

Assessment of drinking water quality: A case study of Barara block of Ambala district, Haryana

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ABSTRACT

The aim of this study was to assess the physico-chemical parameters of groundwater of Barara block of Ambala district during pre-monsoon and monsoon session, 2015. For this a total 30 ground water samples were collected from 30 different villages of Barara block randomly from both the session. The pH, turbidity, total alkalinity, chloride, total hardness, sulphate and COD of groundwater varied from 6.6-8.5, 0.1-0.9 NTU, 37.36-101.55 mg/l, 8.9-71.95 mg/l, 210.4-280.4 mg/l, 1.5- 10.45 mg/l and 25.28-30.46 mg/l respectively. The obtained results clearly revealed that groundwater quality of Barara block was relatively safe for domestic purposes as most of the tested parameters were found within the Bureau of Indian Standards (BIS).

Keywords: Drinking water, Groundwater, Water quality, Physico-chemical, BIS.

INTRODUCTION

Water in its natural form contains various components and its quality keeps on changing from time to time and place to place [1]. The contamination of water is directly linked to the contamination of our environment [2]. Unlike others it is very critical, if an aquifer got polluted and is very difficult, expensive and time consuming affair to clean it up and may remain unusable for decades [3]. Potable water is derived either from surface sources e.g. rivers, lakes, streams, ponds etc. or underground sources e.g. aquifers, wells etc. However, water from either source is rarely fit for drinking [4]. The problems of ground and surface water pollution have reported by various researchers [5,6,7,8,9,10,11,12,13,14,15,16,17,18]. In order to evaluate the groundwater quality of the study area, a systematic study was conducted. The aim of the present study is to improve the current understanding and level of pollution in groundwater at different villages of Barara block.

MATERIALS AND METHODS

Description of Study Area:

The geographical location of Barara block of Ambala district is shown in figure 1. For the study 30 different villages of Barara block were selected randomly. Physico-chemical parameters of the groundwater were analyzed according to the standard methods [19]. A total 30 groundwater samples were collected from 30 different villages (i.e. Salhapur, Adhoyi, Buddian, Barara, Khan Ahmadpur, Rajouli, Dheen, Gagan Pur, Hema Majra, Rajokheri, Paplotha, Sherpur, Simbla, Moujgharh, Mullana, Ponti, Dhonora, Subri, Dliani, Sirasgarh, Jahangirpur, Patti Bagheru, Tangail, Sohana, Nahra, Rukri, Buhian, Duliana, Holi, Sarakpur) of Barara block of Ambala district during pre-monsoon and monsoon seasons of the year 2015.

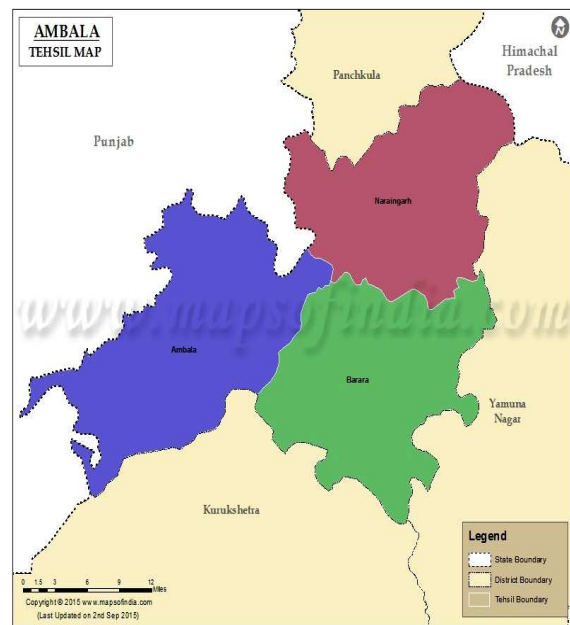


Figure: 1 Geographical location of Barara block of Ambala district

Sampling and Analytical Methods:

Groundwater samples were collected in pre-cleaned, sterilized, plastic bottles of one litre capacity. Water samples were collected directly from the tube wells after running the tube well for about 2-3 minutes. All the water samples were analyzed in the Environmental Engineering Laboratory of Civil Engineering Department, MMU, Mullana. All

the reagents used in the present study were of analytical reagent (AR) grade and distilled water was used for experimental purpose. A comparison of groundwater quality parameters of Barara block as observed with drinking water quality standards (BIS) are presented in Table 1.

RESULTS AND DISCUSSION

pH:

In the present study the pH of the ground water samples varied from minimum 6.6 at sampling station 17 (Monsoon) to maximum 8.5 at sampling station 7 (Pre-monsoon), shown in figure 2. The overall analysis results shows that the pH level of groundwater were within the desirable limit as prescribed by BIS.

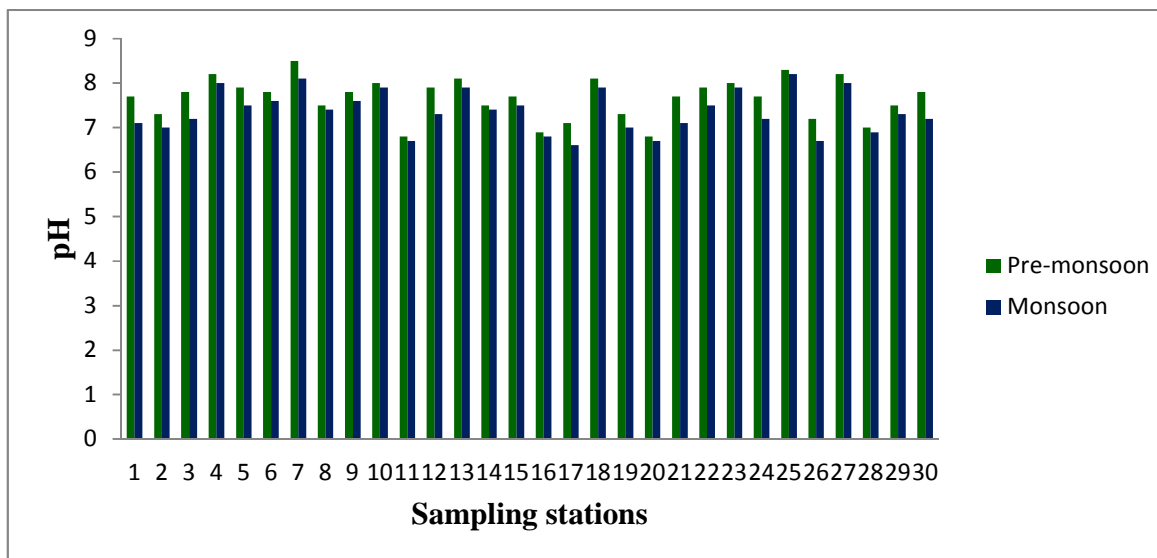


Figure: 2 pH values of groundwater at sampling stations

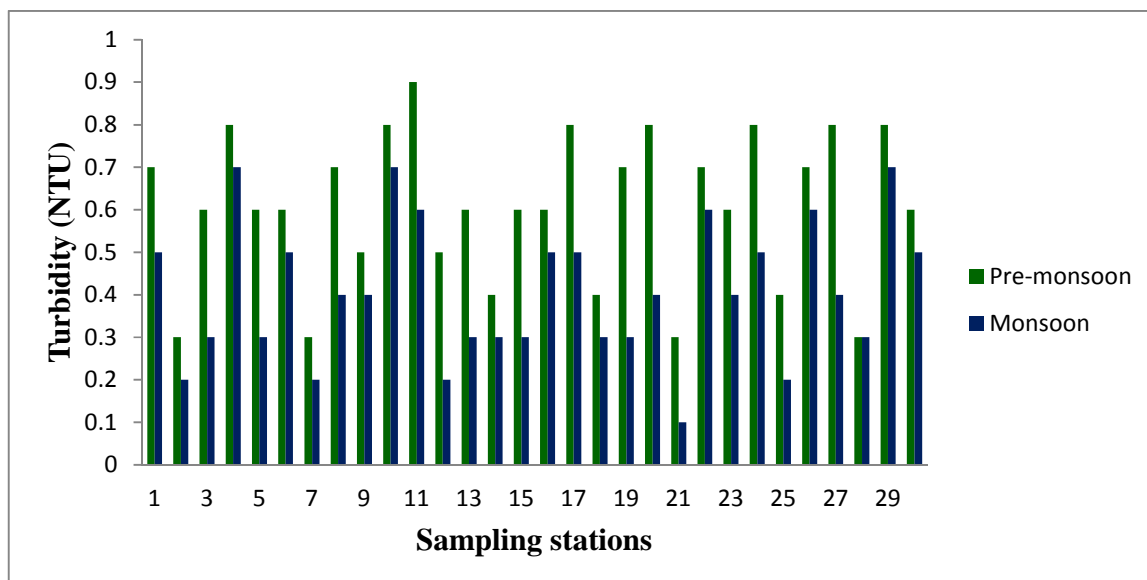


Figure:3Turbidity of ground water at sampling stations

Turbidity:

In the present study the turbidity was observed in the range of 0.1 to 0.9 NTU. The turbidity of the groundwater samples varied from minimum 0.1 NTU at sampling station 21 (Monsoon) to maximum 0.9 NTU at sampling station 11 (Pre-monsoon), shown in figure 3. The overall results shows that the turbidity level of groundwater were within the permissible limits as prescribed by BIS.

Total Alkalinity (TA):

The total alkalinity of the ground water samples varied from minimum 37.36 mg/l at sampling station 16 (Monsoon) to maximum 101.5 mg/l at sampling station 28 (Pre-monsoon), shown in figure 4. The overall analysis results shows that the total alkalinity level of groundwater were within the permissible limit as prescribed by BIS.

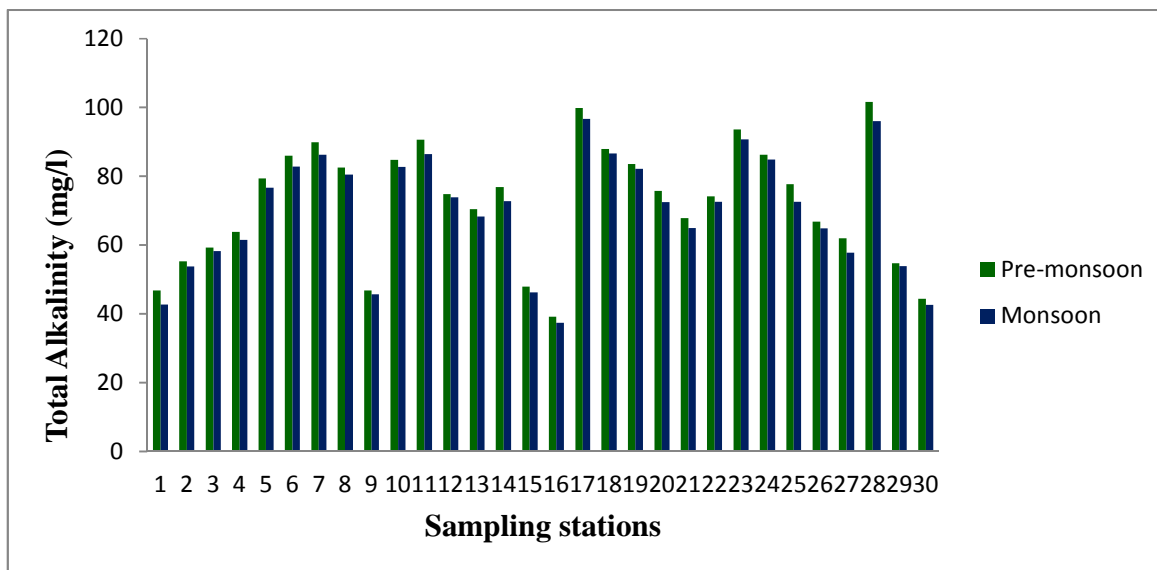


Figure:4 Total alkalinity of ground water at sampling stations

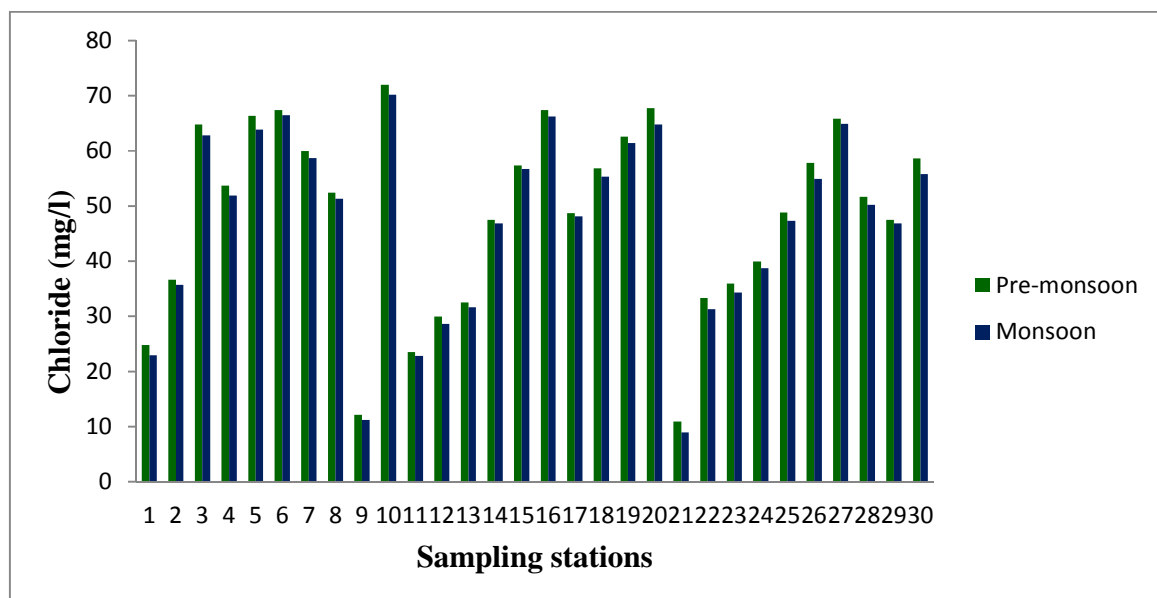


Figure: 5 Chloride concentration of ground water at sampling stations

Chloride (Cl⁻):

The chloride concentration in the ground water samples varied from minimum 8.9 mg/l at sampling station 21 (Monsoon) to maximum 71.95 mg/l at sampling station 10 (Pre-monsoon), shown in figure 5. The chloride concentration of groundwater samples found to be less than 250 mg/l as standards prescribed by BIS. The overall analysis results shows that the chloride content of groundwater were within the permissible limits as prescribed by BIS.

Total Hardness (TH):

The total hardness of the ground water samples varied from minimum 210.4 mg/l at sampling station 18 (Monsoon) to maximum 280.4 mg/l at sampling station 10 (Pre-monsoon), shown in figure 6. The overall analysis results shows that the total hardness level of groundwater were within the permissible limits as prescribed by BIS.

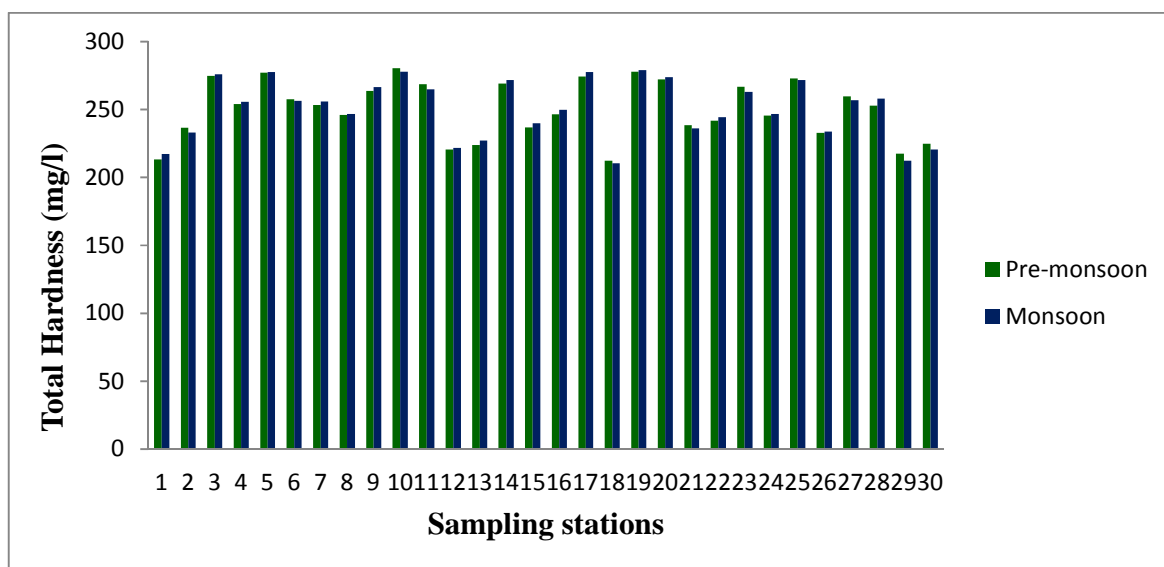


Figure: 6 Total hardness of ground water at sampling stations

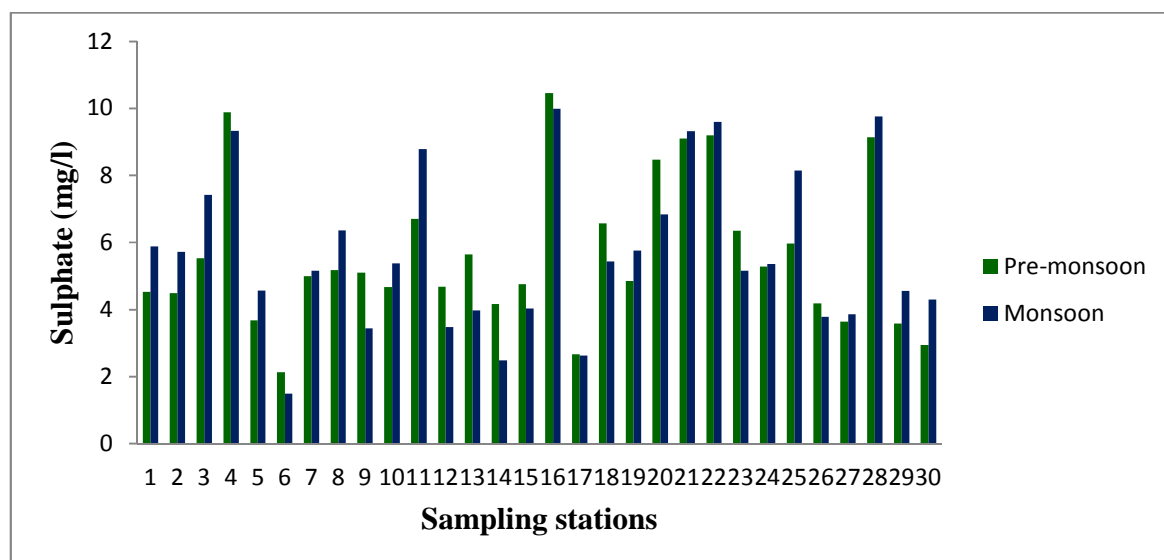


Figure: 7 Sulphate content of ground water at sampling stations

Sulphate (SO₄²⁻):

The sulphate concentration of the groundwater samples varied from minimum 1.50 mg/l at sampling station 6 (Monsoon) to maximum 10.45 mg/l at sampling station 16 (Pre-monsoon), shown in figure 7. The overall analysis results shows that the sulphate content of groundwater were within the permissible limits as prescribed by BIS.

Chemical Oxygen Demand (COD):

The COD of the analysed groundwater samples varied from minimum 25.28 mg/l at sampling station 26 (Pre-monsoon) to maximum 30.46 mg/l at sampling station 9 (Monsoon) shown in figure 8. The overall analysis results shows that during Pre-monsoon and Monsoon the COD levels were above the permissible limits.

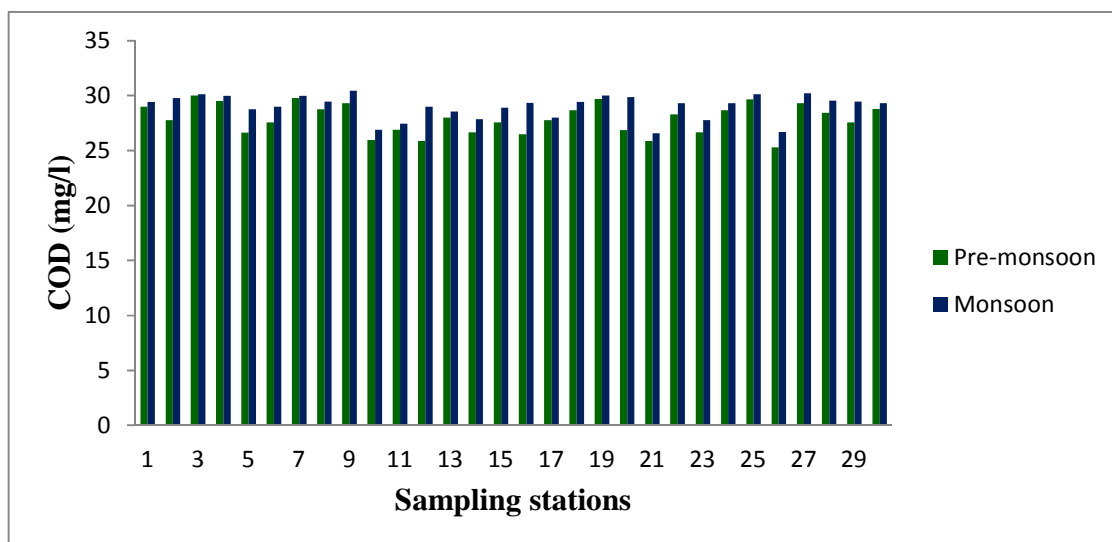


Figure: 8 Chemical oxygen demand of ground water at sampling stations

Table: 1 Comparison of water quality parameters of groundwater of Barara block with BIS drinking water quality standards

Parameters	Observed range of samples		Bureau of Indian Standards	
	Minimum	Maximum	Desirable limit	Maximum limit
pH	6.6	8.5	6.5-8.5	No Relaxation
Turbidity (NTU)	0.1	0.9	1	5
Total Alkalinity (mg/l)	37.36	101.55	200	600
Chloride (mg/l)	8.9	71.95	250	1000
Total Hardness (mg/l)	210.4	280.4	200	600
Sulphate (mg/l)	1.50	10.45	200	400
COD (mg/l)	25.28	30.46	-	10

CONCLUSION

In this study characterization of the physico-chemical parameters of groundwater collected from thirty tube wells at 30 different locations of Barara block was carried out. To assess the quality of ground water each parameter was compared with the standard limits as prescribed by Bureau of Indian Standard (BIS). From the study it can be concluded that groundwater is safe for drinking purposes from the point of view of levels of pH, turbidity, total alkalinity, chloride and sulphate. The total hardness varied in between 210.4-280.4 mg/l, which indicates that groundwater in the deep aquifer is exceeding the desirable limit (200 mg/l) and falling under the maximum limit (600 mg/l), but the levels of COD at all the sampling stations are exceeding the maximum limit of BIS. Therefore, it is suggested to the localities to soften the tube well water before consumption and recommends to find out the source of contaminants which are responsible for contributing higher COD values.

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