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RESEARCH ARTICLE

GROUND WATER QUALITY ASSESMENT OF PUB – NALBARI BLOCK OF NALBARI DISTRICT, ASSAM, INDIA

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ABSTRACT

Groundwater is one of the primary sources for drinking in Nalbari district of Assam, India. Nine water quality parameters have been considered as important indicators to evaluate water quality status in 09 tube well water samples located in the Pub Nalbari Block of Nalbari District. The parameters considered for evaluation are pH, electrical conductivity, calcium, magnesium, chloride and alkalinity. Groundwater was well within the permissible limit for the different water quality parameters. The model predicts status of groundwater quality along with measure of its sustainability. The ranking of the tube wells corresponding to drinking uses also provides clarity to the decision makers to formulate suitable policies for treatment processes and sustainable planning of groundwater resources in the region. The study reveals that the water quality is mainly influenced by natural weathering process.

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INTRODUCTION

Groundwater is the main source of water in the arid and semi-arid environment which fulfills the requirement of different beneficial-uses viz., drinking, domestic or irrigation particularly for the rural population. The quantity of fresh water is finite and it is very necessary to sustain life and the environment. Groundwater contributes 0.6 % of the total water resources on the earth. It accounts for nearly 80% of the rural domestic water needs and 80% of the urban water needs in the developing countries like India (1). Although groundwater is less susceptible to bacterial pollution than surface water but the excessive and improper use of chemical fertilizers, animal manures, insecticides, and pesticides, improperly built or poorly located and maintained septic systems for household wastewater, leaking or abandoned underground storage tanks and piping, improper disposal or storage of wastes and chemical spills at local industrial sites have proved to be major contributors of groundwater pollution (2). It is therefore important to realize that management of groundwater does not only mean assessing groundwater quantity and its availability for different purposes but also its quality which have been impacted significantly to be precursor to various water borne epidemics.

The rural population in the Nalbari district of Assam is dependent on groundwater from tube wells, Ring Well, Tara Hand Pump as potable water. The rural population is not aware of the many pollutants the groundwater contains. Moreover, the inadequate infrastructure in the respective areas required for purification further aggravates the problem. This has led to the outbreak of many water borne diseases in the area. Hence, the study has been conducted to determine the drinking water quality of the region (3). In this paper, the focus of the study is to assess the groundwater suitability for Pub Nalbari area of Nalbari district, Assam, the residents of which use groundwater for different beneficial uses especially for irrigation and domestic uses. Water quality of 9 groundwater tube wells of this region has been analyzed and sustainability of these wells has been assessed. These wells are located in nine different villages of Pub – Nalbari Block of Nalbari District

METHODOLOGY

In this study, a total of 09 important sampling groundwater wells are chosen from the Pub Nalbari region of Nalbari district.

Table 1. Physico – Chemical parameters of ground water of 12 locations

SL NO.	Location	Mg (mg/l)	Cl (mg/l)	pH	EC (µs/cm)	Ca (mg/l)	Alkalinity (mg/l)
1	Khatikuchi	13	13	6.8	371	34	140
2	Dihjari	14	15	7.0	279	32	136
3	Kataki	12	12	7.2	310	27	130
4	Bilpar	10	18	6.9	328	31	220
5	Kundargaon	15	24	6.7	330	30	170
6	Ciling	15	18	6.8	375	37	175
7	Guwakuchi	12	12	7.1	378	50	164
8	Narpara	13	11	6.8	302	40	220
9	Chataibari	14	20	7.2	320	40	180

Table 2. Statistical Analysis of the water quality parameters

Parameter	Minimum mg/l	Maximum mg/l	Mean mg/l	Standard deviation
Mg	10	15	13.11	1.5234
Cl	11	24	15.88	4.1484
pH	6.8	7.2	6.94	0.8471
EC	279	378	332.55	33.06
Ca	27	50	35.66	6.58
Alkalinity	130	220	170.55	31.29

Table 3. Correlation Co-efficient value “r” for the following pairs of parameters.

	pH	EC	Ca	Mg	Cl	Alkalinity
pH	1					
EC	-0.2148	1				
Ca	0.1912	0.4515	1			
Mg	-0.3066	0.0098	0.0036	1		
Cl	-0.2806	0.0036	-0.2861	0.4414	1	
Alkalinity	-0.3272	-0.3991	0.2527	-0.2762	0.1784	1

Each groundwater well has been represented as the groundwater system at that location and sustainability of these wells are assessed in context to domestic and irrigation usage. The quality of water varies with time and space depending on concentration of different water quality parameters. Based on the water quality, user can decide the optimal use of the water at a particular location (4). The combined effect of these parameters for a particular beneficial-use has been evaluated to measure sustainability for each groundwater well. The important parameters considered for domestic purposes are pH, EC, Ca, Mg, Cl, Alkalinity. The pH is measured immediately after collection of the sample using portable pH meter. Conductivity meter was used to measure EC in the sample. EDTA titrimetric method is used to determine Calcium and Magnesium. Chloride is determined by Argentometric Method. Alkalinity was determined by titration with 0.1 N HCl using methyl orange indicators (5)(6).

RESULTS AND DISCUSSION

The pH value of water sample shown in the Table I. It is observed that the pH value of all the water sources is almost the same. Which lies between the ranges 6.8 upto 7.2 laid down by WHO for drinking water. Conductivity is a measure of water's capability to pass electrical flow. This ability is directly related to the concentration of ions in the water. The highest value of Conductance in the water source at Guwakuchi HTW which is recorded as 378 µs/cm, The lowest value is recorded at 279 µs/cm at Dihjari. A higher conductivity value indicates that there are more chemicals dissolved in the water. Minerals such as Calcium, Magnesium still are not normally on the regulatory monitoring list.

Calcium is one of the most abundant substances of the natural waters. Being present in high quantities in the rock, it is leached from there to contaminate the water. Calcium has no hazardous effects on human health. In fact, it is one of the important nutrients required by the organism. Magnesium also occurs in all kinds of natural water with Calcium, but its concentration generally lower than the Calcium. The principal sources in the natural waters are various kinds of rocks. From the table it is observed that the value of calcium of water source is within the desirable limit. Both the Calcium and Magnesium are below the acceptable limit. The Chloride concentration is seen to be very low in the Study area. The permissible limit of Cl in groundwater is 600 mg/l. It is observed from the Table I that the highest value of Alkalinity is recorded for the water source at Guwakuchi (378 mg/l), and the lowest value is recorded at Dihjari (279 mg/l). The mean value is 332.55. If there is too much alkalinity in the water is that the water becomes known as "Hard water".

CORRELATION COEFFICIENT

Correlation Coefficient is indicator of the strength of the linear relationship between two different variables x and y. Here the value of Correlation Coefficient “r” for some pair of parameters (pH & EC), (pH & Ca), (EC & Mg), (Mg & Ca) are determined. The values of “r” lies between -0.2 and +0.4 which are moderate values. On the other hand for some pair of parameters “r” is below -0.2 which is considerably weak relationship. Again the negative value of “r” indicates inverse correlation between the pair of parameters.

CONCLUSION

The analysis of the ground water quality parameters of nine different sources in Pub- Nalbari Block of Nalbari District

shows that the different values of the parameters are acceptable i.e. within the permissible limit according to WHO. Comparatively the value of EC is high in two water sources. This is due to the high concentration of conductive ions like Chloride, Nitrate etc anions or Sodium, Magnesium, Iron etc cations in the sources. Since people in rural areas consume drinking water directly from hand pump or Hand Tube Wells and does suffer from various suspected diseases, systematic and periodic monitoring of the water may prove to be useful in achieving the goal of safe drinking water for all.

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