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Estimation of Fluoride Concentration in Ground Water in Kondapuram Mandal, Spsr Nellore District

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ABSTRACT
The survey was conducted in Kondapuram mandal, Nellore district are highlighted in Fluoride contamination. The Groundwater is the primary source of drinking water in this area and very few people are fed with water supply scheme. They have fluoride bearing minerals which are leached out to the groundwater and contribute high fluoride concentration in the groundwater. Total fifteen water samples are collected from different locations. This study used in SPADNS method. Fluoride levels in 93% of samples exceed the maximum permissible limits (1.5 mg/L). The observed Fluoride levels in this area range from 1.84–3.12 mg/L with an average of 2.2 mg/L. The high fluoride levels may lead to morbidity of dental fluorosis .It is finally concluded that the Kondapuram mandal need a sound Fluoride management plan and the removal of fluoride from drinking water is advisable.
Keywords: Contamination; Fluoride; Groundwater; SPADNS method.

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I. INTRODUCTION:

The crucial role groundwater plays as a decentralized source of drinking water for millions rural and urban families cannot be overstated. According to some estimates, it accounts for nearly 80 per cent of the rural domestic water needs, and 50 per cent of the urban water needs in India. Groundwater is generally less susceptible to contamination and pollution when compared to surface water bodies. Also, the natural impurities in rainwater, which replenishes groundwater systems, get removed while infiltrating through soil strata. But, In India, where groundwater is used intensively for irrigation and industrial purposes, a variety of land and water-based human activities are causing pollution of this precious resource. Its over-exploitation is causing aquifer contamination in certain instances, while in certain others its unscientific development with insufficient knowledge of groundwater flow dynamic and geo-hydrochemical processes has led to its mineralization**[1,2**]. Fluoride content in groundwater is mainly due to natural contamination, but the process of dissolution is still not well understood**[3,4].** Fluoride, an electronegative element, is highly reactive, therefore, almost never occurs in elemental state in natural water. It combines with most of the elements to form ionic or covalent fluorides. Areas with semi-arid climate, crystalline igneous rocks and alkaline soils are mostly affected[3]. The origin of fluoride in groundwater is through weathering of alkali, igneous and sedimentary rocks. The common fluoride bearing minerals are Fluorspar (CaF_2), Cryolite (Na_3AlF_6), Fluor-apatite ($Ca_3(PO_4)_2$ Ca (FCl_2). Fluorite (CaF_2) is the principle bearer of fluoride and is found in granite, granite gneisses and pegmatite**[5,6].** Apart from natural sources, a considerable amount of fluoride may be contributed due to anthropogenic activities. Burning of coal, manufacturing process of aluminium, steel, bricks, Phosphatic fertilizers industries, often contain fluoride as an impurity and are being leached down to the ground water**[,7,8,9**]. The high level of fluoride in drinking water beyond the permissible limit[2] has toxic effects, while its optimum level shows beneficial effects in reducing dental carries. The severity depends upon the amount ingested and the duration of intake**[10].** Fluoride contamination of groundwater is a growing problem in many parts of the world. High concentration of fluoride is reported both from hard rock (granites & gneisses) as well as alluvial aquifers**[11].** In India more than 66million people are at risk of developing fluorosis and high fluoride concentration in groundwater (greater than 1 mg/l) is widespread in the arid to semi-arid western states of Rajasthan and Gujarat and in the southern states of Andhra Pradesh, Karnataka and Tamil Nadu**[12,13,14,15].** People living in such areas were drinking high fluoride water without realizing its presence, which caused various bone diseases. The cause of high fluoride in ground water is geogenic being a result of the dissolution of fluoride bearing minerals. Fluoride in ground water is mainly influenced by the local and regional geological setting and hydro geological condition. However, soil consisting of clay minerals**[16,17],** the influence of local lithology, aided by other factors like semi-arid climate of the region may be responsible for higher concentration of fluoride in the groundwater of the region. In sea area, fluoride containing chemical components of Ca, Mg, Na, Cl, SO4, bicarbonate, Bromide, Phosphate, Iron, Aluminium etc., Locally used agricultural pesticides and anthropogenic contamination of surface water due to many rivers carry on particulate matter on rainy seasons. Fluoride problems are wide spread in nine states of India covering almost the entire country. Nearly 66million of people face the risk of which an estimated 6million are children..

The main source of fluoride in groundwater is rich in fluoride. Most of the people affected by high fluoride concentration in groundwater live in the tropical countries where the per capita consumption of water is more because of the prevailing climate**[18]**. Some Villages are heavily affected with fluorosis **[19,20].**Similarly, the Kondapuram mandal is rich with fluoride which forms the major reason for fluoride contamination in groundwater **[21]**, and the fluoride in the district of Nellore, Andhra Pradesh contain much higher fluoride than the world average fluoride concentration of 810 mg/kg **[22**]. Fluorine is often called as two-edged sword. Prolonged ingestion of fluoride through drinking water in excess of the daily requirement is associated with dental and skeletal Fluorosis. Similarly, inadequate intake of fluoride in drinking water World Health Organization (WHO) has set the upper limit of fluoride concentration in drinking water at 1.5 mg/l **[23],** and The Bureau of Indian Standards, has therefore, laid down Indian standards as 1.0 mg/l as maximum permissible limit of fluoride with further remarks as “lesser the better” **[24].** Intake of fluoride higher than the optimum level is the main reason for dental and skeletal fluorosis. The most effective tools to communicate information on overall quality status of water to the concerned user community and policy makers**(25)**. Thus, it becomes an important parameter for the assessment and management of ground water. Though fuoride enters the body through water, food, industrial exposure, drugs, cosmetics, etc., drinking water is the major source (75%) of daily intake.**[26]** Due to its strong electronegativity, 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 as well as adults. **[27]** Excess fluoride affects plants and animals also.

II. METHODOLOGY:

Study area;

The Kondapuram mandal of Nellore District of Andhra Pradesh, India. occupies an area of 384sq km and has a population of 37,283 are rural. It is the largest in area among the agriculture of Nellore districts. The coordinates of the Kondapuram 15°02′30″N 79°39′52″E.It is in the 21M elevation(altitude) Kondapuram Mandal is bounded by by Lingasamudram Mandal towards North, Kaligiri Mandal towards South, Jaladaniki Mandal towards East , Voletivaripalem Mandal towards North .Kavali City, Kandukur City, Nellore city, Ongole city are the nearby Cities to kondapuram

.groundwater contamination in the study areas. covering entire Kondapuram during the year of 2018-19.

A total 25 ground water samples were collected from bore wells and open wells used for drinking water. The samples are collected simple random sampling in Kondapuram mandal total 25 sampleswere selected(Ganugapenta,Gudavalluru,Perikapalem,Yarrabottlapalli,Iskapalem) samples were collected in precleaned 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 removel of SO4 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. RESULT;

Total 25 samples of the fluoride concentration were analyzed and summarized in Table 1. The fluoride concentration ranged from 0.8 to 1.0 mg/l. out of the 25 samples 25 samples are the above the permissible limit. The highest fluoride levels (3.12) observed at Gudavalluru and lowest at Ganugapenta. The mean values of Kondapuram mandal are(2.31)

In the study 25 samples out of 25 samples are above than the permissible limit. Especially in Kondapuram mandal Gudavalluru, Iskapalem,Perikapalem,yarrabotlapalli and

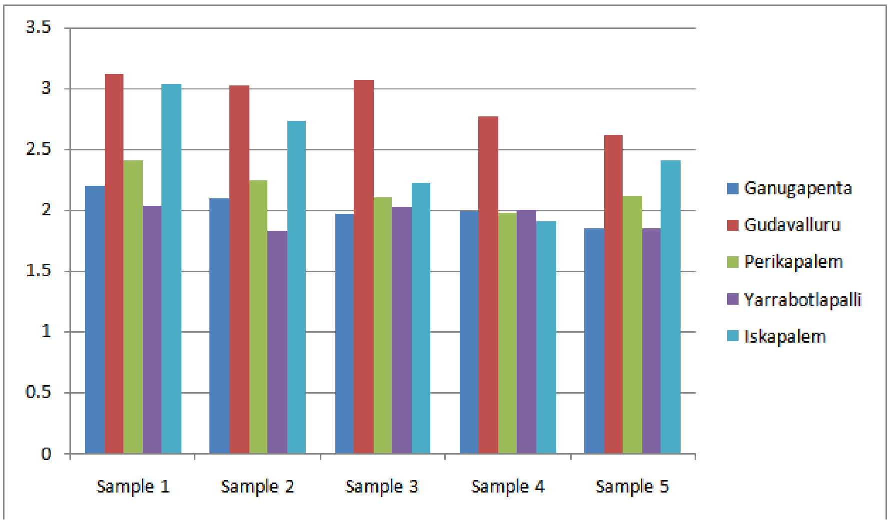
Ganugapenta villages is compeletely above than the permissible limit(2.2 and 3.12ppm).

Water samples from different bore wells of 10 villages which showed a maximum range of 0.8 to 4.0 ppm by DEAN's method. Among 10 villages are showing high levels of Fluoride. Almost all the selected villages are higher than the permissible level of 1 ppm according to WHO (World Health Organization,1984)

Kondapuram mandal

Name of the Village and sources	Fluoride Concentration(mg/l)	Fluoride Standard level
Ganugapenta(Borewell)	2.2	0.8-1.0 mg/l
Sri Colony, Borewell	2.1	0.8-1.0 mg/l
S.C Colony Handpump	1.97	0.8-1.0 mg/l
S.T colony, Handpump	2.0	0.8-1.0 mg/l
Ramnagar, Borewell	1.85	0.8-1.0 mg/l
Gudavalluru (Borewell)	3.12	0.8-1.0 mg/l
Z.P.H.S Handpump	3.03	0.8-1.0 mg/l
Busstop (Borewell)	3.07	0.8-1.0 mg/l
M.P.P School,Borewell	2.78	0.8-1.0 mg/l
Venkaya cly Borewell	2.62	0.8-1.0 mg/l
Perikapalem (Borewell)	2.42	0.8-1.0 mg/l
Busstop, Handpump	2.25	0.8-1.0 mg/l
S.T Cly, Handpump	2.11	0.8-1.0 mg/l
O.C Colony, Handpump	1.98	0.8-1.0 mg/l
B.C Cly, Borewell	2.12	0.8-1.0 mg/l
Yarrabotlaplli (Borewell)	2.04	0.8-1.0 mg/l
Busstop(Borewell)	1.83	0.8-1.0 mg/l
M.P.U.P school(b.w)	2.03	0.8-1.0 mg/l
Temple, Handpump	2.01	0.8-1.0 mg/l
High School, Handpump	1.95	0.8-1.0 mg/l
Iskapalem (handpump)	3.05	0.8-1.0 mg/l
Temple, Borewell	2.74	0.8-1.0 mg/l
MPES, Borewell	2.23	0.8-1.0 mg/l
Bus stop, Handpump	1.91	0.8-1.0 mg/l
Z.P.H.S School Handpump	2.42	0.8-1.0 mg/l

Table:1 Fluoride Concentration of Kondapuram mandal in ppm



Graphical representation of fluoride concentration Kondapuram mandal

IV. CONCLUSION:

The fluoride content is beyond the limit prescribed by standards. Since drinking water is a basic need, the people should consume protected water containing fluoride within the prescribed limits. Hence the future generations in these areas have to take necessary steps to protect themselves from attacking dental and skeletal flurosis.

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