

Spatial Analysis of Fluoride Quality in Parts of Pavagada Taluk, Tumkur District using GIS Techniques

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Abstract:- Ground water is the major natural source of water in drought prone areas. In this present study area, the 10 bore well samples collected in villages of Pavagada taluk, Tumkur district where fluorosis is reported heavily. physico chemical analysis of Sixteen parameters were analyzed, such as pH , EC, TDS, TH, Ca and Mg hardness, carbonates, bi-carbonates, chlorides, fluorides, nitrate, sodium, potassium, sulphates. Fluoride quality ranging between 0.5-0.9 mg/ltr were obtained in the study area. Thematic maps were generated using ARC GIS software techniques. The ground water present in these bore wells require treatment before the usage for drinking, agriculture or other purposes.

Keywords:- Ground Water, Physico-Chemical Characteristics, Water Quality, GIS, Thematic Maps.

I. INTRODUCTION

Ground water is the important source for potable purpose in rural areas. But obtaining in potable state is very unlikely due to the fact that different materials can dissolve in water easily. Hence there is a need to watch over the extent of pollution in ground water. Excess fluoride intake causes various physiological disorders in humans (Sahoo.et.Al.2003; Maiti.et.Al.2004) whereas permissible limit of fluoride in water kills bacteria. Hence there is an important need to monitor the status of fluoride. Therefore it is necessary to maintain the quality of groundwater at regular intervals to observe the suitability of ground water for consumption or other purpose. This study aims to reduce the fluoride concentration in Pavagada taluk, Tumkur district.

II. STUDY AREA

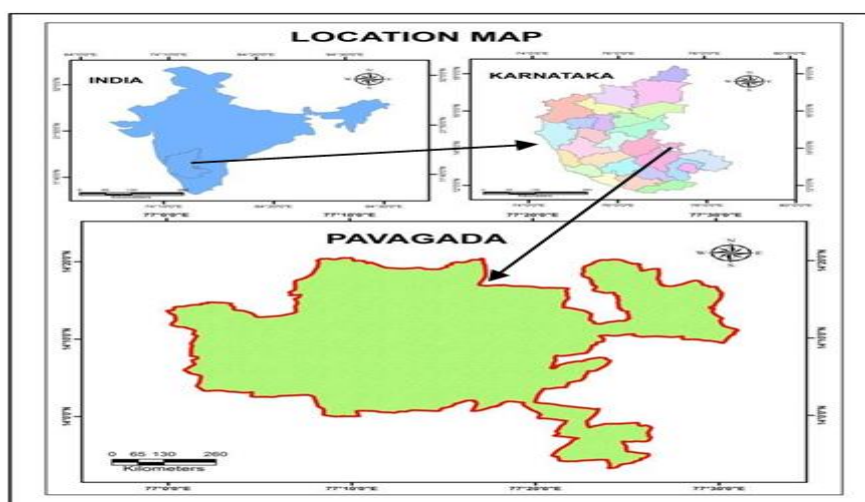


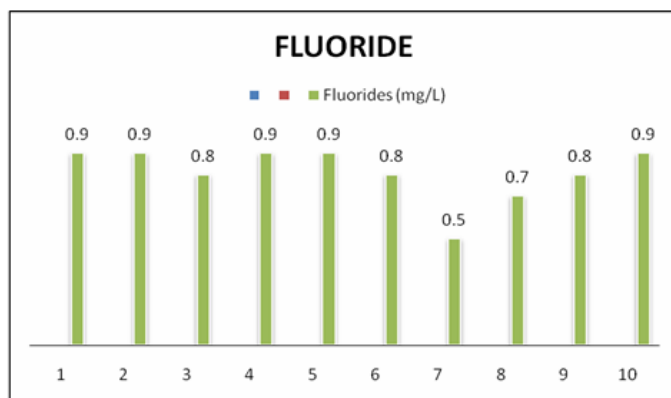
Fig 1:- Location Map

Pavagada is one among the ten taluk headquarters of Tumkur district with 1 town and 153 villages. Pavagada taluk has a geographical bearing of 14.10⁰N and 77.28⁰E. The elevation is 646m with a total geographical area of 1361sq km. The population of the taluk as per 2011 census is 28,486. The average rainfall per year is 526mm. The bore well samples of 10 villages such as CK Pura, Kothur, Kannmedi, Hariharapura, Karekyathanahalli, Mangalavada, Jang amarahalli, Kondethimmanahalli, Devarabetta.

III. MATERIALS AND METHODOLOGY

The samples are collected in polythene bottles and physico- chemical analysis was carried out to determine 16 parameters such as pH , EC, TDS, TA, TH, Ca and Mg hardness, Carbonates, Bi-carbonates, Chlorides, Fluorides, Nitrate, Sodium, Potassium, Sulphates and Sodium absorption ratio (SAR) with fluoride being the main concern. The standard procedures prescribed by APHA were followed to carry out the analysis. Fluoride content was determined by using DR/890 calorimeter. Using Arc GIS Software 10.2.1 version generated thematic maps such as Drainage and lakes, Geomorphology, Groundwater level, Geology, Land use, land cover, Slope, Soil and Fluoride map.

IV. RESULTS AND DISCUSSION



Graph 1:- Fluoride

1.KOTHUR	6.KAREKYATANAHALLI
2.KANNMEDI	7.MANGALAVADA
3.KANNMEDI (SCHOOL)	8. JANGAMARAHALLI
4.C K PURA	9.KONDETHIMMANAHALLI
5. HARIHARAPURA	10.DEVARABETTA

Table 1

Sl. No	Parameters	IS 10500:2012		1	2	3	4	5	6	7	8	9	10
		Acceptable limit	Permissible limit										
1	pH	6.5-8.5 (NR)	No Relaxation	7.23	6.95	7.01	7.14	6.94	7.28	6.83	7.25	7.55	7.48
2	Electrical Conductance (µmhos/cm)	\$	\$	814	931	1450	1100	1680	995	1570	1230	1410	1440
3	Total Dissolved Solids (mg/L)	500	2000	437	469	745	573	888	538	837	624	753	739
4	Total Alkalinity (mg/L)	200	600	112	126	314	156	321	162	224	168	216	178
5	Total Hardness (mg/L)	300	600	138	162	433	197	455	193	385	278	392	339
6	Calcium Hardness (mg/L)	75	200	84	102	268	132	215	117	294	138	219	169
7	Magnesium Hardness (mg/L)	30	100	13.2	14.6	40.3	15.9	58.6	18.5	22.2	34.2	42.2	41.5
8	Carbonates (mg/L)	\$	\$	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9	Bicarbonates (mg/L)	\$	\$	112	126	314	156	321	162	224	168	216	178
10	Chlorides (mg/L)	250	1000	22	24	144	249	203	48	177	59	111	151
11	Fluorides (mg/L)	1	1.5	0.9	0.9	0.8	0.9	0.9	0.8	0.5	0.7	0.8	0.9
12	Nitrates (mg/L)	45 (NR)	No Relaxation	12.3	16.1	13.4	26.5	47.2	15.8	30.2	27.1	49.7	11.7
13	Sodium (mg/L)	\$	\$	40.5	36.4	47.5	45.0	101.8	45.5	83.7	48.1	58.9	70.5
14	Potassium (mg/L)	\$	\$	0.8	0.9	3.0	1.8	1.5	1.6	0.9	0.9	1.7	1.4
15	Sulphates (mg/L)	200	400	10.7	20.3	52.7	52.4	23.6	60.7	27.3	42.3	27.3	47.6
16	Sodium Absorption ratio	\$	26	5.8	4.8	3.8	5.2	8.7	5.5	6.7	5.2	5.2	6.9
Note:(\$)Indicates nolimits have been specified;NR-No relaxation, All values are in mg/L except pH and EC.													
EC in µmhos/cm; ND-Not Detected													

Table 2:- Water quality Parameters

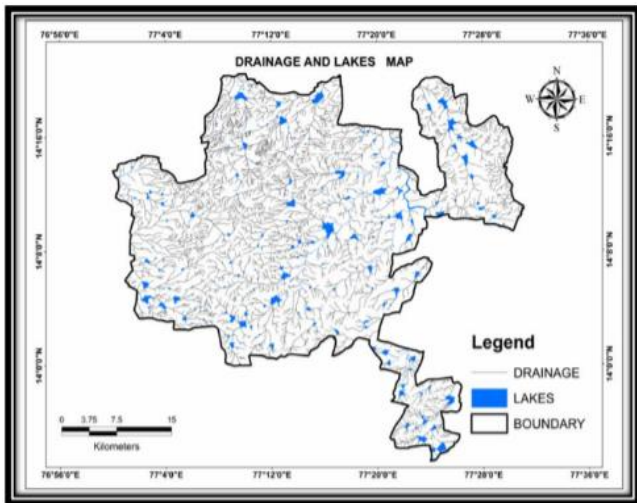


Fig 2:- Drainage and lakes Map

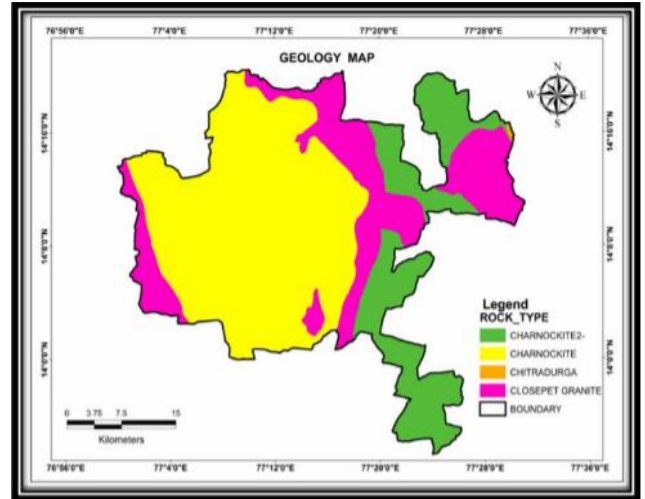


Fig 5:- Geology Map

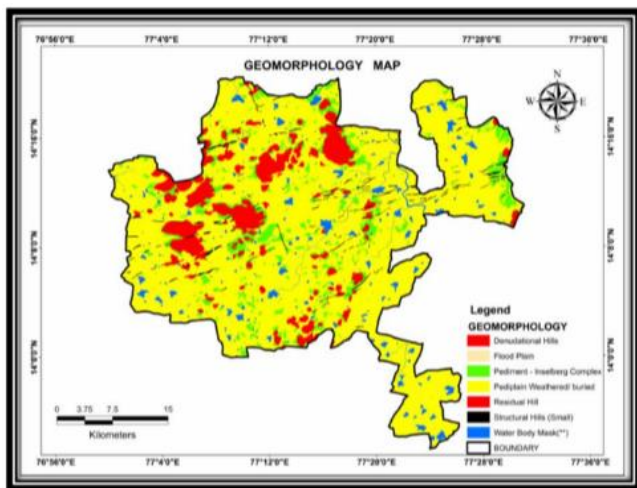


Fig 3:- Geomorphology Map

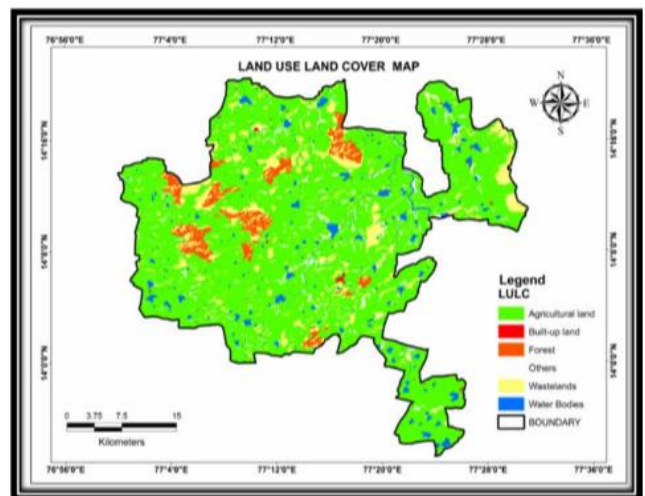


Fig 6:- Land use Land cover Map

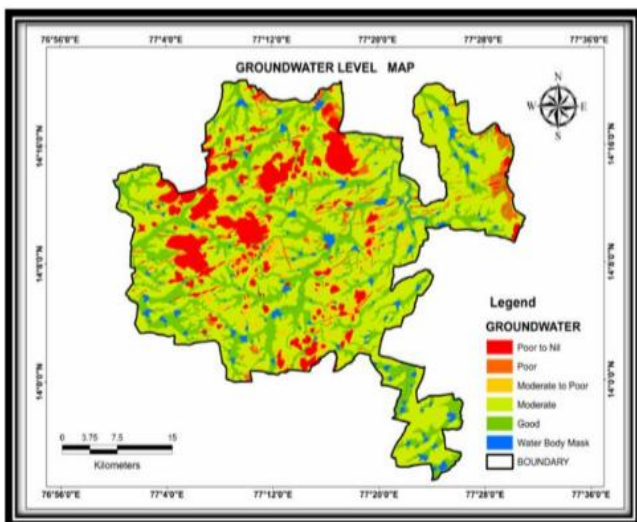


Fig 4:- Groundwater level Map

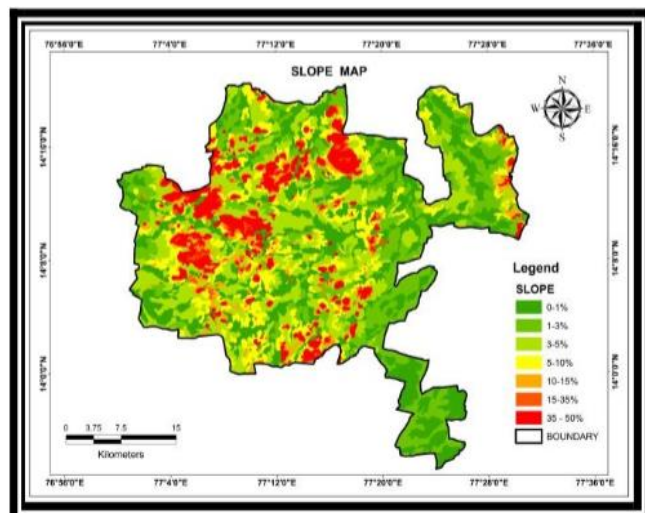


Fig 7:- Slope map

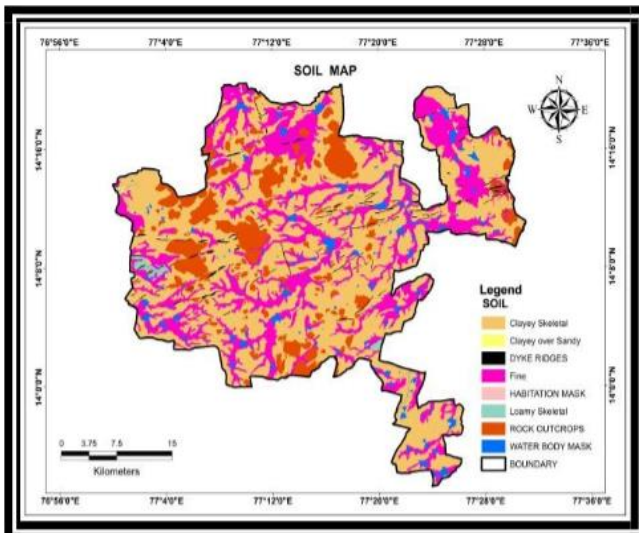


Fig 8:- Soil map

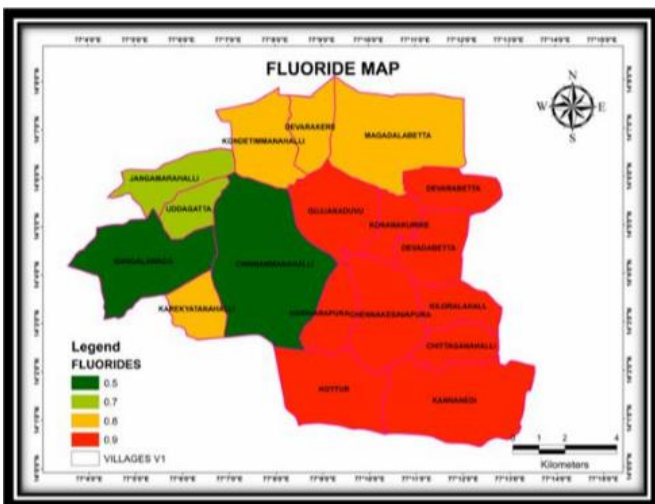


Fig 9:- Fluoride Map

The permissible limits are referred from IS 10500:2012. The fluoride values range from 0.5-0.9 mg/ltr from the analysis with the acceptable limits from 1-1.5 mg/ltr which shows the fluoride content is well under the permissible limit. The lowest value is reported in Mangalvada with the value 0.5 mg/ltr. Using ArcGIS 10.2 version thematic maps were created, Drainage and lake maps indicate that they are vanishing by manmade activities. Pediplain land is dominantly observed in the study area as indicated by the geomorphology map. The northern parts of Pavagada taluk have very low groundwater presence and this can be easily inferred from the groundwater level map. The geology map shows the dominant presence of charnockite rock in the central regions of the study area. Though the land use and land cover map indicate the abundant agricultural land the water bodies are very less likely to be seen.

V. CONCLUSIONS

Proper maintenance of the lakes and by constructing check dams at suitable places the groundwater level as well as the quality can be increased. The northern region is deprived of groundwater hence recharging of groundwater is very much essential in this region. The land area available for surface water sources is very less and has to be increased. The fluoride contamination occurring is seen to be less but still the treatment of water is very much essential. In the study area fluoride ranges between 0.5 to 0.9 mg/ltr.

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