# SURVEY AND ANALYSIS OF UNDERGROUND WATER OF FIVE VILLAGES OF TRIPURA, INDIA

**Monica Debbarma[1], Mitali Saha[2]**

*[1]JRF, [2]Assistant Professor, Department of Chemistry, NIT, Agartala-799055, Tripura, India*
***db.moni@gmail.com, mitalisah@gmail.com***

## Abstract

*The present study emphasizes on the survey and assessment of groundwater quality, sources of ground water contamination, variation of groundwater quality and which will be further purified with the use of nanomaterials. The bases for groundwater quality assessment are underground water (tube-well) and representative monitoring network enabling determination of chemical status of the underground water (tube-well). For this study, water samples were collected from 5 tube wells representing the area of 5 villages (Golaghati, Takarjala, Jampui, Mandwi, and Simna) of Tripura (India). The water samples were analyzed for physico -chemical parameters like Total Dissolved Solid, Total Hardness, Iron, Chloride, Calcium, Magnesium etc using standard techniques in the laboratory and compared with the standards. The results obtained in this study and the Association rules will be helpful for monitoring and managing presence of heavy metals in underground water in the modern research area in terms of water quality. The parameters: pH, TDS, Total hardness and content of Iron, Chloride, Calcium, Magnesium and BOD were studied and compared with the standard values prescribed by ICMR, WHO, APHA and ISU/BIS. The present investigation revealed that the quality of water of a source slightly varies from area to area tube wells but was found that the underground water samples are fit for drinking and utility purpose.*

***Keywords:*** *Water, Total Hardness, Iron, Calcium, Magnesium.*

----------***----------

## 1. INTRODUCTION

Water is considered absolutely essential to sustain life. Clean water is essential to human life and is a critical feedstock in a variety of key industries including electronics, pharmaceuticals and food. Groundwater is the major source of drinking water in both urban and rural areas [1-2]. Groundwater is the most important source of water supply for drinking, irrigation and Industrial purposes. [3-6]. The world is facing formidable challenges in meeting rising demands of clean water as the available supplies of freshwater are decreasing due to, (a) extended droughts, (b) population growth, (c) more stringent health-based regulations, and (d) competing demands from a variety of users. Increasing population and its necessities is one of the most important points that have lead to the deterioration of surface and sub surface water. In India both underground and surface water has a major role to satisfy the needs of domestic and agriculture purposes. The ever growing demands for water resources coupled with the rate at which much of the earth's fresh water being adversely affected by human activities, demonstrate a developing crisis and horrible future if environmental water resources are not appropriately managed. The modern civilization and urbanization frequently discharging industrial effluent, Domestic sewage and solid waste dump. The cause of ground water gets pollute and create health problems [7]. Once the groundwater is contaminated, its quality cannot be restored by stopping the pollutants from the source it therefore becomes imperative to regularly monitor the quality of groundwater and to device ways and means to protect it [8-11]. The objective of this study is to investigate qualitative analysis of some physicochemical parameters of ground water in study area. This may be considered as reference for the society to get cautious about the impending deterioration of their environment and health Tripura is not an exception to this future crisis although the state receives maximum rainfall in the month of June. The state recorded an average annual rainfall of 2100 mm in 2012 which is less compared to last previous 10 years. The conservation of improvised water resources is indispensable for the sustainability of our economic development. For this reason, an attention has been given to the water quality of all the areas of Tripura. The effective maintenance of water quality of local resources through appropriate control measures, continuous monitoring of their quality parameters and their proper may reduce the water crisis of the state. The present study will also strengthen the national and local water quality data base.

## 2. OBJECTIVE

The main objective of the work is to study the water quality of 5 villages of Tripura used for drinking, domestic purpose and agriculture. The water samples was collected and analysed. The quality of underground water of remote areas of Tripura for drinking and other purposes was determined following WHO, APHA and ISU/BIS methods [3-5].

## 3. METHODOLOGY

The water samples from the remote areas of west Tripura district were collected and analyzed for 22 physico-chemical parameters by the following established procedures. The parameters temperature and pH were monitored at the sampling site and other parameters like total dissolved solids, total alkalinity, total hardness, calcium, magnesium, chloride, iron, sulphate etc were analyzed in the laboratory as per the standard procedures of APHA. In this study, the W.Q.I has been calculated by using the standards of drinking water quality recommended by WHO10, BIS 11 and ICMR 12 [3-5].

The Ground water samples were collected from 5 village areas of Tripura State (India) namely, Golaghati, Takarjala, Jampui, Mandwi, Simna. The villages are located at West Tripura Districts under their respective names blocks. The water samples were collected during pre-monsoon (March 2013) season. Ground water, samples were collected in sterilized plastic containers (PVC 1000ml) as per the standard methods of APHA and ISU. The samples S1-S4 were collected on 15.03.13 and S5 was collected on 16.03.13.The location and dates of collection of water samples are given in table-1.

**Table -1:** Five locations of different drinking water samples

| Sl. No. | Name of the locations | Type of water |
|---|---|---|
| 1 | Golagahati Village | Tube well |
| 2 | Takarjala village | Tube well |
| 3 | Jampui Market | Tube well(Hand Pump) |
| 4 | Mandwi Market | Shallow tube well |
| 5 | Simna village | Tube well |

## 4. RESULTS AND DISCUSSION

The physico-chemical characteristics of drinking water of the study area are presented in table-2. The results show that water quality of Golaghat, Takarjala, Jampui, Mandwi and Simna is having recommended value with that of ,WHO ISU/BIS and ICMR The different parameters of different samples (S1-S5) are given in table-2. Based on the experimental observations recorded, the values are compared with the WHO, IS and ICMR standard values. TDS is the term used to describe the inorganic salts and small amount of organic matter present in solution of water and here TDS values of water samples are NIL. The values of pH are in the range of 7.0-8.0 which is almost same in all the samples as well in the standard value. The electrical conductivity was recorded for the five samples as 24,24,27,25 and 26 respectively. The given reported experimental values were compared with the IS and ICMR standard values.

The hardness of water is more or less same in all the samples which was found to be around 174, less than the permissible limit of WHO, IS and ICMR. These findings suggest that the ground water can be used for drinking purposes in the present stage. Water total hardness is imparted mainly by the Iron, calcium and magnesium ions. Iron is found to be present within the range 0.3 mg/l to 0.9 mg/l quantity in all the Samples. Hence it is essential to maintain moderate concentration of iron in drinking water. Chloride although is the indicator of contamination with animal and human waste but the ground water contains chloride, calcium and magnesium within the permissible limit.

Chloride is a common constituent of all natural water and is generally not classified as harmful constituent. The slight difference in the results of the samples may be due to climatic factors such as rainfall, temperature, pressure and humidity etc.

**Table -2:** Analysis of underground different drinking water of five villages

| Sl. No | Parameters | S1* | S2* | S3* | S4* | S5* | Standard (WHO)(DW) | Indian Standard unit (India)(DW) | ICMR |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Temperature (0C) | 30.5 | 30.7 | 30.9 | 31.1 | 30.5 | - | - | - |
| 2 | Total suspended solid(TSS) | Nil | Nil | Nil | Nil | Nil | - | - | - |
| 3 | Total dissolved Solid (TDS) | Nil | Nil | Nil | Nil | Nil | 500 | 500 | 500 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4 | pH | 7.58 | 7.74 | 7.69 | 7.87 | 7.92 | 6.5-8.5 | 6.5-8.5 | 6.5-8.5 |
| 5 | Colour (1/m) | Nil | Nil | Nil | Nil | Nil | - | 5 | - |
| 6 | Turbidity (NTU) | Nil | Nil | Nil | Nil | Nil | - | 10 | - |
| 7 | Conductivity (μ mho/cm) | 24 | 24 | 25 | 27 | 26 | | 300 | 300 |
| 8 | Phenolphthalein Alkalinity (mg/l) | Nil | Nil | Nil | Nil | Nil | - | - | - |
| 9 | Alkalinity (mg/l) | 18.27 | 18.42 | 18.46 | 18.90 | 19.1 | - | 200 | 120 |
| 10 | DO (mg/l) | Nil | Nil | Nil | Nil | Nil | - | - | 5 |
| 11 | BOD (mg/l) | Nil | Nil | Nil | Nil | Nil | 6 | - | - |
| 12 | COD (mg/l) | Nil | Nil | Nil | Nil | Nil | 10 | - | - |
| 13 | Sulphate (mg/l) | Nil | Nil | Nil | Nil | Nil | - | 150 | 150 |
| 14 | Total Hardness (mg/l) | 174 | 174 | 173.9 | 178 | 174 | 500 | 300 | 300 |
| 15 | Chloride (mg/l) | 28.84 | 24.03 | 28.84 | 24.03 | 28.84 | - | 250 | 250 |
| 16 | Calcium (mg/l) | 66 | 67 | 68 | 70 | 66 | 100 | 75 | 75 |
| 17 | Magnesium (mg/l) | 26.24 | 26 | 25.73 | 26.24 | 26.24 | 150 | 30 | 30 |
| 18 | Phosphate (mg/l) | Nil | Nil | Nil | Nil | Nil | - | - | - |
| 19 | Arsenic (mg/l) | Nil | Nil | Nil | Nil | Nil | 0.05 | 0.05 | - |
| 20 | Iron (mg/l) | 0.4 | 0.3 | 0.8 | 0.9 | 0.9 | 1.0 | 0.3 | - |
| 21 | Nitrate(mg/l) | Nil | Nil | Nil | Nil | Nil | - | 50 | 45 |

* S1: Golaghati village, S2: Takarjala village, S3: Jampui Market, S4: Mandwi Market, S5: Simna village

## CONCLUSIONS

From the assessment of different parameters of the water samples of five different village areas (Golaghati, Takarjala, Jampui, Mandwi, Simna) of west Tripura District (India) shows, that samples are suitable for drinking. But from the percentage of different heavy metals, we may conclude that underground water of Tripura including the reported villages needs to be kept under control. More preventive measures are required to decrease the heavy metals as much as possible for future. Therefore the effective maintenance of water quality of local resources through appropriate control measures, continuous monitoring of their quality parameters and their proper use with proper treatment will reduce the water crisis as well as heavy metals.

## ACKNOWLEDGEMENTS

Authors are grateful to AICTE, New Delhi for financial approval. Tripura State Pollution Control Board, Agartala is greatly acknowledged for providing necessary equipments to carry out the research work.

## REFERENCES

[1]. D. Gupta, P. Sunita and J. P. Saharan, Researcher., 1(2), 1-5 (2009).
[2]. Y. A. Maruthi, K. Hossain and A. Goswami, Der Chemica Sinica., 3(5), 1071-1074 (2012).
[3]. N. B. Chauhan and F. J. Thakor, Asian J Exp Biol Sci., 3(3), 582-588 (2012)
[4]. H.Z Goltman, R.S. Clymo and M.A.M. Ohnstad, Methods for physical and chemical analysis of fresh water, I.B.P.H.

and Book No.8, 2nd edition Black well Scientific, Oxford (1978).
[5]. M. Ramesh and K. Elam Valuth, Der Chemica Sinica, 3(5), 1272-1275 (2012).
[6]. T. S. D. Pranavam, T. V. Rao, L. Punithavathi, S. Karunanithi and A. Bhaskaran, Indian J. Sci. Technol., 4 (1), 19-21 (2011).
[7]. A. Agarwal and M. Saxena, Adv. Appl. Sci. Res., 2 (2), 185 -189 (2011).
[8]. D. G. Shah and P. S. Patel, Der Chemica Sinica, 2(5), 8-11 (2011).
[9]. R. K. Trivedy and P. K. Goel, Chemical and Biological Methods for Water Pollution Studies, Environmental Publication, India, 1986.
[10]. S. Hooda, S. Kaur, Cited in Laboratory Manual for Environmental Chemistry, Edited by S.Chand & Company Limited, Ram Nagar, New Delhi, 1999.
[11]. S.C. Hiremath, M.S. Yadawe, U.S. Pujeri, D.M. Hiremath² and A.S. Pujar, Current World Environment. 6(2), 265-269 (2011)

**BIOGRAPHIE:**

Dr. Mitali Saha has obtained her Ph.D. in Organic Chemistry from University of Rajastan.Her fields of interest are Synthetic organic Chemistry, Advanced carbon Products, Nanoscience and Nanotechnology. She also worked as Fast Track Young Scientist in Indian Institute of Technology (IIT), Kanpur.