*International Research Journal of Earth Sciences*_____ ISSN 2321–2527
Vol. **2(7),** 6-9, August **(2014)** *Int. Res.J. Earth Sci.*

Fluoridation Zonation Map of Jagalur Taluk, Davanagere District, India

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Available online at: www.isca.in, www.isca.me
Received 25th July 2014, revised 13th August 2014, accepted 23rd August 2014

Abstract

In order to detect the fluoride concentration of the ground water in Jagalur taluk of Davanagere district in Karantaka, and also for its mapping, a pilot project was taken up by choosing 27 bore wells from different locations of the study area. Ground water samples were drawn from the selected 27 bore wells for both pre-monsoon and post-monsoon seasons and fluoride was detected as per the standard methodology. Locations and altitudes of these bore wells were also obtained using GPS instrument. Fluoride concentration and its spatial distribution mapping has been done using GIS tools for the study area. Based on that, the study area has been divided into four zones of fluoride concentration.

Keywords: Groundwater, GIS, Fluoride, Jagalur tauk, Davanagere district, Karnataka.

Introduction

India relies mainly on groundwater for drinking and agriculture. Withdrawal of groundwater has led to the spectra of depleting the problem of water scarcity. The available groundwater quality is not only contaminated by hazardous pathogenic germs and anthropogenic substances but also geogenic substances adversely affect the water supply of many regions. The groundwater of Jagalur taluk had many threats such as anthropogenic activities, quality deterioration by agricultural activities and over exploitation and also persistence of continuous drought and also affected people conditions.

This paper mainly addresses the Fluoride concentration of 27 groundwater samples during August 2011 in Jagalur taluk, Karnataka (India). The results of fluoride analysis are discussed in details which reflect the present status of the groundwater quality of the study area. Groundwater is extremely important to the future economy and growth of rural India and hence it has to be protected from possible contamination. Therefore, it is recommended that suitable water quality management is essential to avoid any further contamination.

In the present study, groundwater samples have been drawn from the selected 27 bore wells, located in different villages of Jagalur taluk. Bore wells locations along with their altitudes have been recorded using GPS instrument (table-1).

Later, the water samples were subjected to chemical analysis as per the standard methodologies and detected fluoride concentration at the environmental science and technology study center, Bapuji Institute of Engineering and Technology (BIET), Davangere (table - 2).

Methodology

In the present study, 27 (Twenty seven) bore wells water samples were collected during Pre-monsoon (December 2010 and January 2011) and post-monsoon (August and Sept 2011) seasons. (figure-1), following the standard guidelines[1-4] and analyzed for fluoride parameter described by (APHA)[1]. The fluoride data thus obtained was checked, evaluated and used in a Geographical Information System (GIS) environment procedure to prepare fluoride zonation map of the Jagalur taluk of Davangere district of Karnataka. The study area was divided into four zones based on the fluoride concentration, ranging from 0.0 – 0.5 mg/l, 0.5 to 1.5 mg /l, 1.5 mg/l to 2.5mg/l and > 2.5mg/l as shown by four different shadings in figure 1 and 2. The level of 1.5 mg/l is the highest tolerance limit set by the World Health Organization, but in India, because of food habits and the nutrient status of the people, the maximum is set at 1.0 mg/l.

Results and Discussion

From the study it is clear that the Jagalur taluk (figure 1 and 2) is not evenly affected by the fluoride concentration but it is dispersed within the areas. The areas Gurusiddapura, Hirebannihatti, Bharamasamudra and Bangarakkanagudda having more than 1.5 mg/l need specific attention to investigate ways to improve human health and societal implications in them. The areas like Kamalapura, Kolamaghatta, Honnamaradi and Gourammana halli are within the range of 1.0 to 1.5 mg/l. However, the areas around Bilchod, Asagodu, Siddaiahnakote and Kattigehalli have fluoride concentration ranges below 1.0 mg/l.

The results indicate that the areas having fluoride concentration more than 1.5mg/l undoubtedly affect health of the people.

Table-1
Details of Bore Wells Locations

Sl. No.	Village name	GPS Location	Elevation (m)	Depth of bore Well (m)	BGL or below ground level (m)	Age of borewell (years)	Depth of water table from msl(m)
J1	Bilchod	N14°29.98′ E76°09.57′	611	91.44	18.28	10	592.72
J2	Kamalapura	N 14°31.63′ E 76°10.191′	630	85.34	30.48	8	599.52
J3	Kolamaghatta	N 14°31.778′ E76°09.294′	620	182.88	100.00	6	520
J4	Marikunte	N 14°32.038′ E76°10.494′	637	97.53	60.00	12	577
J5	Asagodu	N 14°33.772 E76°09.265′	617	76.2	36.57	15	580.44
J6	Asagodu	N 14°33.704′ E76°09.061′	617	91.44	42.67	20	574.38
J7	Huchangipura	N 14°36.007′ E76°09.382′	623	164.59	134.12	3	488.88
J8	Ujjappava-derahalli	N 14°37.254′ E76°09.549′	611	91.44	64.08	1	546.92
J9	Siddaiahnakote	N 14°37.885′ E76°08.508′	598	91.44	54.86	5	543.16
J10	Basavanakote	N 14°40.044′ E76°07.628′	590	91.44	45.72	8	544.28
J11	Magadi	N 14°40.389′ E 76°10.301′	603	106.68	60.96	2	542.04
J12	Gurusiddapura	N 14°39.597′ E76°11.829′	691	97.53	30.48	8	660.52
J13	Venkateshapura	N 14°38.000′ E76°14.054′	655	91.44	27.43	15	627.58
J14	Venkateshapura	N 14°38.015′ E 76°14.036′	655	91.44	27.43	5	627.58
J15	Gowdikatte	N 14°37.051′ E 76°14.618′	665	91.44	27.43	5	637.58
J16	Hirebannihatti	N 14°36.872′ E76°16.708′	667	106.68	60.96	5	606.04
J17	Kenchenahalli	N 14°34.267′ E 76°18.415′	688	91.44	54.86	5	633.26
J18	Bharamasamudra	N 14°31.056′ E 76°23.190′	656	137.16	106.68	6 months	549.32
J19	Bharamasamudra	N 14°31.080′ E76°23.633′	646	91.44	76.2	10	569.80
J20	Siddammanahalli	N 14°31.021′ E76°24.371′	656	137.16	67.05	4	588.94
J21	Bangarakkanagudda	N 14°31.128′ E 76°25.204′	657	76.2	54.86	5	602.36
J22	Donnehalli	N 14°29.319′ E 76°24.226′	635	91.44	27.43	10	607.58
J23	Honnamaradi	N 14°28.379′ E76°22.523′	649	106.68	45	7	604.00
J24	Gourammanahalli	N 14°25.974′ E76°22.256′	654	73.15	36.57	12	617.44
J25	Kattigehalli	N 14°26.631′ E76°19.823′	659	121.92	60.96	7	598.04
J26	Kattigehalli	N 14°26.627′ E76°19.834	659	121.92	60.96	9	598.04
J27	Bidarakere	N 14°25.784′ E 76°18.039′	679	91.44	30.48	5	648.52

Table-2
Fluoride Concentration of Water Samples

Sl. NO.	Village Name	Fluoride (F^-) mg/l	
		Pre monsoon	Post monsoon
J1	Bilchod	1.04	0.90
J2	Kamalapura	1.16	1.00
J3	Kolamaghatta	1.22	1.10
J4	Marikunte	1.00	1.00
J5	Asagodu	0.60	0.60
J6	Asagodu	0.57	0.40
J7	Huchangipura	1.10	1.00
J8	Ujjappavadera-halli	1.40	1.10
J9	Siddaiahnakote	0.89	0.80
J10	Basavanakote	1.73	1.10
J11	Magadi	1.83	1.20
J12	Gurusiddapura	2.12	1.80
J13	Venkateshapura	1.62	1.42
J14	Venkateshapura	1.60	1.50
J15	Gowdikatte	1.68	1.32
J16	Hirebannihatti	2.15	1.80
J17	Kenchenahalli	1.08	1.00
J18	Bharamasamudra	1.60	1.14
J19	Bharamasamudra	2.03	1.85
J20	Siddammanahalli	1.11	1.10
J21	Bangarakkana-gudda	2.96	2.00
J22	Donnehalli	1.32	1.20
J23	Honnamaradi	1.68	1.40
J24	Gourammanahalli	1.65	1.32
J25	Kattigehalli	0.91	0.90
J26	Kattigehalli	0.86	0.80
J27	Bidarakere	2.70	1.85

Conclusion

There is a need to recharge the bore wells by building artificial recharging structures to bring down the high fluoride concentrations in the affected zones of the study area, as a long term measure in the interest of the welfare of the rural mass.

Acknowledgements

The authors are thankful to KSCST (Karnataka State Council for Science and Technology), Bangalore, for financial assistance.

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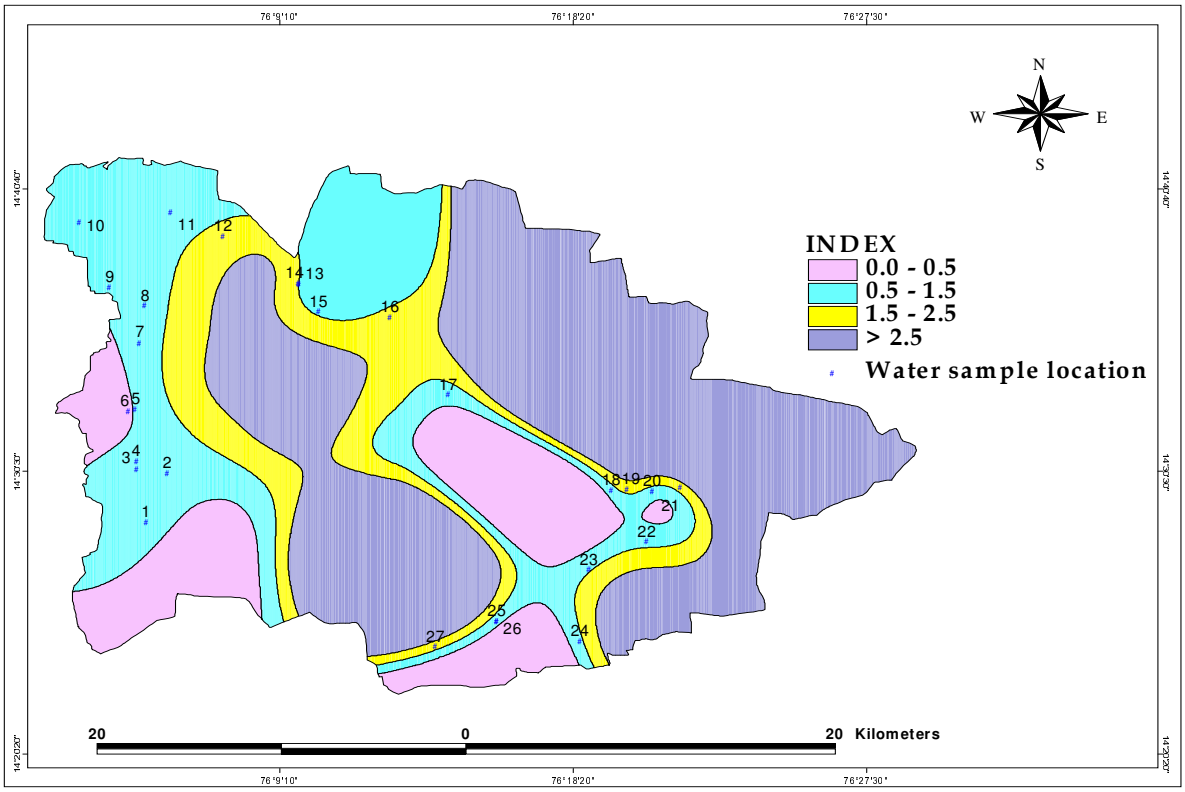

Figure-1
Spatial variation of Fluoride in Pre-monsoon season

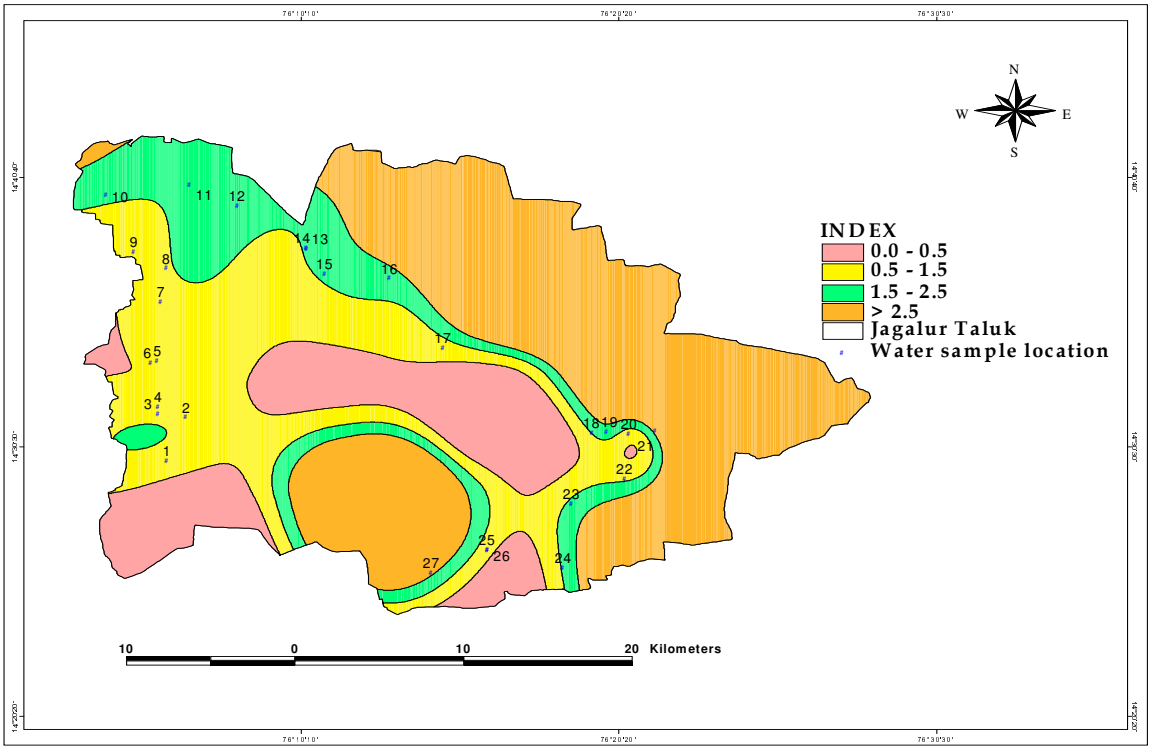

Figure-2
Spatial variation of Fluoride in Post-monsoon season