International Journal of Basic and Applied Chemical Sciences ISSN: 2277-2073 (Online)
An Open Access, Online International Journal Available at http://www.cibtech.org/jcs.htm
2014 Vol. 4 (1) January-March, pp.14-17/Saini and Khan
Research Article

GROUNDWATER FLUORIDE CONTENT AND WATER QUALITY IN *NEEM KA THANA TEHSIL* OF SIKAR DISTRICT (RAJASTHAN)

***Pinky Saini and T.I. Khan**
Indira Gandhi Centre for H.E.E.P.S., University of Rajasthan, Jaipur-302004
**Author for Correspondence*

ABSTRACT
In the present study, *Neem ka Thana, Tehsil* of Sikar district was selected as a study area. Water samples were collected and analysed for physico - chemical characteristics of ground water. It was observed that fluoride concentration range from 0.80 ppm to 10.50 ppm, pH from 7.3 to 8.9, electrical conductivity from 2500 mmhos/cm to 5040 mmhos/cm, calcium hardness from 51-360mg/L, total hardness from 95 to 520mg/L, alkalinity from70-530mg/L, chloride from 196-840mg/L and TDS from 1780 to 3290 mg/L in the study area.

Keywords: *Fluoride, Fluorosis, Neem Ka Thana.*

INTRODUCTION
Fluoride is an element of halogen family found in nature as fluoride. Human beings are exposed to inorganic fluoride through water (mainly) and food. Small amount of fluoride (0.50-1.00 ppm) in drinking water is helpful in prevention of dental caries and in treatment of osteoporosis. Higher fluoride quantity causes fluorosis (dentel, skeletal and non - skeletal) along with many neurological implications (WHO, 1984; 1996; Samal and Naik, 1986; Stanley *et al.,* 1997; Ashutosh *et al.,* 2006) In Rajasthan, groundwater is characterised by comparatively high concentration of fluoride ions. 22 districts out of 32 are presently consuming water contaminated with fluoride (Gupta, 1991 and Sharma *et al.,* 2005). The potable water should be free from pathogenic agents and chemical constituents, peasant to taste and usable for domestic purposes. Water pollution is the contamination of water bodies such as river, lakes and ground water by human activities (Saini *et al.,* 2006). In the present study, water sample were collected from 25 villages of Neem ka thana Tehsil, district Sikar and analysed for physico - chemical characteristics**.**

MATERIALS AND METHODS
Sample Collection
Groundwater sample were randomly and periodically collected in pre cleaned poly ethylene bottles from 25 villages of Neem ka Thana tehsil (Sikar district) of Rajasthan as given in Table 1. Total 125 water samples (5 samples per villages) were collected in pre cleaned poly ethylene bottles and brought to the laboratory for analysis, using standard techniques for physico-chemical parameters.
Physico - chemical analysis were conducted for Physico - chemical parameters like pH ,Electrical conductivity, TDS (Total Dissolved Solid), Total hardness , Calcium Hardness , Chloride and alkalinity were determined with water testing kit (APHA prescribed) (model 161 E) as per standard methods given in APHA, (2005).
Fluoride concentration was determined with the help of selective ion meter 9 mettler Toledo MA 235 pH /ion Analyzer) standard procedure for determining the fluoride followed (APHA, 2005). Total ionic strength adjustment Buffer (TISAB) was used to maintain a suitable ionic strength and also to avoid complex formation.

RESULTS AND DISCUSSION
Analytical results of different samples collected from the study area (25 villages) of Neem ka thana Tehsil are given in Table 1. Results reveal that pH ranges from 7.3 to 8.9 and pH of water samples remain within the permissible limit i.e. is 6.9 to 9.2. Minimum pH (7.3) was found in Jhilo village and maximum pH

(8.9) was found in Thikaria village. A positive correlation has been seen between pH and fluoride. Total samples showed electrical conductivity more than permissible limit ranging from 2500 to 5040 mmhos/cm (Table 1). Calcium Hardness range from minimum of 51mg/L in Thikaria village to 360 mg/L in Jhilo village. 5% villages are having lower concentration and 5% villages are having total hardness more than permissible limit. Alkalinity of villages ranged from 70 mg/L to 530 mg/L against to 200 mg/L. As permissible limit suggested by WHO, 15% of samples possessed lower concentration of alkalinity, 60% samples fulfil WHO standard and 25% higher concentration of alkalinity. Chloride concentration varied from 196 mg/L in Dhani Neemkali to 840 mg/L in Thikaria village. 50% of sample possessed chlorides within the range of WHO standards where as 50% showed excess of WHO standard.
In the study area concentration of fluoride ranged from 0.80ppm to 10.50ppm out of 25 villages. 10 villages showed fluoride concentration in water between 0.80 – 5 ppm, 14 villages between 5.0 ppm – 10 ppm and one village having concentration 10.50ppm.

Table 1: Chemical analysis of groundwater of Neem ka Thana, Sikar, (Raj.)

S. No.	Name of village	pH	Electrical conductivity (mmhos/cm)	TDS (mg/L)	Alkalinity (mg/L)	Chloride (mg/L)	Total hardness (mg/L)	Calcium hardness (mg/L)as $caco_3$	Fluoride ppm
1	Puchala wali	7.5± 0.47	2998±0.16	1820±3.46	185±6.10	710±4.61	125±4.60	100±5.26	3.80±0.33
2	Nijhara	7.4 ± 0.15	2710±0.60	2015±5.02	130±5.52	202±2.82	135±6.34	210±5.65	5.50±0.16
3	Thikaria	8.92± 0.09	4800±0.028	1920±4.21	530±6.55	840±5.06	95±5.12	51±6.05	10.50±0.13
4	Aagwadi	7.5 ±0.30	5040±0.58	2089±4.77	105±5.49	695±5.24	98±4.76	310±6.22	4.60±0.08
5	Dhani ahiran	7.9± 0.15	3510±7.59	3290±6.05	510±8.24	590±6.61	185±4.02	295±5.93	6.10±0.15
6	Basri khurd	8.1 ±0.18	4220±7.52	2115±4.30	385±6.02	245±4.26	478±4.97	290±6.34	7.10±0.54
7	Nai kothi	8.4± 0.30	3989±4.24	2515±5.02	159±4.39	785±4.50	350±7.09	300±7.79	8.88±0.46
8	Puranabas	7.9± 0.32	3515±5.01	1890±4.94	220±5.76	675±4.72	510±6.83	199±7.56	3.95±0.13
9	Godawas	7.8± 0.27	3210±5.65	2220±7.70	315±5.52	205±5.50	280±4.43	198±2.86	8.98±0.05
10	Maonda kala	7.4± 0.26	3005±3.56	2435±41.51	90±5.06	660±7.46	295±4.32	215±6.05	4.80±0.29
11	Dhani baniyala	7.8± 0.27	2819±5.43	2660±7.98	425±5.52	815±6.12	405±3.89	185±8.44	4.10±0.28
12	Dhani neem kali	8.2±0 .25	3890±2.44	1990±6.06	310±8.09	196±5.16	302±22.94	350±4.30	9.10±0.06
13	Rupawas	8.1±0 .27	2500±6.85	2775±7.01	120±5.80	798±54.96.83	99±5.12	305±4.72	7.50±0.19
14	Dabala	8.4± 0.3	4280±4.66	1780±5.52	75±3.34	705±	198±3.03	290±5.12	7.98±0.12
15	Badiya mod	8.3±0 .22	4178±2.40	3055±5.01	70±6.61	210±5.11	229±5.26	275±6.73	7.15±0.07
16	Neem ka thana	7.8 ± 0.18	2610±6.06	3125±4.97	315±4.50	598±41.27	370±5.59	320±6.18	3.95±0.08

17	Bharamod	8.05 ±0.24	4098±4.72	2910±6 .14	95±4.5 0	515±20. 73	415±7.21	280±7.40	6.95±0.08
18	Jhamrala	8.2±0.25	4013±3.27	2895±4 .76	189±3. 57	205±5.2 2	119±4.72	288±5.02	2.90±0.09
19	Jhilo	7.3±0.18	3115±4.43	1790±5 .31	199±5. 89	635±5.9 3	520±4.87	360±5.35	0.80±0.08
20	Raipur	7.6±0.15	2688±3.89	1885±7 .46	225±4. 70	650±10. 87	258±5.35	290±7.42	2.50±0.11
21	Noyorana kothi	7.5±0.33	2810±6.55	2120±7 .25	289±2. 24	201±3.5 0	166±3.89	259±4.26	6.55±0.14
22	Dhandhela	7.7±0.30	3185±6.30	2215±1 0.45	218±4. 72	208±6.0 9	415±7.46	179±4.08	8.15±0.11
23	Bharala	8.2±0.08	4001±7.21	1985±1 0.40	258±22 .69	492±3.9 3	150±5.67	195±4.66	9.50±0.21
24	Patan	7.5±0.02	3310±42.1 1	2005±5 .22	315±4. 91	210±6.1 4	105±7.33	315±5.54	6.90±0.22
25	Bhudoli	8.10±0.1 6	3200±4.14	1990±6 .30	296±6. 41	201±9.2 3	321±4.65	226±5.68	5.45±0.08

Average ± SD

Table 2: BIS Standards of permissible and excessive limits of various parameters

S. No.	PARAMEATERS	P	E
1	PH	6.5	8.5
2	TDS	500	2000
3	ALKALINITY	200	600
4	FLUORIDE	0.5	1.5
5	CHLORIDE	250	1000
6	CALCIUM	75	200

P=permissible E= excessive

Table 3: Showing WHO and USPH Standards of Drinking water

Parameters	WHO	USPH
Fluoride(mg/L)	1-1.5	*1.5*
PH	6.9-9.2	-
E.C.(mmho/cm)	-	300
TDS(mg/L)	500-1500	-
Total hardness(mg/L)	100-500	-
Ca-hardness(mg/L)	75-200	-
Chloride(mg/L)	200-600	250
Alkalinity(mg/L)	200	-

ACKNOWLEDGEMENT
The authors are grateful to the Director, Indira Gandhi Centre for HEEPS and faculty of Environmental Science, University of Rajasthan, for providing necessary facilities. One of the author thanks the IGC for HEEPS for Departmental Scholarship.

REFERENCES

APHA, (2005). Standard methods for examination of water and waste water. 21st Edu. (AmerIican Public Health Association, New York, USA).

Asutosh sabal D, Agrawal D and Khan TI (2006). Fluoride Toxicity in Groundwater of Deoli Tehsil, Tonk District. (Rajasthan). *International Journal of Bioscience reporter* **4**(2).
BIS (Bureau of Indian Standards). 1991. Indian Standard specification for drinking water. IS: 10500. (New Delhi: Bureau of Indian Standards).
Patra RC, Dwivedi SK, Bhardwaj B and Swarup D (2000). Industrial fluorosis in cattles and buffalo around Udaipur, India. *Science of theTotal Environment* **253** 145-15.
Raviprakash S and Krishna RG (1989). The chemistry of ground water pervades area with regard to their suitability for domestic and irrigation purpose India. *Geochemical Journal* **4** 39-54.
Saini MP and Bhardwaj N (2006). Physio- chemical study of fluoride content in groundwater of Udaipur wati, Jhunjhunu District (Raj.). *Proceeding of State Seminar on Excess Fluoride in Potable Water and its Associated Health Hazards. 4-5 Aug; 2006, Alwar (Raj.) India*. 61-62.
Saini Y, Bhardwaj N And Gautam R (2010). Physico- Chemical analysis of groundwater of Jhotwara panchayat samiti, Jaipur (Raj.). *International Quarterly Journal of Environmental Science* **4**(1) 137–139.
Samal UN And Naik BN (1986). Dental fluorosis in school children in the vicinity of an aluminium factory in India. *Fluoride* **21** 142-148.
Stanley VA, Ramesh N, Pillai KS and Murthy PBK (1997). Epideiological survey of fluorosis in Ennore, Madras. *Proceedings of Academy of Environmental Biology* **6** 121 -125 .
Weast RV and Lide DR (1990). Handbook of chemistry and physics, 70th Edition 1989 -1990. CRC press, Bocaraton. *Fluoride* B-17.
WHO (1984). Fluorine and Fluoride. *Environmental Health Criteria Geneva*. **36** 93.
WHO (1996).*Guidelines for drinking water quality.* 2nd Edition **2** (Geneva).