Comparative Study on Analysis of Ground Water and Lake Water in Perungalathur Village

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Abstract: Water is an essential resource for human survival, yet its quality is often compromised due to various factors. In this study, we conducted a comparative analysis of groundwater and lake water in Perungalathur village, focusing on key physico-chemical parameters. This investigation covered three two sources: borewell water and lake water. The study aimed to assess the quality of water in these areas and identify potential solutions to improve water quality. The collected water samples from Perungalathur. Parameters such as pH, dissolved oxygen (DO), alkalinity, total hardness, chloride, calcium, total dissolve solids (TDS) and temperature. were analyzed according to World Health Organization (WHO) standards. The findings revealed that groundwater in the region tends to be acidic and predominantly oxidizing. Lake water quality also exhibited variations. Given the increasing scarcity of clean water, understanding the quality of available water sources is crucial. By comparing different water parameters, we can develop effective strategies to safeguard water resources for future generations. This study gives a valuable insight into sustainable water management in perungalathur and similar region.

Keywords: Water quality, contamination, lake water, ground water, physio-chemical parameters.

1. INTRODUCTION

Groundwater is the water that exists below the surface of the ground in the spaces between particles of rock or soil, or in the crevices and cracks in rocks. Water is the most important in shaping the land and regulating the climate. It is one of the most important compounds that profoundly influence life. According to WHO organization, about 80%of all the diseases in human beings are caused by water. Once the groundwater is contaminated, its quality cannot be restored back easily and to device ways and means to protect it. Water quality index is one of the most effective tools to communicate information on the quality of water to the concerned citizens and policy makers. It, thus, becomes an important parameter for the assessment and management of groundwater.
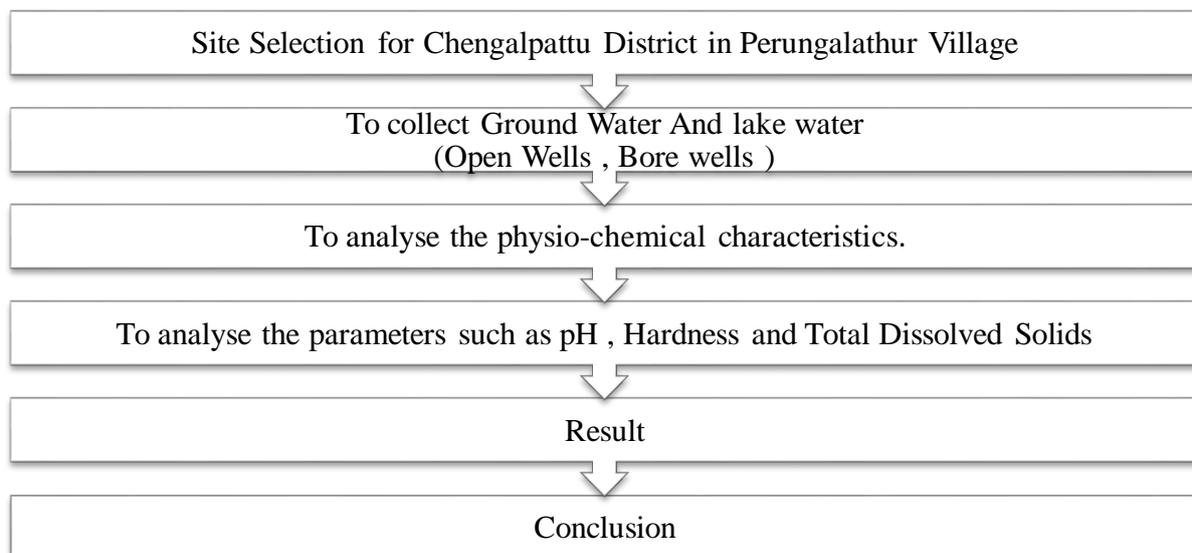
The more common soluble constituents include calcium, sodium, bicarbonate and sulphate ions. Another common constituent is chloride ion derived from intruded sea water, connate water, and evapotranspiration concentrating salts, and sewage wastes for example. Nitrate can be a natural constituent, but high concentrations often suggest a source of pollution. Guidelines for Drinking Water Quality have been published by IS: 10500- 2012. For Drinking water, quality is commonly expressed by classes of relative Suitability, although most classification systems include units on specific conductance, sodium content and boron concentration. Most groundwater is within 100 meters of the surface of the Earth. Industrial and agricultural activities are major sources of contamination. These activities can lead to contamination of well water, municipal drinking water sources and the environment.

A lake is a body of water surrounded on all sides by land. Lake water is still or standing, meaning it doesn't flow from point A to point B in the same way from point river's does. Since they are often fed by rivers, springs or precipitation, lake is primarily freshwater. A lake is a naturally occurring, relatively large and fixed body of water on the earth's surface. It is localized in a basin, or interconnected basins surrounded by try land. Lake lies completely on land and separate from the ocean, although, like the much larger oceans, they form part of earth's water cycle by saving as large standing pools of storage water. Most lakes are fresh water and account for almost the world's surface cycle by serving as large standing pools of storage water. Most lakes are fresh water and account for almost all the world's surface freshwater, but some are salt lakes with salinities even higher than that of seawater. Lake varies significantly in surface area and volume. Lake is typically much larger and deeper, which are also water-filled basins on land, although there is no official definition.

Scope and Objective
➢   To collect the necessary water sample from Perungalathur village.
➢   To evaluate the pollution status between ground water and lake water.
➢   To analyze the sample for various physio-chemical parameters like pH, total hardness (TH) alkalinity electrical conductivity (Calcium Ca, magnesium mg, sodium Na).

2. METHODOLOGY

Site Selection for Chengalpattu District in Perungalathur Village
To collect Ground Water And lake water (Open Wells , Bore wells)
To analyse the physio-chemical characteristics.
To analyse the parameters such as pH , Hardness and Total Dissolved Solids
Result
Conclusion

EXPRIMENTAL INVESTIGATION

Physio Parameter

Colour

The contaminated lake water was slightly green-brownish yellow in colour. Whereas the groundwater is Clear in colour.

Odour

The odour of contaminated lake water and groundwater was objectionable.

Chemical Parameter

Ph

pH of water increased with increased metabolic activities of autographs (Kaul et al., 1980). In this study the pH of both the lake and sampling stations were not neutral and were recorded from 5.3 to 5.9. The pH values are found to be below the permissible limit of WHO (6.5–8.5) (Mohamed Sihabudeen et al., 2015) in all the sampling stations.

Dissolved Oxygen

The level of Dissolved Oxygen in the contaminated lake water is 5.2 mg/l(Table:1) which is not good for aquatic species. The contaminated lake water has moderate level of DO when compared with the drinking water standards (6 to 10 mg/l). Thus the presences of low level of DO indicate the less problems of lake water species and this level of DO is permissible level for domestic and some other purposes and not fit for drinking purposes.

Alkalinity

The total alkalinity of the contaminated water was noted that 550mg/l thus the total alkalinity is very high in the lake water sample. Alkalinity for a standard drinking water is 200mg/l. It Indicates the presence of bicarbonates, carbonates and hydroxides above the normal value the water taste becomes unpleasant high alkalinity should be corrected for both economic and health concerns.

Hardness

Hardness value below 300 mg/l is considered drinkable (ICMR, 1975). The hardness in water may deliver from dissolved CO_2, release by bacteria found in water. In the present study, the total hardness values were observed in the range of 122–910 ppm and 610 ppm for bore well and lake water samples respectively. The mean value of total hardness value exceeded the desirable limit of WHO (300 ppm) in all the stations for both lake and bore well water samples. The high concentration of total hardness may cause heart disease and kidney problem (Jain et al., 1997).

Chloride

Higher concentration of chloride in water is often found in combination with higher sodium concentration. ICMR and BIS have prescribed 250 mg/l as the maximum permissible value. If the chlorine value exceeds 300 mg/l and the presence of a major Cation is sodium, so it is confirmed water is salty. Sources of chlorides are from soluble salts such as sodium chloride. In this study, the chloride values were found above the desirable limit of BIS (1991) (250 mg/l) in lake.

Calcium

Calcium is essential element for various enzymatic transformations within the cell especially in the transphosphorylation in algal, fungal and bacterial cell the normal concentration of

calcium according to the drinking water standards is 75mg/l. The concentration of contaminated lake water is 180 mg/l. thus the level of calcium is found to be very high which contributes to the hardness of water. Calcium is an important content in natural water which determines the rigidity of water. The Indian Standard for Drinking Water Specification stated the tolerance limit of calcium as 75mg/l. The high level of calcium in the lake water results in Encrustation in water supply structure and adverse effects on domestic use.

Total Dissolve Solids (TDS)
High content of dissolved solids in water reduces the utility of water for drinking, irrigation and industrial purpose. The elevation of TDS reduces the solubility of O2, hence enhances the eutrophication (Mathur et al., 2008). TDS of perungalathur are within the permissible limit (1590 mg/L) exceeds the acceptable range. The TDS of sampling stations and lake water samples were above the desirable limit of 500mg/l (BIS, 1991).

Temperature (°C)
Atmospheric temperature influences on water temperature (Kaul et al., 1980). Aquatic organisms are depending on optimum temperature for their favourable growth (APHA, 1992). In this present study the temperature of lake and mean value of sampling stations were 29°C and 32.40. WHO (1993) did not recommend definite value for temperature, however BIS (1991) recommended 40°C is the permissible limit for drinking water. So the temperature of all water samples was within the permissible limit.

Table 1: Analysis of Physico parameters in lake water and groundwater of Perungulathur Chennai

S. No	Parameters	Lake Water	Groundwater
1	colour	clear	slightly Green-brownish yellow
2	odour	unobjectionable	unobjectionable

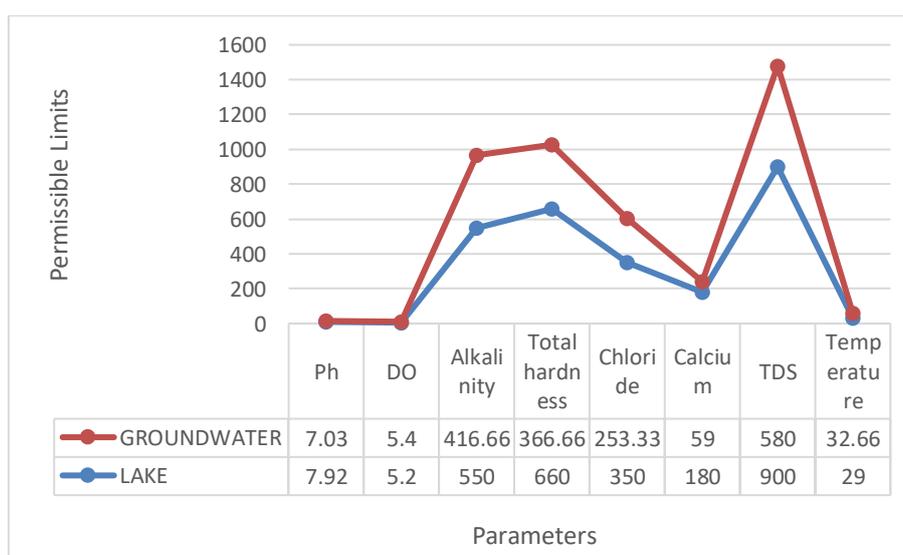Table 2: Analysis of Chemical Parameters 0f Groundwater Sampling Stations in Perungalathur Chennai

S. No	Parameters	S1	S2	S3	Mean Std. Deviation
1	pH	6.6	6.9	7.6	7.03
3	DO	5.6 mg/l	5.2 mg/l	5.6	5.4
4	Alkalinity	200 mg/l	550 mg/l	500mg/l	416.66
5	Hardness	300 mg/l	420 mg/l	380mg/l	366.66
6	Chloride	250 mg/l	290 mg/l	220mg/l	253.33
7	Calcium	75 mg/l	56 mg/l	48mg/l	59
8	TDS	500 mg/l	600mg/l	640mg/l	580
9	Temperature (°C)	30	33	35	32.66

Table 3: Comparison of Water Quality Parameters of Lake and Sampling Stations with Groundwater Standard of BIS, WHO.

S. No	Parameters	lake	Sampling station (mean value)	Desirable limits	Permissible limits
1	pH	7.92	7.03	6.5	8.5
2	DO	5.2	5.4	5	6
3	Alkalinity	550	416.66	50	200
4	Hardness	660	366.66	100	500
5	Chloride	350	253.33	200	600
6	Calcium	180	59	75	200
8	TDS	900	580	500	1500
9	Temperature (˚C)	29	32.66	_	40

3. RESULT AND DISSCUSSION

The collected samples were analyzed for different Physico and chemical parameters such as pH, dissolved oxygen (DO), alkalinity, total hardness, chloride, calcium, total dissolve solids (TDS) and temperature as per the standard methods of Indian Standards for potable water. The results are presented in the Table: 3. The Physico-chemical characteristics of effluent treated water were compared with the Indian Standard Specification for Drinking Water and world health organization. The colour of the effluent treated water was greenish and brownish. The Sample collected from the effluent discharged water storage lake was found to have unobjectionable odour on prolong stay it gave foul smell; this may be due to organic wastes from chemical industries. The water analysis's primary concern with the contaminated lake water analyzed with the drinking water specification and any adverse effects may affect the health.

	Ph	DO	Alkalinity	Total hardness	Chloride	Calcium	TDS	Temperature
GROUNDWATER	7.03	5.4	416.66	366.66	253.33	59	580	32.66
LAKE	7.92	5.2	550	660	350	180	900	29

Graph: Comparison the Water Quality Parameters of Lake water and Sampling Stations with Groundwater.

4. CONCLUSION

The comparative study between ground water and lake water in perungalathur Village reveals several key findings. Firstly, the pH levels in both water sources are within the permissible range, indicating overall good quality. However, the dissolved oxygen (DO) levels are slightly lower than the desirable limits in both cases. The alkalinity of the lake water is significantly higher than the ground water, which may impact its suitability for various uses. Additionally, the hardness of both water sources exceeds the desirable limits, warranting attention. While chloride levels are within permissible limits, the calcium content in ground water is notably lower than in the lake water.

Overall, further monitoring and management are essential to maintain water quality in Perungalathur Village. From this research study, it can be concluded that the ground water and lake water of the study area is not suitable for drinking purpose and must to do the recycling procedure before using irrigation purpose. So we must to take special care for lake water further more pollution should be avoided in and around lake water.

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