

Physico Chemical Analysis of Ground Water of Madhepura District

Arti Kumari, Arun Kumar

University Department of Zoology, B.N.M. University, Madhepura, Bihar, India

ABSTRACT

In the present study, ground water was collected from Alamnagar, Barhauna, Barihi, Bhelwa, Bishanpur, Belo villages of Madhepura district. Physico-chemical parameters like pH, Electrical conductivity (E.C.), Total dissolved solid (TDS), Total hardness (TH) Dissolved oxygen (DO), Biological oxygen demand (BOD) and alkalinity were studied. The pH value ranged from 5.98 to 8.54. Electrical conductivity of ground water sample varies from 891.5 μ S to 1299.75 μ S. Value was lower in monsoon. The TDS value of ground water sample varies in between 575.41mg/l to 1198.25mg/l. The TDS value of selected water source was within permissible limit for drinking water. The TH value ranged in between 120.83mg/l to 432.25 mg/l. The value of DO varies in between 5.1mg/l to 6.8mg/l and the value of BOD ranged in between 1.4mg/l to 3.8mg/l. The total alkalinity of ground water sample ranged in between 197.58mg/l to 571.83mg/l.

Keywords: Physico-chemical parameter, pH, E.C., TDS, TH, DO, BOD, Alkalinity

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INTRODUCTION

Water is most essential fluid for the survival of all organisms. According to an estimate, 97% of total global water is saline while remaining 3% is fresh water. Out of 3% fresh water only 0.01% is available for human beings. For the drinking purpose ground water is main source. It is used for human consumption like drinking, domestic, agriculture and industrial activities. Ground water is considered as pure water because of many filtration mechanism in underground soil. The ground water contain several minerals derived from Earth. Sometimes, ground water contain several heavy metals which are harmful to human beings. In Asian countries, metal contamination of ground water is widely reported from several countries. The quality of ground water is determined by its physico-chemical characteristics. Arsenic and chloride are the serious hazardous pollutant which originate from natural system, anthropogenic and geological sources. Inorganic form of arsenic is considered as major contaminant of ground water (Tuzen et. al. 2010). Contamination of arsenic is a serious problem is several region of world.

Rainfall is the principal source of ground water recharge. Another sources are river, stream, irrigation

water etc. Ground water is the hidden source. At one time its purity and availability were taken for granted. Now, contamination of ground water is a serious issue due to rapid population growth, urbanization, use of fertilizers, pesticides, insecticides, fungicides and herbicides in agriculture system contaminated ground water. As the ground water is recharged from surface water that infiltrated through several layers of soil, a part of pollutants present in soil surface also enters in ground water. The contamination of ground water mostly depend on the depth of ground water. In Madhepura, the depth of ground water ranges from 2m to 19m. 6% of ground water is at a depth of 0.2m, 88% at a depth of 2-5m and 6% at a depth of 5-10m as per the report of depth of water resources, river development and Ganga rejuvenation, Govt. of India, Central ground water board, 2021-2022.

Material and Methods

In the present study, ground water was collected from Alamnagar, Barhauna, Barihi, Bhelwa, Bishanpur, Belo villages of Madhepura district in two liter plastic bottles. Water samples were collected from tubewells and borewells of different villages from April-2019 to March-2021 in four different seasons. Following physico-chemical parameters were studied- pH,

Electrical conductivity (E.C.), Total dissolved solid (TDS), Total hardness (TH) Dissolved oxygen (DO), Biological oxygen demand (BOD) and alkalinity.

pH: pH was determined using cystronic pH meter.

E.C.: Electrical conductivity was measured using cystronic conductivity meter.

TDS: For the estimation of total dissolved solid, 100ml water sample was taken in a crucible and weighed. The water was evaporated and the final weight of crucible was taken. Total solid per 100ml calculated by the formula:

$$TDS = \text{Weight of crucible with water sample} - \text{weight of crucible after evaporation}$$

TH: Total hardness was measured by titrimetric method and calculated by the formula:

$$TH \text{ mg/l} = \frac{TX1000}{V}$$

Where, T= Volume of titrant
V= Volume of sample

DO: For the estimation of DO, samples are first mixed with magnesium sulphate and alkali azide iodide. The precipitate is dissolved in conc. Sulphuric acid and titrated against sodium thiosulphate. Starch is used as indicator. DO was calculated by the formula:

$$DO \text{ (mg/l)} = \frac{N \times V \times 8 \times 100}{\text{ml sample used}}$$

Where, N= Normality of Sodium thiosulphate
V= Volume of titrant used

BOD: The water sample was incubated 300 ml bottles at 20°C for 5 days in dark and final DO was measured. BOD was calculated by the formula:

$$BOD \text{ (5 days)} = DO_i - DO_f \times \frac{300}{\text{sample/bottle}}$$

Where, DO_i= DO initial.
DO_f= DO final.

Alkalinity: Alkalinity was determined by titrimetric method. The sample was titrated against 0.2N sulphuric acid. Methyl orange and Phenolphthalein were used as indicator. Alkalinity was calculated by the formula:

$$\text{Alkalinity} \left(\frac{\text{mg}}{\text{l}} \right) = \frac{(V_1 + V_2) \times N \times 50 \times 1000}{\text{vol. of water sample}}$$

Where,
V₁= Vol. of sulphuric acid used for Phenolphthalein alkalinity
V₂= Vol. of H₂SO₄ used for Methyl orange alkalinity
N= Normality of sulphuric acid.

Result

In the present study, pH, Electrical conductivity (E.C.), Total dissolved solid (TDS), Total hardness (TH) Dissolved oxygen (DO), Biological oxygen demand (BOD) and alkalinity were estimated from tubewell water and borewell water of different villages. The pH value ranged from 5.98 to 8.54. Electrical conductivity of ground water sample varies from 891.5µS to 1299.75µS. Value was lower in monsoon. The average value of Belo was recorded as 1137.83µS, Bishanpur 1299.75µS, Alamnagar 1281.5µS, Barhauna 1426µS, Bhelwa 891.5µS and Barihi 998.33µS. The TDS value of ground water sample varies in between 575.41mg/l to 1198.25mg/l. The average value of Belo was 875.16mg/l, Bishanpur 575.4mg/l, Alamnagar 676.83mg/l, Barhauna 1198.25, Bhelwa 873.5mg/l and Barihi 584.33mg/l. The TDS value of selected water source was within permissible limit for drinking water. The TH value ranged in between 120.83mg/l to 432.25 mg/l. The average value of Belo was calculated as 432.25mg/l that of Bishanpur 214.33mg/l, Alamnagar 182.5mg/l, Barhauna 283.91mg/l, Bhelwa 354.75mg/l and Barihi 120.83mg/l. The value of DO varies in between 5.1mg/l to 6.8mg/l and the value of BOD ranged in between 1.4mg/l to 3.8mg/l. The total alkalinity of ground water sample ranged in between 197.58mg/l to 571.83mg/l. The average value of Belo was 571.83mg/l, Bishanpur 384.91mg/l, Alamnagar 391.41mg/l, Barhauna 463.00mg/l, Bhelwa 197.58mg/l and Barihi 249.66mg/l. The result is mentioned in graph from fig. 01 to fig. 07.

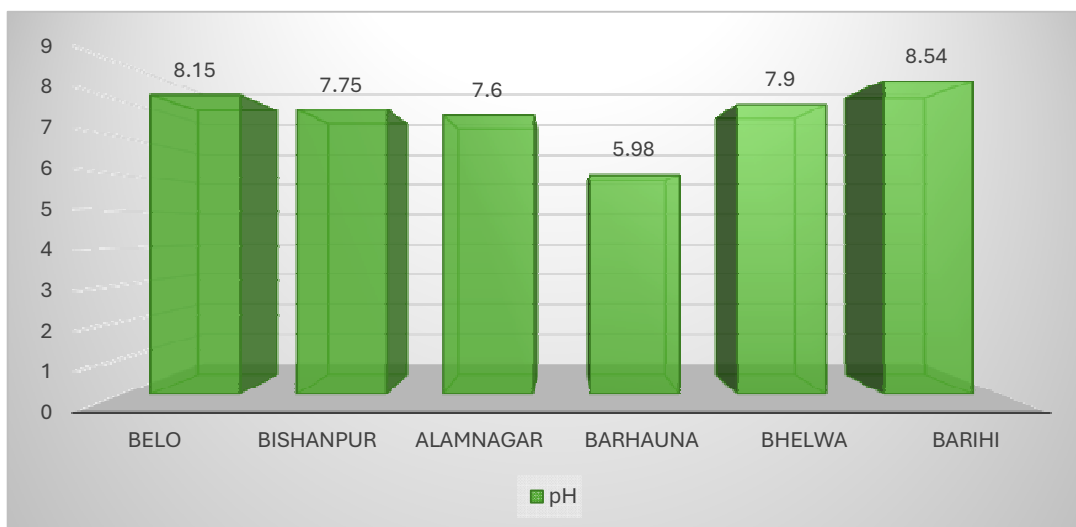


Fig. 01: pH value of ground water from different villages

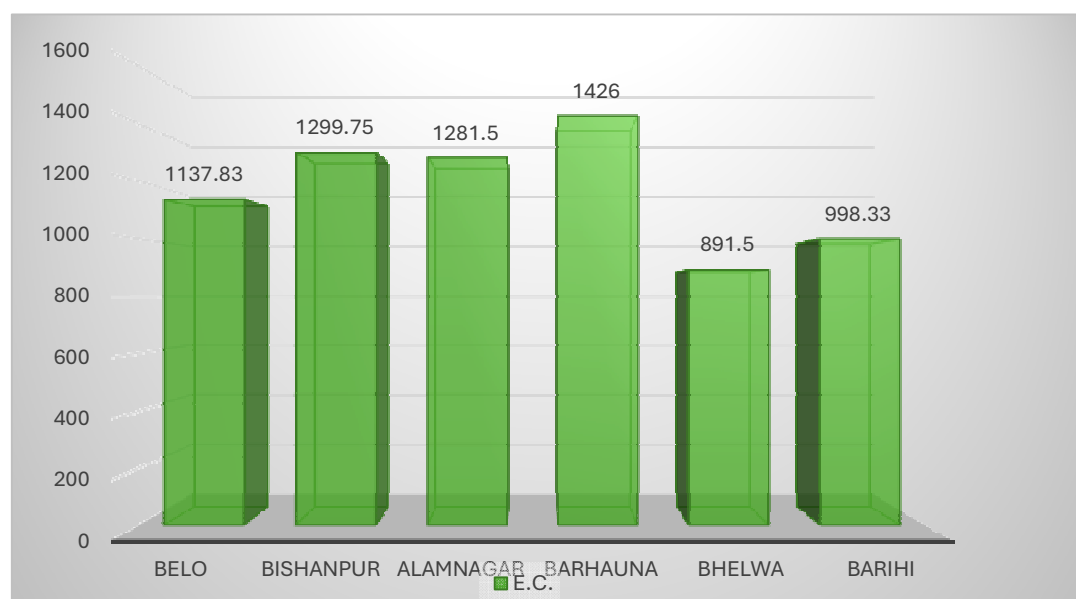


Fig. 02: E.C. value of ground water from different villages

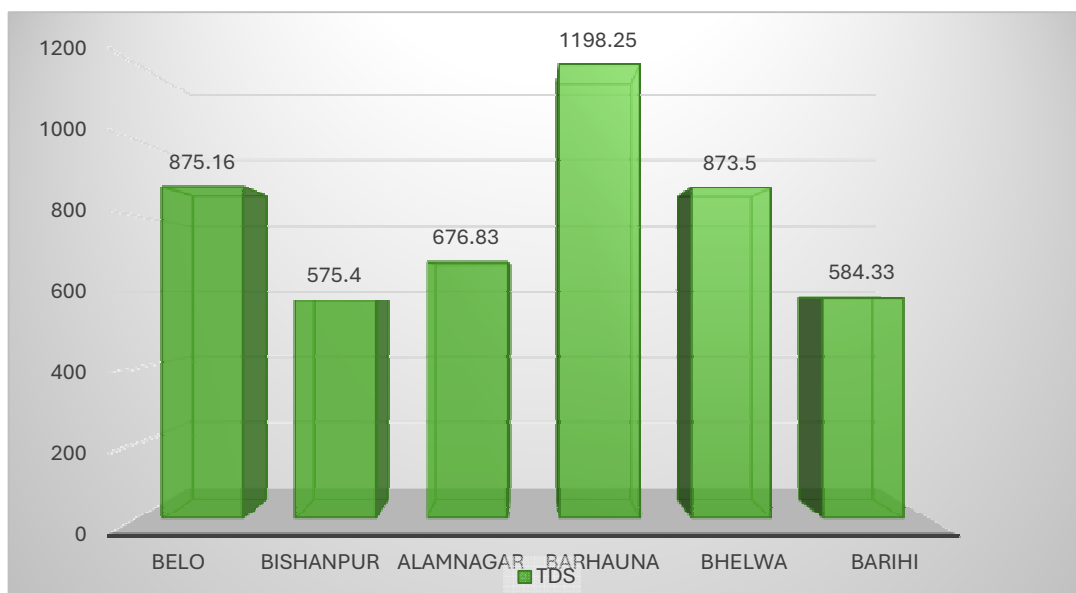


Fig. 03: TDS value of ground water from different villages

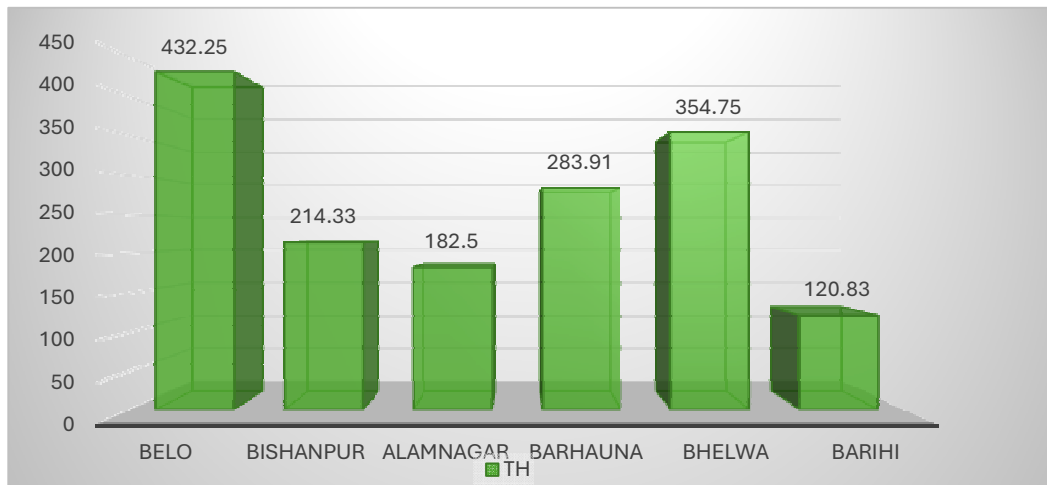


Fig. 04: TH value of ground water from different villages

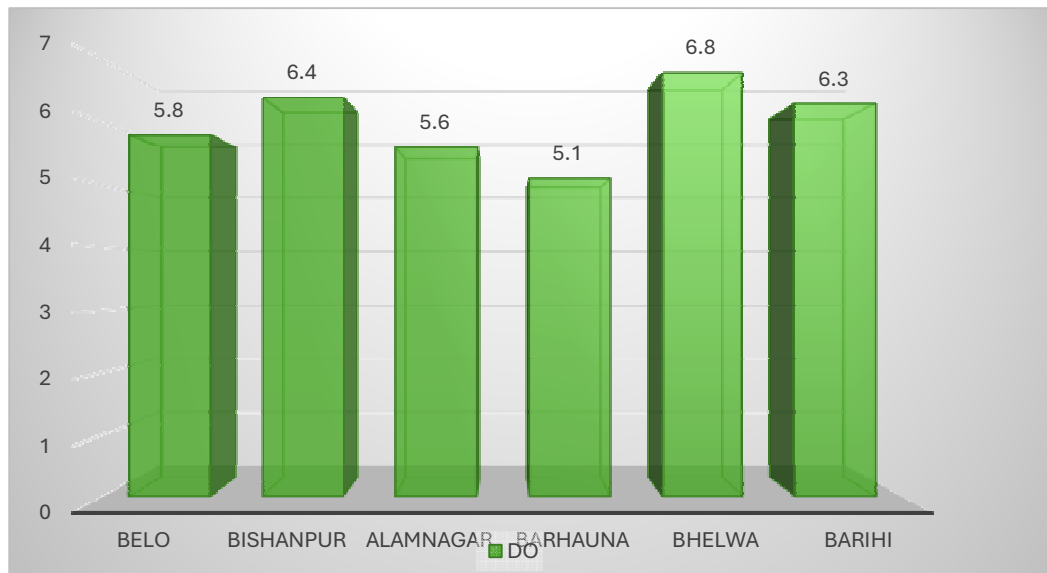


Fig. 05: DO value of ground water from different villages

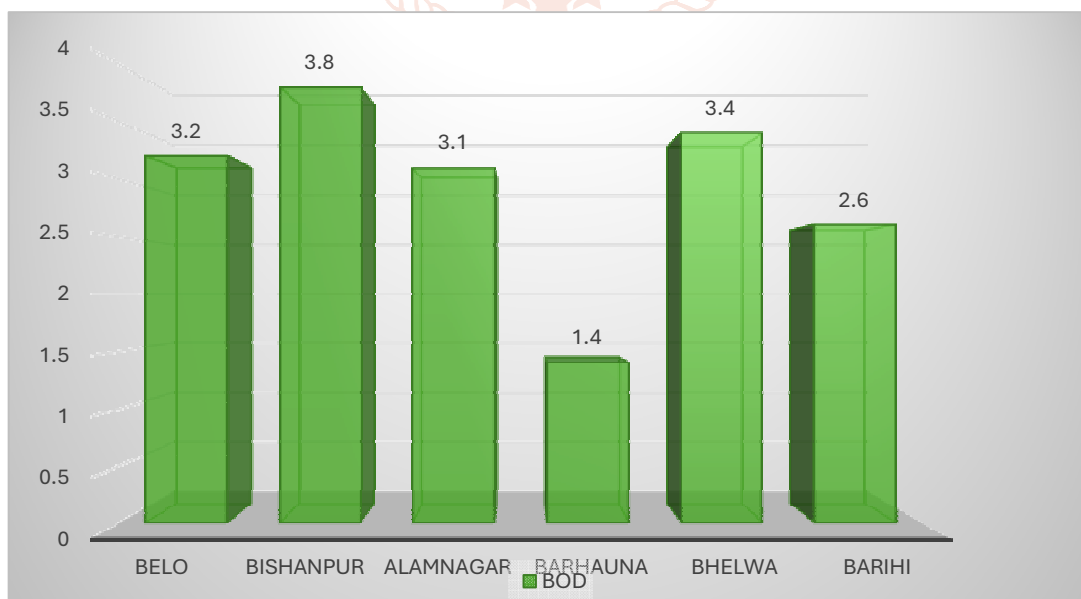


Fig. 06: BOD value of ground water from different villages

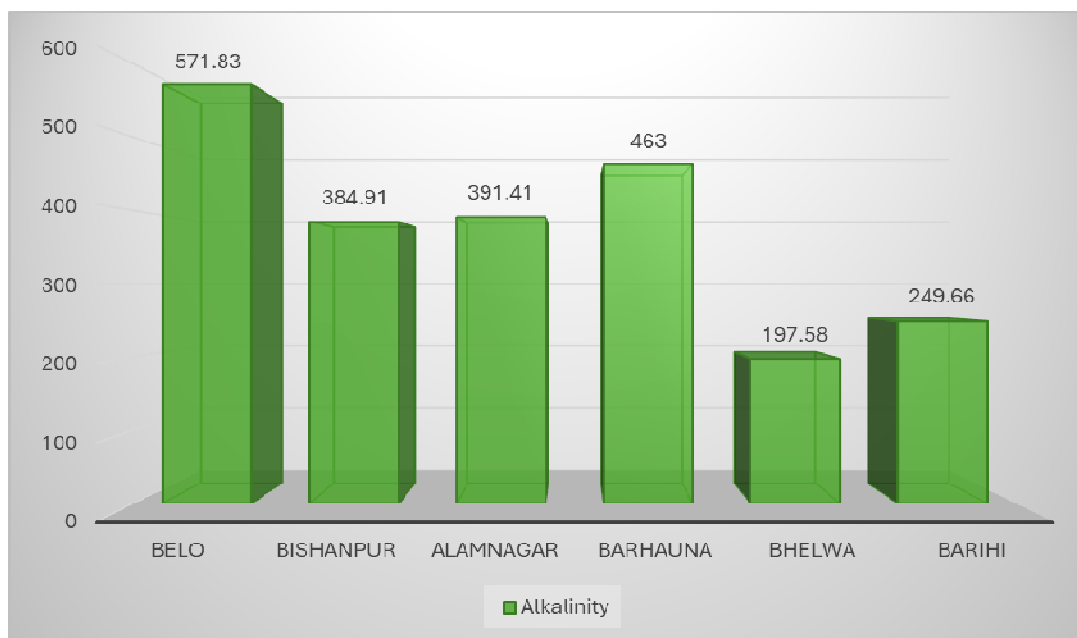


Fig. 07: Alkalinity value of ground water from different villages

Discussion & Conclusion

The physico-chemical quality of ground water from different villages of Madhepura district. The physico-chemical parameters pH, E.C. TDS, TH, DO, BOD and Alkalinity were studied.

The pH value ranged from 5.98 to 8.54. Electrical conductivity of ground water sample varies from 891.5 μ S to 1299.75 μ S. Value was lower in monsoon. The TDS value of ground water sample varies in between 575.41mg/l to 1198.25mg/l. The TDS value of selected water source was within permissible limit for drinking water. The TH value ranged in between 120.83mg/l to 432.25 mg/l. The value of pH, TH and TDS of our study agrees with the values determined by Central ground water board, Govt. of India, 2021-2022. Qureshi et. al. (2021) also reported similar value of pH, TDS, E.C. and TH as observed in our result. The value of DO varies in between 5.1mg/l to 6.8mg/l and the value of BOD ranged in between 1.4mg/l to 3.8mg/l. Ranjana Agrawal (2009) reported the value of DO as 5mg/l. This value also resembles with our result. The total alkalinity of ground water sample ranged in between 197.58mg/l to 571.83mg/l.

References

- [1] APHA 2005 standard methods for the examination of water and waste-water. 21st edition. American Public Health Association Washington.
- [2] Ayoob S. and Gupta A.K. 2006: Fluoride in drinking water a review on the status and stress effects. *Critical reviews in Environmental Science and Technology*. 36: 433-487.
- [3] Dash J.R., Dash P.C. and Patra H.K. 2006: A correlation and regression study on the ground water quality in rural area around Angul-Talcher Industrial zone. *Indian Journal of Environmental Protection*. 26(6): 550-558.
- [4] Indian Standards of Drinking Water (ISI), Specification Bureau of Indian Standards, New Delhi 1993.
- [5] Qureshi S.S., Channa A., Memon S.A., Khan Q., Jamali G.A., Panhwar A. and Saleh T.A. 2021; Assessment of physicochemical characteristics in groundwater quality parameters. *Environmental Technology and Innovation*. Volume 24, pp. 101877.
- [6] Ranjana Agrawal (2009): Study of physico-chemical parameters of groundwater quality of DUDU town in Rajasthan. *Rasayan J. Chem.* vol. 2(4): 969-971.
- [7] Saxena U. and Saxena S. 2013: Statistical assessment of groundwater quality using physico-chemical parameters in Bassi Tehsil of Jaipur District, Rajasthan, India. *Global Journal of Science Frontier Research*. 13(3): 23-31.
- [8] Tuzen M., Saygi K.O., Karaman I. and Soylak M. 2010: Selective speciation and determination of inorganic arsenic in water food and biological samples. *Food and Chemical Toxicology*., 48: 41-46.
- [9] WHO 2006: WHO guidelines for drinking water quality first addendum to third edition, World Health Organisation, Vol. 1.