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Groundwater Quality Assessment In Nellimarla Area Of Vizianagaram District, Andhrapradesh, India

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Abstract

An assessment of the groundwater quality was carried out in Nellimarla area of Vizianagaram District, Andhra Pradesh. The study was aimed at examining the various samples of groundwater and groundwater quality was assessed for drinking. Eight groundwater samples were taken from boreholes of different locations and were analyzed for pH, Electrical conductivity, total dissolved solids, total alkalinity, total hardness, chloride, calcium and magnesium using standard methods. The results were compared with World Health Organization and BIS: 10500 standards. The usefulness of these parameters in predicting groundwater quality characteristics were discussed. Thus an attempt has been made to find the quality of groundwater in Nellimarla area suitable for drinking purposes or not.

Keywords: Alkalinity, Calcium, EC, Hardness, Magnesium, Total Dissolved Solids.

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I.INTRODUCTION

Water is a prime need for human survival and industrial development. For many rural and small scale communities, groundwater is the only source of drinking water. Assessment of groundwater for drinking and irrigation has become a necessary and important task for present and future groundwater quality management. Groundwater quality depends on the quality of recharged water, atmospheric precipitation, inland surface water and subsurface geochemical processes. Temporal changes in the origin and constitution of the recharged water, hydrologic and human factors may cause periodic changes in groundwater quality. Water pollution not only affects water quality but also threats human health, economic development and social prosperity. So, the assessment of water quality is very important factor for knowing the suitability for various purposes.[1]

2.MATERIALS AND METHODS

In the present investigation groundwater samples were collected from eight different locations in the study area in the month of February 2020. Sample locations are shown in the Table 1. Samples were collected in polythene bottles, pre-cleaned by washing with non-ionic detergents, rinsed with water, 1:1 hydrochloric acid and finally with de-ionized water . Before sampling, the bottles were rinsed three times with sample water. Tube wells were operated at least five minutes before collection of the water samples. The water quality parameter estimation was done using standard methods and techniques. Samples were brought to the laboratory for analysis of physic-chemical parameters. Samples were brought to the laboratory and kept at 4◦C until used for analysis of physico-chemical parameters. pH parameter was measured by digital pH meter (Elico LI- 120), EC measured by conductometer (Elico CL-351), TDS determined by Gravimetry, and other parameters such as Total Hardness (TH), Total Alkalinity (TA), Calcium, Magnesium, Chloride ions are determined by titrimetrically. [2]

3.RESULTS AND DISCUSSIONS

The results obtained from analysis of different groundwater samples are shown in Table-2. The statistical evaluations are given in Table-3. [3]

In the present investigation most ofwater samples are colorless and odorless. However some water samples are slightly colored due to muddiness. The main sources of natural alkalinity are rocks, which contain carbonate, bicarbonate, hydroxide compounds and phosphates. The value of Total alkalinity in study area is ranged from 350 to 620 mg/l with mean value of 457.5 ±93.465. Alkalinity itself is not harmful to human being, but in large quantity, imparts bitter taste to water and may cause eye irritation in human. [4]

The mean value of total hardness of studied groundwater samples is 377.5 mg/l with the standard deviation of ±73.046 mg/l.

The value of calcium in study area is ranged from 20 to 160 mg/l with mean value of 87.5 mg/l and standard deviation of ±53.65 and the value of magnesium is ranged from 30 to 250 mg/l with mean value of 86.25 and standard deviation of ±75.0119. [5]

TDS is an important parameter which imparts a peculiar taste to water and reduce its potability.

Table 1: Location of Samples

S.No	Sample Id	Sampling station	Latitude	Longitude
1	S1	Gushini	18.1133	83.3264
2	S2	LN Puram	18.1014	83.2348
3	S3	Ommi	18.0954	83.3318
4	S4	Parasam	18.1414	83.2394
5	S5	Ramateertham	18.0998	83.2993
6	S6	Saripalli	18.078	83.2883
7	S7	Valluru	18.1768914	83.599686

Table 2: Measured Parameter values at different sampling stations

Parameters	S1	S2	S3	S4	S5	S6	S7	BIS/WHO desirable-permissible values
pH	7.59	7.22	7.19	7.23	7.24	7.15	7.44	6.5-8.5
EC	809	1673	1985	1845	1860	1341	2407	750-3000
TDS	530	1090	1290	1200	1210	875	1560	500-2000
TH	350	420	350	490	270	300	410	300-500
Ca	40	80	20	70	50	160	160	75-200
Mg	60	40	70	70	30	140	250	30-150
Cl	90	290	85	320	110	150	310	250-1000
TA	360	490	400	500	350	410	620	200-400

All the units are expressed in mg/l except pH (no units) and EC (micro Siemens/cm), EC=Electrical Conductivity, TDS=-Total Dissolved Solids, TH=Total Hardness, TA=Total Alkalinity, Ca=Calcium, Mg=Magnesium, Cl= Chloride

Table 3: Descriptive statistics of parameters

Parameters	Min	Max	Mean	SD	%CV
pH	7.15	7.59	7.285	0.15014	2.06
EC	809	2407	1707.13	470.889	27.58
TDS	530	1560	1110.63	303.65	27.34
TH	270	490	377.5	73.046	19.35
Ca	20	160	87.5	53.6523	61.32
Mg	30	250	86.25	75.0119	86.97
Cl	85	340	211.875	112.756	53.22
TA	350	620	457.5	93.465	20.43

Desirable limit of TDS is 500mg/l (IS: 10500 standards).The mean value of TDS of studied groundwater samples is 1110.63 mg/l with the standard deviation of ±303.65. The value of EC in study area is ranged from 809 to 2407 mg/l with mean value of 1707.013 and standard deviation of ±470.889.

Chloride is an important quality parameter that affects the aesthetic property of water including taste and renders it unsuitable for drinking purpose if present in high concentration. The chloride concentration in study area ranged from 85 to 340 with mean values of 211.875 ± and standard deviation of 112.756 mg/l. The values in the present study are on higher side considering WHO maximum limit of 250mg/l.

4.CONCLUSIONS

The objective of present work is to study the water quality of groundwater in Nellimarla area of Vizianagaram District so as to assess its suitability for domestic purpose. From the analysis, Total Hardness observed was higher in Water samples S1, S2 and S3 than desirable value 300mg/l and Total alkalinity observed in samples S2, S4, S6, S7 and S8 was higher than desirable value 400 mg/l. Chloride content observed in samples S2, S4, S7 and S8 was higher than desirable value 250 mg/l. Magnesium content observed in water samples (S1, S3, S4, S7 & S8) was higher than calcium content. Continuous monitoring of groundwater is necessary for the health of human. According

to the overall assessment of the focused area, some of the parameters analyzed are above the desirable limits of BIS /WHO and needs some degree of treatment before consumption.

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