

# Drinking Water Quality of Some Selected Villages of Manopad Mandal, Mahabubnagar District, Telangana State (India)

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**Abstract:** This paper deals with the analysis of drinking water of some selected villages of Manopad mandal, Mahabubnagar district, Telangana state. Physico chemical parameters like Temperature, Turbidity, pH, Electrical Conductivity (EC), Total Dissolved Solids (TDS), Total Hardness (TH), Fluorides, Chlorides, Nitrates, Sulphates, and Iron were analysed. Results were compared with standards prescribed by WHO. It was found that the water samples collected from Boravelly new habitation (coded as S1) and Boravelly over head storage tank water were found high amount of TDS. One important point found that except Government School over head storage tank water sample (Coded as S6) all samples were found excess fluoride limit.

**Keywords:** Physico-Chemical Parameters, Groundwater, Water Quality.

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## 1. INTRODUCTION

Water is one of the naturally occurring essential requirements of all living organisms. Any change in the natural quality may leads to disturb the equilibrium system and would become unfit for use. The availability of water through surface and ground water resources has become critical day to day. Despite earth's appearance of watery abundance less than 1% of the water on earth is actually fresh and usable. So therefore only 1% part is available on land for domestic, industrial, agriculture, drinking and waste disposal.

Water quality is critical factor affecting human health and welfare. Studies showed that approximately 1.7 million deaths and 1.9 million disabilities worldwide are attributable to unsafe water, poor sanitation and hygiene. The problem is the backward socio economic development resulting in one of the lowest standard of living, poor environmental conditions and low level of social services.

Physico chemical parameters are highly important with respect to the occurrence and abundance of species. Water meant for drinking must therefore meet quality standards. Water quality is essentially determined by its physical and chemical characteristics. Naturally ground water contains mineral ions. These ions slowly dissolve from soli particles, sediments and rocks as the water travels along mineral surfaces in the pores of unsaturated zone.

This study deals with the physico chemical analysis of drinking water quality was studied at Department of Environmental Sciences laboratory, Sri Venkateswara University, Tirupati. The main aim of this study was to carryout different physico chemical parameters of water samples collected from different villages( Pallepadu, Jallapur and Boravelly) of Manopad mandal and to recommend that whether the water potable or not. The major water quality parameters considered for the examination in this study were Temperature(T), Turbidity, pH, Electrical Conductivity(EC), Total Dissolved Solids(TDS), Total Hardness(TH), Fluorides, Chlorides, Nitrates, Sulphates and Iron.

## 2. MATERIALS AND METHODS

### 2.1. Sampling and preservation:

Ground water samples were collected from different locations of Pallepadu, Boravelly and Jallapur villages of Manopad Mandal. All the samples were found odourless and colourless. Samples were drawn with the aid of plastic 5 litre can which were previously washed and drenched overnight with 5% of HNO<sub>3</sub> solution to avoid contamination. During the

sampling extra care was taken and cans were rinsed several times with water being collected. After sampling onsite analysis was done for Temperature (T), pH, and Electrical Conductivity (EC) due to their unsteadiness in nature. Samples were then transferred to laboratory and kept at 8<sup>0</sup>C-10<sup>0</sup>C in refrigerator prior the time of analysis.

## 2.2. Physico chemical analysis:

Analysis was carried out for various water quality parameters such as Temperature (T), Turbidity, pH, Electrical Conductivity (EC), Total Dissolved Solids (TDS), Total Hardness (TH), Fluorides, Chlorides, Nitrates, Sulphates and Iron. All the reagents used for the analysis were AR grade and double distilled water was used for preparation of solutions and analysis.

## 2.3. Temperature, pH and Electrical Conductivity:

Temperature was determined by using thermometer calibrated from 0<sup>0</sup>C to 100<sup>0</sup>C. The pH of the water sample was measured with a digital pH meter which was calibrated with standard buffer solutions. For Electrical Conductivity digital conductivity meter was used.

## 2.4. Total Dissolved Solids (TDS):

To measure TDS of water sample pre weighed ( $w_1$ ) clean beaker was taken (which was already placed in an oven for 1hour). 100ml of water sample was taken and filtered through a double layered filtered paper, the filtrate was collected in a clean beaker. This was placed in an oven and maintained 105<sup>0</sup>C. After complete evaporation of solution beaker was cooled and weighed ( $w_2$ ). TDS was calculated by substituting the values in below formula:

$$\text{TDS in mg/lit} = \frac{(w_2 - w_1) \times 1000}{\text{Volume of sample}}$$

## 2.5. Total Hardness:

20ml of water sample was taken in a clean conical flask to this 3-5ml of buffer solution and 2-3 drops of Eriochrome Black-T (EBT) indicator added the solution then the solution changed to wine red colour. This was titrated against standard EDTA solution which was taken burette until the colour changed to blue. The final reading of the burette was noted and the titration was repeated to get the concordant value. Finally using the analytical calculation, total hardness of given water sample was determined in terms of mg/lit of CaCO<sub>3</sub>.

## 2.6. Chlorides:

20ml of water sample was pipette out in a clean conical flask, 3-5 drops of KMnO<sub>4</sub> was added then the solution turned to yellow colour. This solution was titrated against standard AgNO<sub>3</sub> solution taken in burette until the colour changed to red. The final reading of the burette was noted and the titration was repeated to get the concordant value. Finally using the analytical calculation, chlorides of given water sample was determined in mg/lit.

## 2.7. Fluorides:

Standard Fluoride Solution, 100ppm: NaF was dried at 110<sup>0</sup>C for 2 hr. Cooled in a desiccator, 0.22 g was accurately weighed into a 1lit. standard flask. Dissolved and diluted to the mark with water and stored in a plastic bottle.

Procedure: 50ml portions of the water were transferred to 100ml standard flasks and diluted to the mark with TISAB (Total Ionic Strength Adjustment Buffer) solution. A 5-ppm Fluoride solution was prepared by diluting 25 ml of the 100-ppm standard to 500 ml in a volumetric flask. 5.00, 10.0, 25.0 and 50.0 ml aliquots of the 5 ppm solution were transferred to 100 ml volumetric flasks, 50 ml of TISAB solution was added and diluted to the mark. (These solutions correspond to 0.5, 1.0, 2.5 and 5.0 ppm Fluoride, respectively, in the sample.) After thorough rinsing and drying with paper tissue, the electrode was immersed in the 0.5 ppm standard. Stirred mechanically for 3 min. then recorded the potential.

The procedure was repeated for remaining standards and samples. Measured potential was plotted against the log of the concentration of the standards. This plot was used to determine the concentration in parts per million of fluoride in the Unknown water samples.

## 2.8. Sulphates & Nitrates:

For sulphates analysis UV-Visible spectrophotometer was used.

For nitrates analysis a Hach DR3900 equipment was used.

### 3. RESULTS & DISCUSSIONS

Results are shown in the table:1

Sample	Parameters analysed										
	Temp. (°C)	Turbidity (NTU)	pH	EC (µsiemen/cm)	TDS (mg/lit)	Total Hardness (mg/lit)	Fluorides (mg/lit)	Cl (mg/lit)	No <sub>3</sub> (mg/lit)	So <sub>4</sub> (mg/lit)	Iron (mg/lit)
S1	24	0.2	7.30	3610	2020	680	2.6	668	0.3	108	0.94
S2	20	0.2	7.06	5120	3270	1480	2.15	1340	31.9	135	0.21
S3	22	0.2	8.03	1621	1026	380	1.9	268	15.4	102	0.13
S4	20	0.2	7.99	1379	879	260	2.4	224	9.5	81	0.36
S5	19	0.2	7.56	1418	910	440	2.7	296	6.5	94	0.31
S6	21	0.2	7.85	1415	904	304	1.05	280	8.3	93	0.15
Maximum Permissible Limit	15°C - 25°C	5-10	6.5-8.5	500-2000	500-2000	300-600	0.5-1.5	250-1000	45-100	200-400	0.3-1.0

S1 Sample collected from Boravelly new habitation ground water (Bore well)

S2 Sample collected from Boravelly over head storage tank (Bore well)

S3 Sample collected from Pallepada BC colony –I (Bore well)

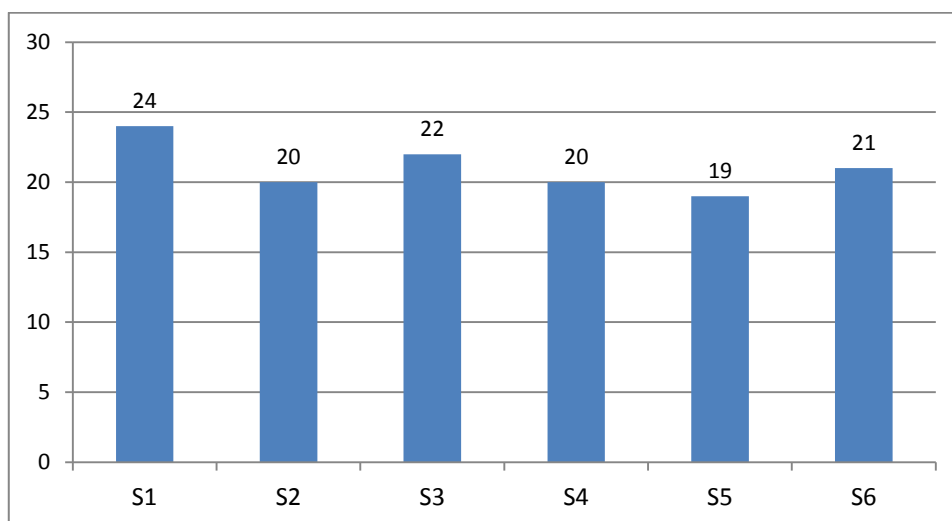
S4 Sample collected from Pallepada BC colony –II (Bore well)

S5 Sample collected from Jallapur Habitation (Bore well)

S6 Sample collected from Govt.School, Jallapur (Bore well)

The physicochemical parameters of the mentioned villages of Manopad mandal can be calculated and given in the table-1 mentioning the amount of parameters and villages sampling point and it has been describe as below:

**Temperature (T) as in °C:** Temperature is an important parameter which plays an important role in metabolic activities of the organism. The temperature ranging from 20°C- 24°C during the study period. Property of water is that with change in Temperature, its density varies and it becomes less with warming up and more with cooling.



**Figure-1**

**pH:** pH is a term used to express the intensity of the acidic or alkaline condition of a solution. Most of the samples were slightly alkaline due to presence of carbonate and bicarbonate ions. The values ranges from 7.3 to 8.03 and were found within the limits as prescribed by WHO.

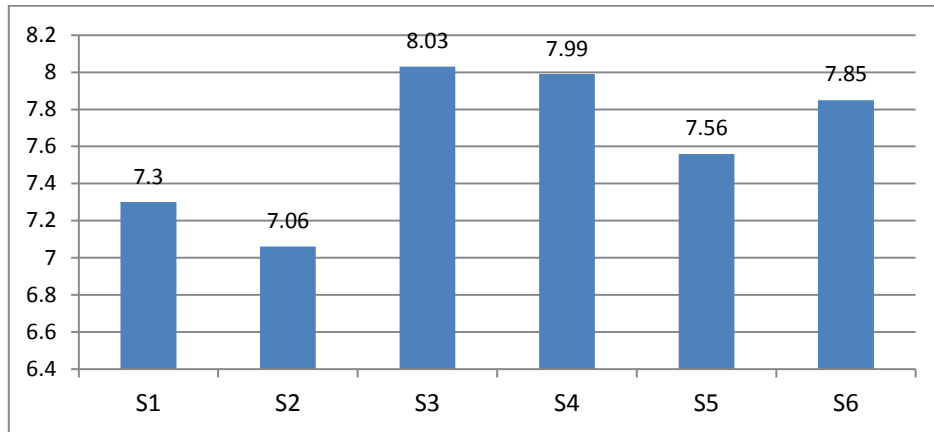


Figure-2

**Electrical Conductivity** (as in micro mhos/cm): Electrical conductivity is a measure of water capacity to convey electrical current. It signifies the amount of Total Dissolved Solids. In this present study the values ranges from 5120 micro mhos/cm to 1379 micro mhos/cm. Sample collected from Boravelly over head storage tank (Bore well) S2 sample was found high electrical conductivity. The decreasing order of the samples is mentioned below:

S2>S1>S3>S5>S6>S4

It indicates the presence of high amount of inorganic substances in ionised form in the villages water of Manopad Mandal.

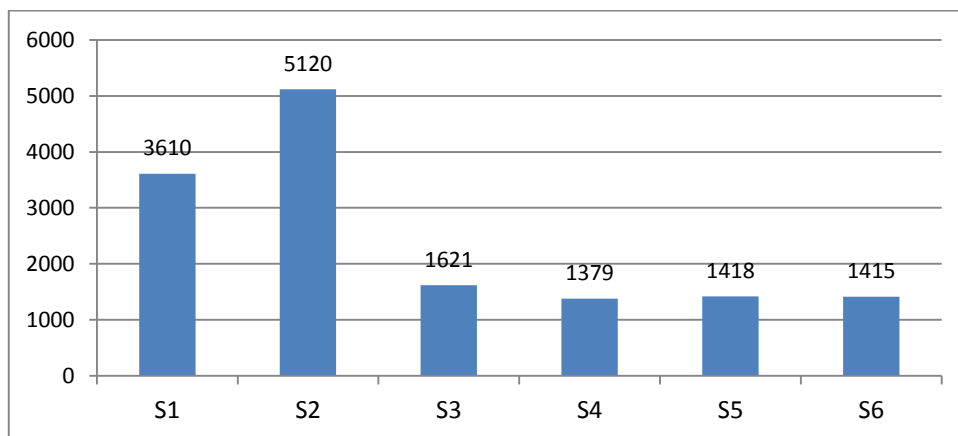


Figure-3

**Total Dissolved Solids (TDS) as in mg/lit:** Total Dissolved Solids indicate the salinity behaviour of ground water. Water containing more than 500mg/lit of TDS is not considered desirable for drinking water but in unavoidable cases 1500mg/lit is also allowed. In this study S2 sample was found high amount (3270mg/lit) of TDS and all the samples were found excess in limit as prescribed by WHO.

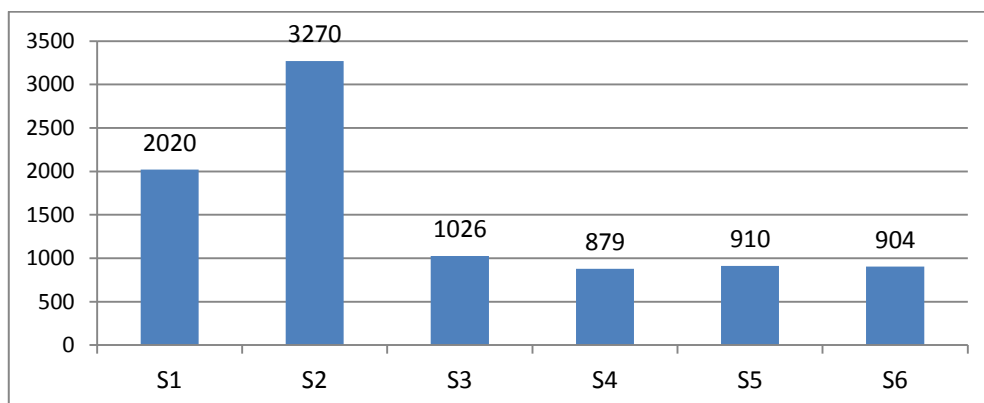


Figure-4

**Total Hardness as in mg/lit:** Hardness is the property of water which prevents the lather formation with soap/detergent and increases the boiling point of water. Hardness mainly depends on the amount of calcium and magnesium salts. Except S2 and S1 samples were found above the limits and remaining are within the limits as prescribed by WHO.

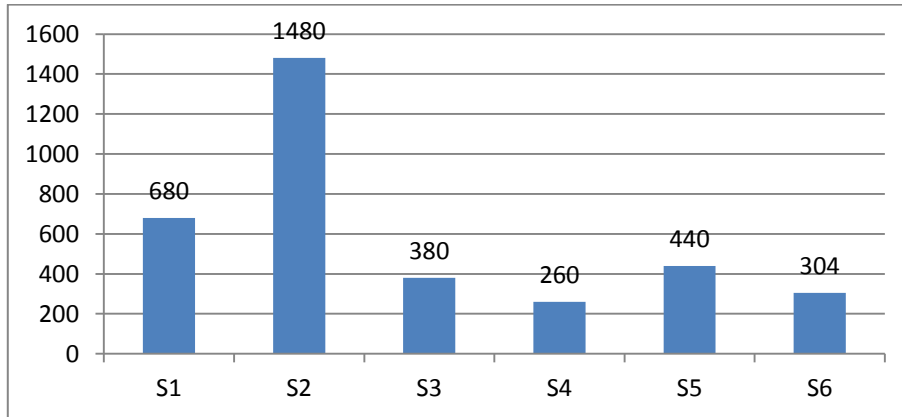


Figure-5

**Fluorides as in mg/lit:** The main source of Indian water seems to be that during weathering circulation of water in rocks and soils fluoride is leached out and dissolved in ground water. Excess intake of fluoride through drinking water causes fluorosis on human being. In the present analysis fluoride was found above the limits as prescribed by WHO. S5, S1, S2, S4, S2, S3 and S6 samples consist 2.7, 2.6, 2.4, 2.15, 1.9 and 1.05mg/lit. of fluoride content respectively.

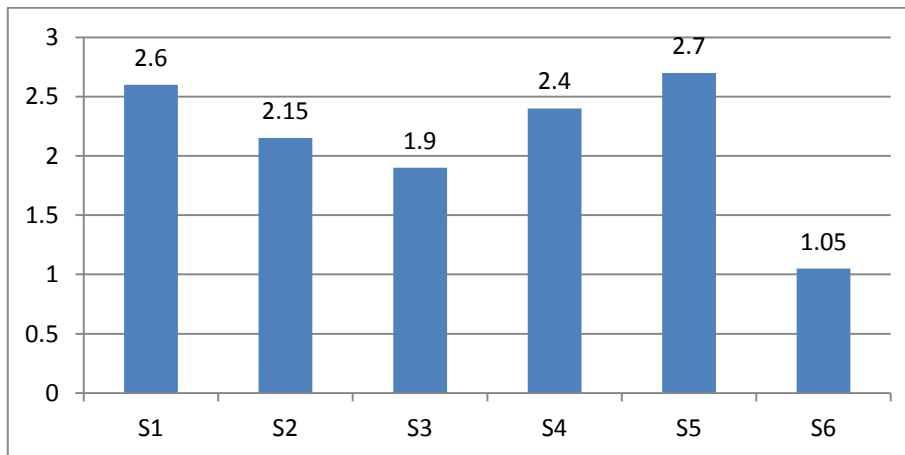


Figure-6

**Chlorides as in mg/lit:** Presence of chlorides indicates the pollution by sewage. People accumulated to higher chloride in water are subjected to laxative effects. In the present analysis chlorides ranges from 1340mg/lit. to 224 mg/lit. Only S2 sample was found excess in limit remaining all samples were found within the limits.

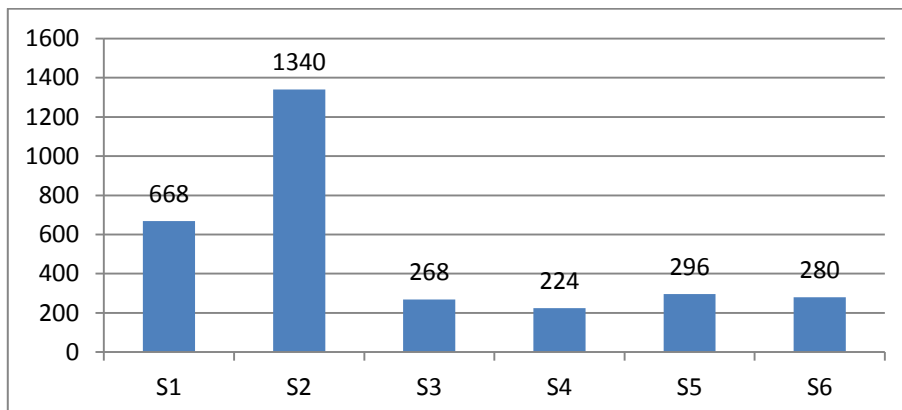


Figure-7

**Nitrates as in mg/lit:** Ground water contains Nitrates due to leaching of nitrates with the percolating water. It can also be contaminated by sewage and other wastes rich in nitrates. Nitrate content in all the samples were found within the limits

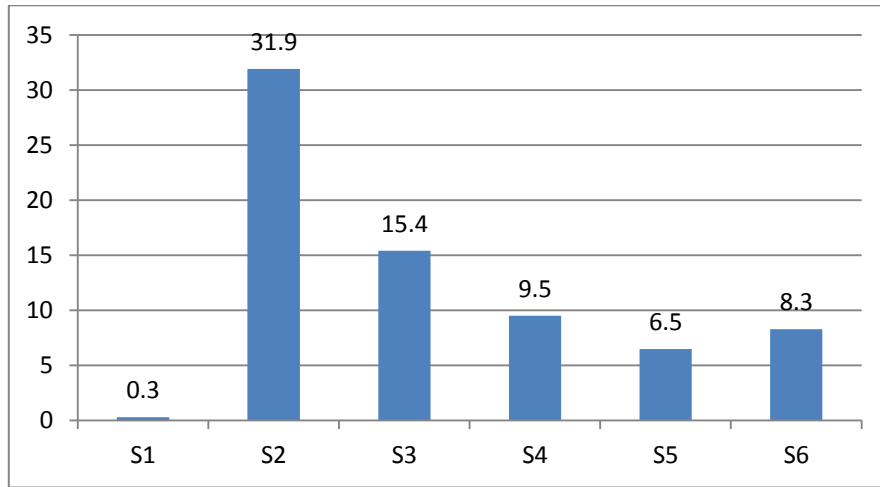


Figure-8

**Sulphates as in mg/lit:** Sulphate may come into ground water by industrial or anthropogenic additions in the form of Sulphate fertilizers or weathering. It can also be contaminated by sewage and other sources rich in sulphates. These were also found within the limits in all samples.

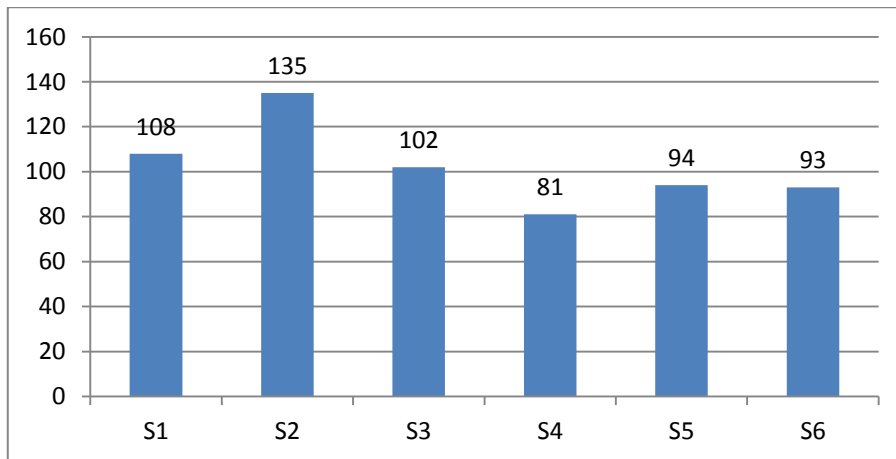


Figure-9

**Iron as in mg/lit:** Iron ions may enters the ground water through percolation of surface runoff and also weathering of rocks. This was also found within the limits in all samples.

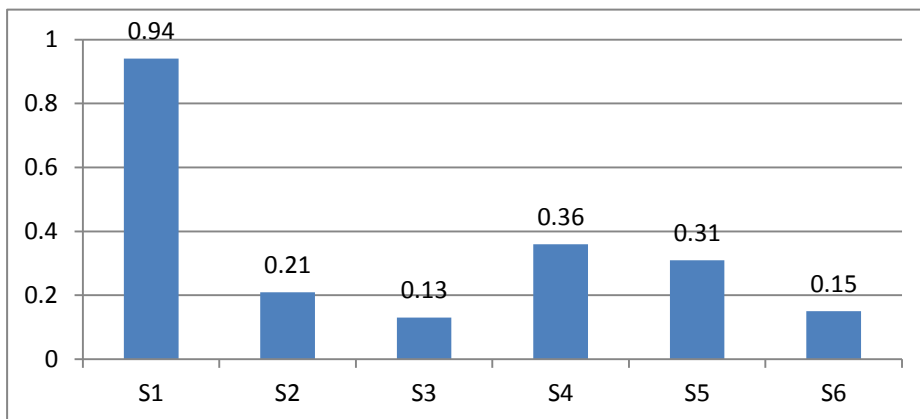


Figure-10

#### 4. CONCLUSION

Deviations from WHO standards were found in the all the samples of Boravelly, Pallepada and Jallapur villages of Manopad mandal. The water sample collected from S2 location (Boravelly over head storage tank) was found very poor in quality and also it has 2.15 mg/lit of fluoride content. All the samples were found excess of fluoride content and these are unfit for drinking. It is observed that there is no water treatment facility at concerned villages due to lack of knowledge regarding water among the people and they consume same bore well water directly for their daily needs including drinking. This led many people are suffering from different health problems. It needs immediate attention of concerned Government authorities and should establish advanced water treatment plants and include defluorination method as a part of their treatment.

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