IRON AND FLUORIDE DISTRIBUTION IN

(ARARIA, BHAGALPUR, KATIHAR, KISHANGANJ, PURNIA)

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INTRODUCTION:

Groundwater is a resource of vital importance to life supporting systems and one of major resource for mitigating drinking needs (Kalra et al., 2014). The groundwater contamination due to anthropogenic as well as natural have emerged as threat to potable water. Fluoride and Iron contamination in groundwater is one of these which have severe effects on human and environmental health (Kumar and Kumar, 2015). Iron, despite being an essential component in human nutrition causes harm in when consumed in excessive amounts whereas fluoride has been found to cause fluorosis (in excess) and dental caries (in deficiency). Multivariate statistical techniques such as Cluster Analysis (CA) are used widely for studying spatial and temporal variations in water quality. Cluster Analysis is one of the exploratory data analysis tool for classification problems. Its sorts cases, data, or objects into groups or clusters on basis of similarities and dissimilarities (Salah et al., 2012).

OBJECTIVES

☐ To study the spatial variability of fluoride (F) and iron (Fe) in five districts of Bihar (Araria, Bhagalpur, Katihar, Kishanganj and Purnia).

☐ To assess the groundwater contamination status for fluoride and iron in the five districts.

STUDY AREA- Araria, Bhagalpur, Katihar, Kishanganj, Purnia

COLLECTION AND ANALYSIS OF DATA

Secondary data was collected from Ministry of Drinking Water and Sanitation, Govt. of India for year 2014-15 for five districts viz. Araria, Bhagalpur, Katihar and Purnia. Analysis of data was done on MS-Excel 2010 and MATLAB (R2010b; Version 7.11.1.866).

RESULTS AND DISCUSSION

Table 1: Average concentration of Iron (Above) and Fluoride (Below)

	Araria	Bhagalpur	Katihar	Kishanganj	Purnia
Mean (mg/L)	0.33	0.20	0.78	0.25	0.25
Std. deviation	0.27	0.05	0.60	0.02	0.12
Coefficient of Variation (%)	81.93	23.57	77.42	8.02	0.12
Maximum	1.78	0.29	1.90	0.29	1.56
Minimum	0.10	0.13	0.04	0.20	0.12

Araria	Bhagalpur	Katihar	Kishanganj	Purnia
0.67	1.01	0.84	0.85	0.83
0.10	0.26	0.08	0.08	0.09
14.73	25.70	9.02	9.40	10.70
0.98	1.98	0.98	0.98	1.05
0.38	0.68	0.15	0.46	0.45

- Distribution pattern of iron and fluoride in the studied five districts (Table-1) with high iron concentrations found at many sites in Araria, Katihar and Purnia (Table 1), high fluoride concentration at many sites in Bhagalpur (Table 1).

- High positive correlation between fluoride and iron concentration of all districts as well as fluoride concentrations of Purnia and Kishanganj (Table 2).

Araria(Fe)	Araria	Araria	Bhagalpur(Fe)	Bhagalpur(F)	Katihar (Fe)	Katihar (F)	Kishanganj (Fe)	Kishanganj (F)	Purnia (Fe)	Purnia (F)
Araria (F)	1	0.08	0.08	0.09	0.06	0.12	0.05	0.05	0.08	0.12
Bhagalpur (Fe)		1.00	0.09	0.11	0.24	0.35	0.19	0.19	0.27	0.33
Bhagalpur (F)			1.00	0.85	0.35	0.43	0.13	0.13	0.46	0.55
Katihar (Fe)				1.00	0.30	0.43	0.19	0.19	0.45	0.58
Katihar (F)					1.00	0.70	0.28	0.27	0.48	0.60
Kishanganj(Fe)						1.00	0.48	0.42	0.70	0.82
Kishanganj (F)							1.00	0.99	0.34	0.34
Purnia (Fe)								1.00	0.33	0.34
									1.00	0.83
Purnia (F)										1.00

☐ Correlation of districts with each other might be due to groundwater movem ent and

☐ eavy iron concentrations in the districts could be an outcome of the heavy iron concentrations in Kosi belt which has been found with abundance of iron in water

☐

➥ rog ne us spatial distributi n of iron is found in Arar ia, Katih ar Pur ia wher as fluoride in the studied ricts have unifo rm ibutio

☐ · wit low RS Ds (Table 1 ; Fig. 2 & 3).

➥ Clus ter I c mprises of Purnia, Ki shanganj Bhagal pur Araria d istricts whe ea Clu ster II co ntains K atihar dis trict for med us ing Eucl idea

⬚ High concentrations of fluoride can have attenuated to the geological origins, weathering of rocks in the region as well as continuous flooding of Kosi in North Bihar.

CONCLUSIONS

Most of the district have high concentrations of iron and fluoride which might lead to health hazards. Overall concentration is generally high in most regions. Statistical techniques such as Cluster Analysis (CA) is an efficient tool to study groundwater variability spatially. The present study is based on secondary data of quality analysis, so it needs further study to understand the dynamics of Iron and Fluoride in the vicinity.

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