ASSESSMENT OF PHYSICO-CHEMICAL PARAMETERS OF GROUND WATER SOURCE IN THE NORTHERN PART OF BAKSA DISTRICT OF ASSAM

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Abstract - A study was carried out in the northern Baksa district to investigate the physico-chemical properties of drinking water used by the residents. The main goal was to evaluate the potable water's fitness in light of the increased incidences of gastro-intestinal disorders and other water-borne diseases prevalent there. Thirty different sampling sites were used to collect the water samples. The pH, electrical conductivity (EC), total dissolved solids (TDS), chlorides, total hardness, arsenic, and dissolved oxygen were all measured in the water sample. The mean value of each parameter was calculated, as well as its standard deviation (SD), standard error (SE), and coefficient of variation (CV) was also determined. To assess the quality, each parameter was compared to the World Health Organization's (WHO) desirable limit and few suggestions were made to improve the quality of groundwater in Baksa districts' northern areas.

Index Terms - Diseases, Ground water, Physico-chemical properties, Potable water.

I. INTRODUCTION:

II. India has an abundance of water resources, including large alluvial basins that store groundwater and an extensive network of rivers. Despite the fact that there is roughly 1100 km^3 of water available for all purposes, there are serious issues with water scarcity, which are mostly caused by variations in availability. Rapid population growth has made the issue worse by raising the demand for water supplies for irrigation, human and industrial consumption, and other uses. In India's urban and rural areas, the two main sources of drinking water are surface water and ground water. The Central Pollution Control Board (CPCB) report states that pesticide runoff from fields, untreated sewage discharge, and household and industrial wastes are the main causes of pollution in the majority of Indian rivers. Actually, two of the main contributors to surface and groundwater pollution are industrial waste and municipal solid waste. Iron, nitrate, arsenic, or other heavy metals in excess render available water unfit for human consumption in many regions of the nation. Summertime conditions worsen because of water scarcity and precipitation runoff. One of the major health problems is the presence of heavy metal ions, harmful microorganisms, and other elements in the water resource used for drinking and domestic use. As a result, a significant sum of money is spent treating contaminated water chemically so that it is drinkable. Therefore, it is necessary to search for some practical indicators, both physical and microbiological, that can be used to track the performance and operation of drinking water systems. The Baksa district's northern residents are outraged by diseases like cholera and jaundice and frequently suffer from episodes of digestive disorders. It is likely that the majority of the illnesses are brought on by tainted drinking water. An investigation was intended to evaluate the physical and chemical characteristics of drinkable water being used in various Northern Baksa locations, where groundwater serves as the primary source.

III. METHODOLOGY:

Sampling sites: Thirty sampling sites were selected for the current study, which was conducted in the northern portion of the Baksa district. Subankhata, Nikashi, Hastinapur, Verakhat, Kumarikata, Paharpur, Singra, Parkijuli, Koklabri, Saukushi, Musalpur, Naraynpur, Suagpur, Medakhat, Odalbari, Adhilbari, Thamna, Dumni, Barbari, Barimukh, Chariamari, Jalah, Badlipara, Bhalukdonga, Golbil, Pakhamara, From October 2016 to September 2017, groundwater was drawn from the tube well situated at these sampling locations.

Sampling technique: 500 ml clean polythene bottles devoid of air bubbles were filled with water samples obtained from the chosen locations, in accordance with standard protocols. After collection, the samples were processed within six hours and put in dark boxes right away.

Physico-chemical analysis: In order to determine the compounds that might support bacterial growth, a variety of physico-chemical parameters were monitored. The electrical conductivity (EC), pH temperature, total dissolved solids (TDS), and dissolved oxygen (DO) were analyzed on the spot itself using the water analysis kit (DECIPEL). The water was immediately brought to the laboratory for further analysis. Total alkalinity, total hardness, and chloride of the water were analyzed following the methods of APHA (1992). The parameter of arsenic was analyzed by the arsenic testing kit (MERCK). The standard deviation (SD), standard error (SE), and coefficient of variation (CV) were determined by the formula.

$$SD = \sqrt{\frac{\sum(X - X^{-})^2}{N-1}}$$

where, N = Total number of sampling point

X = Value of the individual sampling points

X^{-} = Mean value

$$SE = \sqrt{\frac{S^2}{N}} = \frac{S\prime}{\sqrt{N}}$$

where, S^2 =Variance
S' = Standard Deviation
and $CV = \frac{SD}{Average} \times 100$

IV. RESULT AND DISCUSSION:

Table1 displays the mean value of nine groundwater parameters that were examined at 30 sampling points along with their standard deviation (SD), standard error (SE), and coefficient of variation (CV). The average temperature of the water was 18.2 °C, which was colder than the Baksa District's southern average. The rainy and winter months that predominated during the investigation period can be blamed for the lower value of water temperature found in the current study. The alkaline pH range is occupied by the water samples. The recommended pH range for drinking was indicated by the mean value of 8.2 (WHO 1984). In general, the catchment area's geology and the water's ability to act as a buffer affect the pH of the liquid. The Northern Baksa area's groundwater had a mean dissolved oxygen content of 7.6. The WHO states that dissolved oxygen levels in drinking water should not be lower than 5 parts per million. The CV values for dissolved oxygen (15.7), pH (4.8), and temperature (12.4) indicated that there were no significant variations in these parameters between sites. The N.B. area's groundwater had average electrical conductivity (EC) and total dissolved solids (DS) of 2095 µmho/cm and 1650 ppm, respectively. Given that the average total hardness value is 410, it falls within the WHO's (1984) 500 ppm threshold for natural water. The high values of TDS (710), hardness (44.8), and CV of EC (71.4) showed that there were notable differences between sampling points. Because of the high levels of total dissolved solids in groundwater, which may be influencing the conductivity, which in turn affects the percentage of total solids, the EC value exceeded the desired value. When waste waters are dumped into pits, ponds, and lagoons, they allow the waste to migrate down to the water, which may lead to high TDS in groundwater (Fetter, 2000). Seepage and runoff from solids are the main natural sources of hardness in water, along with sedimentary rocks. Generally speaking, regions with thick top soil and limestone formations are where hard water originates (Raghunath, 1966). A natural water system's addition of calcium and magnesium ions as it flows through solids and rocks that contain high concentrations of these elements in mineral deposits is another cause of hardness.

According to WHO (1996), the standard desirable limit of alkalinity in potable water is 120 ppm. At every sampling location, the Northern Baksa area's groundwater had an average alkalinity of 229 ppm, over the allowed limit. Alkalinity has a value that includes organic acids, hydroxide, phosphate, bicarbonate, and borate. These elements consist of the features of the water supply and the ongoing natural processes. Drinking water can contain up to 250 parts per million of chloride (WHO, 1984). The Northern Baksa area's groundwater had a mean chloride content of 418 parts per million. In the northern Baksa region, the levels of chlorides in groundwater were exceptionally elevated. Large concentrations of chloride can be a sign of pollution from domestic or industrial sources, or they can be the result of natural processes like water passing through salt formations found in the earth. Northern Baksa's groundwater has an average arsenic content of 0.02 ppm, which is within the recommended desirable limit (WHO, 1984).

Table-I: The average value of nine parameters of ground water from 30 locations in the northern part of Baksa district, together with their SD, SE, and CV

Sl. No.	Parameters	Mean	SD	SE	CV
1	Water temperature	18.2	2.2	0.4	12.4
2	pH	8.2	0.4	0.08	4.8
3	Dissolved Oxygen (ppm)	7.6	1.2	.024	15.7
4	Electrical Conductivity (µmho/cm)	2095	1496	305	71.4
5	Total Dissolved Solid (ppm)	1650	1172	239	71.0
6	Total Hardness (ppm)	410	184	37.5	44.8
7	Total alkalinity (ppm)	229	56	11.4	24.4
8	Chloride (ppm)	418	400	81.6	95.6
9	Arsenic (ppm)	0.02	ND	ND	ND

VI. CONCLUSIONS

The groundwater study leads to the conclusion that people living in the northern Baksa district may be susceptible to waterborne illnesses due to rich in minerals and other inorganic parameters that provide an environment conducive to the growth of pathogenic microorganisms. In order to reduce contamination and make them safe for consumption, appropriate treatments are therefore required.

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