

## Ground Water Quality and Fluoride Water Analysis G.Konduru and Reddigudem Mandals, Krishna District

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### ABSTRACT

In country like India, the groundwater is widely used for drinking purposes. In central India, the ground water is hard and contaminated with F and other elements above the permissible limits and found to be linked with prevalence of the fluorosis disease, the ground water samples are collected from different locations G.konduru and Reddigudem mandals, krishna, and Andhra Pradesh, India. The work was carried out in the year of 2017-2018. In methodology I use the SPANDNS Method. A total 40 ground water samples were collected from bore wells and open wells used for drinking water. In the study 2 mandals 40 samples are above then the permissible limit. Especially in G.konduru mandal. pinapaka village is completely above than the permissible limit (3.20PPM) and kowluru is also above than the permissible limit (2.4 ppm). Reddigudem mandal munchinapalli villages is completely above then the permissible limit (3.14) and reddigudem is also above than the permissible limit. The concentration of fluoride in all water samples must not exceed the limit decided by WHO. However, there are great variations in concentration of fluoride among different analyzed water samples.

**KEY WORD:** Ground water, fluoride, permissible limit, Spadns method

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### I. INTRODUCTION

Ground water is an important resource for drinking agriculture purposes. Groundwater uses and applications are often related to its composition, which is increasingly influenced by human activities. In fact the water quality of groundwater was affected by many factors including precipitation, surface runoff, groundwater flow, and the characteristics of the catchment area. The over extraction of groundwater caused huge weathering of the metamorphic rocks. In several regions of the country, the groundwater was contaminated with fluoride beyond permissible limit of 1.5 mg/L with linking of fluorosis diseases in human **Salve, P.R., et.al, (2008), Vikas, C. (2009), Kundu, M.C. et.al, (2009), Rao, N.S. (2009), Viswanathan, et. al, (2009)**. Fluoride is found in all natural waters. It occurs in waters from trace to high concentration (**Dar et al., 2011**). Fluoride is present in ground water coming either from natural sources like weathering and volcanic processes or from wastewater of industries like fertilizer, glass, ceramic, brick, iron works and electroplating (**Nigussie et al., 2007**). It has been shown to cause significant effects in humans through drinking water (**WHO, 2006 (World Health Organization)**). Fluoride has both beneficial and harmful effects on the human health depending upon its level. Among the beneficial

effects of fluoride in human body, strengthening of bones and prevention from tooth decay are significant (**NSDWQ, 2008 (National Standards for Drinking Water Quality.)**), but excessive exposure to fluoride in drinking water can give rise to a number of adverse effects (**WHO, 2006 (World Health Organization)**) which can lead to various diseases such as skeletal and dental fluorosis, (**Fawell et al., 2006**). WHO has set a limit value of 1.5 mg·l<sup>-1</sup> for fluoride in drinking water (**WHO, 2004 (World Health Organization); Rafique et al., 2008**). Drinking water is typically the largest single contributor to daily fluoride intake (**Murray, 1986**). For a given individual, fluoride exposure (mg kg<sup>-1</sup> of body weight per day) through drinking-water is determined by the fluoride level in the water and the daily water consumption (liters per day). Well waters contain about 10 mg of fluoride per litre or even more (**NAS/NAE, 1973, (National Academy of Science and National Academy of Engineering); Bulusu et al., 1979**). According to **Slooff et al. (1988)**, more or less 1 mg/L of fluoride was common in both surface and ground water (**McDonagh et al., 2000**). **Dissanayake (1991)** reported that presence of fluoride around 1mg/litre in drinking water is beneficial but prolong exposure to 10 to 20 mg fluoride per person per day for 10 to 20 years can

lead to crippling skeletal fluorosis, (USNRC, 1993) (USA National Research Council) . The presence of fluoride in a limited level is beneficial and ground water was the most important source of fluoride than soft drinks (Zohouri and Rugg-Gunn, 2000). An interesting study was conducted by Srikanth et al. (2002) to determine the fluoride level in the ground water in Africa. Their results showed that higher concentration of fluoride found in ground water was about 3.73 mg/L which was more than the safety level. Extensive dental fluorosis had been observed in the population exposed to drinking water having high fluoride concentration. Ali et al. (2002) investigated the presence of fluoride in drinking water of konwuru village and found it to be within safe limits. However, adjoining areas like Mangamandi with higher fluoride concentrations in the water sources have also shown reported health effects in the form of dental and skeletal fluorosis among the natives due to excessive fluoride intake through drinking water. The present study was conducted to determine the concentration of fluoride in drinking water (tap, well and mineral water) in Quetta city.

## II. MATERIAL AND METHODS :

The Present study was conducted in the year 2017- 2018 in the district of Krishna, Andhra Pradesh state in India. Krishna district is an administrative district in the Coastal Andhra region of the Indian state of Andhra Pradesh. Machilipatnam is the administrative headquarters and Vijayawada is the most populated city in the district. It has an area of 8,727 km<sup>2</sup> (3,370 sq mi) and had a population of 45,29,009 as per 2011 census of India. It is

bounded by West Godavari on the east, Bay of Bengal on the South, Guntur and Suryapet districts in the west and a portion of it also borders with the state of Telangana. 50 mandals in Krishna district under 4 revenue division. Krishna District is formed from District of Rajahmundry in 1859, Guntur district was separated from Krishna in 1904 to form Krishna district which was further divided in 1925, to Krishna and West Godavari districts. Krishna district is the most developed district in Andhra Pradesh.

A total 40 ground water samples were collected from bore wells and open wells used for drinking water. The samples are collected simple random sampling in G.Konduru mandal total 20, samples, were, selected (Kattudipalem, pinapaka, kowluru, g.konduru), reddigudem, mandal (narukulapadu, p.naguluru, reddigudem, munchinapalli) 20 samples were collected in preleased polyethylene bottle of 1 liter.

The water samples are analyzed by SPANDS method . It involves the reaction of fluoride with a red zirconium dye solution .in the acidic medium zirconium reacts with alizarin Red-S to form violet complex, which is bleached on the addition of fluoride ion and colour changes from red violet to yellow green . 100 ml of filtered samples, Then 5 ml of zirconyl acide solution was added to it for the removal of SO<sub>4</sub> interference, followed by the addition of Alizarin Red –S now, wait for at least one hour .Measure the intensity of light at 570 nm and calculate the concentration with the help of standard curve . The above mentioned analytical procedure is followed as prescribed by APHA.

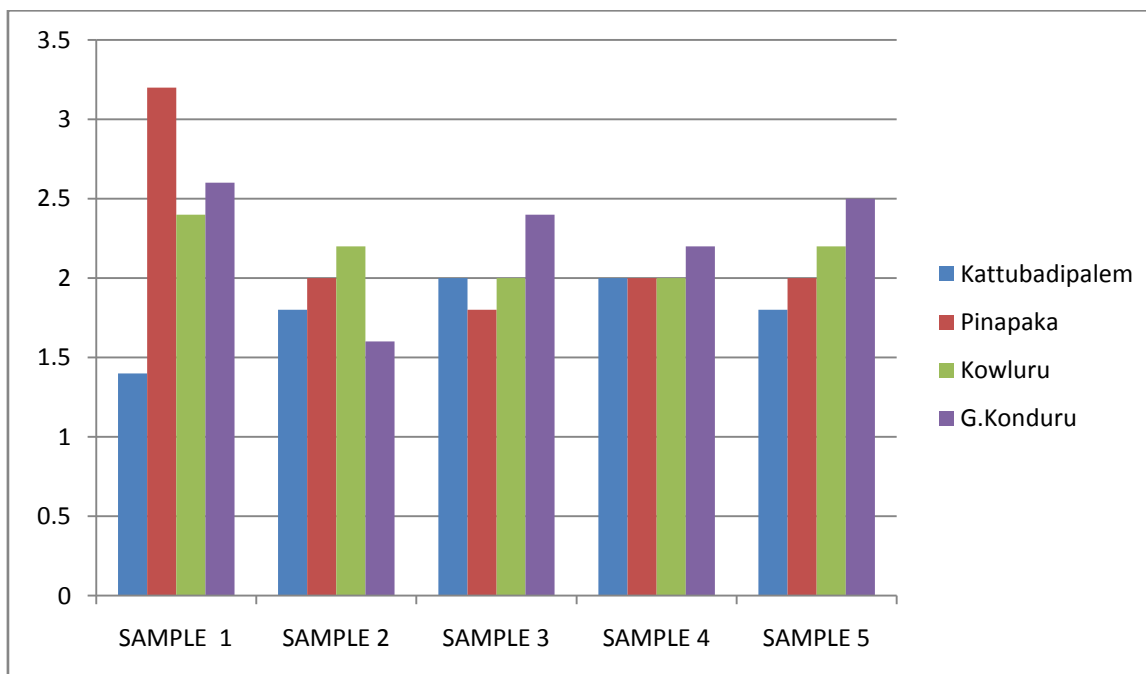
## III. RESULTS G.KONDURU MANDAL

NAME OF THE VILLAGE AND SOURCES	FLORIDE CONCENTRATION (mg/L)	Fluoride permissible (0.8-1.0 mg/L)
<b>KATTUBADIPALEM</b> MPP SCHOOL(BOREWELL)	1.4	0.8-1.0 mg/l
BC COLONY (HANDPUMP)	1.8	0.8-1.0 mg/l
BUS STOP (BOREWELL)	2	0.8-1.0 mg/l
OC COLONY (BOREWELL)	2	0.8-1.0 mg/l
ZPH SCHOOL(HANDPUMP)	1.8	0.8-1.0 mg/l
<b>PINAPAKA</b> BUS STOP(HANDPUMP)	3.20	0.8-1.0 mg/l
OC COLONY(BOREWELL)	2	0.8-1.0 mg/l
MPP SCHOOL (HANDPUMP)	1.8	0.8-1.0 mg/l
RAM NAGAR( HANDPUMP)	2	0.8-1.0 mg/l
SC COLONY(BOREWELL)	2	0.8-1.0 mg/l
<b>KOWLURU</b> BUS STOP(BOREWELL)	2.4	0.8-1.0 mg/l
MPP SCHOOL HANDPUMP	2.2	0.8-1.0 mg/l
SC COLONY BOREWELL	2	0.8-1.0 mg/l
BC COLONY BOREWELL	2	0.8-1.0 mg/l
OC COLONY(BOREWELL)	2.2	0.8-1.0 mg/l
<b>G.KONDURU</b> MPP SCHOOL HANDPUMP)	2.6	0.8-1.0 mg/l
SC COLONY(BOREWELL)	1.6	0.8-1.0 mg/l
BUS STOP ( BOREWELL)	2.4	0.8-1.0 mg/l
ST COLONY (HANDPUMP)	2.2	0.8-1.0 mg/l
ZPH SCHOOL(HANDPUMP)	1.5	0.8-1.0 mg/l

**TABLE 1. FLUORIDE CONCENTRATION OF G.KONDURU MANDAL IN PPM**

The total 20 samples of the fluoride concentration were analyzed and summarized in the TABLE 1 . the fluoride concentration ranges from 1.4 to 3.20 mg/L .out of the 20 samples 20 samples are the above than the permissible limit . The highest fluoride levels( 3.20ppm) observed at pinapaka and lowest at kattudipalem in g.konduru mandal

In the study 20 samples are above than the permissible limit. Especially in g.konduru mandal pinapaka village is completely above than the permissible limit (3.20 PPM) and kowluru is also above than the permissible limit (2.4 ppm)



**FIGURE1:GRAPHICAL REPRASENTION OF FLUORIDE CONCENTRATION G.KONDURU MANDAL**

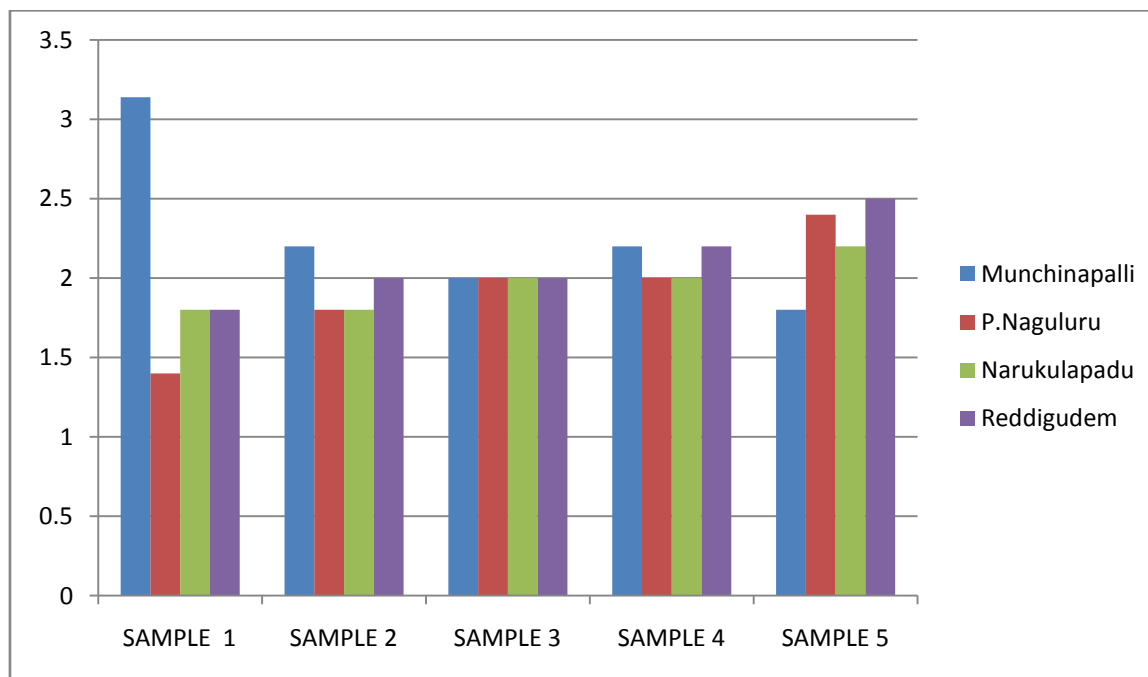
**REDDIGUDEM MANDAL**

NAME OF THE VILLAGE AND SOURCE	FLUORIDE CONCENTRATION (mg/L)	Fluoride permissible (0.8-1.0 MG/L)
<b>MUNCHINAPALLI (HANDPUMP)</b>	3.14	0.8-1.0 mg/l
BC COLONY BOREWELL	2.2	0.8-1.0 mg/l
SW SCHOOL (HANDPUMP)	2	0.8-1.0 mg/l
BUS STOP OPEN WELL	2.2	0.8-1.0 mg/l
SC COLONY (BOREWELL)	1.8	0.8-1.0 mg/l
<b>P.NAGULURU UP SCHOOL OPEN WELL</b>	1.4	0.8-1.0 mg/l
H.W BURIAL GROUND (OPEN WELL)	1.8	0.8-1.0 mg/l
BUS STOP (HAND PUMP)	2.0	0.8-1.0 mg/l
BC AREA (HAND PUMP)	2	0.8-1.0 mg/l
OC COLONY (BORE WELL)	2.4	0.8-1.0 mg/l
<b>NARUKULAPADUMPELE SCHOOL HANDPUMP</b>	1.8	0.8-1.0 mg/l
ST AREA BORE WELL	1.8	0.8-1.0 mg/l
VILLAGE CENTER (HAND PUMP)	2	0.8-1.0 mg/l
BUS STOP( BORE WELL)	2.0	0.8-1.0 mg/l
YANADULA COLONY (HAND PUMP)	2.2	0.8-1.0 mg/l
<b>REDDIGUDEM H.W CHURCH(BOREWELL)</b>	1.8	0.8-1.0 mg/l
PUBLIC BAZER(HANDPUMO)	2	0.8-1.0 mg/l
T.VEERASWAMY HOUSE(HAND PUMP)	2	0.8-1.0 mg/l
BURIALGROUND(BOREWELL)	2.2	0.8-1.0 mg/l
SC.COLONY(HANDPUMP)	2.5	0.8-1.0 mg/l

**TABLE 2. FLUORIDE CONCENTRATION OF REDDIGUEDEM MANDAL IN PPM**

The total 20 samples of the fluoride concentration were analyzed and summarized in the TABLE 2 .The fluoride concentration ranges from 1.4 to 3.20 mg/L .out of the 20 samples 20 samples are the above than the permissible limit .in reddigudem mandal,munchinapalli village have high fluoride level and P.naguluru is low fluoride level .

In the study 20 samples are above than the permissible limit. In reddigudem mandal munchinapalli is also above then the permissible limit. (3.14ppm) and Reddigudem is also above than the permissible limit.(2.5ppm), and P.naguluru (1.4ppm) is below than the limit. The result of the reddigudem mandals is represented in the graphs as follows.



**FIGURE1:GRAPHICAL REPRASENTION OF FLUORIDE CONCENTRATION Reddigudem mandal**

#### IV. CONCLUSION:

The concentration of fluoride in all water samples must not exceed the limit decided by WHO. However, there are great variations in concentration of fluoride among different analyzed water samples. Overall water quality was found unsatisfactory for drinking purposes. Fluoride content was higher than permissible limit in 90% samples The output of the present work may be useful to the local health authorities as well as those responsible for the management of water supply to rural communities .

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