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Analysis of Water Quality of Samples Collected from Thevara Region, Kerala, India

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Abstract: ***By analysing the water sample of the region of Thevara we want to understand the quality of water used by the people of this region. Water quality refers to the chemical, physical, biological, and radiological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purpose. It is most frequently used by reference to a set of standards against which compliance can be assessed. Water samples for the analysis where collected from Vembanad Lake, well, bore well, and corporation in Thevara region. The samples were analysed for parameters like pH, electrical conductivity, dissolved oxygen, biological oxygen demand, chemical oxygen demand, total hardness, alkalinity, total dissolved salts, total suspended solids and chloride. The values of each parameter gave interesting values which therefore where used to determine the quality. Illustrations were made for the ease of comparison. Out of all samples the parameters had very disappointing values, therefore water quality is not up to the standard.***
Keywords: Analysing; Chemical, Physical; Parameters; Illustrations; Quality.

I. INTRODUCTION

Water is one of the most important of all natural resources known on earth. It is important to all living organisms, most ecological systems, human health, food production and economic development.[1] The safety of drinking water is an on going concern within the global village. Traditionally, the safety of potable water supplies has been controlled by disinfection, usually by chlorination and coliform population estimates. However, it has been reported that coliform-free potable water may not necessarily be free of pathogens.[2]

Many congenital diseases such as goiter and cancer have been associated with presence of high concentration of a chemical or its inadequate supply in water.[3] . Low concentration of iodine in Homo sapiens results in goiter. Infants have been considered as a potential high risk group to the toxic effects of sodium from drinking water.[4] . Currently, about 20% of the world's population lacks access to safe drinking water, and more than 5 million people die annually from illness associated with safe drinking water or inadequate sanitation. If everyone had safe drinking water and adequate sanitation services, there would be 200milion fewer cases of diarrhoea and 2.1 million fewer deaths caused by diarrhoeal illness each year [5].
Biofilms in drinking water distribution system has generated health concerns. Biofilms are coating of organic and inorganic materials in pipes that can harbor, protect and allow the proliferation of several bacterial pathogens, including Legionella and Mycobacterium avium complex (MAC). Factors that affect bacterial growth on biofilms include water temperature, type of disinfectant and residual concentration, biodegradable organic carbon level, degree of pipe corrosion and treatment/distribution system characteristics. Chloramines are considerably more effective than chlorine for controlling legionella in biofilms distribution system deficiencies linked to a number of water born disease outbreaks.[5]

Amazingly, current drinking water standards don't even require testing for any of the more than 7,000 pharmaceutical compounds being prescribed; pharmaceutically active compounds such as analgesics, antibiotics, antileptics, anti-rheumatics, beta blockers, chemotherapeutics, steroid hormones and X-ray contrast media have been detected in tap water in Europe and Americas.[6]
As water is one of the most important compounds of the ecosystem, but due to increased human population, industrialization, use of fertilizers in the agriculture and man-made activity. The natural aquatic resources are causing heavy and varied pollution in aquatic environment leading to pollute water quality and depletion of aquatic biota. It is therefore necessary that the quality of drinking water should be checked at regular time of interval, because due to use of contaminated drinking water, human population suffers from varied of water borne diseases. It is difficult to understand the biological phenomena fully because the chemistry of water

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revels much about the metabolism of the ecosystem and explain the general hydro - biological relationship.[7]
Water is one of the principal natural resource for the survival of mankind. With the ever increasing population and simultaneously decrease of surface water resources, groundwater resources have become more important. In our country, more than 60 percent of the irrigation requirements and 85 percent of the drinking water supplies are dependent on groundwater.[8]
The constitution of India through the provisions of Article 47 guaranteed the states to provide clean drinking water improve public health. The constitutional jurisprudence of the country developed by the judiciary has placed drinking water as a derivative right within the purview of right to life under Article 21. Since independence various programmes have been undertaken by the government to provide water to the rural habitations.[9]

A number of water quality parameters are measured to determine water quality. These parameters include physical properties like pH, colour, turbidity, suspended solids, temperature, conductivity, odour etc. Chemical properties like COD, BOD, total nitrogen, total phosphorus, total pesticides etc. Biological properties include total coliform bacteria, fecal coliform counts, faecal streptococci counts, salmonella counts etc.[10]
The chemical attributes that are being tested in the present study are as follows:-

pH
Total alkalinity
Calcium hardness
Electrical Conductivity
Chloride
Dissolved Oxygen
Biological Oxygen Demand
Chemical Oxygen Demand
Total Dissolved Salts
Total Suspended Salts

The total review of all these parameters can give an idea of the water quality. And thus determining the above factors and providing them in an easy understandable form could provide information to the user or public. This is tried through this project.
Also studying the values of these parameters can give the environmental impact due to the pollution caused by the industries which flows the waste to the Periyar river which ends up in Vembanad Lake.
Most of the studies about water quality of Vembanad Lake is conducted in region of Alappuzha. A study conducted by Ashoka Trust for Research in Ecology and the Environment (ATREE), a Bangalore-based non-governmental organisation, in association with the Lake Protection Forum, an organisation of fishermen, over the first three months of this year on the Vembanad lake has shown that the level of Total Dissolved Solids (TDS) has increased and the level of dissolved oxygen has decreased over these three months. The temperature of the lake has shown an increase over the three months.[11]
The water analysis of Thevara region are not much done or published. Thus this project would be one which really shows the quality of water in the region of Thevara, Kochi. The Lake here is mainly influenced by the sea water rise.[20]
The projects aim is to find these quality parameters at possible errors and through this tries to convince the public about the public water quality and the need of proper waste treatment plants. For the reason of comparison, various other samples are taken.

II. MATERIALS AND METHODS

The water samples were collected from the region of Thevara, samples were from well, lake, tap and bore well, on the month of Februaury 2016. The collected water samples were stored in a clean bottle for analysis. The tests for BOD and DO were conducted on the same day of collection. The pH was determined using the pH meter. The oxygen content was measured by Wrinkler's method. All the other parameters were found using APHA(2012).

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III. RESULT AND DISCUSSION

S.NO	PARAMETER	LAKE WATER	WELL WATER	CORP. WATER	BOREWELL	PERMISSIBLE LIMIT
1	pH	7.30	6.63	6.75	6.5	7.0 to 8.5
2	ELECTRICAL CONDUCTIVITY, mS/cm	1.58	0.031	0.01	1.3	0.05 to 0.5
3	DISSOLVED OXYGEN, mg/L	10.4	6.4	11.12	3.44	6.5 to 8.95
4	COD, mg/L	2440	120	12	208	255
5	BOD, mg/L	2.32	2.0	1.08	2.0	5
6	TOTAL HARDNESS, mg/L	1440	245	139.12	1219	200
7	ALKALINITY, mg/L	138	61	20	24	120
8	TOTAL DISSOLVED SALTS, g/L	24.66	5.6	8.45	24.66	2
9	TOTAL SUSPENDED SALTS,g/L	2.33	0.002	0.004	1.066	2100
10	CHLORIDE, mg/L	6248.0625	84.97365	9.9967	1297	250

TABLE 1. Physico Chemical Parameters of collected samples of water during month of February 2016

The water sample was collected from Vembanad Lake flowing through region of Sacred Heart College, from the tap of college, bore well water from region of Thevara, and the Corporation water of Kochi. Each water sample taken other than lake was to understand the quality and are compared with each other with help of bar diagram. The experimentally established values of each parameter is hereby compared. The temperature is not shown because it is reasonable to believe every sample had the same temperature as room temperature.

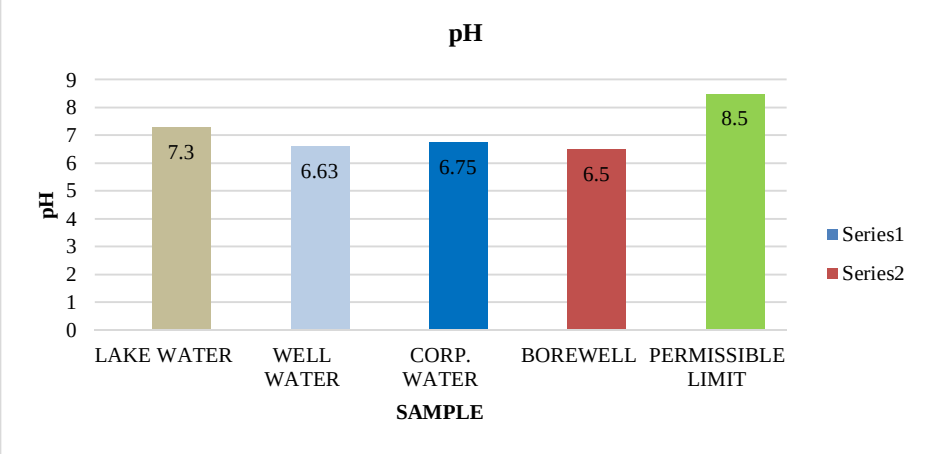

FIG 1. Graph Showing Variation of pH From Different Sources

The pH is considered as an important ecological factor and provides an important information for geochemical equilibrium. pH is an important parameter in water body since most of the aquatic organisms are adapted to an average pH and do not withstand abrupt changes. All the samples had the pH ranging from 6.5 to 7.3. the values are plotted using a bar diagram for the easiness of comparison. According to WHO guidelines, the limit of pH value for drinking water is specified as 7.0 to 8.5.Generally pH of water is influenced by geology of catchments area and buffering capacity of water.

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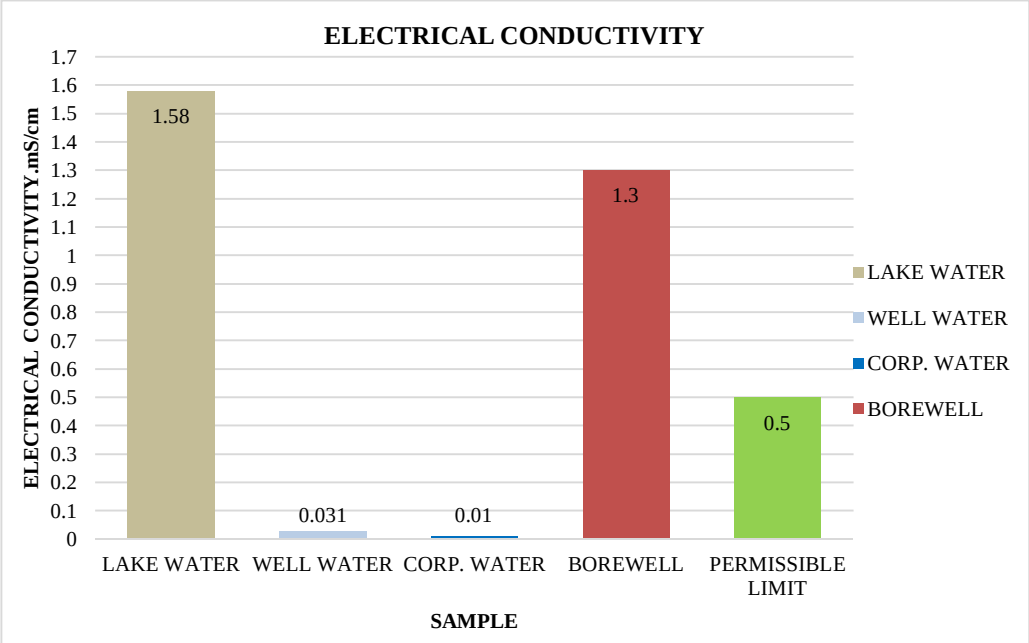

Fig 2. Graph showing variation of electrical conductivity from different sources

Electrical conductivity is high for lake water. Electrical conductivity measures the amount of dissolved mineral content in water. So the number of free ions is higher in lake water. Bore well also has considerable amount of electrical conductivity. Corporation and well water has very weak electrical conductivity, thus ions present would be minimum.

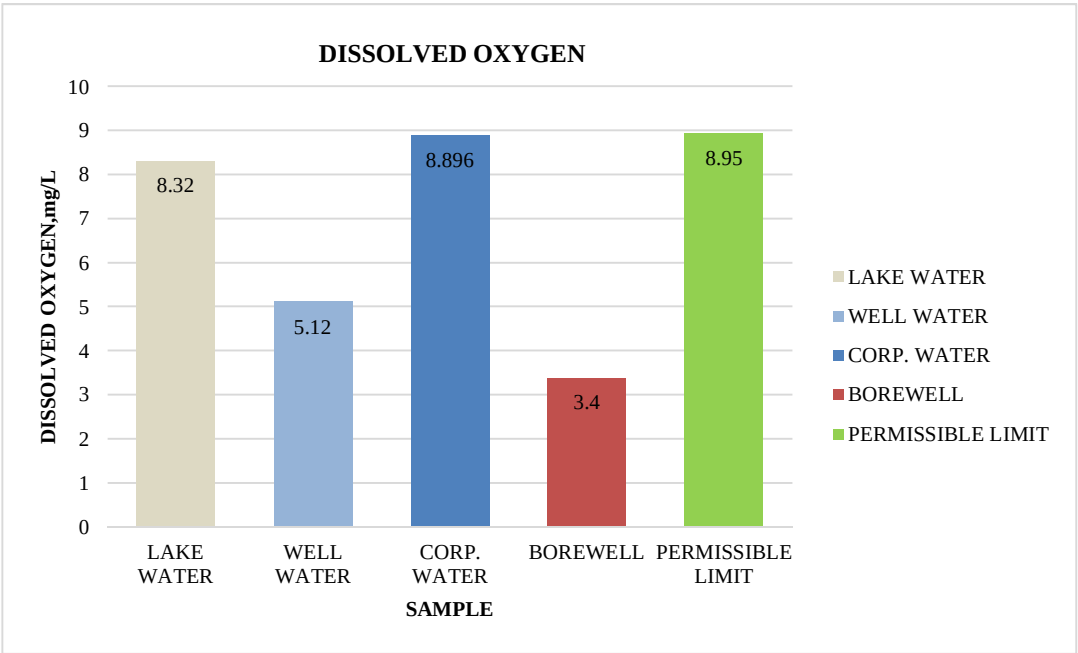

Fig 3. Graph showing variation of dissloved oxygen from different sources

Dissolved oxygen determines the surface water quality and can determine the organic waste content. More the organic concentration, less will be the DO. Amount of dissolved oxygen is higher for corporation water. So it is most potable on the above samples. The water samples collected from well and bore well shows a lower DO than the permissible limit.

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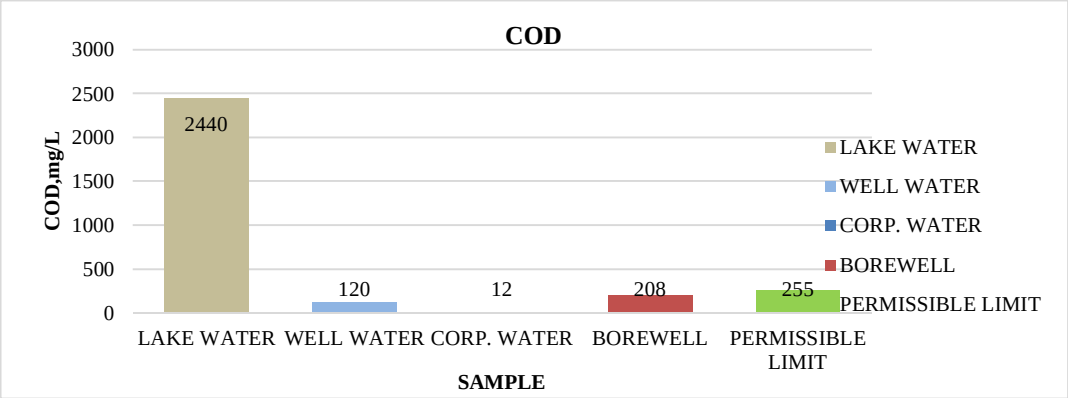

Fig 4. Graph showing variation of cod from different sources

COD is a measure of pollutants in water sample, higher its value, higher the pollutant content.COD is higher for lake water, thus it is highly polluted. Corporation water has lowest amount of COD, thus becomes the least polluted. Tap and bore well water also has considerable amount of COD but has a value under permissible limit. Thus corporation water is potable.

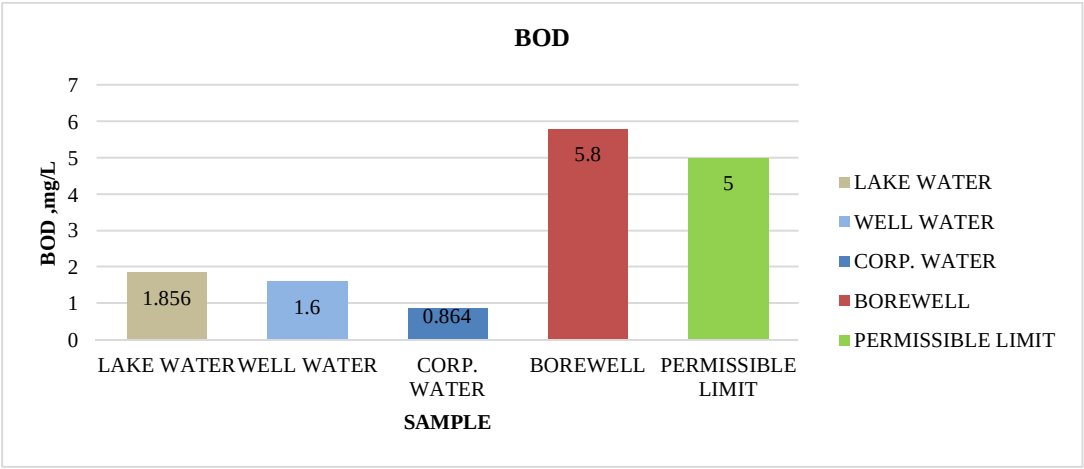

Fig 5. Graph showing variation of bod from different sources

BOD is the oxygen required for the biochemical oxidation of organic matter. BOD is higher for bore well water, thus turning out to contain more organic matter in the whole batch. It is least in corporation water. Lake and tap comes under permissible range.

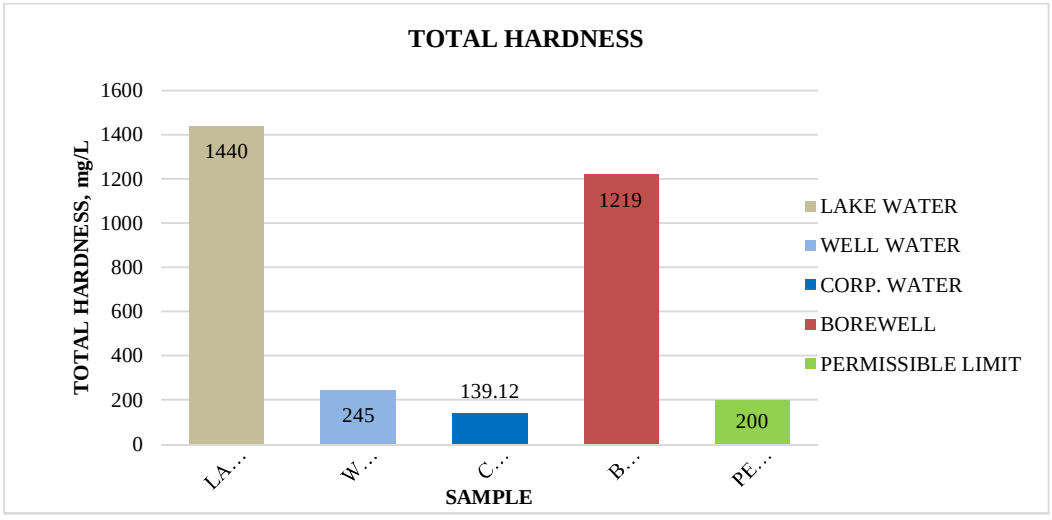

FIG 6. Graph Showing Variation of Total Hardness From Different Sources

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Hardness here is the measure of calcium carbonate in the sample. Lake water is very hard in the batch. So action of soap and detergents is very difficult in it. The amount of calcium ions is very high in it. Corporation water is soft among the samples.

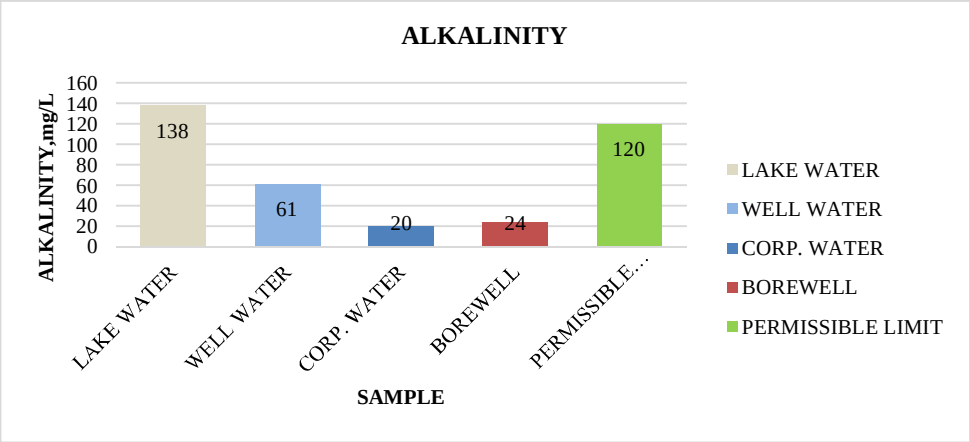

FIG 7. Graph Showing Variation Of Alkalinity From Different Sources

Alkalinity is a measure to understand how basic is the sample. Lake water is most alkaline,exceeding the limit. All other samples do comes under the limit. The measured is methyl orange alkalinity. Corporation water has least value for alkalinity.

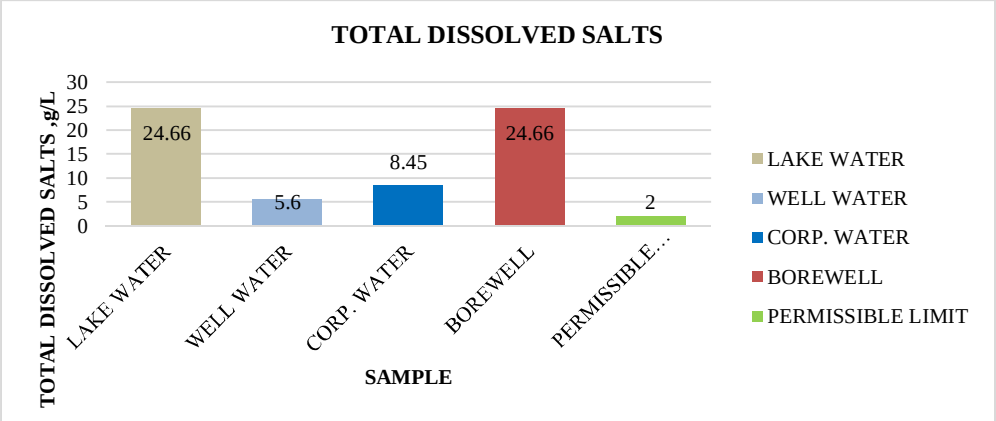

Fig 8. Graph showing variation of total dissolved salts from different sources

The TDS value exceeds the permissible limit for all samples. Thus contains higher dissolved salts, most in case of lake and bore well. Surprisingly the corporation water has a value that exceeds the limit.

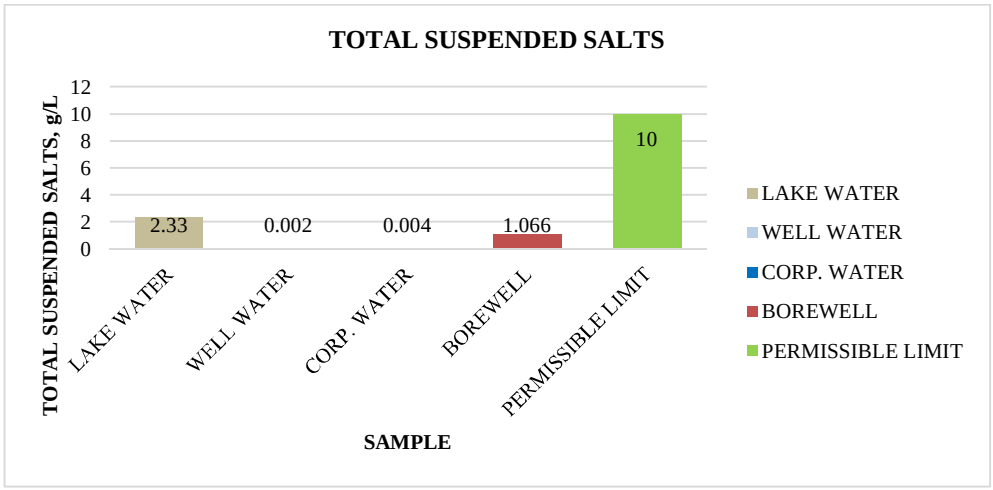

Fig 9. Graph showing variation of total suspended salts from different sources

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All water samples contain very low amount of TSS. Well and corporation water has negligibly small amount of TSS. None of the samples exceed permissible limit. Lake water has higher amount of TSS in the above batch.

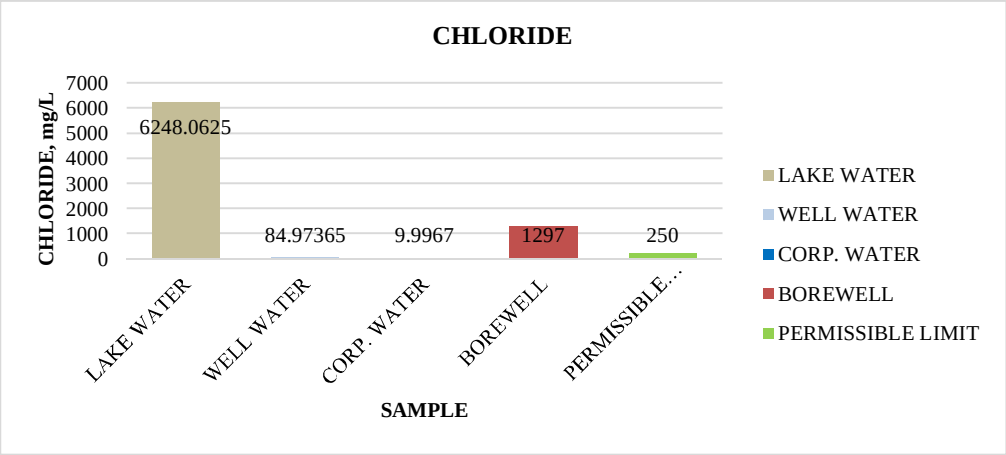

Fig 10. Graph showing variation of chloride from different sources

Chloride content is very high in the lake water. It exceeds more than the limit. Corporation water has least amount of chloride even compared to well water. Bore well water also has considerable amount of chloride content in it.

IV. CONCLUSION

The lake water is of course not advisable for drinking as well as for washing or any other purposes. One of the reasons affecting the quality of water in the Vembanad Lake is that the waste water and industrial effluents are discharged untreated directly into the river Periyar which ends up in the Vembanad Lake, which thus pollutes the water body. This can be shown by the mass fish kill incidents occurring in the parts of Kochi like Eloor, Pathalam, etc..also the water has turned thick black in these regions. The values of the parameters are applicable to changes, according to the time of collection, because the water in Vembanad Lake is always flowing thus giving new samples every time.From the values, interestingly corporation water seems very good for drinking and other human use. The borewell of the Thevara region, from the values of the parameters is comparable to Lake water. The well water seemed a bit advisable though never will be recommended.

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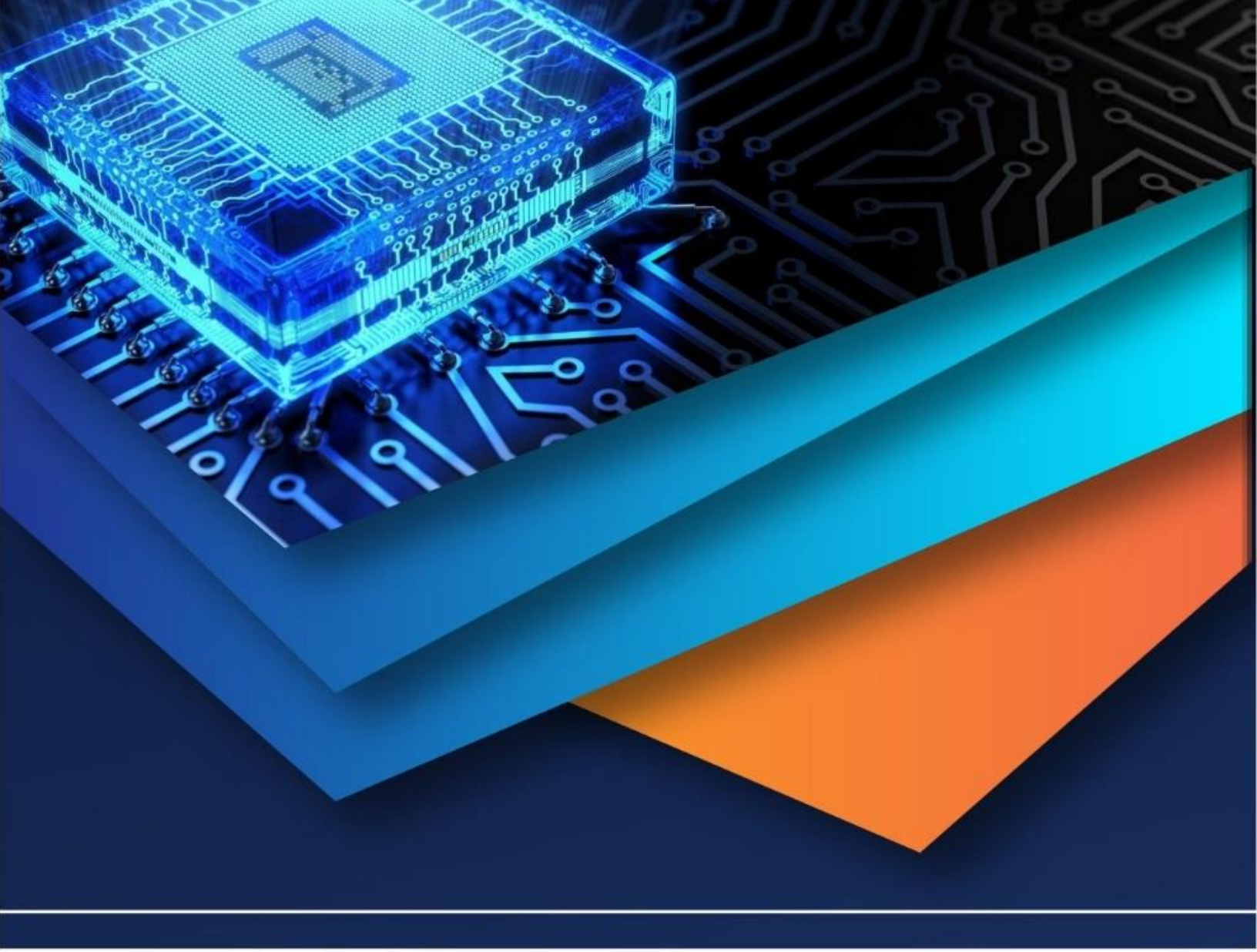

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