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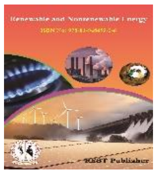

Assessment of Drinking Water Quality using the SPSS Method

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Abstract: *For humans, water is a vital component of survival. It is the main source for supplying home, agricultural, and commercial water needs. In the studied area Due to excessive use of ground water Due to insufficient filling Ground water quality has deteriorated. The overall health and life expectancy of the populace in many developing nations are being negatively impacted by the lack of access to safe drinking water. Because of the increased exploitation by humans, the quality of the world's water supplies is declining. The lithological and geochemical makeup of the rocks, as well as different hydrodynamic parameters, all affect the natural groundwater quality. Agriculture, industry and household sectors Growing needs are largely fulfilled by ground water sources. In certain quantities, Salt, chloride, iron, manganese etc. Natural chemicals for public health Not harmful, but they are drinking water Can affect quality. The World Health Organization (WHO) and Bureau of Indian Requirements' (BIS) drinking water standards were compared to the groundwater's physicochemical properties in the research region to determine if the water was suitable for human use (BIS)*

Keywords: PH, TDS, TH, Calcium, Magnesium and Chloride.

1. INTRODUCTION

Drinking water is crucial for many essential actions and is an ingredient that all living organisms require. It should be unrestricted and free-flowing. Along with historical civilization, it underwent a significant metamorphosis [1]. The most important freshwater reservoirs on land are lakes and groundwater. These support aquatic life, particularly fish, and are utilised for irrigation and home uses. On the other side, an expanding population needs a significant water supply. Municipal and industrial effluents, weathering, erosion, and other factors frequently contaminate water quality. [2]. Water quality can be assessed using physico-chemical parameters, with harmful limits for human health established at the international or national level (WHO, 2004). The best way to express the quality of water sources for consumption is the Water Quality Index (WQI). Use of water quality data useful for changing policies [3]. Urbanization and population density along the coastlines are growing quickly, and their associated activities demand more water. Because there is no industrial contamination, these waterways are completely ignored or undergo rigorous sanitary treatment. [4]. Many parameters compromise the quality of the data since it might do, making decisions based on Very important. Traditionally, Specialists in water resources report water quality some parameters with recommended data by comparison. Technical terms for drinking water quality does not give a comprehensive picture of the status of drinking water quality[5]. Millions serving as a decentralized source to the population In addition to doing so, underground in providing irrigation needs Water also plays an important role. Grown and growing For countries, groundwater is intrinsic to it Due to the characteristics, constant temp Wide distribution, continuous availability Character, excellent natural quality, limited Vulnerability, low growth costs and drought Water that includes reliability Most important and reliable of supply is evidenced. Population growth, rapid Urbanization and industrialization, agriculture of expansion and economic growth Due to the demand of ground water has increased over the years. [6].

2. WATER QUALITY

Rapid urbanization, particularly in developing nations like India, has had an impact on the supply and quality of groundwater Due to its exploitation. Once groundwater is polluted, it cannot be cleaned up by preventing contaminants at the source. [7]. Groundwater is naturally recharged Fertile; it is annually due to rainfall will be filled. Protection and quality of ground water to protect, quality is key. Because of this, Groundwater quality as a prospective future water source and its present and past from the perspective of both applications Evaluation is very important [8]. The chemistry of groundwater is domestic, for irrigation and industrial purposes a key that determines its use factor. Rapid urbanization and Industrialization, harsh environment Irregular and short A lot of ground water quality within distance Land use causes variations It varies from place to place, it's everywhere Strictly development activities controls. [9]. Economy and food production are interconnected, mainly by water Depending on availability, it is in various stages It is a determining factor in the development of countries. This is from two main natural sources are interconnected, mainly by water bore well water and ground water. Will grow Countries that are safe for citizens to drink. Providing water is huge challenging for governments [10]. For assessment of water quality in ground water Common method, WHO, BIS and ISI Quantification of parameters with fixed criteria is to compare. This type of assessment is simple and comprehensive, but about watersheds Managers who need brief information and Complete information on water quality for decision makers and cannot provide a descriptive picture. To solve this problem, several water quality indices have been developed for water quality parameters as an integral indicator value [11]. Groundwater is more dependable than surface water because of its capacity to replenish and lower susceptibility to contamination. However, because surface water and groundwater interact so closely, there is a considerable risk of contamination [12]. All over the world, groundwater is used extensively for drinking water and agriculture. Population growth, industrialization, heavy use of petrochemical, urban and industrial effluents lead to pollution of ground water as unfit drinking water can lead to short term effects like vomiting, diarrhoea, skin rash in humans. Quality matching studies are very important to society [13]. Large and complex data sets, for management planning and financing to give priority score are aggregated, it is water quality helps understand concerns. Geography and human-induced activities affect water distribution [14]. Acceptable water quality index for drinking water (WQI) is denoted by a value called Sodium Absorption Rate (SAR), Penetration Index (PI), Residual sodium carbonate (RSC), percent sodium (%Na), Kelly ratio (KR) and magnesium Hazards (MH) are for agricultural use An index describing the acceptance of groundwater values [15]. In various places and periods to compare water quality status WQI is a water quality indicator Acts as a tool. This is due to many water quality factors exhibits a synergistic effect. However, in literature generally there is no single recognized WQI in the literature[16].Basic physicochemical properties (Temperature, pH, dissolved oxygen, dissolved organic matter materials, etc.) and nutrients three Can be divided into categories: Micro pollutants (mineral and organic), metals, pesticides and including drugs; Biological parameters. Cyanobacteria, pathogenic microorganisms and Water quality indicators[17].

3. RESULT AND DISCUSSION

TABLE 1. Standards for drinking water quality as advised by BIS and WHO

Parameter	BIS Standards Desirable	BIS standards Max permissible	WHO standards
pH	6.5-8.5	6.5-8.5	6.5-9.2
TH	300	600	300
TDS	300	1500	500
Chloride	250	1000	250
Calcium	75	200	100
Magnesium	30	100	150
Sulphate	250	400	200

Requirements and the WHO's recommended quality standards are shown in Table 1. In recent years, many data sets Combined, reflect the overall quality underground by exporting scores Water quality as a tool for assessing water quality of researchers using the index (WQI). The number has increased. Affects water quality variables and natural or human inputs The relationship between influencing factors, Correlation, factor analysis, cluster analysis, Statistical techniques like dendrogram can be determined using These Methods Hydro chem., by various researchers are widely used in research. Water Indicate the origin of pollution. [18, 19]. Environmental conditions of any lake system Characteristics of the lake and various ecosystems How it is exposed to influences It depends. Consequently, anthropogenic impacts Natural processes (rainfall Inputs, corrosion and surface materials weather etc.) (Urban, industrial and agricultural activities) in addition to surface water they also affect the quality. Any lake Environmental conditions of the system and the lake properties and for various environmental impacts it depends on how it unfolds. (urban, industrial and agricultural activities) [20, 21]. Groundwater chemistry varies seasonally and geographically due to geochemical processes. Additionally, nitrogen leaching and metal release from soil may be caused by water of poor quality. To assess whether water is suitable for a certain usage, the quality of the groundwater must be determined. Groundwater geochemical investigations provide us a better knowledge of potential quality changes as development proceeds [22]. Different samples were collected from Tiruchirappalli and from those samples Physicchemical parameters selected are PH, TDS, TH, Calcium, Magnesium, Chloride, Sulphate were analyzed to estimate the groundwater quality.

TABLE 2. Reliability

Cronbach's Alpha	N of Items
0.627	7

The Cronbach's Alpha Reliability result is displayed in Table 2. The model's total Cronbach's Alpha score is 0.627, which denotes a 62% dependability level. Cronbach's Alpha values that are more than 50% can be taken into account for analysis.

TABLE 3. Descriptive Statistics

	Range	Min	Max	Sum	Mean	Std. Deviation	Variance	Skewness	Kurtosis
PH	1.7	6.5	8.2	1480.5	7.402	.4435	.197	-.345	-.775
TDS	1199	301	1500	186667	933.33	349.226	1.220E5	-.119	-1.148
TH	388	211	599	83144	415.72	117.259	1.375E4	-.087	-1.291
Calcium	290	60	350	40214	201.07	87.612	7.676E3	.019	-1.388
Magnesium	349	100	449	55779	278.90	99.379	9.876E3	-.016	-1.136
Chloride	249	200	449	64792	323.96	72.300	5.227E3	-.044	-1.134
Sulphate	110	60	170	22405	112.02	30.641	938.869	.091	-1.137

The data for analysis N, range, minimum, maximum, mean, standard deviation, Skewness, and Kurtosis are shown in Table 3 as descriptive statistics. The metrics used to evaluate the output include PH, TDS, TH, calcium, magnesium, chloride, and sulphate.

TABLE 4. Frequencies Statistics

		PH	TDS	TH	Calcium	Magnesium	Chloride	Sulphate
Mean		7.402	933.34	415.72	201.07	278.90	323.96	112.02
Median		7.400	954.50	421.00	198.50	283.50	326.50	109.00
Mode		7.4	492[a]	378	96[a]	346[a]	365	107
Percentiles	25	7.100	663.00	308.50	122.00	194.50	264.00	85.25
	50	7.400	954.50	421.00	198.50	283.50	326.50	109.00
	75	7.800	1241.75	515.00	285.00	361.25	383.75	138.75
		a. Multiple modes exist. The smallest value is shown						

Table 4 illustrates the frequency statistics of the given parameters. It shows mode, mean, median values of output evaluation parameters PH, TDS, TH, Calcium, Magnesium, Chloride, and Sulphate.

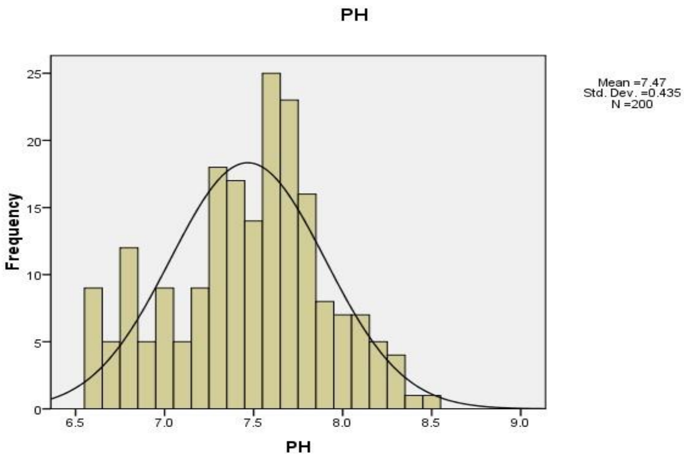

FIGURE 1. Frequency of pH value

The pH value's histogram plot is displayed in Figure 1. Most groundwater samples have pH values between 6.6 and 8.5, with a mean value of 7.47. It is clear that the data is slightly skewed to the right due to high values for 7.2-8.0, while almost all other values are below the normal curve, indicating that the sample follows a significantly normal distribution.

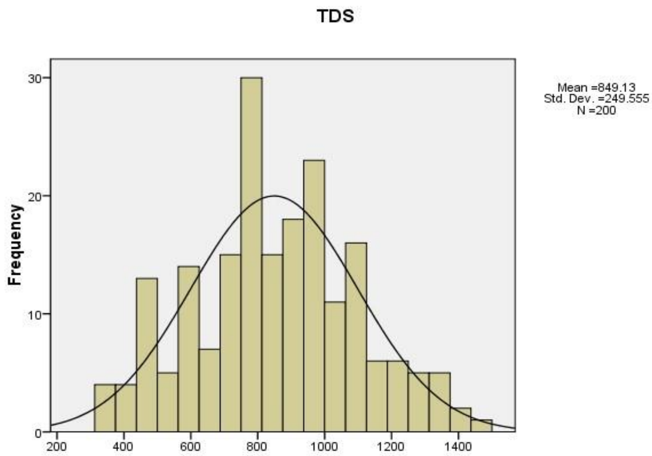

FIGURE 2. Frequency of TDS value

The histogram plot for the TDS value is displayed in Figure 2. Most groundwater samples have TDS values that range from 300 to 1500, with an average value of 849.13. It is clear from this data that the data is slightly skewed to the right due to high values for 800-1200, while nearly all other values are under the normal curve, indicating that the sample follows a significantly normal distribution.

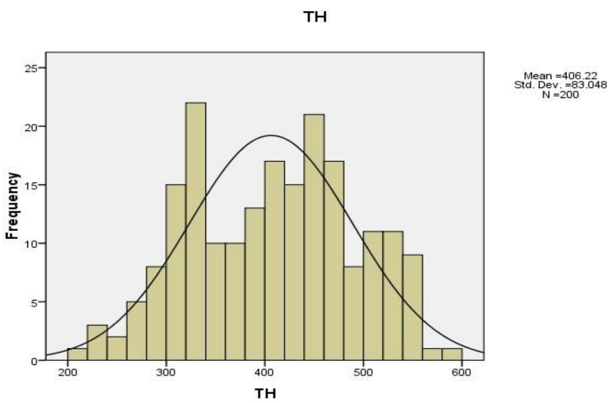

FIGURE 3. Frequency of TH value

Figure 3 shows the histogram plot for the TH value.The TH value of most of the groundwater samples varies from 210 to 600 with an average value of 406.22, where it can be clearly seen that the data is slightly skewed to the right due to high values for 400-550, while almost other values are under the normal curve, suggesting thatthe sample follows significantly normal distribution.

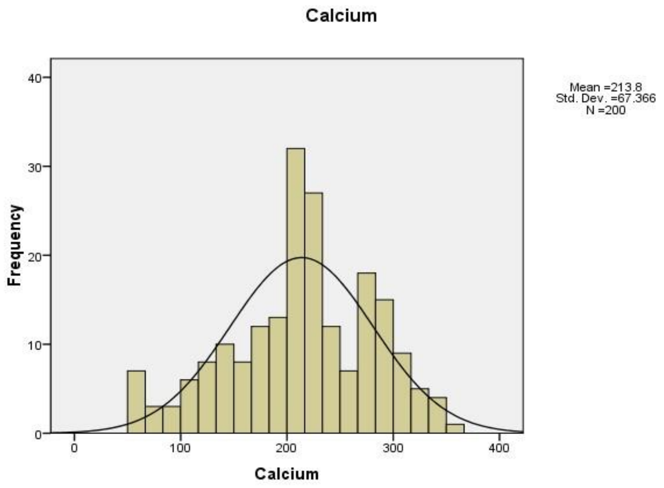

FIGURE 4. Frequency of Calcium value

Figure 4 shows the histogram plot for Calcium value.The Calcium value of most of the groundwater samples varies from 60 to 350with an average value of 213.8, where it can be clearly seen that the data is slightly skewed to the right due to high values for 202-275.

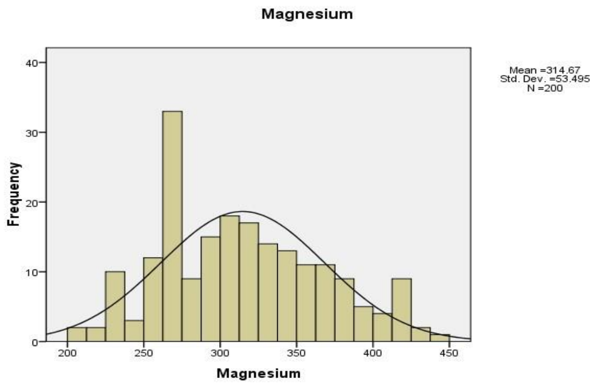

FIGURE 5. Frequency of Magnesium value

The histogram plot for the value of magnesium is shown in Figure 5. Magnesium levels in the majority of groundwater samples range from 150 to 450 with an average value of 317.67. It is clear from this data that the distribution is bellshaped, with values from 230 to 270 and from 410 to 420 occurring more frequently than all other values, which suggests that the sample follows a significantly normal distribution.

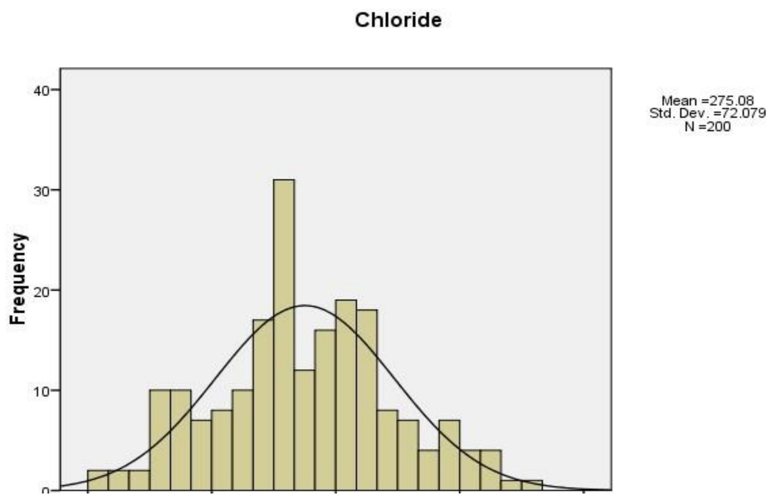

FIGURE6. Frequency of Chloride value

Figure 6 shows the histogram plot for Frequency of Chloride value.TheChloride value of most of the groundwater samples varies from 100 to 450with an average value of 275.08, where it can be clearly seen that the data is slightly skewed to right shaped with values from 230 to 320 more frequent, while all other values are under the normal curve, suggesting thatthe sample follows significantly normal distribution.

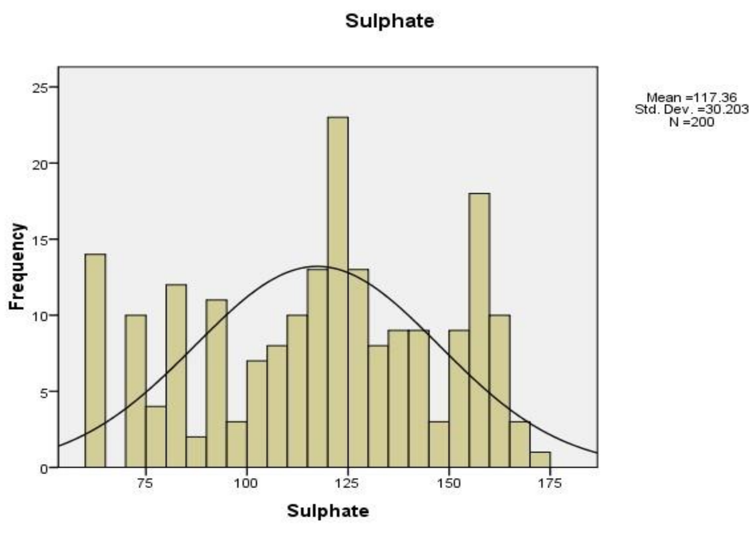

FIGURE7. Frequency of Sulphate value

The histogram plot for the Frequency of Sulphate value is shown in Figure 7. The majority of the groundwater samples have a sulphate value that ranges from 60 to 175 with an average value of 117.36. It is clear from this data that the data is slightly skewed to the right, with values 60–85, 120–130, and 150–165 occurring more frequently than other values, despite the fact that all other values fall under the normal curve and indicate that the sample follows a significantly normal distribution.

TABLE 4. Correlations

	PH	TDS	TH	Calcium	Magnesium	Chloride	Sulphate
PH	1	.030	.031	-.011	-.023	-.084	.110
TDS	.030	1	.137	-.033	-.012	.023	-.016
TH	.031	.137	1	.075	-.002	-.149*	.039
Calcium	-.011	-.033	.075	1	.122	-.039	-.027
Magnesium	-.023	-.012	-.002	.122	1	.144*	-.039
Chloride	-.084	.023	-.149*	-.039	.144*	1	.117
Sulphate	.110	-.016	.039	-.027	-.039	.117	1

Table 4 shows the correlation between motivation parameters for given evaluation parameters. Here pH is having the highest correlation with sulphate and lowest with chloride. TDS is having the greatest correlation with TH and lowest with calcium. TH is best related with TDS and worst with chloride. Calcium is having best correlation with Magnesium and worst with Chloride. Magnesium is having greatest correlation with chloride and lowest with sulphate. Chloride is having best correlation with magnesium and worst with pH. Sulphate is having best correlation with Chloride and worst with magnesium.

4. CONCLUSION

The supply of clean and appropriate drinking water to safeguard human health, a fundamental human right, is one of the most important challenges for water authorities. Physicochemical properties of water samples, State-of-the-art information on quality parameters sampling and analysis for preparation are made, it is a general public Water quality. Groundwater is the primary source of demand has the most important environment in the world today one of the problems is water pollution. In the environment of water due to human activities that release toxins Quality may be adversely affected or May worsen. Specific to groundwater Nature causing high concentrations of elements Processes also have an impact on it. Uncontrolled use of ground water resources degrading groundwater quality, lowering water table, Reduces groundwater potential. Using water to manage water quality A to monitor and evaluate quality a valuable tool.This is the complete story of groundwater although it cannot be said, many are significant it is created based on attributes. Also, the general public on water quality can be easily understood.

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