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Investigation of Bore Well Water Samples for Drinking Quality by Physical and Chemical Methods

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Abstract: Water has a highly important function as a resource on earth; it is necessary for all living beings, as well as for domestic, industrial, agricultural reasons, as well as for the production of food and other things. The level of contaminants in the atmosphere has grown, and they are now combining with water, Living continues. The water that has been diluted with the contaminants, which is not utilised for drinking but is used for household uses on a regular basis. There were certain dissolved contaminants that were not visible in the water, which was used for drinking in many areas, and these pollutants caused a great number of diseases, both recognised and unknown. The chemical and physical analysis that must be performed before to the use of water for a variety of applications. In order to prevent a wide variety of illnesses the analysis of water was deemed to be safe for consumption. The following topics are mentioned in this paper: gathered samples from four bore wells located closer to Kanigiri region for the purpose of conducting physical and chemical analysis; these samples are used to determine whether or not the water is suitable for the intended purpose. Both the physical and chemical tests yielded findings that were in accordance with the quality requirements for water that were established by the WHO, EC, and EQS. Aside from that, it is not recommended for the intended application.

Keywords: Bore well water samples, Chemical analysis, Physical analysis, Water quality, and standards.

I. INTRODUCTION

Water has a highly important function as a resource on earth; it is necessary for all living beings, as well as for domestic, industrial, agricultural reasons, as well as for the production of food and other things. The level of contaminants in the atmosphere has grown, and they are now combining with water, Living continues. The water that has been diluted with the contaminants, which is not utilised for drinking but is used for household uses on a regular basis. There were certain dissolved contaminants that were not visible in the water, which was used for drinking in many areas, and these pollutants caused a great number of diseases, both recognised and unknown. The chemical and physical analysis that must be performed before to the use of water for a variety of applications. In order to prevent a wide variety of illnesses the analysis of water was deemed to be safe for consumption. The following topics are mentioned in this paper: gathered samples from four There is water present in a variety of forms, including 97% of water as saltwater in the oceans, which is not suitable for drinking, 2.97% of water as ice glaciers, and just 0.3% of water that is appropriate for drinking, which is also found in ground and surface water bodies (Nandal et al 2018). According to Muhammad et al. (2013), we have a responsibility to preserve the small percentage of water that is contaminated by containments. This water is required for drinking, agriculture, and industrial use via analysis. Water that is free of toxins is necessary for maintaining good health and staying away from ailments. The contaminants were responsible for the development of very severe illnesses, which in turn led the water to become contaminated and difficult to drink (Devangee et al. 2013). When the pollutants had an influence on the chemical compounds that were present in the water, they altered the contents of the water to the point where the percentages exceeded the legal limits. If the water does not meet the criteria, it should not be used for drinking reasons (Ritabrata 2018). If the standards are not met, the water should not be utilised. It is necessary to conduct assessments of the contaminants that are present in water, especially in the areas where bore wells are located (Devendra et al. 2014). There are three categories of pollutants that have an effect on water: those that are physical, chemical, and biological (bacteriological). According to Monica et al. (2017), the biological analysis is more

difficult to accurately estimate than the physical and chemical analyses, which can be done swiftly with the use of tools and methodologies.

Despite the fact that India is well-known for its abundant agricultural resources, the country is now facing the challenge of producing fifty million tonnes of garbage, which accounts for around thirty percent of its overall output (Cheng et al. 2010). In today's world, the emphasis is placed on transforming waste into environmentally friendly energy rather than tilling it into the ground. The use of biomass as a biofuel is possible because, in addition to providing sustainability, it also has the benefit of being able to neutralise carbon dioxide emissions.

It is most noteworthy to note that the quantity of carbon dioxide that is released into the environment during the burning of biomass is same to the amount that is consumed by biomass from the atmosphere (Demirbas et al 2004). One of the most significant dangers associated with drinking polluted water is the development of ailments such as diarrhoea, kidney, liver, tooth, and heart issues. The water samples were subjected to an E. coli test in order to evaluate their microbiological characteristics (Aryal et al. 2012, Khadsan 2020). According to Qing GU et al (2014) and Amanial Haile Reda (2016), the quality of the water will be satisfactory if it satisfies the requirements set by the WHO, BIS, EC, ICMR, and ISI, as well as the EQS standards. Considering that India is mostly an agricultural nation, it has a significant need for freshwater for the purpose of irrigation. The majority of people who live in rural areas rely on ponds as a source of food and water. According to Nandal et al. (2018), India has only reached 71.8% of its aim to provide the rural population with safe, sufficient, and drinking water. Furthermore, India is a long way behind in fulfilling its Sustainable Development Goal (SDG) on clean water and sanitation.

The physical examination of the water samples was carried out in order to determine the quality of the water. This analysis included temperature, colour, taste, turbidity, and odour. However, the chemical analysis required for drinking is necessary. The criteria for chemical analysis include pH, TDS, Ca, Mg, and Chlorides, and some regions primarily focus on fluorides of the water sample. The analysis is adequate for industrial applications and irrigation purposes. Following the acquisition of the parameters, Patrick Levallois et al. 2019 provided an explanation. A number of technological approaches, including wetlands, the activated sludge process, the aerated process, and the trickling process, are required in order treatment of the water. In the year 2020, Patrick (Vinothkanna et al.)
12 bore well samples near ABR College of Engineering and Technology were collected for physical and chemical investigation to determine water compatibility. The physical and chemical tests met WHO, EC, and EQS water quality requirements. Not recommended for intended usage. No damage is caused by temperature, turbidity, smell, odour, or colour. Chemical analysis showed pH within acceptable ranges (6.5-8.5). All water samples. Results: DO, BOD, COD, TH, Ca, Mg, and EC within permitted ranges, with expanded maximums. Fluoride levels did not meet water quality guidelines (1-1.5ppm). The TDS levels did not meet the permitted range (500-2000ppm). Fluorides and TDS surpass WHO, EC, and EQS water quality requirements. For groundwater treatment, surface water requires a minimum of 3, 1000-liter-per-hour RO-plants. Otherwise, health complications such as damaged nerves, blood cells, tumours, teeth, and bones arose. (Karumanchi Meeravali et al, 2020).

In this paper, performing an analysis of the physical and chemical characteristics of water samples, which were obtained from a total of four bore wells, with each sample being gathered from a total of four bore wells, is the primary purpose. The physical and chemical characteristics were evaluated in accordance with IS: 10500-2012, and the results were compared to the allowable limits. The findings were drawn based on the bore well samples that were obtained.

MATERIAL AND METHODS

Study area: The physical and chemical study of four samples of drinking water that were obtained from four bore wells was carried out using a variety of techniques, as shown in Table 1. The samples were collected from bore wells located at a depth of between ten and thirty metres in Kanigiri, Andhra Pradesh, at a coordinate of (15°40’81.64” N, 79°50’41.02” E). This location is considered remarkable due to the fact that the water in the surrounding area contains higher levels of fluoride. Not only is the location so distant from the city, but there is also no access to the municipal water supply. However, the people continued to live from this location, and they drank water from bore wells, surface water bodies, and groundwater bodies for their drinking needs. Indeed, it is essential that we do an analysis of the physical and chemical characteristics pertaining to their health, irrigation (crop output), and the potential dangers to the lives of college students.

The physical and chemical characteristics, together with their dimensions, as well as the allowed limitations (standards that EU, WHO, and EQS adhere to) for drinking were included in Table 1. Additionally, the methodologies and instruments that were used were included in the table.

Table 1. Types of instruments related methods for physical and chemical parameters

Types	Parameters	Units	Permissible limits (EC, WHO, and EQS)	Instrument/Methods
Physical parameters	Temperature	℃	20-35℃	Thermometer
	Color	TCU	5-20	Platinum cobalt
	Taste	Units	Less than 3	By Tasting
	Turbidity	NTU	1 to 5	Turbidity meter
	Smell/Odor	units	Less than 3	Wide mouth glass stoppered bottle
Chemical parameters	pH	0-14	6.5-8.5	pH meter
	EC	ppm	300-600	EC meter
	TDS	ppm	500- 2000	Ignition Method
	Total Hardness	ppm	200- 600	Titrimetric method
	Ca	ppm	75-100	Titrimetric method
	Mg	ppm	75-100	Titrimetric method
	DO	ppm	3-4	Titrimetric method
	BOD	ppm	5-7	Titrimetric method
	COD	ppm	7-8	Titrimetric method
	Iron	ppm	0.3	Titrimetric method
	Alkalinity	ppm	40	Titrimetric method
	Chloride	ppm	Less than 250	Titrimetric method
	Fluorides	ppm	1-1.5	Titrimetric method

Table 2. Physical and chemical parameters of the bore wells (BW-1 to BW-6)

Types	Parameters	Units	BW-1	BW-2	BW-3	BW-4
Physical parameters	Temperature	℃	28	30	30	30
	Color	units	<2.5	<3	<2	<2.5
	Turbidity	NTU	6	6	7	5
Chemical parameters	pH	0-14	7.5	7.8	7.6	7.8
	EC	ppm	450	455	450	450
	TDS	ppm	200	195	180	192
	Total hardness	ppm	100	105	100	99
	Ca	ppm	75	72	73	74
	Mg	ppm	40	38	35	39
	DO	ppm	6	7	5.9	5.7
	BOD	ppm	5	6	4.9	4.5
	COD	ppm	8	9	7.9	7.7
	Iron	ppm	1	1	1	1
	Alkalinity	ppm	15	15	14	16
	Chloride	ppm	191	187	190	179
	Fluorides	ppm	3	4	4	4

*Note: No found of Barium and copper contents. Smell and order observed acceptable limits

RESULTS AND DISCUSSION

In addition, the pH that was collected from the indifferent wells was within the acceptable range for all of the water samples (pH: 6.5-8.5). Additionally, DO, BOD, COD, TH, Ca, Mg, and EC all had the same trend, but their maximum limits were enlarged accordingly. Fluoride concentrations do not meet the requirements set out by the water quality guidelines. As seen in Figures 2, 3, and 4, the TDS values did not fall inside the acceptable range.

CONCLUSIONS

Temperatures, turbidity, smell, odour, and colour are not detrimental conditions in this study endeavour.There are no toxic conditions. According to the results of the chemical analysis, the pH of all of the water
samples was found to be within the acceptable range (6.5-8.5). The levels of DO, BOD, COD, TH, Ca, Mg, andEC were found to be within the acceptable range, although the maximum concentrations were increased. The
levels of fluoride in the water did not meet the criteria for water quality, which ranged from 1 to 1.5 parts permillion. In addition, the TDS did not meet the allowed levels, which ranged from 500 to 2000 ppm. Thefluorides and total dissolved solids levels are higher than the water quality limits set by the WHO, EC, and EQS.

A minimum of three RO plants with a capacity of one thousand litres per hour was recommended for the treatment of the groundwater, according to surface water requirements.

All other things being equal, health problems manifested themselves, such as a damaged neurological system, blood cells, cancer, tooth, and bone problems.

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