

NOTE

Fluoride Level and Water Quality in Ground Water Samples of Coastal Areas in Radhapuram Taluk of Tirunelveli District

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The present work deals with the concentrations of fluoride and various parameters such as pH, electrical conductivity, total hardness, total alkalinity, chloride and salinity in Radhapuram taluk of Tirunelveli district. These parameters were recorded by means of collecting fifteen samples of drinking water from different parts of seven villages of this region. Fluoride in ground water is heterogeneously distributed and is in the range of 1.6– 4.4 ppm, which is much above the permissible limits.

Key Words: Water quality, Fluoride level, Groundwater Radhapuram Taluk.

Due to the non-availability of surface water, ground water is used as a major source for drinking purpose in many parts of coastal areas of Radhapuram taluk such as Erukkanthurai, Perumanal, Srenganarayanapuram, Chettikulam Pudumanai, Sathiapuram, Chettikulam and Kannankulam. These villages are located on the coastal area of the Bay of Bengal in the same belt from Kannankulam on the southern side to Erukkanthurai on the northern side. Fluoride is an element present in ground water in these villages under study. Small concentration of fluoride in drinking water (1 ppm) has beneficial effect on human body which prevents dental caries. However, higher concentration (above 1 ppm) causes serious dental fluorosis and above 5 ppm causes skeletal fluorosis¹.

All the ground water samples of six villages were collected in cleaned polythene bottles. Fluoride concentration was measured by spectrophotometer². The pH was determined by digital pH-meter³ and electrical conductivity was analyzed using digital conductivity bridge⁴. Total alkalinity, total hardness, chloride and salinity were determined by the titration methods^{5, 6}.

Experimental determination values (Table-1) show that the water samples contain different levels of fluoride. Wide variations have been found in the distribution of fluoride in the coastal areas under study ranging from 1.6–4.4 ppm. All the fluoride values are much above the permissible limits. Fluoride is beneficial to certain extent when present in concentrations of 0.8–1.0 ppm for calcification of dental enamel, especially for children below 8 years of age⁷.

TABLE-1
PHYSICO-CHEMICAL PARAMETERS IN DRINKING WATER

Description of source from which it was collected	Fluoride (ppm)	pH	EC (mho/cm)	Total alkalinity (ppm)	Total hardness (ppm)	Chloride (ppm)	Salinity (ppm)
Bore water from public tank at Erukkanthurai	3.4	8.16	1475	270.48	195	36.23	65.42
Bore water from public tank at Perumanal	4.0	8.14	1399	217.35	170	31.26	56.45
Bore water from public tank at Sri Renganarayanapuram	3.5	8.00	2662	198.03	105	32.93	59.46
Bore water from Mrs. Panchavarnam house at Sri Renganarayanapuram	4.4	8.60	1383	193.20	150	34.56	62.41
Bore water from Rajadurai's house at Chettikulam pudumanai	4.1	7.86	2812	246.33	405	435.10	785.38
Bore water from Mrs. Padman's house at Chettikulam Pudumanai	3.0	8.12	1322	299.46	445	330.55	596.67
Bore water from public tank at Sathiapuram	3.4	8.30	1770	154.56	195	113.20	204.35
Bore water from Northern side of rice mill at Chettikulam	3.1	8.26	895	217.35	335	277.38	500.70
Bore water near Moorthy temple at Chettikulam	1.8	8.42	2733	251.16	580	464.63	838.68
Bore water near Amman temple at Chettikulam	2.8	7.78	1650	299.46	405	358.70	647.48
Bore water near Sivan temple	2.0	8.04	1809	86.94	465	324.74	586.18
Hand pump water from Govt. Hr. Sec. School, Chettikulam	3.0	7.62	2150	231.84	480	336.63	607.64
Hand pump water near the pool at Chettikulam	3.5	7.65	2200	317.35	495	1239.88	2238.01
Water from public tank at Chettikulam	2.0	7.78	2000	275.31	470	2436.42	4397.76
Water from public tank at Kannankulam	1.6	7.89	2050	333.27	395	739.93	1335.60

Leone *et al.*⁸ expressed that fluoride content of drinking water has no biological side effects. Nawlakhe *et al.*⁹ reported that fluoride causes dental fluorosis if present in excess of 1.5 ppm and skeletal fluorosis beyond 3 ppm, if such water is consumed for a period of 8–10 years continuously.

The pH of all water samples ranged from 7.62–8.60. The limits for pH value for the quality of drinking water are specified at 6.5–8.5.

The electrical conductance of samples ranged from 895–2812 mho/cm. According to the investigations of Tripathi *et al.*⁷, samples of water containing higher salinity are associated with electrical conductance, which is applicable to the present study.

The levels of fluoride in drinking water are associated with higher alkalinity levels. This may be due to the release of OH^- and HCO_3^- ions simultaneously during the leaching and dissolution process of fluoride bearing minerals in the ground water. More and more leaching of minerals leads to high fluoride concentrations with higher alkalinity¹⁰.

Total hardness (calcium and magnesium) of all water samples ranged from 105–580 ppm. Most of the water samples had above the permissible limit (300 ppm). The amount of chloride in all samples of water ranged from 31.26–2436.42 ppm and salinity of water samples ranged from 56.45–4397.76 ppm. About 60% of water samples have been found to contain above the desirable limits (250 ppm) of chloride.

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