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Original Research Paper

Chemistry

WATER QUALITY PARAMETRIC EVALUATION IN THE PROXIMITY OF GAJUWAKA, VIZAG DIST.AP.

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ABSTRACT Water pollution is the most severe type of problem. In recent decades, we have observed immense growth in the deterioration of water quality in and around the residential and industrial zones of the city. The significant rise in water pollution affects the biotic, abiotic, flora, and fauna of water bodies and changes their quality. The assessment of water quality and physio-chemical Analysis of Groundwater, bore and well water samples collected from five sites around the Gajuwaka area of Vizag District in Andhra Pradesh. Evaluation of. Analysis of physicochemical parameters during different seasons for one year (April 2022-March 2023) has been conducted which includes parameters such as pH, TDS, Hardness, Alkalinity, DO, BOD, Chlorides, fluorides, sulfates, Ammonia, a few soft metals (Na and K), and heavy metals (Cd, Cu, Hg, Mn, Zn, and Hg), Etc.

KEYWORDS : Physico-chemical Parameters, Pollution, Visakhapatnam, A.P.

INTRODUCTION

Groundwater is vital for domestic, agricultural, and industrial purposes. Good quality drinking water is of primary importance to humankind. Keeping the fact in mind, an analysis of water samples was conducted by collecting through ponds (surface water), open wells, and bore wells in and around Sheelanagar, Sattivanipalem village, Ahmed Nagar, Narava village, and Autonagar of (VEPZ) Visakhapatnam.

Table_1: Details of the Water Sampling Sites.

Sample-I	Sheelanagar
Sample-II	Sattivanipalem
Sample-III	Narava village
Sample-IV	Ahmednagar
Sample-V	Autonagar(Industrial estate)

Sampling Site Location

https://goo.gl/maps/UWxEHwBK4T7e2WqQA

Experimental

The bottles were cleaned with hydrochloric acid, rinsed with distilled water, and filled with the selected samples; analytical-grade reagents were used throughout the sample collection. The approaches utilized to estimate different physical and chemical parameters are described in the standard methodology.

RESULTS AND OBSERVATION

Tables 2 and 3 describe the physico-chemical characteristics of the water samples.

Temperature

Temperature is essential to the solubility of minerals and rocks; the higher the temperature, the faster the rate of biological reactions in water. Between 25.5 and 30.10 Celsius, on average, was the temperature observed.

pH

The pH should be ideal for the best water quality. It is crucial for water analysis to calculate acidity, alkalinity, and other processes like coagulation and disinfection. Higher pH values are a sign that dangerous chlorinated chemicals are present. The pH ranges (7.30–8.00) are within Indian requirements.

Turbidity

Total solids impact water clarity and quality. The high concentration of dissolved particles reduces light transmission through water, which prevents photosynthesis. According to the WHO, drinking water standards turbidity should be between 300–400 ppm. The water samples' TDS measurements range from 220 ppm to 530 mg/lt.

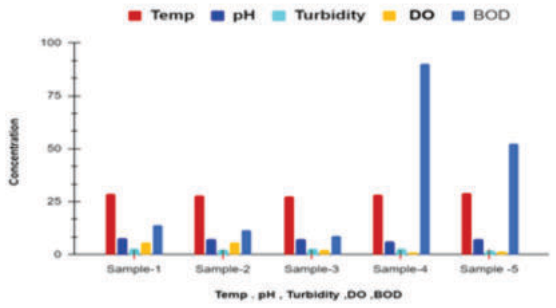
Hardness

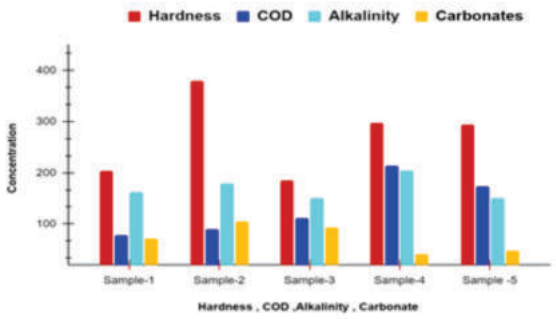
Cations and anions, including calcium, magnesium, bicarbonates, and sulfates, are responsible for the hardness of water. Hardness primarily develops when water percolates through limestone deposits. The current sample's Hardness values range from 180 to 382 mg/lt

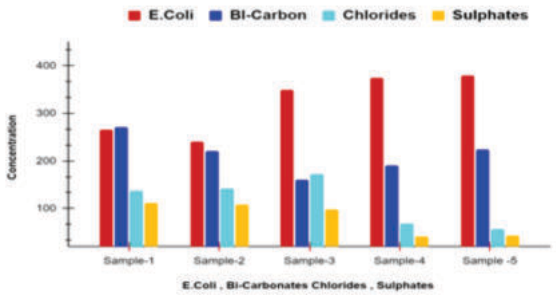
Table 1: The Physico-chemical Characteristics Of The Water Samples.

S.No	Parameter	Sample -1	Sample -2	Sample -3	Sample -4	Sample -5
1.	Temp 0C	27.5-28.5	27.0-28.0	26.5-27.6	27.3-28.2	27.8-28.9
2.	pH	7.60-7.63	7.40-7.45	7.25-7.32	6.00-6.14	7.35-7.42
3.	Turbidity	2.0-2.5	2.0-2.5	2.1-2.5	2.0-2.5	1.5-2.0
4.	Hardness	200-203	380-382	180-185	295-298	290-294
5.	E.Coli	265-530	241-582	350-574	375-700	380-900
6.	DO	5.80-5.85	5.75-5.77	2.15-2.19	1.15-1.20	1.2 - 1.25
7.	BOD	13.4-14.0	10.4-11.5	8.2 - 9.0.	90-106	50.5-52.5
8.	COD	78-116	90-132	112-136	213-254	174-180
9.	Alkalinity	162-228	178-210	150-155	203-227	150-160
10.	Carbonate	70-72	100-105	90-93	40-42	48-50
11	Bi carbonate	270-275	220-254	160-215	190-232	224-254
12.	Fluoride	0.0-0.5	0.05-0.07	0.01-0.02	0.35-0.36	0.20-0.21

13.	Ammonia	0.09-0.10	0.04-0.05	0.20-0.21	0.26-0.27	0.22-0.23
14.	Chloride	137-138	141-145	172-175	68-70	56-60
15.	Sulphate	112-115	108-110	98-99	41-47	43-45
16.	Phosphate	0.23-0.25	0.27-0.30	0.23-0.25	1.39-1.40	1.09-1.10







Total Coliforms (E. coli): Include bacteria from soil and water. Some could result in severe food poisoning. The healthy strains are an organic part of the gut's flora and support their hosts' well-being by producing vitamin K2 and stopping harmful bacteria in the intestine. The present results show the presence of more pathogens in water values range from 240 - 900.

Dissolved Oxygen (DO)

It is a critical parameter for water quality tests. The temperature of the water changes by releasing waste from thermal and power plants discharges. The direct diffusion of dissolved oxygen from the air and the photosynthetic activity of autotrophs are responsible for its presence in water, raising or lowering oxygen levels. DO values are found below average, according to Indian standards.

Biochemical oxygen demand (BOD) and chemical oxygen demand (COD)

Both parameters are used to assess the quality of surface water and groundwater by measuring the presence of organic compounds in the water. The values obtained for these two parameters [1.5–6.5 and 65- 180 mg/lit)] are both considerably above the permitted limits.

Table-2: Analysis Of Metals In Water Samples

S. No	Parameter	Sample -1	Sample -2	Sample -3	Sample -4	Sample -5
1.	Potassium	1.78-1.80	2.5-2.6	11 -12	14.0-14	11.5-12.0
2.	Calcium	64.8-65.0	96.7-100.2	56.7-58.5	88.1-108.4	72.7-75.5
3	Sodium	16.8-17.0	12.4-12.5	9.0-9.5	3.2-3.4	2.7-3.8
4.	Magnesium	58.4-77.9	68.2-85.8	39.6-57.1	47.6-81.5	61.2-68.4
4.	Iron	2.65-2.70	5.0-6.0	8.0-8.5	15.0-17.0	8.1-10.2
5.	Zinc	6.70-6.80	128-130	192-195	18.9-19.5	19.3-20.0
6.	Cadmium	1.02-1.05	454-460	503-505	3.19-3.20	102-105
7.	Chromium	1.83-1.85	1.83-1.85	0.17-0.18	3.0-4.0	4.7-4.8
8.	Copper	1.48-1.50	8.36-8.40	9.58-9.60	1.8-2.0	1.19-1.20
9.	Lead	1.1-1.8	4.2-4.5	2.6-3.8	1.8-2.0	2.2-2.9
10.	Arsenic	2.8-3.0	0.21-0.25	0.02-0.04	1.13-1.15	1.06-1.30
11.	Mercury	0.8-1.6	1.0-2.2	1.2-1.5	4.1-4.5	2.0-2.1
12.	Manganese	6.1-6.5	3.3-4.2	2.5-5.0	17.3-18.4	14.3-20.6
13.	Silver	2.9-3.0	13-14	12-14	16-17	100-110
14.	Barium	12.5-13.5	13.0-20.0	11.3-11.5	9.5-10.0	13.8-14.0
15.	Molybdenum	1.0-1.5	4.0-4.5	1.0-1.5	3.0-3.5	78-80
16.	Aluminum	7.0-7.5	1.0-1.2	3.0-3.5	330-335	93-95
17.	Nickel	2.2-2.5	270-275	120-150	3.5-3.6	2.9-3.0
18.	Cobalt	1.1-1.5	0.5-1.0	0.5-1.0	1.5-2.0	4.0-4.2

Alkalinity

The primary natural rocks with carbonate, bicarbonate, hydroxide compounds, silicates, and phosphates are alkalinity sources. An alkalinity value of less than 100 mg/lit is ideal for domestic use. However, excessive quantities give water a harsh flavor. The total alkalinity range in the study's water samples is 150-410 mg/lit.

Carbonates and Bicarbonates

Hardness is a result of carbonates in water. Temporary or carbonate hardness and alkalinity are regularly used, though not always interchangeably. Bicarbonate, or carbonate, is a more scientific term for alkalinity, which is the concentration of the bicarbonate (HCO_3) ion in the water body. When acid enters water containing bicarbonate, the ion changes into CO_2 gas. Carbonates (80 -105) and bicarbonates (60 -310)

Fluoride

According to a recent report, fluorosis affects over 66.7 million people in India, including 6 million children, due to high fluoride intake. Plants and animals are also affected by high fluoride intakes. According to the World Health Organization, 15 mg/lit is the recommended fluoride level in water. In the current samples, the fluoride conc is less than permissible levels (0,1 - 0.40 mg/lit).

Ammonia

Ammonia is a bio active chemical that can be introduced as a significant pollutant into water sources and streams through industrial waste or discharge. The decay of plant and animal

waste additionally produces it. Ammonia is typically regarded as an indicator of rising pollution levels in water, coupled with phosphorus, and can produce harmful froth above the water's surface, making it highly unhealthy. The Ammonia in the water samples is below average level.

Chloride

All naturally occurring waters include mineral chloride. Calcium, potassium, and sodium salts are the sources of chloride in water. High chloride ions affect taste; Values of chloride in current samples ranges from 56 mg/lit - 175 mg/lit.

Sulfate

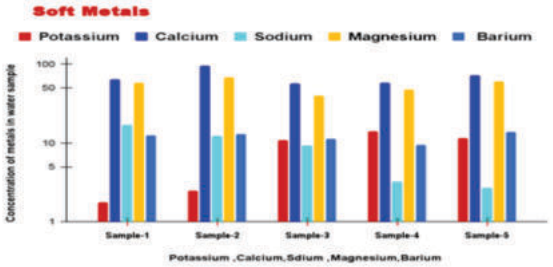
The sources of sulfates in water are mostly from dissolution of minerals and rocks which can be removed from drinking water using expensive procedures like distillation, reverse osmosis, or electrodialysis. An alkalinity value of less than 100 mg/lit is optimal for domestic use. To some extent, the sulfate ion has little effect on the flavor of water when it is present in modest concentrations. The sulfate ion concentration in the current sample is 43 to 115 mg/lit.

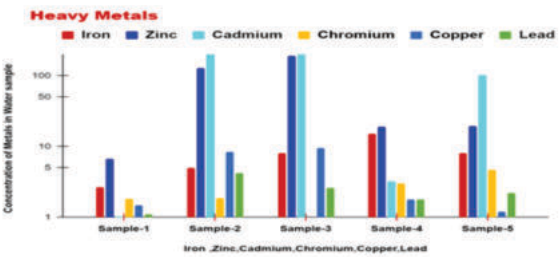
Phosphate

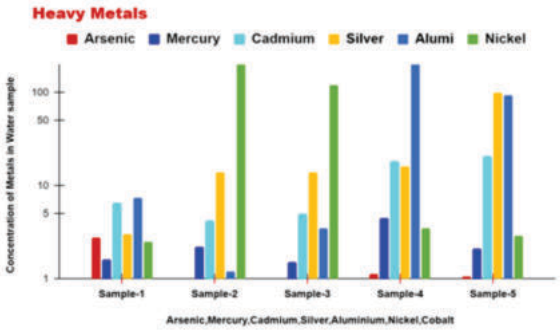
Phosphate-containing substances in water bodies promote algae growth, which produces many other nutrients which decrease oxygen. When algae perish, they break down, and the presence of bacteria converts the nutrients found in the organic substance into inorganic form. This breakdown process uses oxygen, lowering the dissolved oxygen concentration and affecting aquatic life. Phosphates in the current samples ranged between 0.2 – 1.4 mg/lit.

Metals

Worldwide, many people suffer from acute and chronic illnesses due to excessive heavy metals in water. More than 5 mg of zinc and 0.3 mg/liter of iron are not permitted in drinking water. Some metals give the water a metallic or astringent taste and a milky, chalky, or turbid appearance. Zinc toxicity symptoms include low blood pressure, urine retention, jaundice, joint discomfort, fever, coughing, and a metallic taste. Lead and cadmium entering feed ingredients from the soil pose a potential health risk. Pb's toxicity prevents enzymes from functioning normally, which can lead to headaches, arthritis, and other health problems. Due to the widespread use of mercury-containing substances, fungicides, algaecides, and the paper pulp industry, the problem of Hg concentration is getting worse. Heavy metals are known to cause dermatitis, skin cancer, lung cancer, and even lymphatic cancer. These metals are also poisonous and cancer-causing. Heavy metals in drinking water must be removed for human health and a clean environment.







CONCLUSION

People and other living things can be exposed to heavy metals through the food chain. They can also become highly toxic when they mix with different environmental factors, including water, soil, and air. Numerous experimental research was conducted to evaluate the promising treatments, including water testing, purification, prevention, and quality checking. The outcome of the current study will help to keep safe potable water for future requirements.

Acknowledgments

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