Study of Fluoride Contamination in Potable water at different locations in India

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ABSTRACT

The water containing High fluoride concentration results large health threat to large number of people around the world. In the above paper we are going to analyze the contamination of water with fluoride and other chemical constituent at those places where they are the only source of drinking water for local people. The collection and analysis of samples were done in the month of May – June specially in the season of summer.

Keywords: Fluoride, Ground water, Wilcox, Piper Diagram

1. Introduction

As we all know the quality of water is identified with the help of many parameters. Fluoride is one of the important parameter for water quality in rural water supply system, which is assumed to be dangerous if it exceeds its prescribed limit. First of all in 1937,the excess concentration of fluoride from ground water was reported in the state of Andhra Pradesh .

The quantity of fluoride present in ground water depends upon climate, composition of the host rock, and hydrogeology. The fluoride bearing rocks are the main cause of fluoride in ground water such as fluorspar, cryolite, fluorapatite and hydroxyl apatite.

2. Materials and Methods

2.2 Sample collection

The different samples of water containing fluoride were collected from either hand pumps or open wells in various villages at different locations of the block during the summer season from the month of May and June.

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The analysis was done in summer season because often contamination increases in this season due to low dilution and this tends to the accumulation of ions. Before sampling, of the water it is left to run from the source for few minutes.

2.3 Methodology

Different statistical analysis was accomplished with the help of computer. Mean, Standard Deviation, CV and relation between different parameters seasonally at each sampling site was obtained with the help of computer.

The water samples were collected and analyzed for various physicochemical parameters according to APHA (2009). The concentration of fluoride in different water samples were measured by using an Orion, model 2100. Different parameters pH and electrical conductivity of the water samples were measured by using a portable pH meter and EC meter . Chloride is the main constituent of raw sewage as they remain unbreakable in the digestive systemand they cannot be ignored because they are one of the main constituent of human diet

Titration is one of the best ways of measuring total water hardness and Total alkalinity using standard sulfuric acid and standard EDTA solutions, respectively.

3. Observation and Discussion

3.1 Phyischo-chemical Parameters

Parameters like pH, electrical conductivity, total alkalinity, total hardness as well as calcium, magnesium, chloride, carbonate, and bicarbonate are the different physico – chemical parameters which were also analyzed along with with the determination of fluoride concentrations.

The findings and their comparison with WHO health based drinking water guide lines (2008) are presented in Table 1.

NO.	Parameter	WHO	MIn	Max	Mean	SD
1.	PH	6.5 -9.5	6.1	9.2	8.7016	0.04
2.	Total Hardness	300-500	40.11	490.74	210.32	0.51
3.	Total Alkalinity	100 –500	52.34	447.55	242.17	0.40
4.	EC	-	150	2000	721.8	0.32
5.	F-	0.5	0.736	3.34	1.1532	0.24

6.	Cl-	220	20.27	247.73	70.666	0.37
7.	HCO3-	-	54.05	436.33	146.1	0.39
8.	CO3	-	0	87.28	41.67	4.87
9.	Ca2+	100-300	12.66	164.54	65.043	0.56
10.	Mg2+		2.56	33.25	12.38	0.66

3.2 Fluoride

The frequency distribution of the groundwater samples containing different amounts of fluoride showed in fluoride histogram (Fig.2). The fluoride concentration was ranged from 0.936–4.34 mg/L with highest fluoride level at (4.34 mg/L) and lowest at (0.936 mg/L). In terms of frequency distribution, the fluoride level lower than 1.0 mg/L was observed as 3.28% at two locations between 1 and 1.5 mg/L it was 14.75% at nine locations and at the fluoride level greater than 1.5 mg/L, it was 81.97% at fifty locations. There are maximum numbers of village (21 samples) fall on the region of fluoride concentration between 1.5 – 2.0 mg/L.
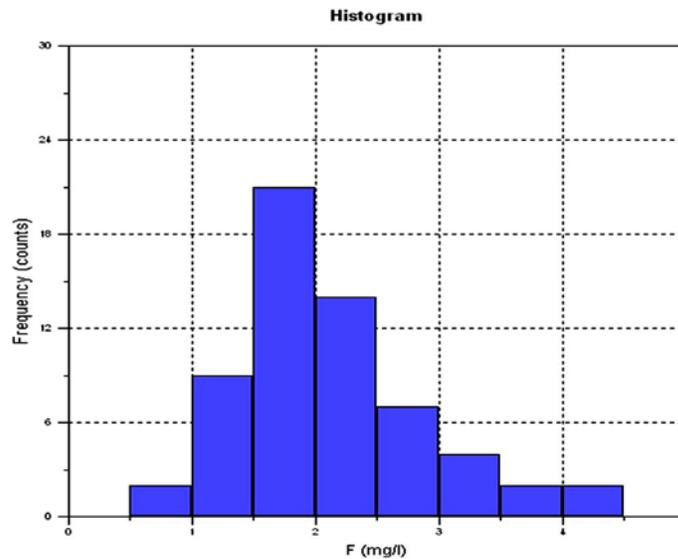
3.3 Scatter plots, & Wilcox diagrams

In order to stablish the relationship between two different variables a well known graphical method is used in this analysis knowns as two dimensional scatter plot.
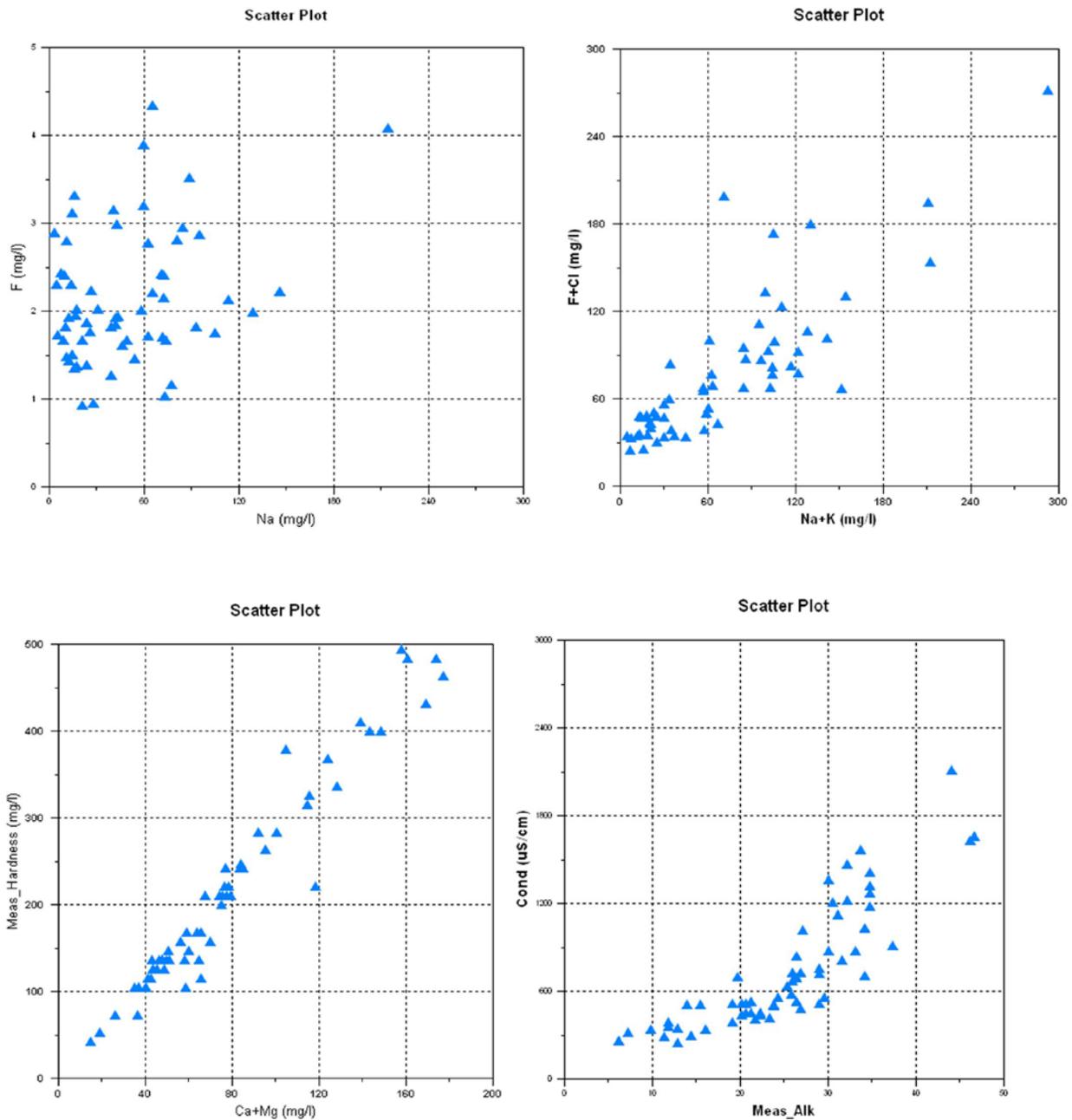
Figure 3: Scatter plots is used to show correlation between different cations and anions like Sodium ions Vs Fluoride ion concentration, sum of sodium and potassium ions verses sum of fluoride and chloride ions, the sum of calcium and magnesium ions with total hardness, and alkalinity with conductivity observed that there is no connection between fluoride and sodium and having the correlation factor 0.166. Data of the study area are present by plotting them on a Piper tri linear diagram (Fig.4).

Piper Plot
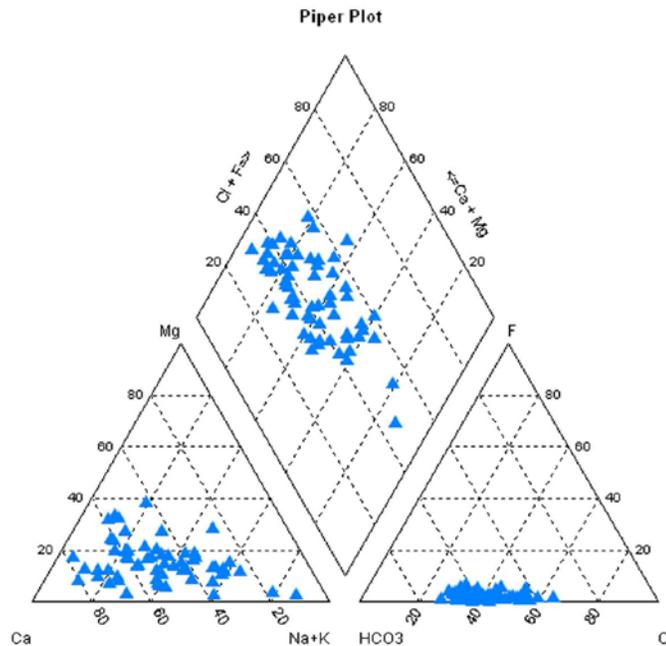
4. Conclusion

Different potable water sources from various locations in India are tested for their chemical composition and their application for drinking and irrigation purposes concerning fluoride as main constituent. Most of the water samples taken are not capable of being used for drinking and irrigation as they contains large amount of fluoride. Hence, without any prior treatment it is not suitable for consumption..

5. References

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