Potable Water Quality Evaluation of Kilvelur Taluk, Nagapattinam District, TamilNadu, India

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Abstract - The present work is evaluating the water quality for the ground water of Kilvelur taluk, Nagapattinam District. Ground water is an important and precious natural supply for drinking other purposes in Kilvelur area. In the present study, nearly twenty water samples were collected and analysis was done as per the standard method of APHA. The physico – chemical 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 for calculating the quality of water during the period of November 2016. The results were compared to the standard guideline values of World Health Organization. From the observation it was concluded that some of the parameters are above the desirable limits of WHO.

Keywords: Ground Water, WHO, Water Quality, Kilvelur Taluk.

I. INTRODUCTION

Water may be a nice presentation of nature, it is life supporting material. There is n life while not water; it substantially needed for healthy growth of organisms. Water plays terribly important role within the life cycle of organisms. Pollution is changing into the foremost difficult threat to personalities as results of fast industrial development and growth of population throughout the globe. A water bodies are disturbed by living and non – living things like environmental climax and washer person, fisher and household sewerage are discarded in watercourse. Over utilization of pesticides, fertilizers, insecticides by farmers can float through water and blend in stream. Irregular and insufficient waste water treatment facilities in India large supply of waste water is being released into the stream and pond. It is practiced in numerous cities and towns[1].

The importance of ground water existing of human society cannot be exaggerated. There are many states in India wherever 90% populations are addicted to ground water for potable and alternative functions. Safe potable is very essential for health and development issue a regional, national and native level. In some regions, it is shown the investments in facility and sanitation will yield a web economic profit since the reduction in adverse health effects and health preserve price out with the prices of enterprise the interventions. The contaminated potable water is risky to the person, it should be fatal conjointly. The untreated water cause defects organ injury, nervous system, replica effects and fatal diseases. As no physico – chemical issue to determine the potable water quality and correct measures are to be assumed for the appropriate quality of water supplying system, thus this essential work was dispensed technically to search out the pollution issues alongside the recommendation for correct management on the beverage[2].

The current work could be a trial to work out the standard of water for beverage from Kilvelur taluk, Nagapattinam District.

Table 1: Name of the locations of Kilvelur taluk

Samples	Locations
S1	Kovil Paththu
S2	Vettaikkaraniruppu
S3	Pudhupalli
S4	Vizhunthamavadi
S5	Kameswaram South
S6	Kameswaram North
S7	Ramar Madam
S8	Prathabaramapuram
S9	Seruthur
S10	Cholavidyapuram

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S11	Venmani
S12	Venmanacheri
S13	Vappanchery
S14	Needur
S15	Palakurichi
S16	Vandalur
S17	Thevur
S18	Velankanni
S19	Thiruppoondi
S20	Killukudi

II. MATERIAL AND METHODS

The water samples for physicochemical analysis were collected in the month of November - 2016from Kilvelur taluk, Nagapattinam. The collected water samples were stored in cleaned and well dried 2.5litre polythene bottles with necessary precautions (APHA, 1995)[3]. The several physico – chemical parameters enclosed assessment of 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 were analysed.

III. RESULT AND DISCUSSION

The determined physicochemical parameters test results of ground water samples are given in Table 2. The water samples assessed and the results were compared to WHO.

Table – 2: Physico – chemical parameters of ground water of Kilvelur taluk collected during Post monsoon – November 2016.

Stations	Samples	pH	EC	TDS	TH	Ca	Mg	CO_3^{2-}	HCO_3^-	Cl	NO_3	SO_4	PO_4	Na	K	DO	BOD	COD
Kovil Paththu	S1	7.8	1130	855	915	440	285	360	400	281	22	70	4.3	87	68	12.6	10.2	34
Vettaikkaraniruppu	S2	7.5	103	581	580	325	108	300	250	84	21	57	3.9	92	43	10.4	9.1	28
Pudhupalli	S3	7.7	97	1592	720	485	186	325	500	405	24	52	4.7	106	38	14	8.4	17
Vizhunthamavadi	S4	7.9	121	812	510	312	163	490	400	144	22	71	2.8	145	48	16.2	11.0	13.5
Kameswaram	S5	7.6	710	223	574	296	212	340	400	118	20	66	5.1	84	42	18.5	5.2	22
Kameswaram	S6	7.8	679	592	725	472	107	505	600	155	19	49	3.7	151	50	16	9.8	19.4
Ramar Madam	S7	7.6	681	925	1035	780	240	305	380	220	20	62	3.2	142	46	18	11.7	16
Prathabaramapuram	S8	8.0	455	574	958	634	286	440	300	123	25	77	5.3	125	61	21	8.8	12.5
Seruthur	S9	8.4	966	846	970	687	272	525	300	98	21	69	3.1	177	72	15.3	4.1	10.7
Cholavidyapuram	S10	7.6	497	1505	825	520	186	520	400	67	19	95	2.6	163	56	17	7.9	20
Venmani	S11	7.2	588	617	580	345	126	450	405	103	24	78	1.0	160	52	15.4	9.6	21.7
Venmanacheri	S12	7.7	910	822	636	305	234	330	400	206	21	82	0.9	135	36	14.1	12.1	25
Vappanchery	S13	7.2	1812	1180	592	294	224	500	445	425	19	65	2.9	169	77	13	7.5	22
Needur	S14	7.8	1630	1050	805	466	310	550	300	406	25	52	4.4	131	32	12	8.8	31
Palakurichi	S15	8.3	611	415	620	370	218	430	350	96	22	61	4.3	152	95	14	13	34
Vandalur	S16	8.1	865	792	325	198	105	435	460	188	20	76	5.5	80	70	12.5	14	15
Thevur	S17	8.6	580	493	300	166	122	615	200	98	18	94	2.8	174	58	17.6	9.6	14
Velankanni	S18	7.2	562	550	565	405	103	415	405	287	23	73	3.1	183	104	12	8.2	25
Thiruppoondi	S19	7.0	3121	2210	1730	1262	412	820	500	1540	26	34	2.2	126	87	4.1	6.1	14
Killukudi	S20	7.1	3345	2194	2010	1160	640	745	510	1266	25	42	0.8	139	82	6.5	7.3	16.2

Hydrogen ion concentration (pH)

The pH of water is very vital. The pH values determined using pH meter was found to be more or less closer for every sample, wherever values were varied 7 – 8.6 (Figure 1). The pH values should be within the range of 6.5 to 8.5 (WHO) for drinking and domestic purposes. The fluctuations in optimum pH values could result in a rise or decrease within the toxicity of poisons in water bodies. The pH is most vital in crucial the corrosive nature of water. Lower values of hydrogen ion concentration higher is that the corrosive nature of water. The higher values of hydrogen ion concentration ascertained recommended that carbon dioxide, carbonate & bicarbonate equilibrium is affected more due to change in physicochemical condition[4].

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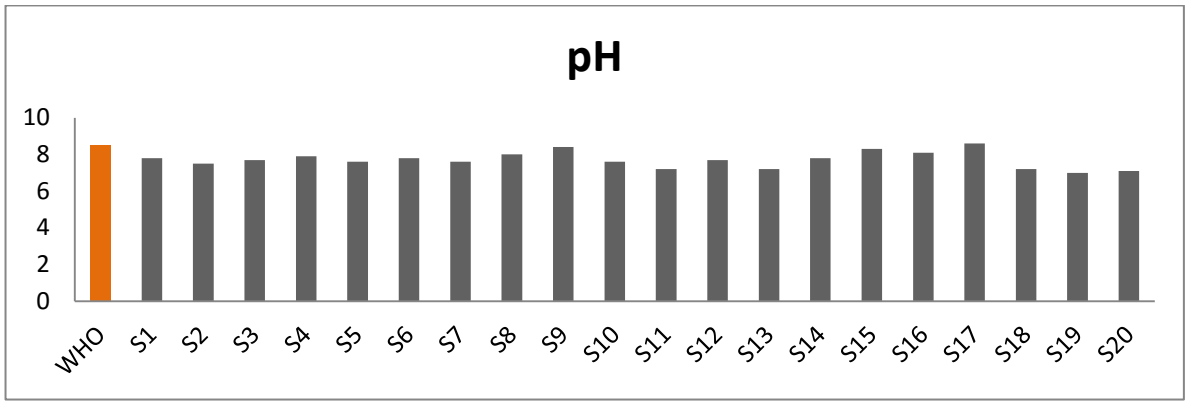

Figure 1: Comparison of pH in several ground water

Electrical Conductivity

Specific conductivity phenomenon may be a numerical expression of the capability of an aqueous solution to hold an electric power and is tool to determine the water purity. The power based on the presence of ions and their total concentration, mobility, relative concentration and temperature of measurement[5]. The acceptable limit of specific conductivity in potable water is prescribed as 1400µS/cm (WHO). In this study, the electrical conductivity levels among 97µS/cm to 3345µS/cm (Figure 2). However, maximum results are within the standard level of WHO, and specially the two water samples Thiruppoondi and Killukudi location values are above the permissible results due to relatively dissolved inorganic substance.

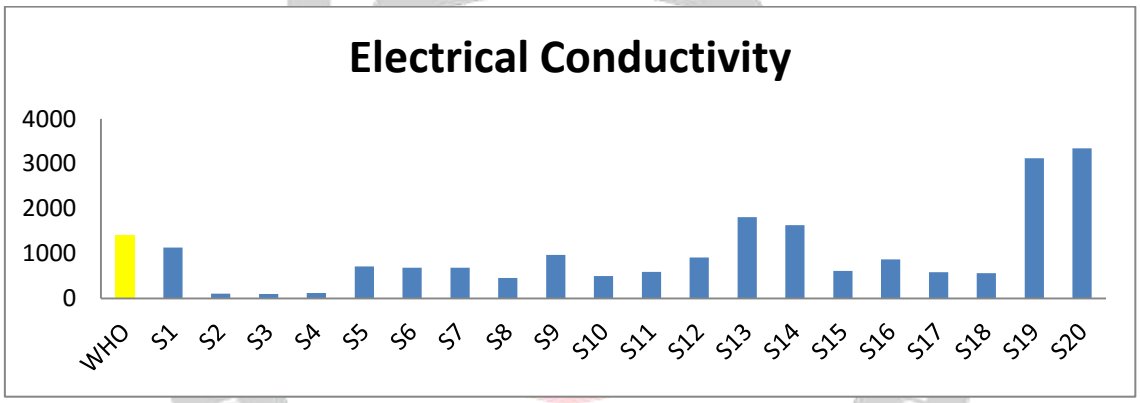

Figure 2: Comparison of Electrical Conductivity in several ground water

Total dissolved solids (TDS)

Total dissolved solids shows the number of ions present in water and determine the water quality. Higher amount of TDS in water minimize the water clarity, reduces photosynthesis and increases water temperature, once combined with the toxicant compounds and heavy metals[4]. The present work, TDS values varied 223 ppm – 2210 ppm (Figure 3). The highest values observed at the sampling location are Thiruppoondi and Killukudi, which was above the desirable limit recommended by WHO standard (500 ppm).

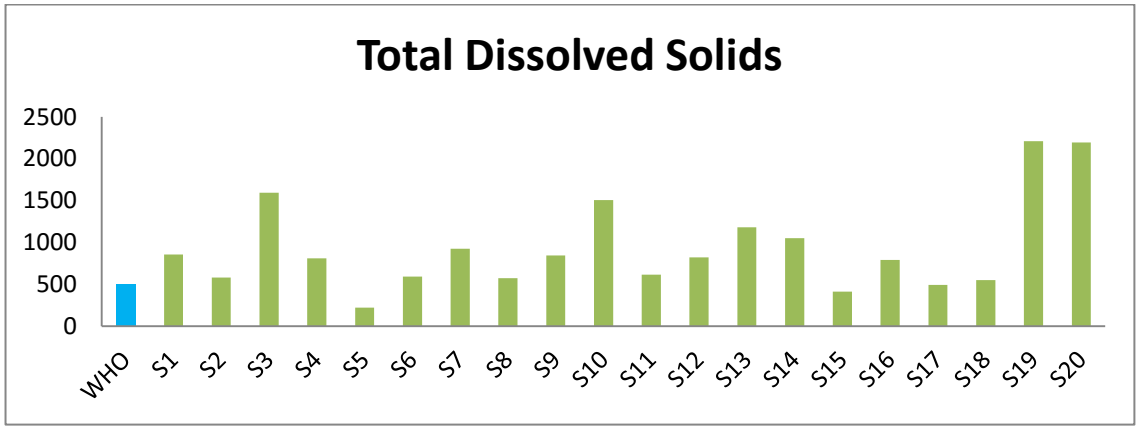

Figure 3: Comparison of Total dissolved solids in several ground water

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Total Hardness, Calcium and Magnesium

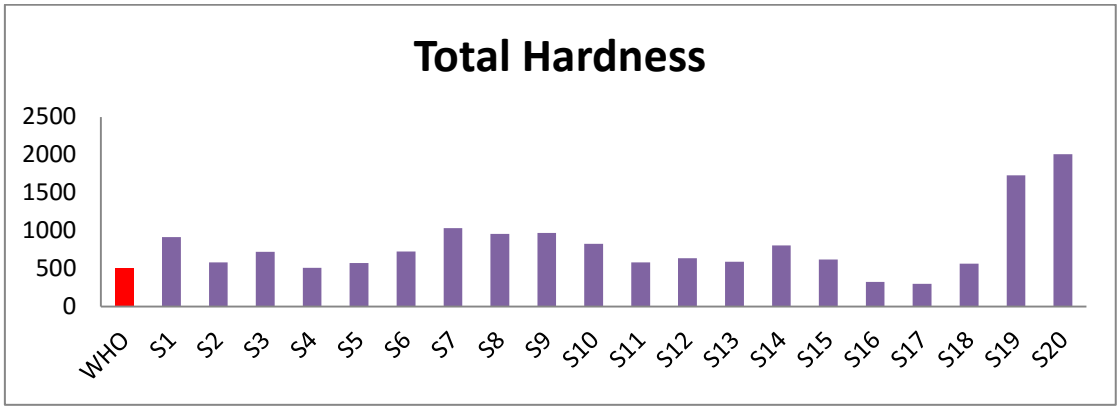

Figure 4: Comparison of Total Hardness in several ground water

Hardness is one among the essential characteristics of ground water from a utility purpose for various functions. In water, hardness is principally contributed by carbonates, bicarbonates, chlorides and sulphates of calcium and magnesium. So the primary hardness inflicting ions are calcium and magnesium. WHO standards recommended maximum permissible limit for hardness is 500 ppm (Figure 4). Most of the samples have high hardness value which is exceeded the recommended level[6]. The results of calcium observed between 166 ppm – 1262 ppm, those results are higher than the desirable limit (75 ppm) as shown in figure 5. The results of magnesium ranges observed between 103 - 640 ppm. Magnesium of studied ground water samples in most of the locations are above the prescribed level (30 ppm) as shown in figure 6.

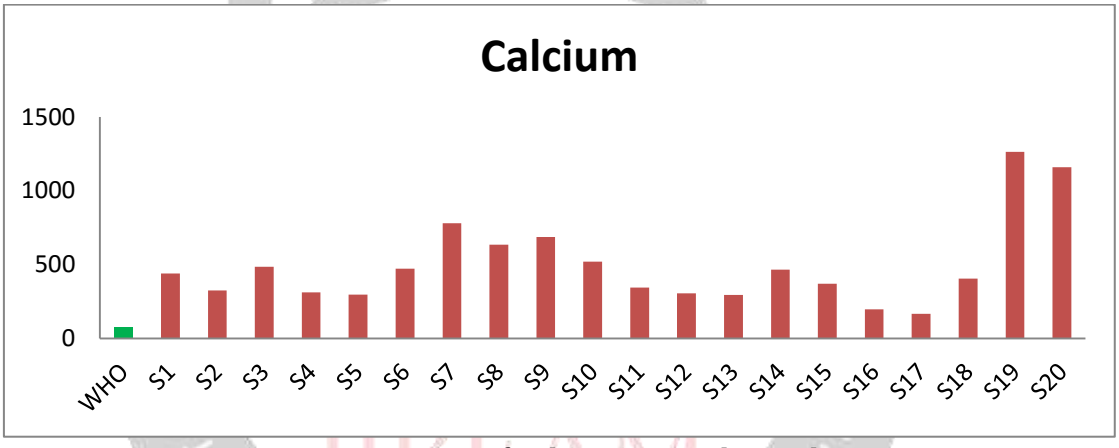

Figure 5: Comparison of Calcium in several ground water

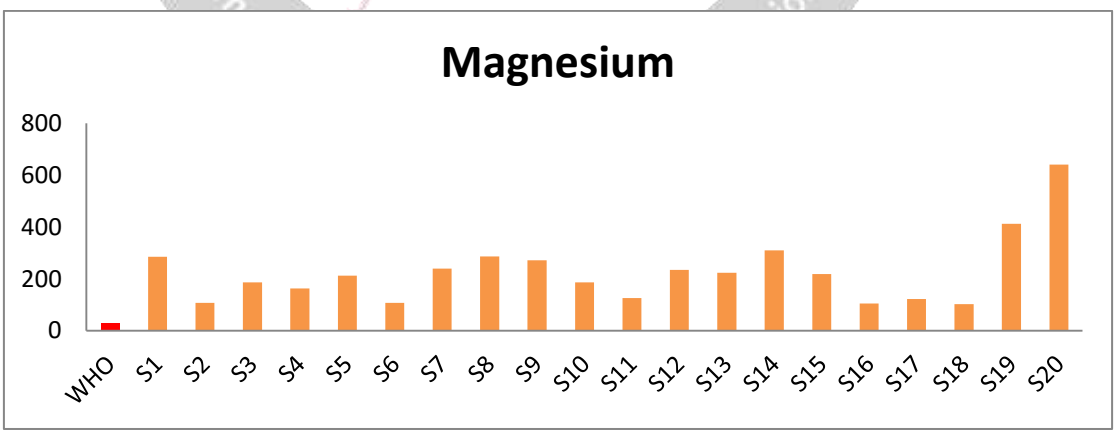

Figure 6: Comparison of Magnesium in several ground water

Carbonate and Bicarbonate Alkalinity

The major sources of alkalinity are rocks that contain carbonate, bicarbonate, hydroxide compounds and phosphate. Alkalinity in itself is not dangerous to person, however in large quantity, it circulate bitter taste to water and will create eye irritation in human[7]. The result of carbonate alkalinity in current work is varied from 300 – 820 ppm (Figure 7). The result of bicarbonate alkalinity in current work is ranged from 200 – 600 ppm (Figure 8). These carbonate and bicarbonate alkalinity was found with high values than that permissible by WHO (75 & 30 ppm).

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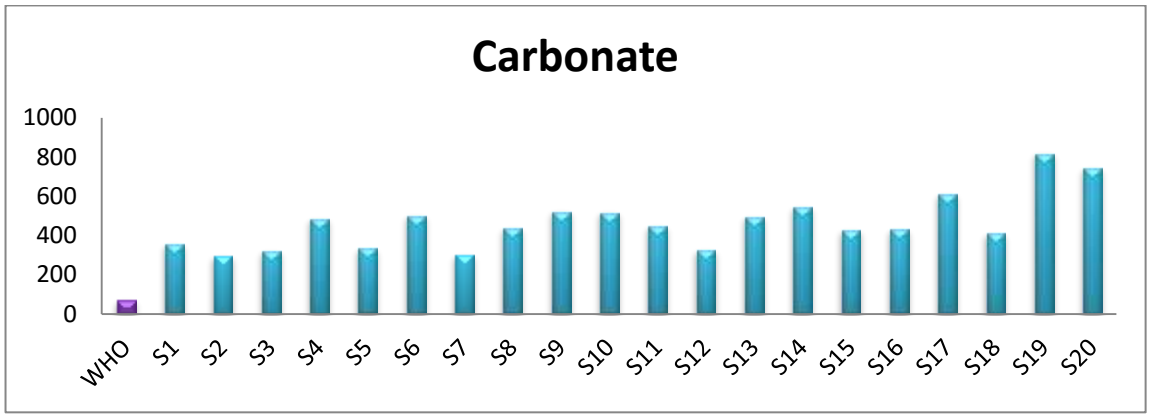

Figure 7: Comparison of Carbonate in several ground water

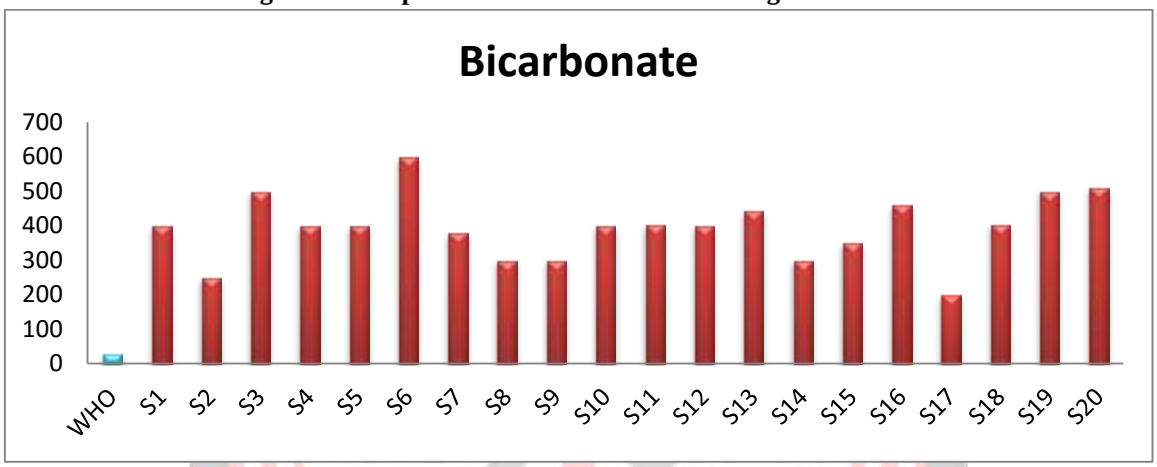

Figure 8: Comparison of Bicarbonate in several ground water

Chloride

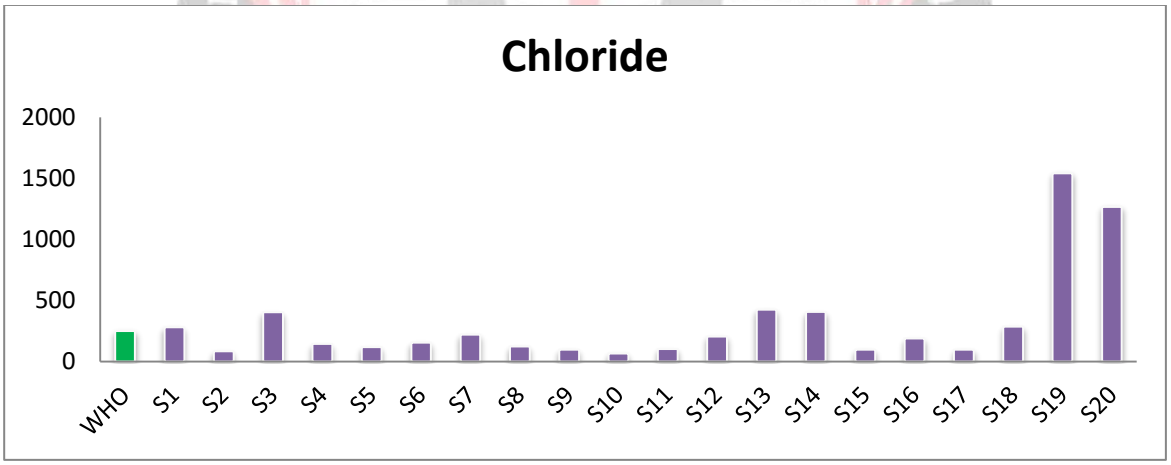

Figure 9: Comparison of Chloride in several ground water

Discharge of household sewage is that the major supply of chloride in water[8]. The concentration of chloride content calculated in the sample location varied 67 – 1540 ppm. The WHO permissible limit recommended for potable water is 250 ppm. The chloride value recorded in the present study varied 67 – 1540 ppm (Figure 9); these values are above the prescribed level.

Nitrate

The major supply of nitrate in water from the atmosphere is plant wastage and animal waste or excreta. Once the water present above 100 ppm of nitrate, it is bitter in taste. Usually the natural water contains solely 10 ppm of nitrate content[9]. The present study, all water samples within the WHO permissible limit (50 ppm) as shown in figure 10.

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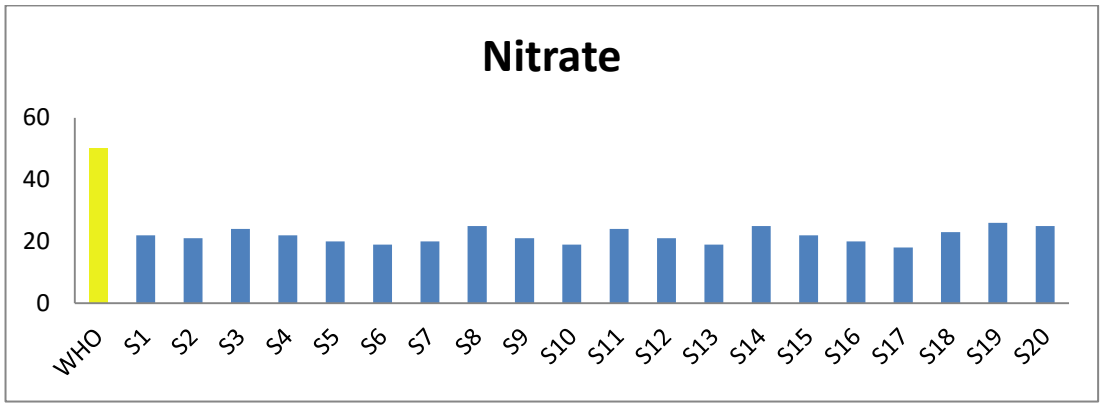

Figure 10: Comparison of Nitrate in several ground water

Sulphate

In ground water, mostly sulphates are produced from the dissolution of minerals like gypsum and anhydrite, sea water intrusion acid rock drainage and manmade sources are the sources sulphates in drinking water. The present work, sulphate values were found within desirable level (500 ppm) as shown in figure 11.

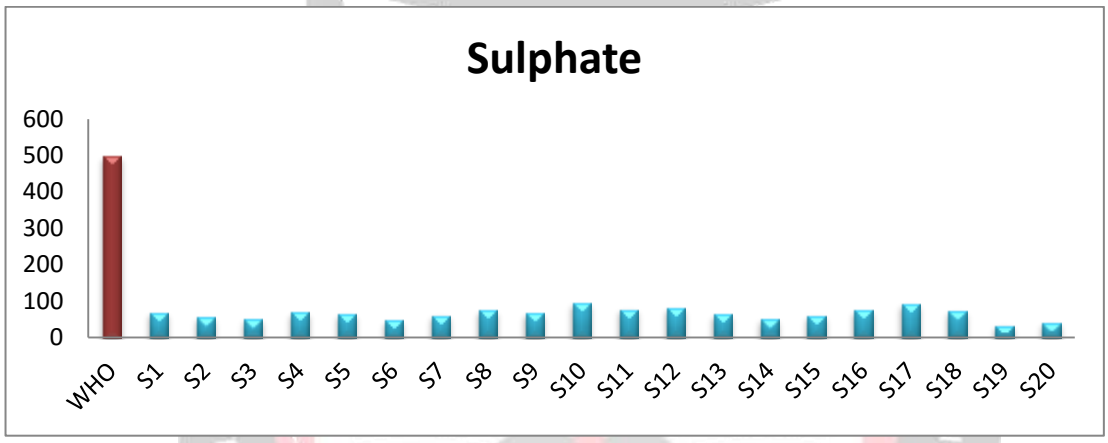

Figure 11: Comparison of Sulphate in several ground water

Phosphate

Normally phosphate happens in fresh water as inorganic or organic phosphate. Household sewerage, agricultural wastage and detergents are the major source of phosphate in water. Excess phosphate could result in growth of unwanted alga and eutrophication[8]. The value of phosphate of ground water varied between 0.8 – 5.5 ppm as shown in figure 12. In the water sample of all locations of Kilvelur taluk the phosphate is present above the range given by WHO (0.1 ppm).

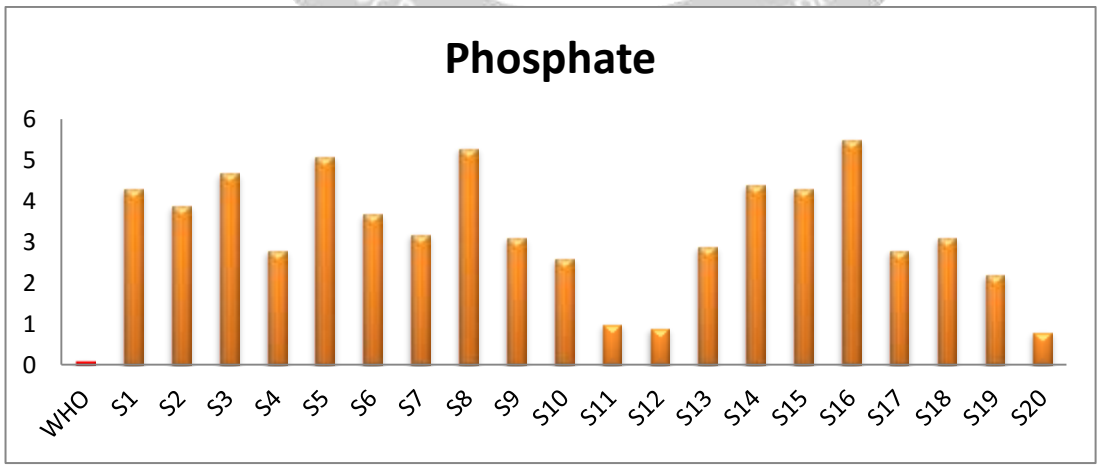

Figure 12: Comparison of Phosphate in several ground water

Sodium

Sodium is one amongst the foremost luxuriant components and could be a common constituent of natural water. The concentration of sodium in water affects especially when considering their solubility for agricultural usages or boiler feed

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water. The concentration ranges from terribly low within the surface water and comparatively high in deep ground water and highest within the marine water. In current work, sodium concentration of ground water was ranged from 80 – 183 ppm (Figure 13), are within the standard value of WHO (200 ppm).

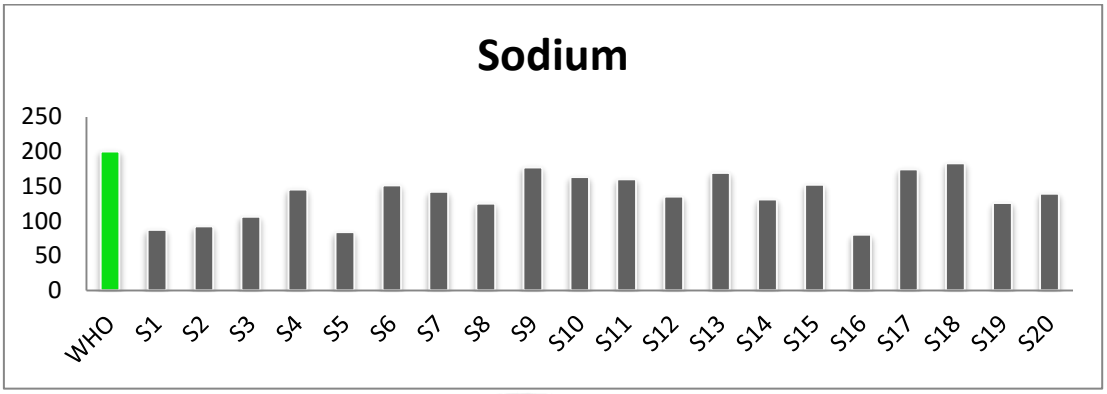

Figure 13: Comparison of Sodium in several ground water

Potassium

Potassium ranks seventh among the component in order of abundance, behaves kind of like sodium and remains low. Though it contains less than 20 ppm, it plays an important role within the metabolism**.** The potassium concentration fluctuated between 32 – 104 ppm (Figure 14). In the analysis of water sample it is found that the potassium is above the desirable level (12 ppm).

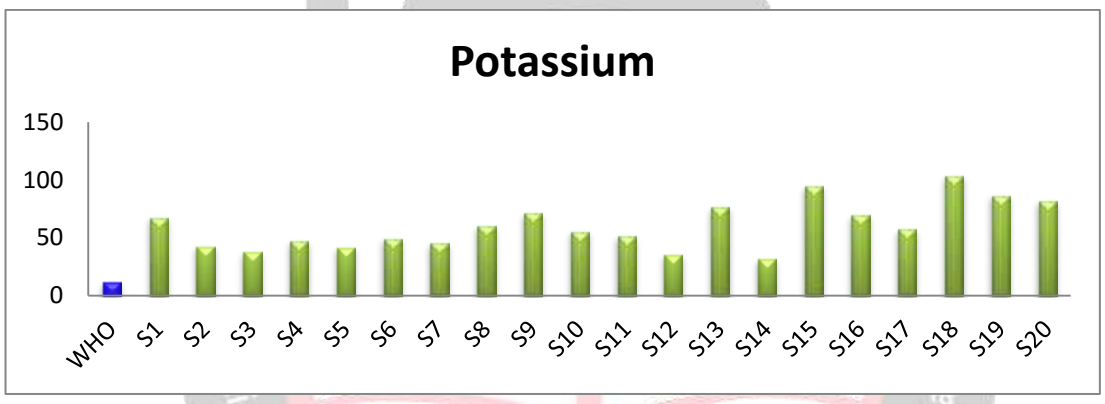

Figure 14: Comparison of Potassium in several ground water

Dissolved Oxygen

Dissolved oxygen is one among the necessary parameter in water quality assessment. Its presence is important to maintain several forms of life within the water and also the impact of waste discharge during a water body are mostly assessed by the oxygen balance of the system. It could be rapidly discarded from the waste waters by release of the oxygen demanding waste[10]. DO values are get in the present study were observed higher (Figure 15) the permissible limit of WHO (5 ppm), that the ground water samples contains free from organic contamination. The greater value of DO will impart sensible aesthetic taste to water.

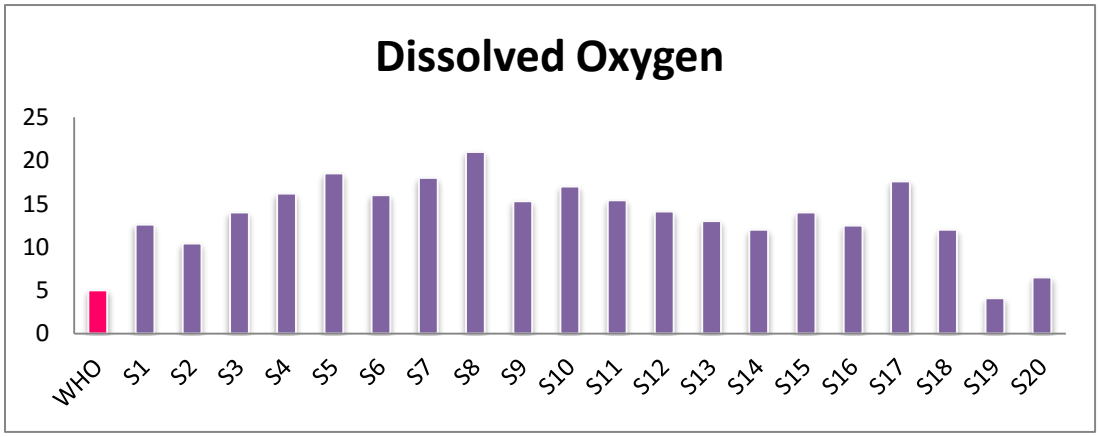

Figure 15: Comparison of Dissolved Oxygen in several ground water

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Biochemical oxygen demand

Biochemical oxygen demand means the rate of utilization of oxygen by microorganisms in aerobic deterioration of the dissolved organic substance in water. Increase in BOD because of significant liberation of waste matter effluent, animal and crops waste and household biodegradable pollution. Low BOD content is an indicator of excellent water quality, whereas a high BOD indicates impure water[11]. The result of BOD for the present study is observed from 4.1 – 14 ppm (Figure 16). The most allowed level of BOD in WHO is 5ppm. High BOD could cause to have an effect on the aquatic life.

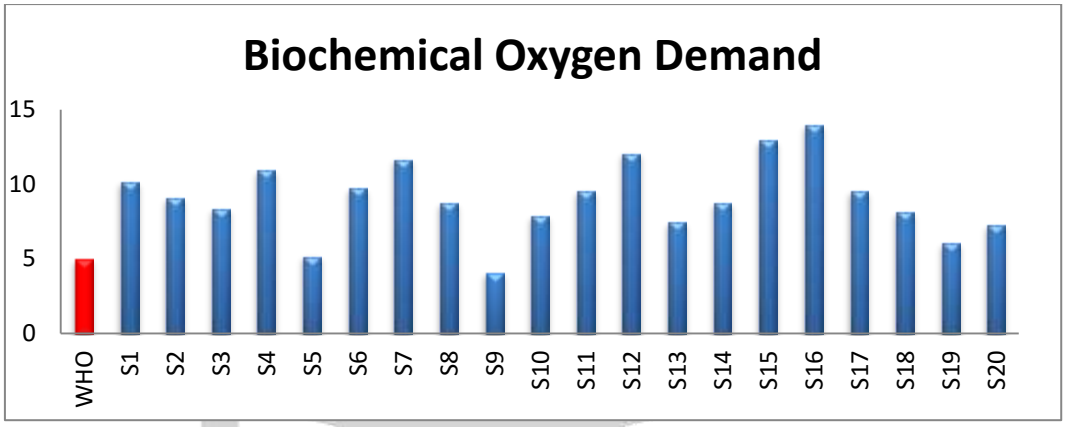

Figure 16: Comparison of Biochemical Oxygen Demand in several ground water

Chemical oxygen demand

Chemical oxygen demand calculations are the measure of the oxygen equivalent of that portion of the organic substance during a sample that is vulnerable to oxidation by a strong chemical oxidation. It is calculable carbonaceous issue of organic substance. In the current study, COD values varied 10.7 – 34 ppm[11]. The COD values of all water samples were found higher than the prescribed level World Health Organization (10 ppm). COD could also be the discharge of household biodegradable pollution and industrial effluent to soil and water bodies and should ensure to the work of economic wastes. High COD could cause to have an effect on the aquatic life.

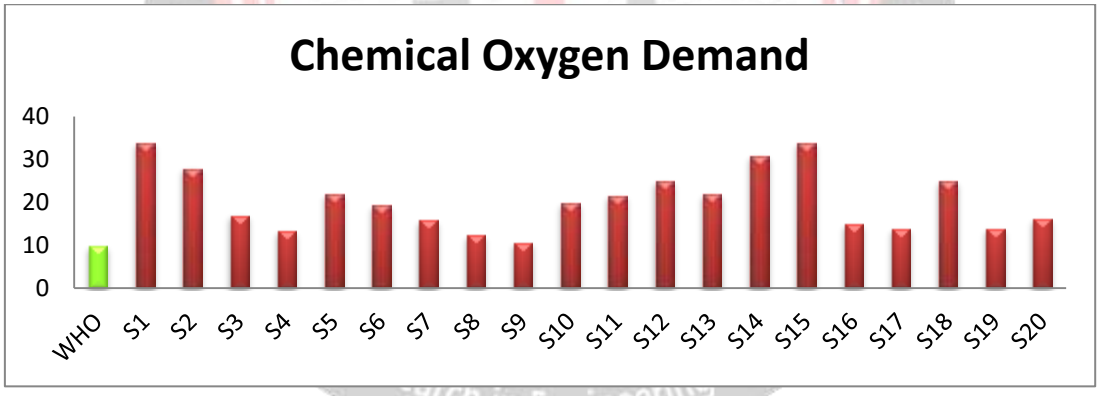

Figure 17: Comparison of Chemical Oxygen Demand in several ground water

IV. CONCLUSION

The water samples were collected from twenty different locations at Kilvelur taluk, Nagapattinam District. The present work, ground water samples were subject to physicochemical analysis. The values were shown most of the physicochemical parameters such as Electrical conductivity, Total dissolved solids, Total hardness, Calcium, Magnesium, Carbonate, Bicarbonate, Chloride, Phosphate, Potassium, Dissolved oxygen, Biochemical oxygen demand, Chemical oxygen demand are well higher than permissible limit. This value terminated that location water samples are not appropriate for drinking purpose and agricultural activities. Correct techniques of water treatment ways and agricultural management ought to be enforced above said locations.

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