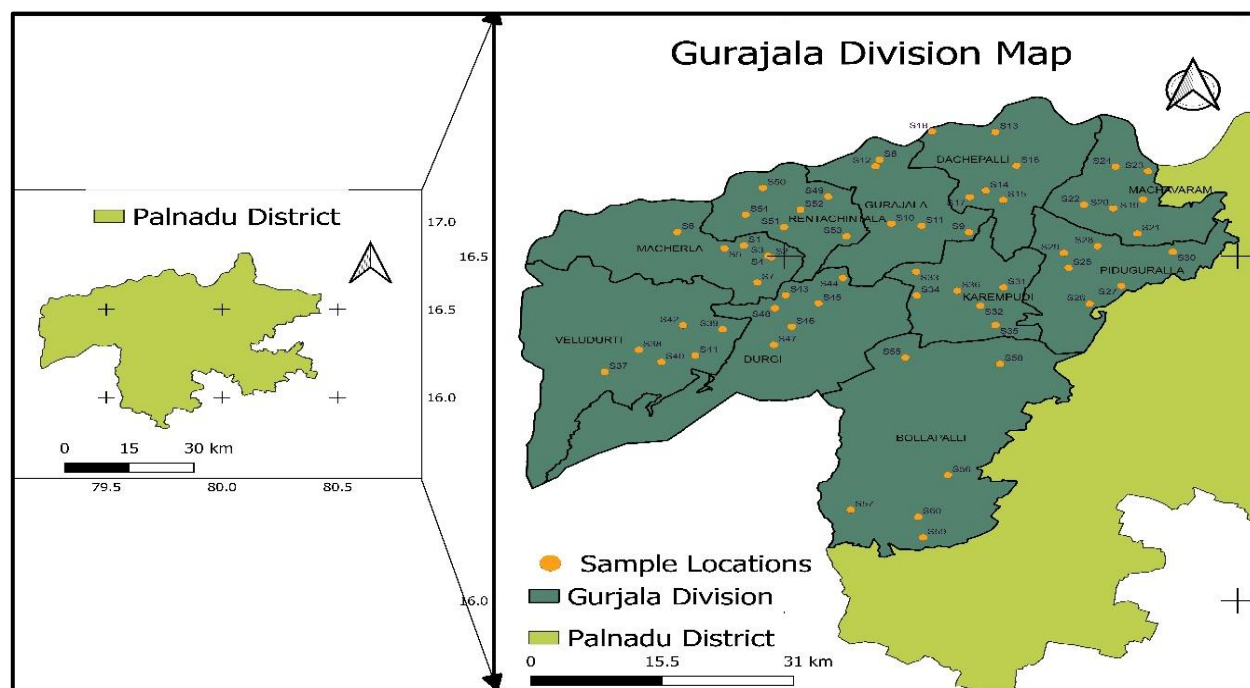
The present study's goals are to study the levels of harmful metal of Fluoride concentrations in groundwater samples and to offer solutions for the safe use of groundwater for diverse applications.

Table 1: Groundwater samples locations in Gurazala division

Samples Code	Name of the Mandal	Name of the Village
S1	Macherla	Thallapalle
S2		Kambhampadu
S3		Macherla
S4		Rayavaram
S5		Amani
S6		Pasuvemula
S7	Gurajala	Cherlagudi Padu
S8		Daida
S9		Gogulapadu
S10		Gurazala
S11		Pallegunta
S12		Telukutla
S13	Dachepalli	Bhatrupalem
S14		Dachepalle
S15		Kesanu palle
S16		Madinapadu

S17		Nadikudi
S18		Pondugula
S19	Machavaram	Akurajupalle
S20		Machavaram
S21		Mallavolu
S22		Pinnelli
S23		Tadutla
S24		Vemavaram
S25		Piduguralla
S26	Guttikonda	
S27	Janapadu	
S28	Kamepalle	
S29	Karalapadu	
S30	Konanki	
S31	Karempudi	Chintapalli
S32		Karempudi
S33		Miriyala
S34		Narmalapadu
S35		Singaretla thanda
S36		Oppicharla
S37		Veldurthy
S38	Gundlapadu	
S39	Patlaveedu	
S40	Veldurthi	
S41	Uppalapadu	
S42	Mandadi	
S43	Durgi	Atmakur
S44		Darivemula
S45		Durgi
S46		Kolagutla
S47		Mutukuru
S48		Polepalle
S49	Rentachintala	Goli
S50		Mallavaram
S51		Paluvayi
S52		Pasarlpadu
S53		Rentala
S54		Tummurkota
S55	Bollapalli	Ayyannapalem
S56		Bollapalle
S57		Gutlapalle
S58		Mellavagu
S59		Perurupadu
S60		Vellatur

Fig 2. Sampling location map at study area of Gurazala division of Palnadu



4. METHODOLOGY:

Groundwater samples have been collected from hand pumps/bore wells, 10 mandalas of Gurazala division of Palnadu District for Chemical analysis, which will be has been carried out, in the environmental engineering Laboratory, Department of Civil Engineering, VFSTR, deemed to be University, Guntur, A.P., India. The Chemical parameters evaluated through standard test procedures and the study aims in evaluating groundwater quality status in the study area and its portability during pre-monsoon time. As per UNESCO document procedures water samples were collected. The collected samples were carefully labelled with the precise location of sample collection at the study area. Standard procedures are used to analyze samples that are brought to the lab in bottles (APHA 1998). Sampling location map at study area of Gurazala division of Palnadu. Fig 2 has shown the sampling location map at study area of Gurazala division of Palnadu.

5. RESULTS AND DISCUSSIONS:

Groundwater samples collected were labeled with code numbers S1, S2, S3,S4,S5,S6,S7,S8,S9,S10,S11,S12,S13,S14,S15,S116,S,17,S18,S19,S20,S21 up to S60 from the Gurazala division were analyzed for Fluoride (F). The maximum mean fluoride content during the pre-monsoon season at Gurazala division was 1.15 mg/l observed in Bollapalle mandal and the mean minimum was 0.74 mg/l observed in Rentachintala mandal. Table 3 has shown the Fluoride content at study area during Pre Monsoon season. and Fig 3 has shown the Fluoride levels at Gurazala Division during Pre Monsoon season.

US Agency for Toxic Substances and Disease Registry has classified fluoride amongst the 12 most hazardous contaminants mainly due to its toxic nature and high reactivity (ATSDR, 2003). Intake of fluoride above 1.5 mg/l can result in skeletal and dental fluorosis both in animals and humans (Dehghani et al., 2019; Sahu et al., 2017;).Fluoride by its inherent capacity replaces the calcium present in teeth and bones and results in making them weak and causes osteoporosis especially in adults.

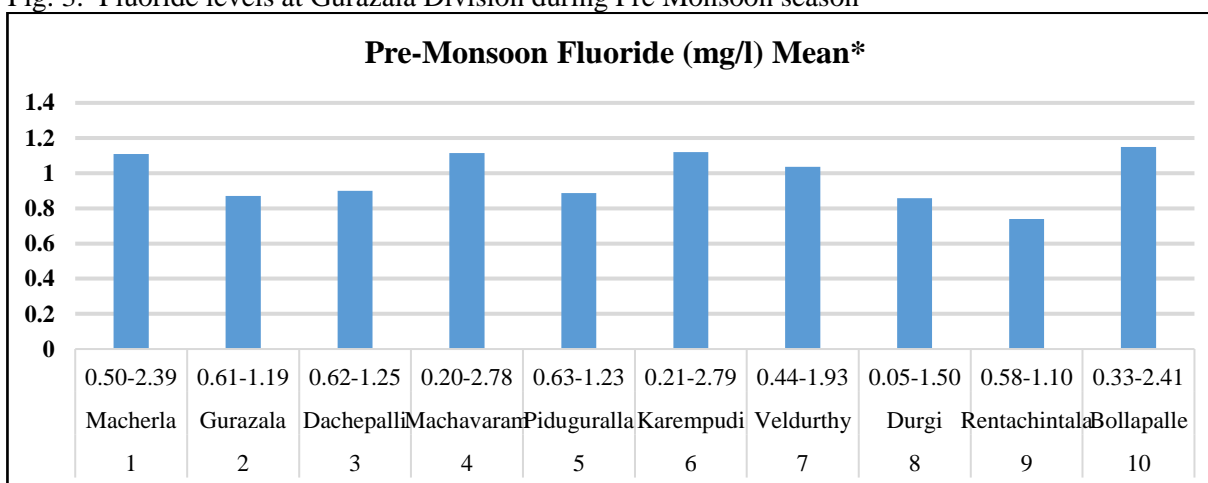
Table 3: Fluoride content at study area during Pre Monsoon season

S. No.	Name of the Mandal	Number samples	Pre-Monsoon Fluoride (mg/l)	
			Range	Mean*
			1	Macherla
2	Gurazala	6	0.61-1.19	0.870
3	Dachehalli	6	0.62-1.25	0.900

4	Machavaram	6	0.20-2.78	1.115
5	Piduguralla	6	0.63-1.23	0.887
6	Karempudi	6	0.21-2.79	1.120
7	Veldurthy	6	0.44-1.93	1.037
8	Durgi	6	0.05-1.50	0.858
9	Rentachintala	6	0.58-1.10	0.740
10	Bollapalle	6	0.33-2.41	1.150

* This value is an average value of 6 replicates of the parameters at particular point

Fig. 3: Fluoride levels at Gurazala Division during Pre Monsoon season



Presence of excess levels of fluoride in ground water is a worldwide phenomenon (Nizam et al, 2022) and excess levels results in detrimental health conditions. In the present study area in Gurazala division 35% of the samples during pre-monsoon exceeded the IS 10500:2012 limit of 1 mg/l. Continuous monitoring of the water resources by the regulatory authorities/ Boards at regular intervals must be carried out. From the audit report of CAG (CGWB,2021) in India it was observed that against budget 2,349.48 crore during the period 2012-19, the expenditure incurred was 1,109.73 crores. Thus, effective steps must be taken for proper utilization of funds. And the APGWD (Andhra Pradesh Ground Water Department) must allocate sufficient funds for monitoring of ground water in Palnadu district and Applying the Nalgonda Technique to de-fluoridate water is not only feasible but also highly effective.

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