PHYSICO-CHEMICAL STATUS OF GROUND WATER SAMPLES IN NAGERCOIL TOWN, KANYAKUMARI DISTRICT, TAMIL NADU

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Abstract: The Physico-chemical status of water samples from five different stations in Nagercoil town was assessed. The study was carried out by collecting five groundwater samples (both bore-well and open well) during January 2011 – April 2011. The results were compared with standards prescribed by WHO and ISI 10500-91. Total 10 parameters were analysed. It was found that the ground water was contaminated at few sampling sites, namely, Vadassery market area, Meat area and agricultural area while the sampling sites residential area and rocky area showed physico-chemical parameters within the water quality standards and the quality of water is good and it is fit for drinking purpose.

Keywords: Ground water, physico-chemical parameter, open well, bore-well, Nagercoil Town.

INTRODUCTION

Natural resources are important wealth of our country, water is one of them. Water is a wander of the nature. "No life without water" is a common saying depending upon the fact that water is the one of the naturally occurring essential requirement of all life supporting activities[1]. Since it is a dynamic system, containing living as well as non-living, organic, inorganic, soluble as well as insoluble substances. So its quality is likely to change day by day and from source to source. Any change in the natural quality may disturb the equilibrium system and would become unfit for designated uses.

In India, most of the population is dependent on ground water as the only source of drinking water supply. The ground water is believed to be comparatively much clean and free from pollution than surface water. But prolonged discharge of industrial effluents, domestic sewage and solid waste dump causes the ground water to become polluted and created health problem[2]. The rapid growth of urban areas has affected ground water quality due to over exploitation of resources and improper waste disposal practices. Hence, there is always a need for and concern over the protection and management of ground water quality[3]. Ground water contains high amount of various ions, salts, etc. So if we were using such type of water as potable water then it leads to various water borne diseases[4].

Considering the above aspects of ground water contamination, the present study was undertaken to investigate the possible impact of the ground water quality of some open wells and bore wells in Nagercoil town of Kanyakumari District. Thus in this research work an attempt has been made to assess the physical and chemical parameters of ground water was determined and compared with standard values recommended by WHO[5].

MATERIAL AND METHOD

Ground water samples were collected from five bore wells and open wells in different areas as mentioned earlier. The water samples were collected during the period January 2011 – April 2011 in clean polythelene bottles without any air bubbles. The bottles were rinsed before sampling and tightly sealed after collection and labeled in the field.

Water quality parameters such as pH and electrical conductivity were measured by using digital pH meter and digital conductivity meter respectively. TDS were measured by using evaporating method at 185°C. Total hardness was determined by EDTA titration method. Chloride was measured volumetrically by $AgNO_3$ method using potassium chromate as an indicator. Sodium, potassium, Nitrate, sulphate and phosphate were analysed using standard methods.

RESULT AND DISCUSSION

The sampling locations is given in Table 1.

Table 1. Sampling locations

Sample No.	Sampling locations	Source
S_1	Vadassery Market	Bore well
S_2	Vadassery Market	Open well
S_3	Meat Area	Bore well
S_4	Meat Area	Open well
S_5	Agricultural Area	Bore well

S_6	Agricultural Area	Open well
S_7	Residential Area	Bore well
S_8	Residential Area	Open well
S_9	Rocky Area	Bore well
S_{10}	Rocky Area	Open well

pH

The pH values of water samples varied between 6.34 – 8.42 and were found within the limit prescribed by WHO. Most of the water are slightly alkaline due to presence of carbonate and bicarbonate[6]. The higher range of pH indicates higher productivity of water[7].

Electrical Conductivity (EC)

EC in water is due to ionization of dissolved inorganic solids. It signifies the amount of total dissolved salts[8]. EC values were in the range of 373 – 4329 µs/cm. The high conduction observed in agricultural area (i.e.) S5 and S6 and this can be attributed high chloride concentration in ground water[8].

Total Dissolved Solids (TDS in mg/l)

TDS indicate the salinity behaviour of ground water. Higher TDS shows longer residence values period of water[9]. The TDS varied varied from 254 mg/l to 2840 mg/l. The sampling station S_3, S_4, S_5, S_6 showed higher TDS values than the prescribed limit given by WHO and ISI. The high TDS of water samples make the ground water of all habitations non-potable as it is highly likely to cause gastrointestinal irritation[10].

Total Hardness (mg/l)

Hardness results from the presence of calcium and Magnesium are most abundant in ground water. The water hardness is primarily due to the result of interaction between water and geological formation[9]. Hardness is varying from 31 mg/l to 245 mg/l which were found within WHO limit.

Sodium

The sodium concentration varies from 8 mg/l to 50 mg/l. The sodium concentration in the ground water is due to the chemical weathering of feldspar mineral in the country rocks. The excess in drinking water may induce heart failure and Hypertension.

Potassium

The potassium concentration is varying from 0 to 13 mg/l. The potassium concentration in water is low because of high degree of stability of potassium bearing minerals.

Chloride

Chloride concentration are varying from 43 mg/l to 476 mg/l. In sample S_3, S_4, S_5, S_6, the chloride concentration are beyond the concentration limit recommended by WHO and which is set as 250 mg/l. Unusual concentration may indicate pollution by organic waste. Chloride salts in excess of 100 mg/l give salty taste to water. When combined with calcium and magnesium, may increase the corrosive activity of water.

Nitrate

The nitrate concentration level varied from 1.5 mg/l to 16 mg/l and found within the prescribed limit.

Sulphate

Sulphate content of the water sample were in the range of 5 mgl/ to 83 mg/l. Maximum permissible limit of sulphate in drinking water is 200 to 250 mg/l. Sulphate content above the permissible limit cause diarrhoea.

Phosphate

The phosphate content in the ground water samples was found in the range of 0 – 1.41 mg/l. Phosphate occur in ground water as a result of fertilizers, detergents, domestic sewage and industrial waste water.

Table 2. Average results of the physico-chemical parameters of different sites in Nagercoil Town

Sl. No.	Parameter	Sampling points in Nagercoil Town										WHO (1973)	ISI 10500-91
		S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}		
1	pH	6.40	6.65	8.86	8.37	8.27	8.42	7.97	7.59	6.34	6.66	7 - 8.5	6.5-8.5
2	EC	577	595	2037	912	4329	3802	373	442	610	636	1400	--
3	TDS	423	418	1398	641	2840	2581	254	300	420	442	1000	500
4	TH	37	43	245	91	148	191	31	46	86	81	500	300
5	Sodium	8	9	16	15	45	50	10	9	16	15	200	200

6	Potassium	3	2.5	4	1	1	13	1	0	1.5	0	--	--
7	Chloride	51	60	316	119	476	433	52	109	43	54	250	250
8	Nitrate	15	16	10	9.5	7	5	7	11	1.5	2	5	45
9	Sulphate	16	21	26	19	83	50	5	17.5	15.5	19	250	200
10	Phosphate	0.575	0.645	0.13	0.17	1.41	0.98	0.755	0.804	--	--	--	--

CONCLUSION

The above observations in the present study indicate the higher values of some parameters of the samples. They minimize the stability of these samples for drinking purposes without treatment. But, after the filtration and disinfection, naturally present impurities can be removed in water, which provide its suitability for drinking and domestic purposes. People depend on this water are often prone to health hazards due to polluted drinking water. Therefore, some effective measures are urgently required to enhance the drinking water quality by delineating an effective water quality management plan for the region Nagercoil.

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