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Assessment of Water Quality in Gariavidi Mandal, Vizianagaram District, Andhra Pradesh, India

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Abstract

Water quality is a crucial factor affecting public health, agriculture, and overall community well-being. This study evaluates the physicochemical and microbial properties of drinking water in different areas of Garividi mandal, Vizianagaram district, Andhra Pradesh, to determine its suitability for consumption. The analysis included temperature, pH, turbidity, total dissolved solids (TDS), total hardness, alkalinity, and microbial contamination. Results indicate that all parameters comply with the Bureau of Indian Standards (BIS, 2012), confirming the safety of the water. The microbial assay showed the absence of coliform bacteria, Escherichia coli (E. coli), fungi, and pathogenic bacteria, ensuring that the water does not pose a health risk. Regular monitoring and preventive measures are recommended to maintain long-term water quality.

Keywords: Water Quality, Physicochemical Analysis, Microbial Assay, Drinking Water Safety, BIS (2012) Standards.

1. Introduction:

Water quality assessment[1-5] is a crucial aspect of environmental monitoring, ensuring the safety and sustainability of water resources for human consumption, agriculture, and industrial use. In rural and semi-urban areas, water contamination due to natural and anthropogenic factors poses a significant challenge to public health.

Gariavidi Mandal, located in the Vizianagaram district of Andhra Pradesh, relies on surface and groundwater sources for its water supply. Factors such as agricultural runoff, industrial effluents, and improper waste disposal can impact water quality, leading to potential health hazards. Regular monitoring and assessment of water parameters such as pH, dissolved oxygen, turbidity, total dissolved solids (TDS), and microbial contamination are essential for ensuring water safety. This study aims to evaluate the physicochemical and microbiological quality of water sources in Gariavidi Mandal under BIS drinking water standards (2012)[6] and identifying potential contamination sources and assessing their

impact on human health and the environment. The findings will help in formulating appropriate water management strategies and ensuring safe drinking water for the local population.

2. Materials and Methods:

Water samples were collected from hand pumps on 3 different areas [Gotnandi (Sample -1), Bondapalle (Sample -2), Sarveswarpuram (Sample -3)] in Gariavidi Mandal of Vizianagaram District, AP and analyzed for physicochemical and microbial characteristics [**Table.1**]. Standard methods were employed for testing temperature, pH, turbidity, TDS, total hardness, chloride, fluoride, nitrate, alkalinity, and electrical conductivity [**Table.2**]. Microbial analysis was conducted to detect coliform bacteria, E. coli, total bacterial count, fungi, and pathogenic bacteria (Salmonella, Vibrio cholerae, Shigella).

Table:1. Details of Sample Sources

Sample No.	Sample Station	Type of Source	Latitude	Longitude
S1	**Gotnandi**	Hand pump	18.391601^0	83.589386^0
S2	**Bondepalle**	Hand pump	18.377167^0	83.590767^0
S3	**Sarveswarapuram**	Hand pump	18.380227^0	83.606332^0

Table.2: Methods of Analysis

S.NO.	Parameter	Method	Instrument/Equipment
1	Temperature	Laboratory method	0.1^0C scale thermometer
2	pH	Electrometric	pH meter
3	Conductivity	Electrometric	Conductivity meter
4	DO, BOD	Iodometric (Titrimetric)	
5	Hardness, Ca	Titration with EDTA	
8	Alkalinity	Titration with Sulphuric acid	
9	Chloride	Titration with Silver nitrate	
10	Na,K	Flame Photometric	Flame photometer
11	Nitrate, Phosphate	Spectrophotometric abs. UV,Vis.	UV-Vis.Spectrophotometer

Figure.1: Collection of Water samples from Gotnandi (Sample -1), Bondapalle (Sample -2) & Sarveswarpuram (Sample -3) of Garividi (M), Vizianagaram Dt, Andhra Pradesh

3. Results and Discussion:

This section presents the key findings from the water quality analysis and interprets their significance. This section provides a detailed analysis of various physical, chemical, and microbiological parameters, comparing them with standard guidelines such as BIS(2012) Standards[6] to assess water suitability for different purposes. These findings are typically presented in table [**Table.3**] and graphs [**Figs.2&3**] for clarity and ease of comparison.

A) Physicochemical Parameters:

- **Temperature:** The temperature of the water samples ranged from **30.0°C to 30.5°C**, which is within the acceptable limits for drinking water.
- **pH:** The pH values were **7.7 to 8.2**, falling within the BIS permissible range of **6.5 to 8.5**, indicating a slightly alkaline nature.
- **Turbidity:** The turbidity values were between **6.0 and 7.8 NTU**, remaining below the permissible limit of **10 NTU**, ensuring good water clarity.
- **Total Dissolved Solids (TDS):** The TDS levels varied from **400 to 456 mg/L**, well within the BIS standard of **≤ 500 mg/L**, indicating a balanced mineral composition.

➢ **Total Hardness:** Measured as **$CaCO_3$**, the hardness ranged between **56 and 62 mg/L**, which is below the BIS limit of **75 mg/L**, ensuring no excessive mineral deposits.
➢ **Chloride (Cl^-):** Chloride concentrations ranged from **150 to 200 mg/L**, remaining within the permissible limit of **<250 mg/L**, confirming no excessive salinity.
➢ **Fluoride (F^-):** The fluoride levels were **1.0 to 1.4 mg/L**, within the safe BIS limit of **0.6 to 1.5 mg/L**, preventing risks associated with fluoride deficiency or excess.
➢ **Nitrate (NO_3^-):** The nitrate content was **28 to 35 mg/L**, well below the BIS guideline of **<45 mg/L**, ensuring no risk of contamination from fertilizers or sewage.
➢ **Alkalinity:** The alkalinity levels ranged from **152 to 186 mg/L**, remaining within the permissible BIS limit of **<200 mg/L**, ensuring stable water quality.
➢ **Electrical Conductivity (EC):** The EC values varied between **0.01 and 0.03 µS/cm**, which is significantly below the **0.05 µS/cm** limit, indicating minimal dissolved ionic content.

Table.3: Physico-chemical parameters of groundwater in three different places of Garividi Mandal, Vizianagaram District, Andhra Pradesh

S.No.	Parameters Study	S1	S2	S3	Normal values(BIS Norms,India,2012)[6]
1.	**Temperature °C**	30	30.5	30	
2.	**Color**	clear	clear	clear	
3.	**Odour**	Nil	Nil	Nil	
4.	**pH**	7.7	7.9	8.2	6.5 to 8.5
5.	**Turbidity, NTU, Max**	6.0	7.8	6.8	< 10
6.	**TDS (mg/L)**	456	400	420	≤ 500
7.	**Total Hardness(mg/L) (as $CaCO_3$)**	62	60	56	<75
8.	**Ca^{2+} Hardness (mg/L)**	64	65	50	<75
9.	**Mg2+(mg/L)**	22	20	24	<30
10.	**Ca $^{2+}$(mg/L)**	50	60	67	<75
11.	**Cl^-(mg/L)**	200	180	150	<250
12.	**F^-(mg/L)**	1.4	1.2	1.0	0.6 to 1.5
13.	**NO_3^-(mg/L)**	28	31	35	<45
14.	**Alkalinity-(mg/L) (as $CaCO_3$)**	152	186	176	<200
14.	**EC(µS/cm)**	0.01	0.03	0.02	**<0.05**

S1= Hand pump, Gotnandi
S2= Hand pump, Bondepalle,
S3= Hand pump, Sarveswarapuram

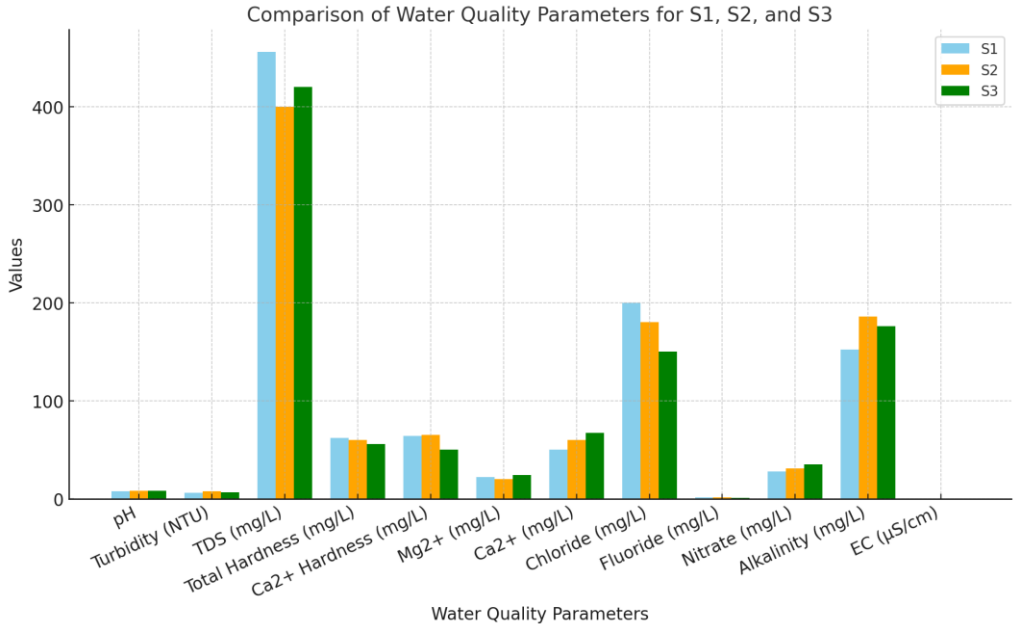

Figure.2: Bar graph comparing the ground water quality parameters for S1, S2 & S3

B) Microbial Analysis:

➢**Total Coliform Count:** No coliform bacteria were detected in any of the water samples, ensuring no fecal contamination.

➢**E. coli Presence:** The absence of *E. coli* confirms that the water is not contaminated with human or animal waste.

➢**Total Plate Count (TPC):** The total bacterial count was within the permissible limit of **<500 CFU/mL**, ensuring microbiological safety.

➢**Fungal Contamination:** No fungal growth was observed, indicating safe storage conditions and low risk of microbial spoilage.

➢**Pathogenic Bacteria:** No traces of Salmonella, Vibrio cholerae, or Shigella were found, ensuring that the water does not pose any major health threats.

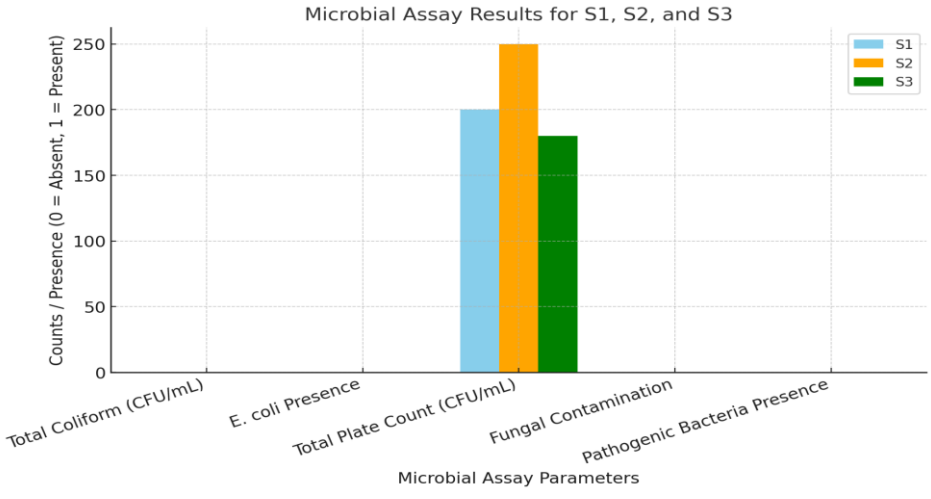

Figure.3: Bar graph representing the Microbial Assay Results for S1, S2, and S3.

The graph[**Fig.3**] shows the total coliform count, E. coli presence, total plate count, fungal contamination, and pathogenic bacteria presence in each sample. Since all samples tested negative for harmful microbes (coliforms, E. coli, fungi, and pathogens), the water is microbiologically safe for consumption

4. Conclusions:

The comprehensive analysis of ground water quality in Gariavidi Mandal, Vizianagaram District, Andhra Pradesh, indicates that the water is safe for consumption based on BIS (2012) standards. The physicochemical parameters, including pH, TDS, hardness, chloride, fluoride, and nitrate levels, fall within permissible limits. The microbial analysis confirms the absence of coliform bacteria, E. coli, fungi, and pathogenic microorganisms, ensuring the microbiological safety of the water. Since water quality can fluctuate due to environmental factors, regular monitoring and proper sanitation measures are recommended to maintain long-term water safety.

5. Recommendations

✓Periodic water quality testing should be conducted to detect any emerging contaminants.
✓Awareness programs should be organized to educate villagers on the importance of water hygiene and sanitation.
✓Protective measures such as proper storage, filtration, and chlorination should be implemented to ensure continuous water safety.

6. Disclosures:

There is no conflict of interest for all authors.

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References

1. Freeze, R.A., & Cherry, J.A. (1979). "Groundwater" – A classic textbook on groundwater science.
2. Lapworth, D.J., et al. (2017). "Urban Groundwater Quality: A Global Perspective." Environmental Pollution, 223, 590-610.
3. Rao, G.S., & Rao, B.V. (2010). Assessment of Groundwater Quality in Rural Areas of Andhra Pradesh. Journal of Environmental Science and Engineering, *52*(3), 199-204.
4. Vasanthavigar, M., Srinivasamoorthy, K., Vijayaraghavan, K., et al. (2010). Application of Water Quality Index for Groundwater Quality Assessment: Thirumanimuttar Sub-Basin, Tamil Nadu, India. Environmental Monitoring and Assessment, 171(1), 595–609.

5. Kumar, M., Ramanathan, A. L., Tripathi, R., & Rao, M. S. (2006). Evaluation of Groundwater Quality and Its Suitability for Drinking and Agricultural Use in the Coastal Region of Chennai, India. Environmental Monitoring and Assessment, 132(1–3), 181–195.
6. Bureau of Indian Standards (BIS). (2012). Indian Standard Drinking Water Specification (IS 10500: 2012).