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# Physico-chemical analysis of bore water samples in Chintapalli Mandal, Visakhapatnam District, A.P., India

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**Abstract**
Study of water quality tells about present status of useable water for drinking as well as domestic use. The present study is to determine water quality parameters in bore water samples from five different bores in five different villages in Chintapalli mandal. The water samples were collected during the period of 2015-16 and analyzed different parameters is such pH, electrical conductivity, Total Dissolve Solids, Total Hardness, Calcium, Magnesium, Chloride, Nitrate, Sulphate and Dissolve Oxygen using standard methods of analysis. The Bore water samples were below the WHO limits while $Ca^{2+,}$ $Mg^{2+,}$ $Cl^{-}$, $NO_3^{-}$, $SO_4^{2-}$ and DO levels above the WHO standards. Generally, the results exhibited significant variation in the parameters studied on the samples; this could be attributed to the geographical positions and usage of the surrounding areas.

**Keywords:** bore water, physico-chemical, analysis, WHO

## Introduction
Water is essential for the survival of all living organisms. In nature, 75% of earth covering with surface of water. Now a day's increasing population and its necessities have lead to the deterioration of surface and subsurface water. Ground water is the major source in drinking water both urban and rural areas. Ground water is a reliable source of water supply, because it is often unpolluted due to restricted movement of pollutants in the soil profile [1].

The quality of water rapidly alters as a response to alteration in the surrounding environment. The quality drinking water fall from physico- chemical and microbial parameters. Potable water is free from disease producing microorganisms and chemical substance that are dangerous to health [2]. The study area chintapalli is a tribal area, majority of the people live in hilly terrain. They depending on bore water for drinking and domestic use in interior areas tribal depends on spring water only. Compare with the different sources in tribal areas, 60%of tribal people depends on bore water for drinking purpose. So, my aim of the present studied to assess the quality of drinking water samples in five different villages. Thus there is a need to look for some useful indicators, both chemical and physical that can be used to monitor both drinking water operation and performance consumed by Tribal Community by Physical, Chemical parameters.

## Material and Methods
### Study area
The study area Chintapalli Mandal located in Visakhapatnam district, Andhra Pradesh which is on the north-eastern part of India. The physicochemical parameters of 5 samples were collected from the bore wells located in these stations during the months of January 2015 to March 2016. The sample code, name of the village, Longitude, Latitude and Altitude are shown in Table 1and figures.

**Table 1:** Sample Locations

| Sample Code | Name of the Village | Longitude | Latitude | Altitude |
|---|---|---|---|---|
| B1 | Lothugedda | N17°57'782" | E082°23'645" | 2363 ft |
| B2 | Annavaram | N17°59'041" | E082°24'897" | 2375 ft |
| B3 | Vangasari | N17°54'659" | E082°24'187" | 2449 ft |
| B4 | Gondipakalu | N17°48'332" | E082°28'267" | 2640 ft |
| B5 | Kitumula | N17°50'588" | E082°31'487" | 2914 ft |


B1 Lothugedda

B2 Annavaram

B3 Vangasari

B4 Gondipakalu

B5 Kitumula

**Analysis of water sample**

The bore water samples were collected in a clean plastic can of 2 lit capacity for physic-chemical parameters such as pH, electrical conductivity (EC), total dissolved solids (TDS), total hardness (TH), magnesium ($Mg^{2+}$), calcium ($Ca^{2+}$), sulphate ($SO_4^{2-}$), chloride ($Cl^-$), nitrate ($NO_3^-$) and dissolve oxygen (DO) as per APHA standard procedures [3]. The results are comparing with the WHO and BIS standards of drinking water quality.

**Result and Discussion**

The physic-chemical parameters exhibited considerable variation from sample to sample. The results of the physic-chemical parameters for water samples were presented in table 2.

**Table 2:** the results of Physico-chemical parameters of different sites in Chintapalli

| S. No. | Parameters | B1 | B2 | B3 | B4 | B5 | Mean |
|---|---|---|---|---|---|---|---|
| 1. | pH | 7.2 | 7.4 | 7.0 | 7.9 | 7.8 | 7.46 |
| 2. | EC | 124 | 178 | 243 | 263 | 254 | 199.52 |
| 3. | TDS | 282 | 200 | 143 | 102 | 152 | 133.16 |
| 4. | TH | 42.7 | 78.3 | 90.8 | 100 | 82.6 | 74.71 |
| 5. | $Ca^{2+}$ | 17 | 21 | 30 | 30.2 | 22.5 | 21.90 |
| 6. | $Mg^{2+}$ | 15 | 18 | 24 | 24 | 19 | 17.78 |
| 7. | $Cl^-$ | 12 | 10 | 16 | 12 | 10 | 10.08 |
| 8. | $SO_4^{2-}$ | 2.5 | 5 | 10 | 2 | 6 | 5.24 |
| 9. | $NO_3^-$ | BDL | BDL | BDL | BDL | BDL | - |
| 10. | DO | 4.9 | 5.9 | 5.5 | 4.9 | 6.2 | 5.24 |

pH is does not have a direct effect on health, all biochemical reactions are sensitive to the variation [4]. In the present study pH values of bore water samples varied from 7.0 to 7.9 with a mean of 7.46. The permissible limit of WHO is 6.5 to 8.5 and pH was found within the limit prescribed in all bore samples.

Electrical conductivity is a measure of water capacity to convey electric current. It signifies the amount of total dissolved salts [5]. The values of EC were 124 to 263µs/cm. The recommended permissible limits for electrical Conductivity are 300µs/cm to 400µs/cm [6]. In the study area all water samples were lower than the permissible limits.

Total dissolved solids are a measure of the combined content of all inorganic and organic substances contained in a liquid in molecular, ionized or micro granular suspended form [7]. The concentration water samples ranged from 102 to 282mg/lit with the mean of 133.16 mg/lit below the WHO and BIS standers. The lower level of TDS indicated the pollution and recharging of underground water through either rain water or by the water from nearby canals [8, 9].

Total hardness ($CaCO_3$) in the all bore water ranged from 42.7 to 100mg/lit the persisted limits of WHO is 300-600mg/lit. In the study area water samples below WHO standards.

The hardness is depending to due to the presence of calcium and magnesium ions in water. The range of calcium and magnesium in water samples were found to be15 to 30.2 mg/lit below the persisted limits, similar observations were recorded by Geetha [10].

The chloride concentration compared with the finding of [8] Chloride ranged from 10 to 16mg/lit which is below the WHO & BSI levels. However its presence connotes pollution hence the drinking water requires treatment before use.

The sulphate concentration varied between 2 to 10mg/lit. According to WHO [11] guidelines for drinking water quality, $SO_4^{-2}$ should be lower than 500mg/L and it found within the below prescribed limit in all bore water samples. The nitrate concentration in the study area below the desirable limits (BDL).

DO (Dissolved Oxygen) content in water samples depends on a number of physical, chemical, biological and microbiological processes [12]. DO values varied from 4.9 to 6.2 mg/lit. In the all samples DO values higher than the WHO standard, it is indicating heavy contamination by organic matter.

## Conclusions

The analysis of the water quality parameters of bore water from five different places in chintapalli mandal in Visakhapatnam show that the Ca, Mg, Cl, S and N values are below the permissible limits. The DO values above the desirable limit. It is necessary to apply strong preventions immediately to save water from deterioration in the study area. Its evidence that water borne diseases and purify the water to make it fit for drinking, since the associable organisms are of public health significance being implicated in one form of infection or other. The areas which are no facility of municipal tap water, in those areas educative programmers must be organized by researchers and Government agencies to aware the villagers on the proper use of drinking water.

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