



PHYSICO-CHEMICAL ANALYSIS OF GROUND WATER QUALITY WITH SPECIAL REFERENCE TO NITRATE OF BARACHATTI BLOCK O, GAYA DISTRICT, BIHAR (INDIA)

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ABSTRACT

The present investigation deals with ground water quality of five different areas of barachatti block and its adjoining area i.e. Barachatti (S1), Sharma (S2), Bazarker (S3), Rohi (S4) and Shobh (S5). The groundwater parameters such as temperature, pH, turbidity, electrical conductivity, alkalinity, dissolved oxygen, biochemical oxygen demand, total hardness, calcium, magnesium, phosphate, sulphate, arsenic, iron, chloride and fluoride were estimated in the samples to evaluate their quality. The data of physico chemical parameters are compared with WHO (1992) and IS: 10500 standards for drinking water. Our result revealed that concentration of DO, BOD, Total hardness, Calcium, magnesium, sulphate, turbidity, alkalinity, phosphate, iron and chloride are within permissible limits and Iron, phosphate are negligible in comparison to permissible limits whereas the concentration of nitrate is higher at sampling areas S2, S3 and S5. The concentration of from 20 mg/l to 60 mg/L which is higher the permissible limit of WHO health based guide line values. The concentrations of nitrate above 40mg/L cause Blue diseases in infants (Sharma, 1997). The higher concentration of nitrate needs proper treatment before the use for drinking purposes and irrigation purposes. Finally it can be suggested that an intensive study may be carried out before the domestic consumption.

Keywords: Groundwater, Water Quality, Dissolved Oxygen.

INTRODUCTION

Barachatti is a block in the gaya district of bihar. Barachatti is located at an elevation of 159 m (522 ft) above sea level. It is situated 45 km towards south from district headquarters gaya. 150km from State capital Patna towards north. It is bounded by chouparan block towards east, Itkhori block towards south, fatehpur block towards north, mohanpur Block towards North. bodh gaya city , gaya city ,sherghati city jhumri tilaiya city are the nearby Cities to barachatti. Water is one of the most important and basic natural resources and forms about 75% of the matter of the earth crust and present in the form of marine water (Ocean and Sea) and fresh water (River, Lake, ponds, Streams and Ground water etc.). Water is the prime requirement for life and used for drinking, bathing, recreation, irrigation, fisheries, navigation and power generation purposes etc. India receives 1800-1900 mm of rainfall annually. According to an estimate made by Indian central water commission (ICWC) for pollution control the total utilizable water from surface water sources is 690 cubic kms and ground water sources is about 452 cubic kms (Sud., 1997). The management for waste water discharges from habitat centers, industries, agricultural activities etc to maintain the quality for various purposes. India required 60% water for irrigation and 85% for drinking purposes which depends upon groundwater; India is the largest user of ground water in using over 25% of the total global use of ground water. (Gautam and Kumar, 2010) India has more than 20 million bore wells in comparison to 0.2 million in USA. The increasing human population has tremendously increased the demand of fresh water. The rapid growth of urban areas has affected

the ground water quality due to over exploitation of resources and improper waste disposal practices. National Environmental Engineering Research Institute (NEERI), Nagpur has estimated that a staggering 70 % of the available water in India is polluted (Sharma et al., 1996-1997).The present study and investigation has been designed to understand the chemical characteristics of ground water of this region with special reference to arsenic.

OBJECTIVE

The objective of the present investigation has been made to understand the chemical characteristics of ground water quality of barachatti block with special reference to nitrate.

STUDY AREA

In the present investigation, there are five water samples from different areas of barachatti block were collected in the month of December 2015 to estimate quality of ground water. These water were extensively used for drinking purposes. The sampling stations are Barachatti (S1), Sharma (S2), Bazarker (S3), Rohi (S4) and Shobh (S5).

MATERIALS AND METHODS

The analysis of Phosphate, Iron, PH , Total Alkalinity, Calcium Hardness, Nitrate, Nitrite, Ammonium, Fluoride, Residual chlorine, chloride, Arsenic etc. were carried out by water testing kits which are supplied by Nice Chemicals (P)Ltd. Cochin, Kerala. The temperature of water samples were measured by thermometer (Celsius). The water

analysis observed data were compared with the standard data provided by WHO for drinking purposes.

RESULTS AND DISCUSSION

The ground water are quality parameters given in Table-1. and data are comparing with WHO (2011) and IS: 10500 standards for drinking water.

Temperature: Temperature of water plays important role for living beings. Quality of water is also maintained by temperature. The temperature of different sampling station ranges from 27oC to 28oC

pH: The pH of ground water ranges from 6 to 7 which is within the range of drinking water proposed by ISI 1991 is 6.5 to 8.5.

Alkalinity: Generally ground water associated with dissolved carbon dioxide, bicarbonates and hydroxides which occurs due to dissolution of minerals in the soil. The values of alkalinity ranges from 150 to 300 mg/l.

Iron: The concentration of iron varies from 0.2mg/L to 3.0 mg/L whereas permissible limit for iron is 0.3 to 1.0 mg/L. Only the sample S3 have higer value of iron (3mg/l).

Calcium Hardness: The value of calcium hardness varies from 100mg/l to 400mg/l.

Nitrate: The biochemical oxidations of nitrogenous substances coming from domestic wastes are main source of nitrate in Ground Water. The concentration of nitrate in present study varies from 20 mg/l to 60 mg/L which is higher the permissible limit of WHO health based guide line values. The concentrations of nitrate above 40mg/L cause Blue diseases in infants (Sharma, 1997).

Nitrite: It varies from 0.0 to 3.0 mg/l in the samples.

Ammonium: It varies from 0.5 to 3.0 mg/l

Chloride : The chloride values ranges from 150 mg/L to 500 mg/L in the present sample. The permissible limit of chloride in drinking water is 250mg/L as suggested by WHO and ISI. The higher concentration of chloride may affect heart and kidney disease affected person (Patil et al., 2002)

Total Hardness: The temporary hardness of water is only due to dissolved of Calcium and Magnesium bicarbonate in water, where as permanent hardness is due to presence of chlorides of Calcium and Magnesium in water. The value of total hardness ranges 150 to 1500mg/L.

Table 1: Showing different Parameters of ground water of barachatti block.

| SI No | Parameters | Experimental Area Location | | | | |
|-------|-----------------|----------------------------|----|----|----|----|
| | | S1 | S2 | S3 | S4 | S5 |
| 1 | Temperature(°C) | 28 | 28 | 28 | 28 | 27 |

| | | | | | | |
|----|--------------------------|-----|-----|-----|-----|-----|
| 2 | PH | 7 | 6 | 6 | 7 | 7 |
| 3 | Alkalinity (mg/l) | 230 | 240 | 250 | 150 | 300 |
| 4 | Phosphate (mg/l) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5 | Iron (mg/l) | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 |
| 6 | Calcium Hardness (mg/l) | 225 | 300 | 300 | 400 | 100 |
| 7 | Nitrate (mg/l) | 20 | 30 | 40 | 30 | 20 |
| 8 | Nitrite (mg/l) | 0.0 | 3.0 | 3.0 | 0.5 | 1.0 |
| 9 | Ammonium (mg/l) | 0.5 | 1.0 | 1.0 | 3.0 | 0.5 |
| 10 | Fluoride (mg/l) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 11 | Chloride (mg/l) | 300 | 320 | 220 | 150 | 500 |
| 12 | Residual chlorine (mg/l) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | Arsenic (mg/l) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | TotalHardness (mg/l) | 350 | 400 | 150 | 600 | 350 |
| 15 | Sulphate(mg/l) | 150 | 120 | 130 | 140 | 170 |
| 16 | Sodium (mg/l) | 60 | 40 | 35 | 55 | 25 |
| 17 | Potassium (mg/l) | 6 | 8 | 10 | 7 | 11 |
| 18 | DO(mg/l) | 3.2 | 3.5 | 2.3 | 2.1 | 4.0 |
| 19 | BOD(mg/l) | 2,0 | 2.2 | 2.8 | 2.4 | 2.5 |

CONCLUSION

1. It was observed that the concentration nitrate in present study varies from 20 mg/l to 60 mg/L which is higher the permissible limit of WHO health based guide line values.
2. The higher concentration of nitrate needs proper treatment before the use for drinking purposes
3. The observed values of sulphate, sodium, potassium, DO, Nitrate, BOD are within the permissible limits as per WHO guide lines for drinking water. The values of phosphate, fluoride, residual chlorine and arsenic are observed negligible.

SUGGESTION

The detail investigation may be carried out on other living organisms to avoid the hazardous/ injurious impact of the nitrate contamination.

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