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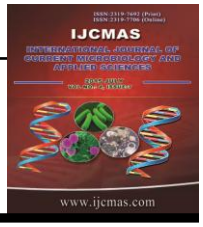

Original Research Article

A Study on Fluoride Levels in Borewell Water of Nalgonda District, Telangana, India

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A B S T R A C T

Keywords

Fluoride, Standard fluoride testing kit, Borewell water, Nalgonda

In the present study, fluoride levels were estimated in different areas of Nalgonda District of Telangana, India. Levels of fluoride in these areas ranged from 0.5mg/L to 5mg/L. Highest levels of fluoride was seen in Dasarigudem (near 12th Battalion) water sample (5mg/L) followed by Narketpally (3mg/L), while lowest levels were observed in Peddakaparthy, Settipalem, Akkachelma, Chinnasuraram, Korlapadu, Pacharigadda, Bhavaninagar (0.5mg/L). The number of samples with 0.5, 1, 2, 3 and 5mg/L of fluoride levels were 7, 67, 9, 1 and 1 respectively.

Introduction

Water is one of the component that is essential for sustaining life and environment. Groundwater forms a major source of drinking water. Ground water contributes of only about 0.6% of total water resources and is the major available source of drinking water (Swetha Garimella and Ramchander Merugu, 2014). Fluorides are widely distributed in nature and it is estimated to constitute about 0.32% of the earth's crust (fluorine in the form of fluoride) (WHO environmental health criteria 36, Geneva. (1984). Fluoride could be found in a number of minerals, of which fluorspar, cryolyte and fluorapatite are the most common (WHO, 1993). Human health is threatened by most of the agricultural development activities particularly in relation to excessive application of fertilizers and unsanitary conditions (M. Venkateshwarlu (2014).

Water forms the most important component of eco-system therefore any imbalance either in term of its amount or presence of added impurities to it can harm the whole eco-system (Ranjana, 2009) Nearly 12 million tons of fluoride deposits on the earth's crust are found in India. These fluoride deposits are the reason for fluorosis in 17 states of India (UNICEF, 1999). The most seriously affected areas are Andhra Pradesh, Punjab, Haryana, Rajasthan, Gujarat, Tamil Nadu and Uttar Pradesh (Venkateshwarlu *et al.*, 2014). High groundwater fluoride concentrations associated with igneous and metamorphic rocks such as granites and gneisses have been reported from India, Pakistan, West Africa, Thailand, China, Sri Lanka and Southern Africa (WHO, 2006). The distribution of fluoride content in the

groundwater of individual states is reported on the analysis of ground water quality monitoring data. Due to the strong electro negativity, fluoride gets attracted to positively charged calcium in teeth and bones. The major chemical parameter of concern is fluoride. Ground water is ultimate, most suitable fresh water resource with nearly balanced concentration of the salts for human consumption. Over burden of the population pressure and dumping of the polluted water by various industries at inappropriate place enhance the infiltration of harmful compounds to the ground water (Rajashekara *et al.*, 2005; Rajan and Paneerselvam, 2005). The high fluoride concentration in ground water in Nalgonda district reported by many researchers (Ayoob and Gupta, 2006; Ibrahim *et al.*, 2011; Pillai and Stanley, 2002). The present study therefore, was taken up to determine the fluoride levels in and around areas of Nalgonda District of Telangana, India.

Material and Methods

A standard fluoride testing kit was used to determine the fluoride. Borewell water samples were collected from different areas in Nalgonda District (Telangana, India). The collecting bottles were thoroughly cleaned by rinsing with 8M HNO_3 solution followed by several washes with double distilled water (Figure 1).

Results and Discussion

A total of 85 borewell water samples collected from different areas of Nalgonda District were tested in duplicates. The results are summarized in table 1. It was observed the fluoride content in these samples ranged from as low as 0.5mg/L to 5mg/L. For convenience the study area is broadly grouped under categories depending upon the fluoride levels (group I- 0.5mg/L, II- 1 mg/L, III- 2 mg/L, IV- 3 mg/L and V- 5mg/L) (Table 2). The numbers of samples with 0.5, 1, 2, 3 and 5mg/L of fluoride levels were 7, 67, 9, 1 and 1 respectively. A representative figure for determining the fluoride level is shown in figure 2.

Doubled distilled water, tap water and sodium fluoride (Figure 3) were used as controls (Table 2 & Figure 4). 87% of the borewell water samples are within the Permissible limits of WHO (2004) (1.5mg/L). Similar studies on fluoride levels were carried out by Swetha Garimella and Ramchander Merugu (2014), Medikondu Kishore and Y Hanumantharao (2010). Results from their experiment revealed that the levels of fluoride levels which ranged between 1.0–3.5mg/L and 1.02–4.5mg/L respectively. However the area of sample collection by above authors were from different areas of Nalgonda District (Telangana, India).

Table.1 Fluoride concentration of borewell water samples

S. No	Sample collection area	F^- (mg/L)	S. No	Sample collection area	F^- (mg/L)
1	Rainigudem-2	1	16	Mallepallivari gudem	1
2	Chowtuppal-2	2	17	Cherlapally	1
3	Dasarigudem	5	18	Narketpally	2
4	Kesharaju pally	1	19	Thipparthy	1
5	Z.P.H.S Chityala	1	20	Bhaskar Theatre (Nalgonda)	1
6	Kotha gudem	1	21	Chityal (Dhaba)	1
7	Velimineduu	1	22	Opposite Divis	1
8	Ramalingala gudem	1	23	Pedda Kaparthy	0.5

9	Pedda kaaparthy Aareygudem	1	24	Choutuppal-1	2
10	A.Duppala pally	1	25	Madgulapally	1
11	Reddy Bavi (Toll Plaza)	1	26	Narketpally(poultry)	3
12	Z.P.H.S Aarey gudem	2	27	Boyavada Colony (Nalgonda)	1
13	Gundram Pally	1	28	B.T.S (Nalgonda)	1
14	Akkachelma (Nalgonda)	1	29	Chandana pally	1
15	Rainigudem-01	2	30	Reddy colony (Nalgonda)	1
S. No	Sample collection area	F^- (mg/L)	S. No	Sample collection area	F^- (mg/L)
31	Setti Palem	0.5	59	Pillala Marri	1
32	Tripuraram	1	60	Ravula penta	1
33	Old City (Nalgonda)	1	61	Veeduvari gudem	1
34	Venganna gudem	1	62	Bottuguda(Nalgonda)	1
35	Parvathi Puram	2	63	Bhavani Nagar (Nalgonda)	0.5
36	Srinadha Puram	1	64	Kranthi Nagar (Nalgonda)	1
37	T.S.R.S (S.B.C)	1	65	Laxmidevi gudem	1
38	Suryapet Town -2	1	66	Bokka munthala padu	1
39	Itikyala	2	67	Pushpavathi gudem	1
40	Prakasham Bazar (Nalgonda)	1	68	Molka patnam-1	1
41	Akkachelma(Nalgonda)	0.5	69	Surya peta-1	1
42	Thatikallu	1	70	Thimmayi gudem	1
43	Chinna suraram	0.5	71	Bheemavaram	1
44	Pedda Devulapally	1	72	Mukundapuram	1
45	Sriram Nagar (Nalgonda)	2	73	Nakerekal-1	1
46	Panagal river	1	74	Ilapuram	1
47	Molkapatnam -2	1	75	14^{th} mile	1
48	Darushafa (Nalgonda)	1	76	Bheemavaram (musi river)	2
49	Babu sai peta	1	77	M.V. Primary school Rayini gudem	1
50	Lane wadi(Nalgonda)	1	78	Nakerekal-2	1
51	Settipalem-2	1	79	Edulagudem (Miryalaguda)	1
52	Korlapadu	0.5	80	Ashok nagar (Miryalaguda)	1
53	Pacharigadda	0.5	81	Pedda cheruvu (Miryalaguda)	1
54	Ramgiri(Nalgonda)	1	82	Shanti nagar (Miryalaguda)	1
55	Panagal river-2	1	83	Housing board River (Miryalaguda)	1
56	Chandanapally-2	1	84	Nandipahad (Miryalaguda)	1
57	Pedda Suraram	1	85	Vinobha nagar (Miryalaguda)	1
58	Nidamanoor	1			

Table.2 Classification of areas based on fluoride levels

Group	I (0.5mg/L)	II (1 mg/L)	III (2 mg/L)	IV (3 mg/L)	V (5mg/L)
No of areas	7	67	9	1	1
85 (100%)	8.23%	78.82%	10.58%	1.18%	1.18%

Figure.1 Water samples collected from different areas of Nalgonda District

Figure.2 Estimation of fluoride levels

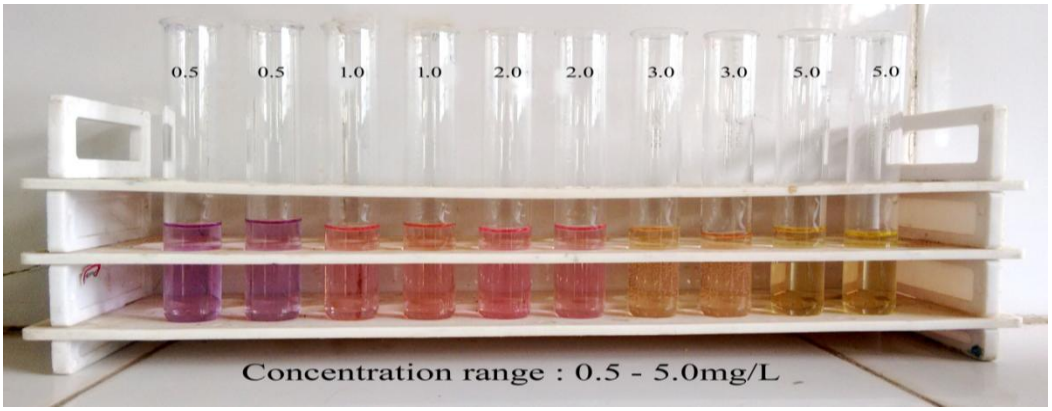
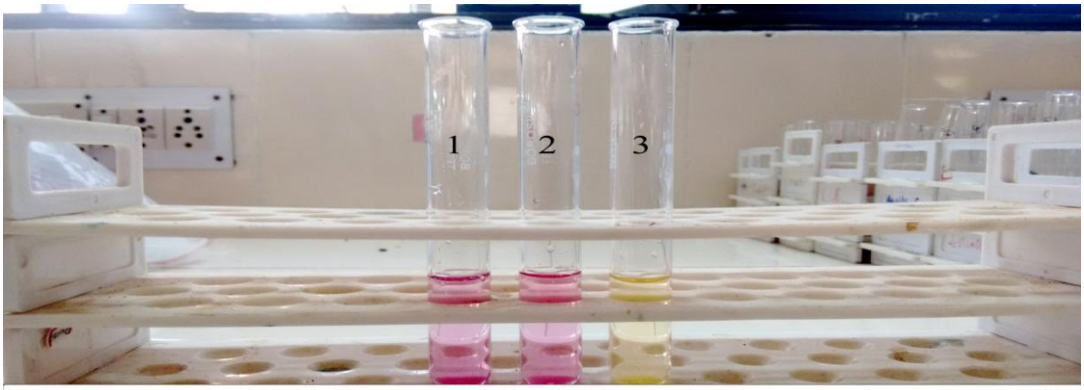
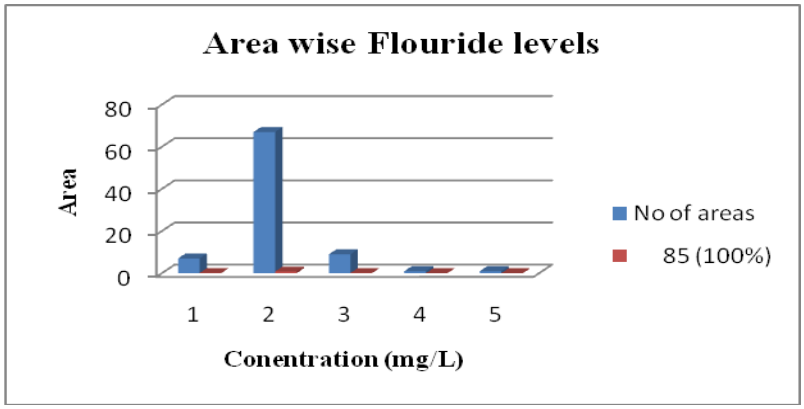


Figure.3 Controls samples



As controls double distilled water, tap water and sodium fluoride (5mg)

Figure.4 Area wise fluoride levels



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