Environment and Ecology 40 (2A) : 458—463, April—June 2022
ISSN 0970-0420

Assessment of Ground Water Quality of Different Villages of Chaka Block, Prayagraj District

Ajay Patidar, Abhishek James, Ibadaiahun Myrthong, Rahul Nishad

Received 11 November2021, Accepted 19 February 2022, Published on 10 April 2022

ABSTRACT

Groundwater is the primary source of drinking water for more than most of the populations. Being a basic need of human development, health and wellbeing, safe drinking water is an internationally accepted human right which has been enlisted as one of the ten targets in the Millennium Development Goals (MDGS). Deterioration of groundwater quality due to anthropogenic activities is increasing at an alarming rate. The present study was focused on eight villages of Chaka Block at Prayagraj District. Sampling and analysis was conducted as per the guidelines of CPCB. Physico-chemical parameters such as pH, EC, TDS, Total Hardness, Alkalinity, Chloride, Sulfate, Nitrate and Phosphate were analyzed. The result of the analysis revealed that the data of some of the parameters are above the desirable limit but within the permissible limit when compared with the water quality standards of WHO and BIS. It is recommended to carry out a continuous water quality monitoring program and development of effective management practices for utilization of water resources.

Keywords Analysis, Groundwater, Health, Human, Parameters.

Ajay Patidar
M.Sc Environmental Science, College of Forestry, SHUATS

Abhishek James
Assistant Professor, Dept of Environmental Sciences &NRM, SHUATS

Ibadaiahun Myrthong*
Assistant Professor, Dept of Environmental Sciences &NRM, SHUATS, Uttar Pradesh 211007, India

Rahul Nishad
SRF, Forest Research Center for Eco-Rehabilitation, Prayagraj
Email: imyrthong644@gmail.com
*Corresponding author

INTRODUCTION

Water constitutes about 70% of the body weight of almost all living organism. Life is not possible on this planet without water. About 97% of water on earth is salty and only 2.8% is present as fresh water from which about 20% constitutes ground water. Ground water is highly valued because of certain properties not possessed by surface water (Goel 2000). Groundwater quality has become an important water resources issue due to rapid increase of population, rapid industrialization, unplanned urbanization and too much use of fertilizers and pesticides in agriculture (Joarder *et al.* 2008).

Ground water is the major source of drinking water in both urban and rural areas. The domestic sewage and industrial waste are the leading causes of ground water pollution (Garg *et al.* 1999). Fresh water is already a limiting resource in many parts of the world. In the next century, it will become even

more limiting due to increased population, urbanization and climate change (Jackson *et al.* 2001). As a decentralized source of drinking water and myriads of other services for millions of rural and urban families, groundwater as a natural resource plays a crucial role which, accounts for nearly 80% of the rural domestic water needs and 50% of the urban water needs in India (Kumar *et al.* 2005). Ground water is a liberal part of the environment whose importance cannot be neglected especially where high degree of drinking water is dependent on ground water (Singh 2006). Fresh water is finite resource, essential for agriculture, industry and even human existence, without fresh water of adequate quantity and quality, sustainable development will not be possible (Kumar 1997).

The ground water is cleaner and pollution free as compared to surface water. But during the last decade, ground water get polluted drastically because of increased human activities (Jamal 1998, Singh 2006, Mishra and Bhatt 2008, Murhekar 2011). In the present Era, it has become a necessity to protect the groundwater resources against pollution (natural or anthropic), because they could have negative effects on the human health (Srinivas *et al.* 2011). contamination of ground water resources has a substantial risk to the natural environment and to the health of local residents who use these water resources for drinking and other domestic purposes (Mor *et.al.* 2006). Concentrations of all kinds of pollutants have an influence on the water quality and also determine the use of water. It is, therefore, necessary to monitor water quality, understand the chemical characteristics and provide a reliable assessment of water quality (Zhang *et al*. 2010).

Table 1. Sampling sites.

Sl. No.	Villages	Latitude	Longitude
1	Amiliya (S1)	25^0 40’ 07” N	81^0 82’ 83” E
2	Arail Uparhar (S2)	25^0 39’ 48” N	81^0 80’ 45” E
3	Bagbana (S3)	25^0 39’ 38” N	81^0 80’77” E
4	Balapur (S4)	25^0 39’ 45” N	81^0 81’ 18” E
5	Baswar (S5)	25^0 39’ 48” N	81^0 80’ 45” E
6	Bhandra Umarganj (S6)	25^0 39’ 37” N	81^0 80’ 35” E
7	Bongi (S7)	25^0 38’ 57” N	81^0 80’ 78” E
8	Baramar (S8)	25^0 38’ 74” N	81^0 80’ 61” E

MATERIALS AND METHODS

The study area is located at Chaka Block, Prayagraj District. Prayagraj is located in south eastern part of Uttar Pradesh at an elevation of 98 m from the mean sea level (Fig. 1). Prayagraj district covers an area of 5246 sq kms. Administratively the district comprises of 8 Tehsil and 20 blocks with a population of 4941510 people. Chaka block has 49 villages and lies on the Prayagraj road approximately skims away from the industrial area of Naini on the outskirts of Prayagraj across the river Yamuna, located at 25.170 North latitude and 81.560 East longitudes in Prayagraj District of Uttar Pradesh. The main occupation of the villagers of Bara Tehsil was agriculture and there was 200 acres of farmland. The major sources of drinking water in these areas are hand pumps, wells and tube wells.

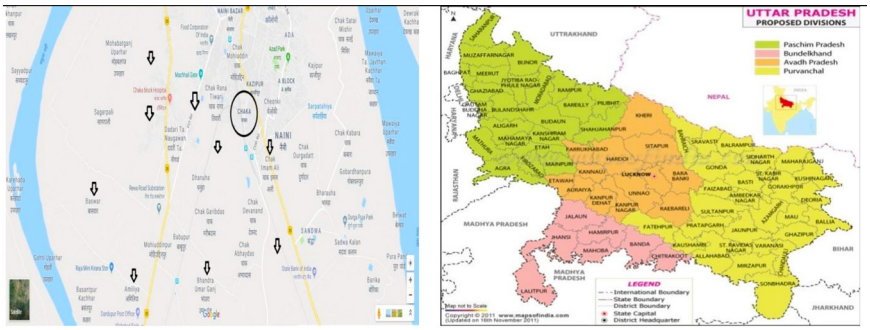

Fig. 1. Map of study area.

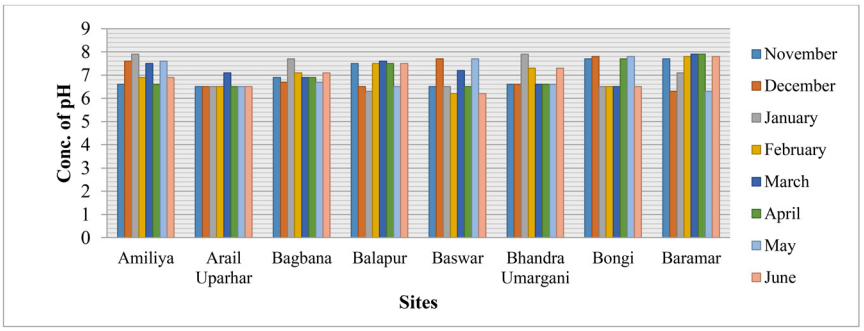

Fig. 2. Graphical representation of pH at different sites.

Water samples were drawn from hand pumps during Nov 2017-June 2018, at an interval of one month to know the variability. The depth of hand pumps ranged from 90-130 feet in all these stations. The samples were collected as per the Standard Methods of Water Examination, APHA (1991). All the sampling and analysis were carried out as per the CPCB guidelines.

RESULTS AND DISCUSSION

The results and the statistical measures revealed that the pH of all the groundwater samples of the study area was within the permissible limits. The maximum value of pH was 7.9 recorded at Bhandra Umarganj in the month December whereas the minimum value of pH was 6.2 recorded at Baswar in the month of February. Perusal of the data revealed that the maximum value of EC was 0.85 recorded in the month of December at Amiliya and the minimum value was 0.61 recorded at Arail Uparhar in the month of March whereby an increase in pH increases the EC of water and decrease in pH decreases the EC of water. Increase in EC also indicates the presence of polluting matter (Myrthong *et al.* 2014). The maximum value of TDS was observed at Baramar in the month of June with 340 and the minimum value was 331 recorded at Bhandra Umarganj in the month of March. The maximum value of total hardness was observed at Amiliya with 150 in the month of May and the minimum value was recorded in the month of November at Amiliya with 102 (Fig. 2–5). Total hardness was found to be much higher than the desirable limit but are still within the permissible limit when compared with Bureau of Indian standards. Increased level of calcium or magnesium along with their carbonates, sulfates and chlorides will increase the hardness in water (Kaur *et al.* 2017). The maximum value of alkalinity was observed at Baramar in the month of January with 389 and the minimum alkalinity was

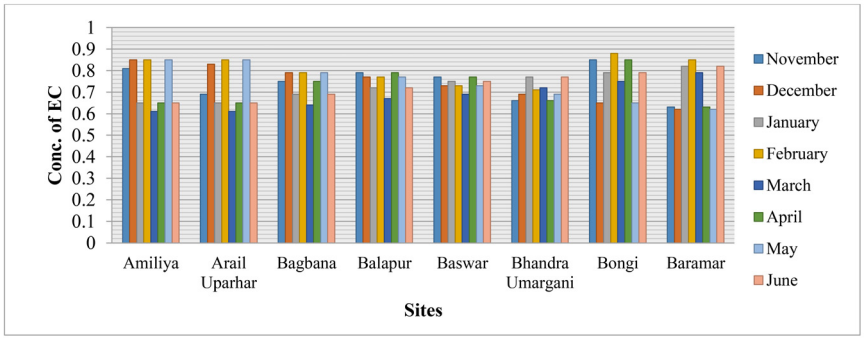

Fig. 3. Graphical representation of EC at different sites.

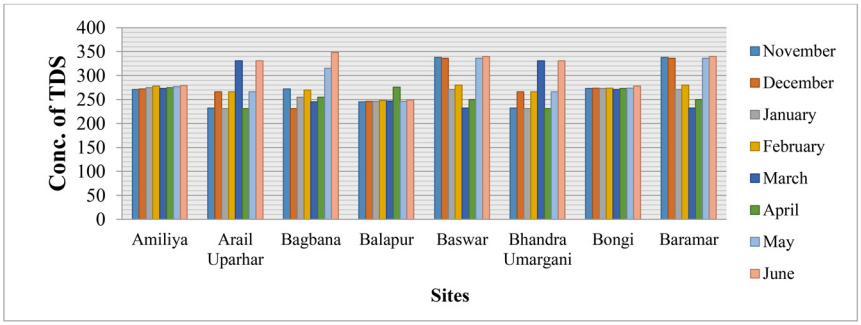

Fig. 4. Graphical representation of TDS at different sites.

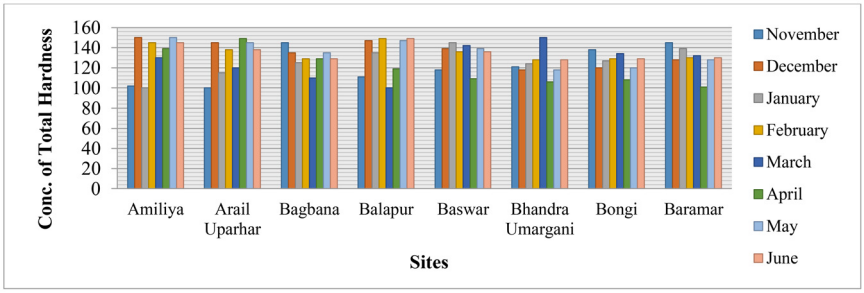

Fig. 5. Graphical representation of total hardness at different sites.

observed at Arail Uparhar in the month of June. Increased level of OH, CO_3, HCO_3 ions will increase the alkalinity of water (Kaur *et al.* 2017). The maximum value of Chloride was observed at Amiliya with 99 in the month of January and minimum was 51 in the month of November at Balapur (Fig. 6). All the values of chloride are within the permissible limit as prescribed by BIS. Inorganic fertilizers and irrigation drainage can increase the level of chloride in water. The maximum value of sulfate was recorded Amiliya with 99 in the month of January and the maximum value of sulfate was recorded at Bhandra Umarganj with 35 in the month of June. It is important to check the concentration of sulphate regularly as its increase adds to the increase of electrical conductivity of water. The maximum value of nitrate was 50 recorded at

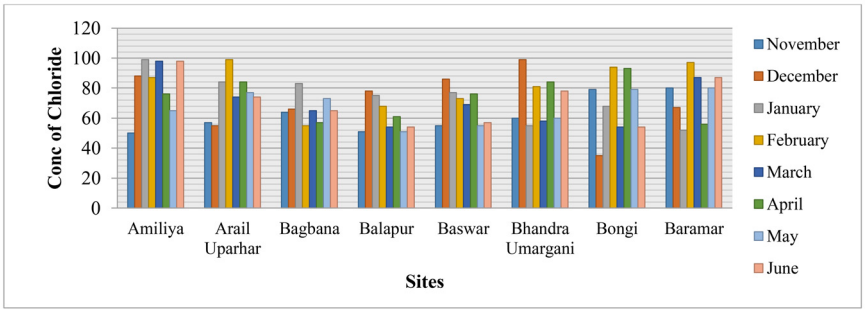

Fig. 6. Graphical representation of chloride at different sites.

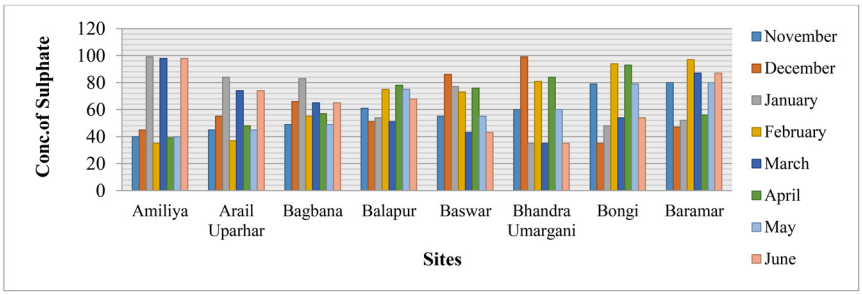

Fig. 7. Graphical representation of sulfate at different sites.

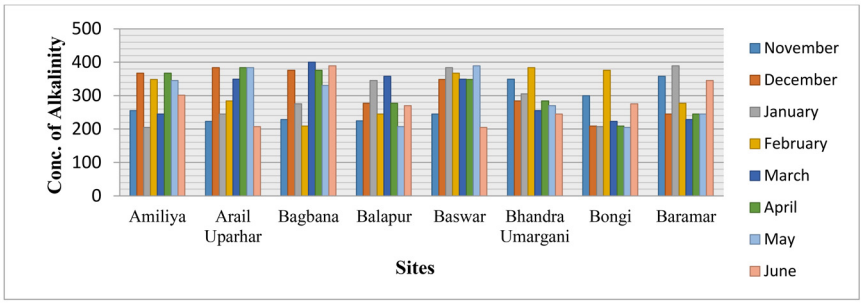

Fig. 8. Graphical representation of alkalinity at different sites.

Baswar in the month of April and the minimum value was 35 recorded at Amiliya in the month of December. As far as nitrate is concern the concentration is slightly more than the desirable limit. The maximum value of phosphate was observed at Bhandra Umarganj in the month of June and the minimum value was 30 recorded in the month of November at Baswar. The average concentration of phosphate were higher than the desirable limit which is a caused of concern, The maximum value was recorded in the summer presence of phosphates in groundwater may be attributed to natural minerals or through pollution by application of fertilizer, sewage and industrial waste (Alemu *et al.* 2015) (Fig. 6–10).

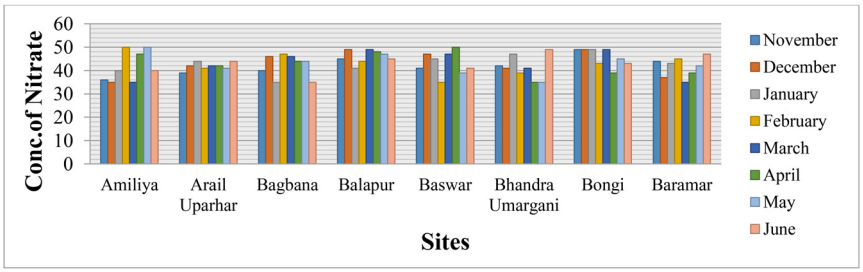

Fig. 9. Graphical representation of nitrate at different sites.

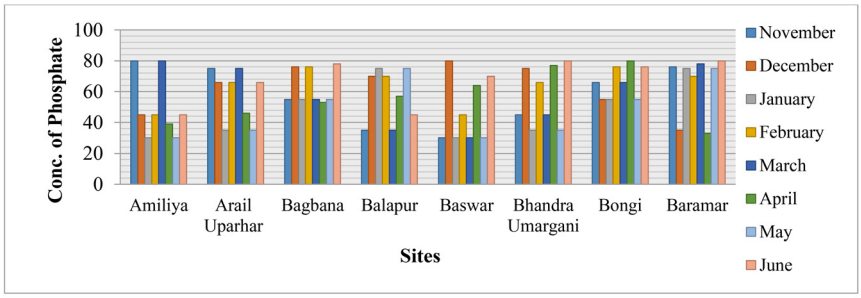

Fig. 10. Graphical representation of phosphate at different sites.

CONCLUSION

From the present study it can be concluded that at some sites of the selected villages of Chaka Block the water quality is contaminated since their values are higher than the desirable limit prescribed by WHO and Bureau of Indian standards. It was observed that there is a considerable variation in the values of some of the parameters during summer and winter revealing that there is an influence of climatic factors including rock water interaction as well as anthropogenic activities, such as increase in pumping, excessive use of fertilizers, and discharge of industrial effluents. Although the findings of the present research reveals that all the values are within the permissible limit regular monitoring and analysis is required to check the suitability of water since groundwater is the only source of drinking water for the people in the this area.

ACKNOWLEDGEMENT

I would like to thank the Head of Department of Environmental Science for all the support rendered throughout the analysis, I would also like to thank my parents, friends and each and everyone involved in the successful completion of this work.

REFERENCES

Alemu ZA, Teklu KT, Alemayehu TA, Balchu KH, Mengesh SD (2015) Physico-chemical quality of drinking water sources in Ethiopia and health impact: A retrospective study. Environm Syst Res 4 : 22-30.

APHA (1991) Standard Method for the examinations of water and wastewater. 14th ed. American Public health Association, pp 1189-1193.

Garg VK, Chaudhary A, Dahiya D S (1999) An appraisal of groundwater quality in some village of district Jind. *Ind J Environ Prot* 19 : 267-272.

Goel PK (2000) Water Pollution - Causes, Effects and Control, New Age Int (P) Ltd, New Delhi.

Jackson RB, Carpenter SR, Dahm CM, Knight DMM, Naiman RJ, Postel SI, Running SW (2001) Water in Changing world. issues in ecology. 9, Washington, DC: *Ecol Soc Am* 2 : 1027-1045.

Jamal AA (1998) Physico -chemical studies in Uyyakondan channel water of river Cavery. *Pelagia Res Lib* 17 : 111.

Joarder MA, Raihan F, Alam JB, Hasanuzzaman S (2008) Regression analysis of groundwater quality data of Sunamjang District, Bangladesh. *Int Jour. Environ Res* 2 : 291-296.

Kaur T, Bhardwaj R, Arora S (2017) Assessment of groundwater quality for drinking and irrigation purposes using hydrochemical studies in Malwa region, southwestern part of Punjab, India *Appl Water Sci* 7: 3301–3316.

Kumar N (1997) A View on Freshwater environment. *Ecol Env Cons.* 3 : 3-4.

Kumar K, Singh RD, Sharma KB (2005) Water resources of lndia. *Curr Sci* 89 : 794-811.

Mishra A , Bhatt V (2008) Physico-chemical and microbiological analysis of Linder ground water in V.V. Nagar and Nearby Places of Anand District, Gujarat, lndia. E-J Chem 5 : 487-492.

Mor S, Ravindra K, Dahiya RP, Chandra A (2006) Leachate characterization and assessment of groundwater pollution near municipal solid waste landfill site. *Environme Monit Assess* 4 : 325-334.

Murhekar CH (2011) Determination of physio -chemical parameters of surface water sample in and around Akot city *Int J Res Chem Env* 1 : 183-187.

Myrthong I, Sharma R, Synrem G, Kumar S (2014) River water quality: A case study of Yamuna at Allahabad *Asian J Environm Sci* 9 : 62-67.

Singh V (2006) Physico-chemical examination of water, sewage and Industrial effluents. *Res Chem Env* 10 : 62-66.

Srinivas P, Kumar P, Srinivatas GN, Prasad A , Hemalatha T (2011) Generation of groundwater quality index map a case study,m *Civil Environm Res* 1 : 9-21.

Zhang X, Wang Q, Liu Y, Wu J, Yu M (2010) Application of multivariate statistical techniques in the assessment of water quality in the Southwest new territories and Kowloon, Hong Kong *Environ Monit Assess* 173 : 17-27.