# Physico-chemical Analysis of water samples for Drinking Water Quality

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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 industrial and 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. Life 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 ailments, 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 ailments, the analysis of water was deemed to be safe for consumption. This article discusses the following: 18 water samples were taken from locations closer to ABR College and across the city for the purpose of conducting physical and chemical analyses. These samples were used to determine whether or not the water was 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 specified application.**

***Keywords:*** **Physical, Chemical parameters, Water, drinking water quality, river samples, Water quality**

## INTRODUCTION

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 burying it in 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.

Surprisingly, the amount of carbon dioxide that is used by both The quantity of biomass that is released into the atmosphere is equivalent to the amount that is released during the burning of biomass (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. After the parameters were collected, Patrick Levallois et al. 2019 indicated that it was necessary to treat the water using a variety of technological approaches, including trickling process, aerated process, activated sludge process, and wetlands (Vinothkanna et al. 2020). According to K Meeravali et al.'s (2020) findings, variables like as temperature, turbidity, smell, odour, and colour do not pose any risks. 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). It was determined that DO, BOD, COD, TH, Ca, Mg, and EC were all within the acceptable range, however the maximum values were exceeded. It was determined that the fluoride levels did not meet the water quality guidelines of 1–1.5 parts per million. In addition, the TDS did not meet the acceptable levels, which ranged from 500 to 2000 ppm. The fluorides and total dissolved solids levels are higher than the water quality limits set by the WHO, EC, and EQS. For the purpose of treating the groundwater, surface water recommended a minimum of three RO plants that are capable of producing one thousand litres of water per hour. If this had not occur, health problems such as a damaged brain system, blood cells, cancer, tooth, and bone problems would have occurred.

Performing an analysis of the physical and chemical characteristics of water samples, which were obtained from a total of 18 water samples were taken from locations closer to ABR College and across the city for the purpose of conducting physical and chemical analyses, is the primary purpose. The physical and chemical characteristics were evaluated in accordance with IS: 10500-2012. The results were compared to the allowable limits, and conclusions were drawn based on the bore well samples that were obtained.

## MATERIAL AND METHODS

Study area: The physical and chemical examination of 18 samples of drinking water samples obtained from throughout the city was carried out using a variety of methodologies, as shown in Table 1 listed the samples were gathered from a variety of places. This location is considered remarkable due to the fact that the water in the surrounding area contains higher levels of fluoride. 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 are observed by the European Commission, the World Health Organisation, and the European Union) for drinking, were included in Table 2. Additionally, the methodologies and instruments that were utilised were also included.

Table 1 The samples were gathered from a variety of places

| S. NO | LOCATION NAME | LATITUDE | LONGITUDE | DENOTED |
|---|---|---|---|---|
| 1 | DARAVARI THOTA, ONGOLE | *15.494267* | *80.046751* | *L1* |
| 2 | IDSMT LAYOUT, HOUSE BOARD COLONY, ONGOLE | *15.493979* | *80.039536* | *L2* |
| 3 | ZP COLONY, ONGOLE | *15.493797* | *80.03971* | *L3* |
| 4 | GANDHI STATUE, GADDALAGUNTA, ONGOLE | *15.499735* | *80.035028* | *L4* |
| 5 | SS TANK-I, ONGOLE | *15.497582* | *80.032113* | *L5* |
| 6 | GADDALAGUNTA MAIN ROAD, ONGOLE | *15.500594* | *80.036153* | *L6* |
| 7 | SANTHA PETA, ONGOLE | *15.494445* | *80.051082* | *L7* |
| 8 | SANTHA NUTHALAPADU | *15.553882* | *79.936019* | *L8* |
| 9 | CHIMAKURTHY | *15.581365* | *79.85497* | *L9* |
| 10 | MARRICHETLAPLEM | *15.578535* | *79.771287* | *L10* |
| 11 | UPPALAPADU | *15.583733* | *79.757634* | *L11* |
| 12 | PEDARIKATTLA | *15.520456* | *79.526759* | *L12* |
| 13 | YADAVLLI ROAD | *15.464431* | *79.509128* | *L13* |
| 14 | KANIGRI | *15.402587* | *79.508991* | *L14* |
| 15 | KANIGRI | *15.409215* | *79.508987* | *L15* |
| 16 | KANIGRI | *15.409271* | *79.505973* | *L16* |
| 17 | KANIGRI | *15.409271* | *79.505973* | *L17* |
| 18 | CHINAIRLAPADU | *15.388623* | *79.547262* | *L18* |

Table 2. Types of instruments related methods for physical and chemical parameters

| Types | Parameters | Units | Permissible limits (EC, WHO, and EQS) | Instrument/Methods |
|---|---|---|---|---|
| Physical | Temperature | $^0$C | 20-35$^0$C | Thermometer |
| parameters | 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 | pH | 0-14 | 6.5-8.5 | pH meter |
| parameters | EC | ppm | 300-600 | EC meter |
| | TDS | ppm | 500- 2000 | Ignition Method |
| Total Hardness | | ppm | 200- 600 | Titrimetric method |
| | DO | ppm | 3-4 | Titrimetric method |
| | Iron | ppm | 0.3 | Titrimetric method |

## RESULTS AND DISCUSSION

Table 3 presented the physical and chemical characteristics of the samples from (L-1 to L-6), Table 4 presented the physical and chemical characteristics of the samples from (L-7 to L-12), and Table 5 presented the physical and chemical characteristics of the samples from (L-13 to L-18). Determined parameters of Temperature, pH, EC, TDS, Total Hardness, DO, Iron, Alkalinity, and Acidity with comparing of quality requirements for water that were established by the WHO, EC, and EQS.

Table 3. Physical and chemical parameters of the Location from (L-1 to L-6)

| *Type* | *Parameters* | *Permissible limits* | *Units* | *L-1* | *L-2* | *L-3* | *L-4* | *L-5* | *L-6* |
|---|---|---|---|---|---|---|---|---|---|
| Physical parameters | Temperature | 20 - 35$^0$C | $^0$C | 30.6 | 30.4 | 30.8 | 30.5 | 30.3 | 29.4 |
| Chemical parameters | pH | 6.5 - 8.5 | 0-14 | 7.25 | 7.18 | 7.93 | 7.78 | 7.74 | 7.46 |
| | EC | 300 - 600 | µS/cm | 1526 | 1434 | 1826 | 7162 | 918 | 843 |
| | TDS | 500 - 2000 | ppm | 717 | 717 | 913 | 381 | 459 | 421 |
| | Total Hardness | 200 - 600 | ppm | 470 | 435 | 75 | 180 | 140 | 280 |
| | DO | 3 - 4 | ppm | 7.50 | 7.10 | 7.00 | 7.00 | 7.00 | 6.80 |
| | Iron | 0.3 | ppm | 2.02 | 1.70 | 0.90 | 0.21 | 0.34 | 1.6 |

Table 4. Physical and chemical parameters of the Location from (L-7 to L-12)

| *Type* | *Parameters* | *Permissible limits* | *Units* | *L-7* | *L-8* | *L-9* | *L-10* | *L-11* | *L-12* |
|---|---|---|---|---|---|---|---|---|---|
| Physical parameters | Temperature | 20 - 35$^0$C | $^0$C | 30.0 | 30.2 | 29.8 | 29.6 | 30.7 | 30.3 |
| Chemical parameters | pH | 6.5 - 8.5 | 0-14 | 7.4 | 7.92 | 7.53 | 7.95 | 7.15 | 7.46 |
| | EC | 300 - 600 | µS/cm | 1366 | 886 | 514 | 1150 | 2246 | 620 |
| | TDS | 500 - 2000 | ppm | 698 | 443 | 255 | 576 | 1123 | 316 |
| | Total Hardness | 200 - 600 | ppm | 245 | 165 | 130 | 380 | 640 | 375 |
| | DO | 3 - 4 | ppm | 6.80 | 6.80 | 6.80 | 6.80 | 6.80 | 6.80 |
| | Iron | 0.3 | ppm | 0.5 | 0.800 | 0.260 | 1.3 | 0.15 | 0.26 |

Table 5. Physical and chemical parameters of the Location from (L-13 to L-18)

| *Type* | *Parameters* | *Permissible limits* | *Units* | *L-13* | *L-14* | *L-15* | *L-16* | *L-17* | *L-18* |
|---|---|---|---|---|---|---|---|---|---|
| Physical parameters | Temperature | 20 - 35$^0$C | $^0$C | 29.8 | 29.9 | 29.4 | 30.0 | 29.8 | 30.2 |
| Chemical parameters | pH | 6.5 - 8.5 | 0-14 | 7.07 | 6.99 | 7.1 | 7.3 | 7.64 | 6.7 |
| | EC | 300 - 600 | µS/cm | 1664 | 3122 | 3126 | 3286 | 622 | 380 |
| | TDS | 500 - 2000 | ppm | 832 | 1564 | 1563 | 1643 | 296 | 380 |
| | Total Hardness | 200 - 600 | ppm | 360 | 635 | 240 | 650 | 190 | 65 |
| | DO | 3 - 4 | ppm | 6.80 | 6.80 | 6.70 | 6.70 | 6.70 | 6.70 |
| | Iron | 0.3 | ppm | 2.5 | 0.80 | 0.22 | 2.50 | 0.13 | 0.21 |

## DISCUSSION

Temperature is not dangerous in this study, but scent, odour, and colour are somewhat yellow. Chemical analysis showed pH in the acceptable range (6.5-8.5) for all water samples. DO, TH, within permitted but beyond maximum limits. EC concentrations did not meet water quality criteria (300-600µS/cm) for L-1 to L-17, however L-18 was acceptable as RO water samples. The others were raw water samples. Water with high electrical conductivity (EC) contains more dissolved salts or nutrients. This may cause nutrient burn, salt buildup, and plant and aquatic life damage. Not recommended for drinking water L-1 to L-17 Otherwise, neurological system, blood cell, cancer,

tooth, and bone damage occurred. Recommended drinking water sample L-18

## CONCLUSIONS

In this research work, there is no harmful with temperatures but smell, odor, and color are lightly yellow harmful also. From chemical analysis- pH also obtained in the permissible limits (6.5-8.5) for all water samples. DO, TH, obtained in the permissible limits but extended maximum limits. EC contents weren't satisfied with the water quality standards (300 - 600µS/cm) for L-1 to L-17, but L-18 is permissible limit it is RO water samples remaining all are raw water samples. When water has a high electrical conductivity (EC), it indicates that there is a high concentration of dissolved salts or nutrients. This may result in problems such as nutrient burn and salt accumulation, and it may also be harmful to aquatic life or plants. L-1 to L-17 not recommend for drinking water Otherwise, health issues arrived like a damaged nervous system, blood cells, cancer, dental, and bones. L-18 sample recommend for drinking water.

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