Water Quality in Raw Water in Municipalities of Guntur District Andhra Pradesh

Dr. B. V. Sudheer[1], Dr. V. Sivaramaprasd[2]

[1, 2] Regional Public Health Laboratory, I.P.M, Guntur , A.P. India

[1]Faculty member in Medicine, Guntur Medical College, Guntur, A.P, India.

Abstract: *Physic chemical analysis of raw water samples in eleven Municipalities of Guntur District during January 2015 was carried out. The analysis of different parameters namely- PH, turbidity, color, total alkalinity, total Hardness, chloride, Nitrate, fluoride and iodine were carried out as per standard methods. The present study aimed to study the variations in Physic-chemical qualities in water resources in Municipalities of Guntur Dist in order to suitability of water for drinking purpose. The results obtained from different sampling stations are found to be within the range of Indian standards of Physical-Chemical parameters.*

Keywords: EC (electrical conductivity), TDS (total dissolved solids), TH (total hard ness), TA (total alkalinity)

1. Introduction

Water is essential for the survival of any form of life particularly the Human beings. The fresh water about 3% present in the globe is enough to meet the requirements of Human race for millions of years. Water pollution is a phenomenon by which the quality of the water is deteriorated as a result of various activities. In India only 12% of people get good water for drinking (Kudesia,1980)[1] .Inadequate management of water resources as directly or indirectly resulted in the degradation of hydrological environment (Karanth,1989)[2]. The surface water is the main resource of water used for drinking purposes in Municipalities of Guntur district. The main water source of surface water used in Guntur District Municipalities is from the River Krishna water through Right canal of Nagarjunasager dam and its branches. The present study is carried out to study the variations in the Physic-Chemical qualities water resources in the Municipalities of Guntur District.

2. Materials and Methods

Water samples are collected from 11 sampling stations (Municipal Summer Storage tanks) for analysis and were given S1-Macharla, S2-Piduguralla, S3-Sathenapalli, S4-Narasaraopet, S5-Chilakaluripet, S6-Guntur, S7- Ponnur, S8-Bapatla, S9-Repalla, S10- Tenali, S11- Mangalagiri.

Samples for analysis were collected in sterilized bottles using standard procedure in accordance with the standard methods of APHA (1995)[3]. The analysis of various Physical-Chemical parameters namely PH, , Electrical Conductivity, TDS, Total Hardness, Total Alkalinity, Calcium , Magnesium, Chloride, iron and Fluoride were carried out as per the methods described in APHA(1992).

3. Results and Discussion

The physic-Chemical parameters of water of the water samples are presented in the Table-1.

Table 1: S1.Macharla ,S2.Piduguralla S3.Sathenapalli S4 Narasaraopet S5 Chilakaluripet S6 Guntur S7.Ponnuru S8.Bapatla S9 Repalle S10 Tenali S11. Mangalagiri
Raw Water Characterics Of Samples Collected In Storage Tanks of The Municipalities Of Guntur District. A.P.

	S1	S2	S3	S4	S5	S6
Colour	No	No	No	No	No	No
Turbidity	6.0	4.0	3.0	3.0	1.8	2.0
Odour	agreeable	agreeable	agreeable	agreeable	agreeable	agreeable
PH	7.6	7.6	7.82	7.52	8.5	8.4
EC in umho/cm	544	732	350	260	420	522
TDS mg/l	359	483	231	171	277	343
TA	200	160	160	120	152	104
TH	140	180	140	180	150	188
Calcium	24	40	32	45	32	32
Magnesium	20	20	15	17	17	26
Chloride	80	100	60	52	80	96
Fluoride	0.9	0.7	0.5	0.5	0.5	0.5
Iron	Nil	Nil	Nil	Nil	Nil	Nil

	S7	S8	S9	S10	S11
Colour	No	No	No	No	No
Turbidity	5.0	6.0	3.0	0.69	1.2
Odour	agreeable	agreeable	agreeable	agreeable	agreeable

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PH	8.2	7.7	7.0	7.2	7.58
EC in umho/cm	480	446	480	580	580
TDS mg/l	317	294	316	383	383
TA	128	160	120	160	160
TH	160	140	172	140	240
Calcium	45	32	37	32	56
Magnesium	12	15	20	15	24
Chloride	80	60	80	60	72
Fluoride	0.5	0.5	0.5	0.5	0.5
Iron	Nil	Nil	Nil	Nil	Nil

Indian Standards of Drinking Water
Table 2: Organoleptic and Physical Parameters

SNO. (1)	Characteristics (2)	Requirement (Acceptable limit) (3)	Permissible limit in the absence of Alternative source (4)
1	Colour Hazanunits Max.	5	15
2	Odour	Agreeable	Agreeable
3	PH value	6.5-8.5	Not relaxation
4	Taste	Agreeable	Agreeable
5	Turbidity NTU Max	1	5
6	Total Dissolved Solids mg/L Max	500	200

Note:- It is recommended that the acceptable limit is to be implemented Values in excess of those mentioned funder acceptable render the water not suitable but still may be tolerated in the absence of an alternative source but up to the limits indicated under permissible limit in the absence source in col.4 above which the sources will have to be rejected.

Table 3: General Parameters concerning Substances Undesirable Excessive Amounts.

SNO (1)	Characteristics (2)	Requirement (Acceptable limit) (3)	Permissible limit in the absence of Alternative source (4)
1	Calcium(as Ca) mg/L Max.	75	200
2	Magnesium(as Mg) Mg/L Max	30	100
3	Total Alkalinity as CaCO3. Mg/L Max	200	600
4	Total Hardness (as CaCO3) mg/L Max.	200	600
5	Chloride(as Cl) mg/L Max	250	1000
6	Fluroide (as F) mg/L Max	1.0	1.5
7	Iron (as Fe) mg/L Max	0.3	No relaxation

4. Turbidity

Turbidity is a measure of water clarity how much the material suspended in water decreases the passage of light through the water. Suspended materials include soil particles (clay, silt, and sand), algae, plankton, microbes, and other substances. These materials are typically in the size range of 0.004 mm (clay) to 1.0 mm (sand). Turbidity can affect the color of the water

Higher turbidity increases water temperatures because suspended particles absorb more heat. This, in turn, reduces the concentration of dissolved oxygen (DO) because warm water holds less DO than cold. In the study the value of Turbidity ranges from 0.69 to 6.0NTU. The maximum turbidity seen in Samples S1 and S8. And minimum Turbid seen in S10. As per Indian Stranded of specification Turbidity below 1NTU is the acceptable limit for drinking water and values above 1 the water is not suitable, but still may be tolerated in the absence of an alternative source but up to the limit of 5NTU.

PH
The PH value of the water changes due to the biological activity and industrial contamination. The PH values of the present investigation are varying between 7.0 to 8.5. The Indian standard of drinking water is 6.5 to 8.5 is the acceptable limit. PH is considered as an important ecological factor and provides an important piece factor and piece of information in many types of geochemical equilibrium or solubility calculation (Shyamala et al., 2008)[4]. The maximum PH recorded at S5 (Chilakaluripet) sample was 8.5 Higher PH values includes the formation of trihalomethanes which are toxic (Trivedi 1986)[5]

Electrical Conductivity

Conductivity is the ability of water to conduct an electrical current, and the dissolved ions are the conductors. The major positively charged ions are Sodium, Calcium, Potassium, and magnesium. The major negatively charged ions are chloride, Sulfate, carbonate and bicarbonate. Nitrates and phosphates are minor contributors to conductivity, although they are very important biologically. As the concentration of dissolved salts increases conductivity also increases. Rain falling into water body or rain runoff flowing into it, will decrease conductivity. Evaporation and loss of fresh water will increase the conductivity [6.] EC is an index to represent the total concentration of soluble salts in water (Purandara et al.. 2003) [7] .The values obtained in the study range from 420to

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580umhos/cm. The maximum EC is in Tenali S10 and Mangalagiri S11 samples.

TDS (Total Dissolved Solids)

Dissolved solids refer to any minerals, salts, metals, cations or anions dissolved in water. TDS comprises inorganic salts (principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides and sulfates) and some small amounts of organic matter that are dissolver in water. TDS in drinking water originate from natural sources; sewage, urban run-off, industrial wastewater, and chemicals used in the water treatment, and the nature of the piping or hardware used to convey the water.TDS is used as an indicator test to determine the general quality of the water. Water containing more than 500 mg/l of TDS is not considered desirable for drinking water supplies, though more highly mineralized water may be used where better quality water is not available (Jain ,2002) [8]. In the study the TDS values range from 171 to 383 mg/l. The higher values are in S10 and S11. The elevated TDS is not a health hazard. The TDS concentration is a secondary drinking water standard and it is more of an aesthetic rather than a health hazard.

Total Alkalinity (TA)

Alkalinity value in water provides an idea of natural salts present in water. The cause of alkalinity in the minerals which dissolve in water from soil. The various ionic species that contribute to alkalinity includes bicarbonates, hydroxide, phosphate, borate and organic acids. These factors are characteristics of the source of water and natural processes taking place at any given time.(Sharma 2004) [9]. The alkalinity value less than 100 mg/l is desirable for domestic use.[10] Values in excess of 200 is not suitable for drinking but may be tolerate in the absence of an alternative source but to limit of 600. In our study the values of alkalinity found in the range of 104 to 200 mg/lt. The maximum TA is in S1 (Macharla) sample. However in large quantities it imparts bitter taste to water.

Total Hardness (TH)
Hardness is a measure of the ability of water to cause precipitation of insoluble calcium and magnesium salts of higher fatty acids from soaps solutions. The principal hardness causing ions are Calcium, Magnesium Bicarbonate, Carbonate, Chloride and Sulphates. Hardness is the property of water which prevents the lather formation with soap and increases the boiling points of water (Trivedy and Goel ,1986) [11] The Hardness values in the study 140 to 240mg/l. The maximum total hardness value was observed as 240mg/l in sampling located in S11 (Mangalagiri) and minimum in S6 (Guntur).

The maximum value of **the Carbonate** was recorded as 56 mg/l at sampling S11(Mangalagiri) and minimum at sampling S1 (Macharla) as 24mg/l. The maximum value of the **Magnesium** was recorded as 26.35 mg/l at S6 (Guntur) and minimum value at sampling S7 (Ponnur) as 11.71mg/l.
Chlorides occur in all types of natural waters. It occurs as NaCl, $CaCl_2$, and $MgCl_2$ in varying concentrations. The higher the concentration of chloride is considered to be an indication of pollution due to high organic water of animal origin (Singh 1995). The choride values obtained in the study are found in the range between 52to 100mg/l.The maximum value of chloride is recorded as 100 at S7 (Ponnur) and minimum value at S9 (Repalla).

Fluoride
Fluoride may cause health problems if present in water supplies in amounts greater than the drinking water standard. The fluoride values obtained in the study range 0.5 to 0.9ppm.

5. Conclusion

The analysis of the water quality in parameters of drinking water from 11 different municipalities in Guntur District in comparison with the Indian standards of Physic-Chemical parameters .Turbidity, PH, EC ,TDS ,Total Alkalinity, Total Hardness ,Chloride ions and Fluoride ions are within the acceptable limits for human consumption except Turbidity in most of the samples except S10 so they need treatment before the used for drinking purposes as per the Physico-chemical parameters.

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