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Short Communication

Estimation of physico–chemical parameters of ground water in Kilvelur Taluk, Nagapattinam District, Tamilnadu, India

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Abstract

Ground water is the major role for drinking in Nagapattinam District. The current investigation, twenty bore well samples collected for investigation in Kilvelur taluk, Nagapattinam district. The parameters like pH, Electrical conductivity, Total dissolved solids, Total hardness, Calcium, Magnesium, Carbonate, Bicarbonate, Chloride, Nitrate, Sulphate, Phosphate, Sodium, Potassium, Dissolved oxygen, Biochemical oxygen demand, Chemical oxygen demand of ground water samples was determined. To compare the above parameter of the ground water samples with World Health Organization and Indian Council of Medical Research limitations it exhibit some ground water samples are polluted and others are within the permissible limits.

Keywords: Ground water, Physico-chemical parameter, WHO, ICMR.

Introduction

Ground water is greatly basic existence of overall biotic communities[1]. Water is fundamental to swallow and local usages and it must be free from chemical defilement and microorganisms[2]. In India, facing important trouble is particularly ground water scarcity because of increasing population and commercial expansion. Almost all the ground water bodies everywhere are getting impure, so lowering the drinking water bodies. Every human being is based upon water and occurs in several formations such as sea, stream, pond, clouds, mist, rainfall, and snowdrift etc[3]. Ground water is employed for cultivation, commercial, domestic, restoration and survival action of overall world[4].

The current work includes the investigation of ground water quality regarding physicochemical parameters of Kilvelur taluk, Nagapattinam district. Area lies between to 10.6665" N latitude and 79.7961" longitude. The collected samples are gathered in plastic can from groundwater of twenty locations of Kilvelur taluk, Nagapattinam district from May 2015. The water samples are taking by the following stations in Table-1.

Materials and methods

The twenty water test samples were investigated different water quality parameters for example, pH, Electrical conductivity, Total dissolved solids, Total hardness, Calcium, Magnesium, Carbonate, Bicarbonate, Chloride, Nitrate, Sulphate, Phosphate, Sodium, Potassium, Dissolved oxygen, Biochemical oxygen demand, Chemical oxygen demand are resolved. The ground water quality has been estimated by differentiating every parameter with the recommendable level in potable water suggested by World Health Organization and ICMR.

Table-1: Name of the stations of Kilvelur taluk.

Samples	Stations
S1	Kovil Paththu
S2	Vettaikkaraniruppu
S3	Pudhupalli
S4	Vizhunthamavadi
S5	Kameswaram South
S6	Kameswaram North
S7	Ramar Madam
S8	Prathabaramapuram
S9	Seruthur
S10	Cholavidyapuram
S11	Venmani
S12	Venmanacheri
S13	Vappanchery
S14	Needur
S15	Palakurichi
S16	Vandalur
S17	Thevur
S18	Velankanni
S19	Thiruppoondi
S20	Killukudi

Table-2: The physicochemical parameters of water samples of Kilvelur taluk collected during Pre monsoon – May 2015.

Stations	Samples	pH	EC	TDS	TH	Ca	Mg	CO_3^{2-}	HCO_3^-	Cl^-	NO_3^-	SO_4^{2-}	PO_4^{3-}	Na	K	DO	BOD	COD
Kovil Paththu	S1	7.52	1100	842	615	350	245	300	350	248	19	92	6.5	115	62	16.2	8.5	20.4
Vettaikkaraniruppu	S2	7.46	57	339	262	170	42	200	200	53	20	86	4.3	105	42	14.6	8.2	21.5
Pudhupalli	S3	7.39	28	1120	551	327	152	200	450	370	20	88	4.1	125	48	10.8	9.1	26.2
Vizhunthamavadi	S4	7.48	76	588	246	120	83	200	150	117	22	97	1.5	114	52	15.1	7.5	18.3
Kameswaram South	S5	7.83	538	421	316	233	74	250	250	57	20	74	3.5	79	34	14	8.2	21.8
Kameswaram North	S6	7.30	811	681	444	310	61	150	625	111	18	78	3.6	144	54	10.3	7.5	18.5
Ramar Madam	S7	7.12	920	738	492	296	98	150	475	159	17	62	2.5	134	53	13.5	8.4	21.0
Prathabaramapuram	S8	7.47	557	438	262	110	56	200	525	68	19	95	5.2	126	62	13	7.6	16.2
Seruthur	S9	7.49	805	676	535	402	65	150	600	106	20	79	1.8	166	84	12.4	7.2	18.5
Cholavidyapuram	S10	7.29	353	1480	722	531	121	150	350	56	20	82	2.4	148	65	12.4	6.8	19.3
Venmani	S11	7.61	534	418	299	145	74	100	275	82	20	83	0.5	146	68	14.6	8.6	26.3
Venmanacheri	S12	7.49	859	697	342	225	53	200	225	155	20	89	0.4	116	67	14.6	8.4	22.5
Vappanchery	S13	7.50	1780	1040	599	379	97	350	225	326	20	75	2.2	165	82	13.5	7.8	19.7
Needur	S14	7.67	1856	1080	567	411	58	250	500	302	19	90	4.6	148	78	11.9	6.8	18.2
Palakurichi	S15	7.56	412	351	267	142	59	50	400	57	19	73	3.4	126	66	15.7	9.8	28.3
Vandalur	S16	7.44	811	664	524	432	74	100	450	130	20	81	5.1	86	44	10.8	7.6	19.8
Thevur	S17	7.90	392	333	225	118	92	250	200	52	20	87	2.9	120	52	13.5	8.0	19.5
Velankanni	S18	7.89	469	351	326	253	48	150	500	233	20	97	3.2	130	64	11.9	7.4	17.1
Thiruppoondi	S19	6.99	3582	2370	1685	836	549	300	1150	1394	16	57	1.5	112	48	4.32	5.3	15.7
Killukudi	S20	6.94	3320	2290	1711	925	582	350	900	1229	19	87	0.4	130	63	5.4	5.7	16.5

Results and discussion

pH: The term hydrogen ion concentration is employed to specific strength of the acidic or basic appearance in the solution[4]. Hydrogen ion concentration values of ground water shows between 6.94 - 7.90 and were found within the limit (6.5 to 8.5) prescribed by WHO and ICMR.

Electrical Conductivity (EC): It may be an evaluation of groundwater capability to have the number of positive and negative species transport an electric charge. EC reveals that the quantity of entire soluble salts[5]. Electrical conductivity values of water samples varied between 28µS/cm -3582µS/cm. The two samples S19 and S20 show high electrical conductivity values, it exhibit higher soluble inorganic material.

Total Dissolved Solids (TDS): Total Dissolved Solids exhibit quantity of soluble salt conduct of the ground water. Groundwater carrying greater than 500ppm of total dissolved solids does not utilized swallowing purpose however in inevitable condition upto 1500ppm is additionally permitted[6]. Present investigation, demonstrated that the TDS parameter shifted from 333ppm to 2370ppm. The inspecting focuses S19 and S20 indicated higher TDS values than as far as possible (500ppm) given by WHO and ICMR.

Total Hardness (TH): Total hardness is the characteristics of water that blocks the bubble production with detergents will increase the melting points of water[7]. Calcium, magnesium salts responsible for hardness of water[4]. Current investigation, estimation of total hardness in groundwater was in middle of the

range 225ppm to 1711ppm. The hardness values for water test sample S19 and S20 were higher than the recommended furthest reaches of 500ppm.

Calcium and Magnesium (Ca^{2+} and Mg^{2+}): Calcium could be solid homogeneous inorganic substances that are necessary for astragalus and dental. The hearts, axon, curdling systems want calcium but greater quantity of calcium creates dangerous consequences of health[8]. Calcium and Magnesium are directly regarding hardness[4]. Most of the samples show the Calcium in ranges between 110ppm to 925ppm; these values are above the prescribed limit (75ppm).

The magnesium concentration of within the explored groundwater tests varied between 42ppm to 582ppm. All samples have higher values than the desirable limit of (30ppm) as compared to WHO and ICMR parameters.

Carbonate (CO_3^{2-}) and Bicarbonate (HCO_3^-): Total Alkalinity is the degree of groundwater's ability to consume acids because of the water contains may be the presence of OH^-, HCO^{3-} and $CO3^{2-}$ of Na, Ca and K [4]. Carbonate alkalinity ranges from 50mg/L to 350mg/L and Bicarbonate alkalinity are found 150mg/L to 1150mg/L. The present study, Carbonate, Bicarbonate values observed in most groundwater showed above its prescribed level (75ppm and 30ppm).

Chloride (Cl^-): The amount of chloride ion determination indicates pollutants of waste water. Individual aware in a higher amount of chloride ion consumption if it presents in drinking water it leads cathartic effects[9]. Current investigation, the values are varied between 52mg/L to 1394mg/L. Some results of groundwater are higher than that of prescribed level (250ppm).

Nitrate (NO_3^-): Nitrate is present in ground water because of the action of nitrogen accompanied by filtering water. Groundwater may be polluted in waste water and different waste contains higher amount of nitrate[10]. Nitrate values in groundwater samples varied between of 16mg/L to 22mg/L. These results are in the permissible level (50ppm).

Sulphate (SO_4^{2-}): Sulphate naturally contains groundwater while it releasing adhesive and inorganic substances[11]. Releasing of waste material from commercial and household activities in groundwater it leads to higher amount of concentration[4]. Sulphate values of groundwater samples varied between 57ppm to 97ppm and these results are in the permissible level (500ppm).

Phosphate (PO_4^{3-}): Phosphate present in normal or waste waters as inorganic phosphates as well as normally present in Phosphates. Phosphates present in groundwater because of soaps, surfactants are utilized to steam engine, manures and biological action. The Phosphate concentration varied between 0.4ppm to 6.5ppm. From this observation the PO_4^{3-} are very high in prescribed level that is 0.1ppm.

Sodium (Na): Sodium is usually observed in lesser amounts than Calcium and Magnesium in fresh water. Accordingly, 100% of sodium levels in water are allowed to drink. In the current investigation, the amount of Sodium is found to be 79 mg/L to 166mg/L those results are permissible level of 200ppm.

Potassium (K): The principal supply of potassium in regular crisp groundwater is weathering of crag yet the concentration of Potassium will increases in the contaminated water is because of transfer of waste water[7]. In the current investigation, Potassium ion results are in the range of 34mg/l to 84mg/l which is exceeded WHO guideline of 12ppm.

Dissolved oxygen (DO): DO is a critical parameter in water exceptional assessment and displays the physical and biological techniques prevailing inside the water. The dissolved oxygen indicates the pollutants in groundwater bodies[4]. The dissolved oxygen values varied from 4.32 mg/L to 16.2 mg/L those results are greater than desirable limit (5ppm).

Biochemical oxygen demand (BOD): Biochemical oxygen demand means number of oxygen required by bacterium and different pathogens within the biochemical decay and conversion of organic matter undergoing aerobic conditions. Higher values of biochemical oxygen demand parameters were observed 5.3 to 9.8mg/l. It was above WHO recommended level 5mg/L.

Chemical oxygen demand (COD): COD is commonly taken into consideration as the oxygen equivalent of the quantity of the organic substance oxidisable by using potassium dichromate[7]. The groundwater with higher BOD and COD is completely fallacious for swallowing, agricultural, household, commercial and different functions. The current investigation, all the ground water samples for all seasons 15.7mg/L to 28.3mg/L and results showed higher than WHO prescribed level (10.0ppm).

Conclusion

Deviations were noted by ground water samples and the results shows ground water pollutants. Commonly, groundwater parameters of Kilvelur taluk location are not poisonous to living organisms. Except few instances wherever most of the parameters showed higher values of TDS, TH, Cl^-, Ca, Mg, CO_3^{2-}, HCO_3^-, Phosphate, Potassium, DO, BOD, COD contents in Thiruppoondi and Killukudi areas would like some treatment for minimization of those parameters. Hence, some scientific filters should be operated. It is may be due to the increase in industries, other human modernization actions, elevated people habits increase the solid waste[12] and the pollutants may leach inside the groundwater. The majority of parameters were reported less than the permissible limit. The low concentrations of ions do not have any significant adverse impact within the use of those water samples for drinking and cooking purposes.

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