

# Physicochemical Analysis of Groundwater sample of Basri Khurd Village of Neemkathana block of Sikar, India

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## Abstract

Physico-chemical analysis of groundwater of Basri Khurd village of Neemkathana block is taken to evaluate its suitability for domestic use. Groundwater samples were collected from the bore well for the assessment period from Jan-2016 to Dec-2016. Physico-chemical parameters pH, total hardness, total alkalinity, chloride, nitrate, sulphate, fluoride, and TDS are selected. Methods were used as suggested by BIS (IS 10500: 2012 estimation of acceptable limits and permissible limits for selected parameters. Results for fluoride nitrate and TDS parameters were above the acceptable limit, as the value of any parameter is more or less than the selected standard then the sample is contaminated, so the groundwater of Basri Khurd village is found not suitable for human health for the assessment period.

**Keywords:** Groundwater, physio-chemical parameters, WHO, BIS, TDS

## Introduction

Britannica dictionary has defined water "A substance composed of the hydrogen and oxygen element and existing in gaseous, liquid, and solid states. It is one of the most plentiful and essential compounds. A tasteless and odourless liquid at room temperature, it has the important ability to dissolve many other substances. Indeed, the versatility of water as a solvent is essential to living organisms". Approximately the world's one-third population using groundwater for drinking purposes (Nickson *et al.*, 2005). Freshwater is required for domestic, agriculture, industrial, and for all commercial purposes, for human existence, freshwaters adequate quality as well as well as quantity are required (Kumar, 1997). Bureau of Indian Standards, developed Indian standards for drinking water BIS(SI 10500:2012), consists of six tables such as Organoleptic and Physical Parameters, General Parameters Concerning Substances Undesirable in Excessive Amounts, Parameters Concerning Toxic Substances, Parameters Concerning Radioactive Substances, Pesticide Residues Limits, and Test Method and Bacteriological Quality of Drinking Water

Table 1: Comparison of Water Quality Standard in India

Parameter	BIS (IS 10500: 2012)		BIS (IS10500: 1991)		ICMR (1975)	CPCB
	Acceptance Limit	Permissible Limit	Acceptance Limit	Permissible Limit		
Ph	6.5 to 8.5	No relaxation	6.5-8.5	No relaxation	6.5-9.2	6.5-8.5
TDS (mg/L)	500	2000	500	2000	-	-
Total hardness (as CaCO <sub>3</sub> ) (mg/L)	200	600	300	600	600	600
Total alkalinity (as CaCO <sub>3</sub> ) (mg/L)	200	600	200	600	No	600
Nitrate (mg/L)	45	No relaxation	45	100	100	-
Sulphate (mg/L)	200	400	200	400	400	-
Fluoride (mg/L)	1	1.5	1	1.5	1.5	1.5
Chloride (mg/L)	250	1000	250	1000	1000	1000

### Study Area

Neemkathana block is over-exploited, and the hydrological formation of Basri Khurd village is Quartzite. Geographical location Basri Khurd village 27.7284° N, 75.7594° with area of 589 hectares. Neemkathana is the nearest town to Basri Khurd the village and distance between is 17 km away. Due to unavailability of surface water people of 1,596 are dependent on groundwater.

### Material and Methods

Table 1: List of Parameters and Methods of Determination

Parameters	Methods of determination
pH	pH Meter
TH (mg/L)	EDTA Method
Ca (mg/L)	Titration Method
Mg (mg/L)	Titration Method
TDS (mg/L)	Potentiometric Method
F <sup>-</sup> (mg/L)	UV Spectrophotometric Method
SO <sub>4</sub> <sup>2-</sup> (mg/L)	Turbid meter Method
NO <sub>3</sub> <sup>-</sup> (mg/L)	Spectrophotometer

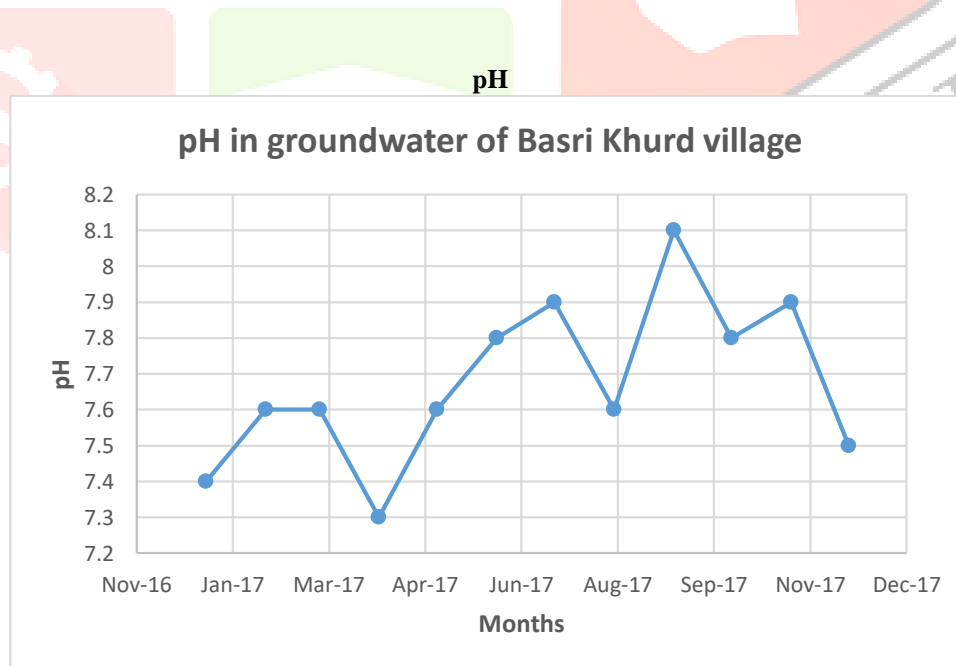
## Results and Discussions

### Assessment of groundwater of Basri Khurd village in Neemkathana block

Groundwater samples from Basri Khurd village were collected for the assessment period of Jan-2017 to Dec-2017 and analyzed for selected physico-chemical parameters. The results of physico-chemical parameters shown in the table2.

**Table: 2 Water testing data of Basri Khurd village in Neemkathana block**

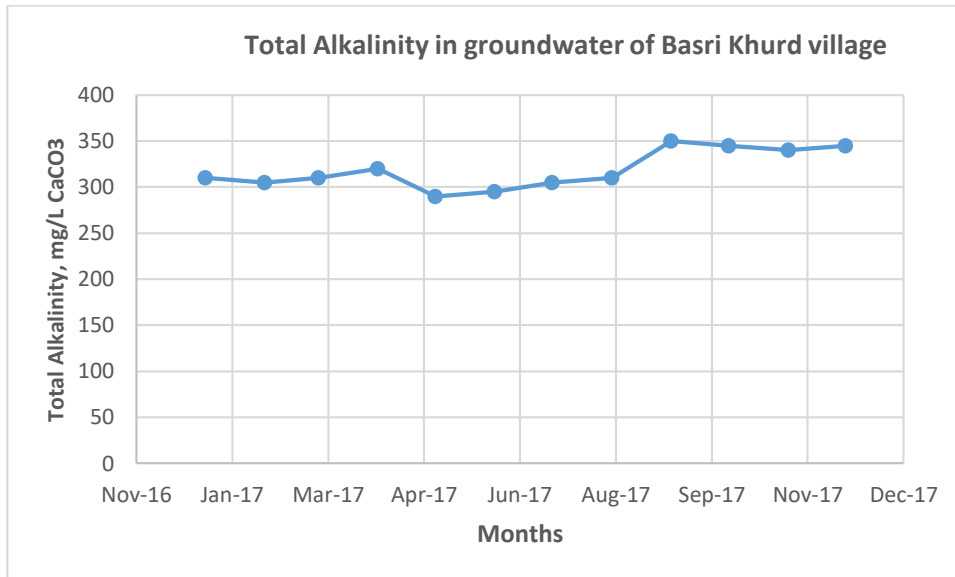
Water testing of Basari Village in Neemkathana								
Month	PH	Total Alkalinity, mg/L CaCO <sub>3</sub>	Total Hardness, mg/l	Chloride, mg/L	Sulphate, mg/L	Nitrate, mg/L	Fluoride, mg/L	TDS, mg/L
Jan-16	7.4	310	450	140	45	65	1.04	1120
Feb-16	7.6	305	425	105	45	70	1.05	1050
Mar-16	7.6	310	410	120	42	68	1.22	1110
Apr-16	7.3	320	415	125	40	70	1.6	1095
May-16	7.6	290	405	120	45	68	1.25	1090
Jun-16	7.8	295	385	140	40	71	1.54	1105
Jul-16	7.9	305	390	135	45	75	1.55	990
Aug-16	7.6	310	415	130	45	69	1.57	975
Sep-16	8.1	350	395	150	53	70	1.5	985
Oct-16	7.8	345	390	150	45	69	1.8	970
Nov-16	7.9	340	405	145	50	71	1.75	980
Dec-16	7.5	345	395	120	40	68	1.8	995



**Figure 1: pH of groundwater in Basri Khurd village of Neemkathana block**

Figure 1 shows that the pH of the groundwater of Basri Khurd village found within (BIS IS 10500: 2012) acceptable limit of 6.5 – 8.5 for the assessment year from Jan-2017 to Dec-2017. A minimum of 7.3 was observed in the month of April-2017, and a maximum of 8.1 was observed in the month of Sept- 2017.

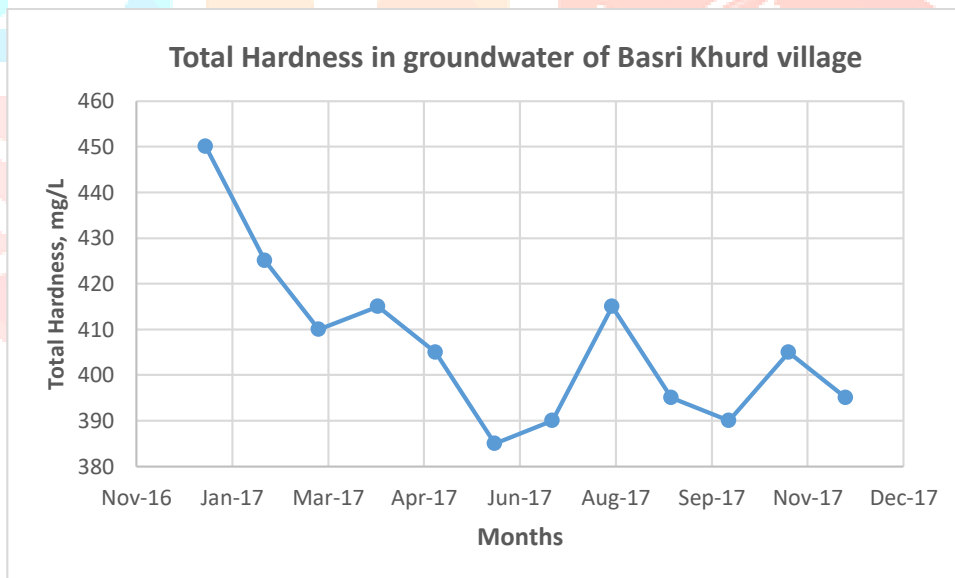
**Total alkalinity**



**Figure 2: Total alkalinity in groundwater of Basri Khurd village in Neemkathana block**

Figure 2 shows that the total alkalinity for the groundwater of Basri Khurd village was found beyond the BIS (IS 10500: 2012) acceptable limit of 200 mg/L, but all the results are within the permissible limit of 600 mg/L, the results of the test indicate that the value is maximum 350 mg/L in the month of Sept-2017 while minimum 290 mg/L in the month of May-2017.

**Total hardness**



**Figure 3: Total hardness of groundwater in Basri Khurd village of Neemkathana block**

Figure 3 shows the assessment of parameter total hardness for the assessment period and the results state that this parameter was found more than the BIS standard. the maximum total hardness of 450 mg/L was found in the month of Jan- 2017 and the minimum total hardness of 385 mg/L is observed in the month of June- 2017.

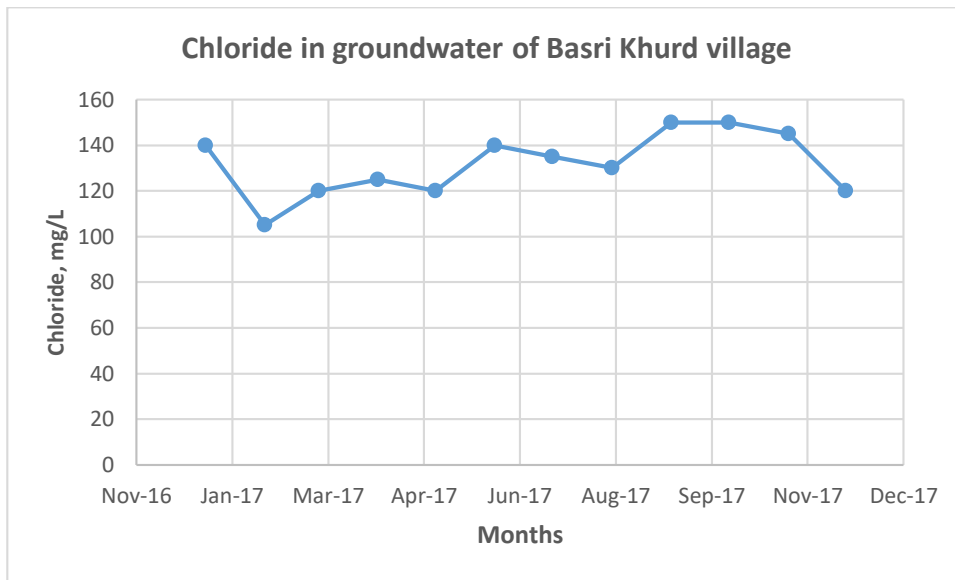


Figure 4: Chloride in groundwater of Basri Khurd village in Neemkathana block

Figure 4 shows that the maximum chloride 150 mg/L was found in the month of Sept, Oct-2017 and the minimum chloride concentration 105 mg/L is observed in the month of Feb-2017. The chloride concentration of groundwater in the Basri Khurd village was observed within the BIS (IS 10500: 2012) acceptable limit of 250 mg/L.

**Sulphate**

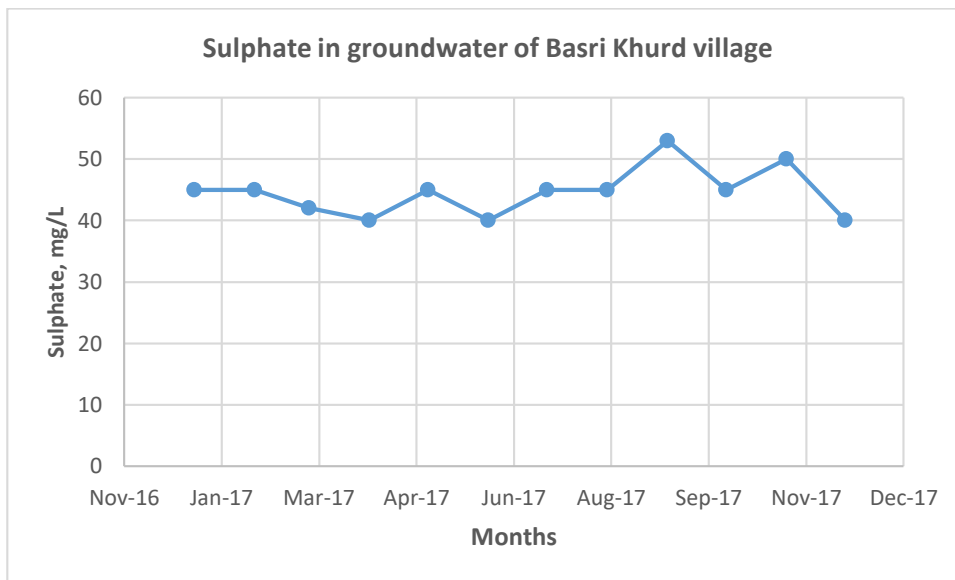
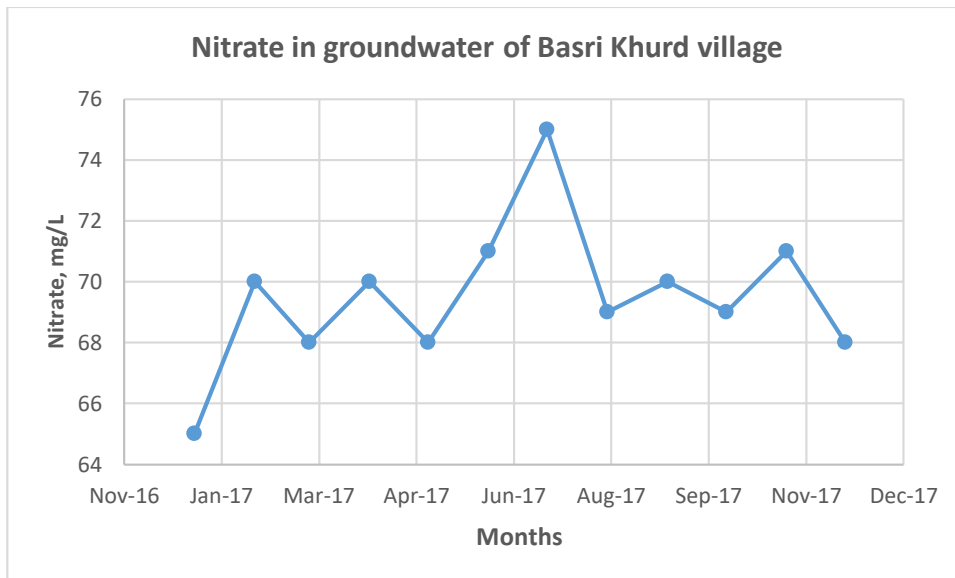


Figure 5: Sulphate in water of Basri Khurd village of Neemkathana block

Figure 5 shows that the maximum sulphate 53mg/L was found in the month of Sept-2017 and the minimum of 40 mg/L sulphate is found in the month of April, and Dec-2017. The sulphate concentration in groundwater of Basri Khurd village is observed higher than the BIS (IS 10500: 2012) acceptable limit of 200 mg/L.

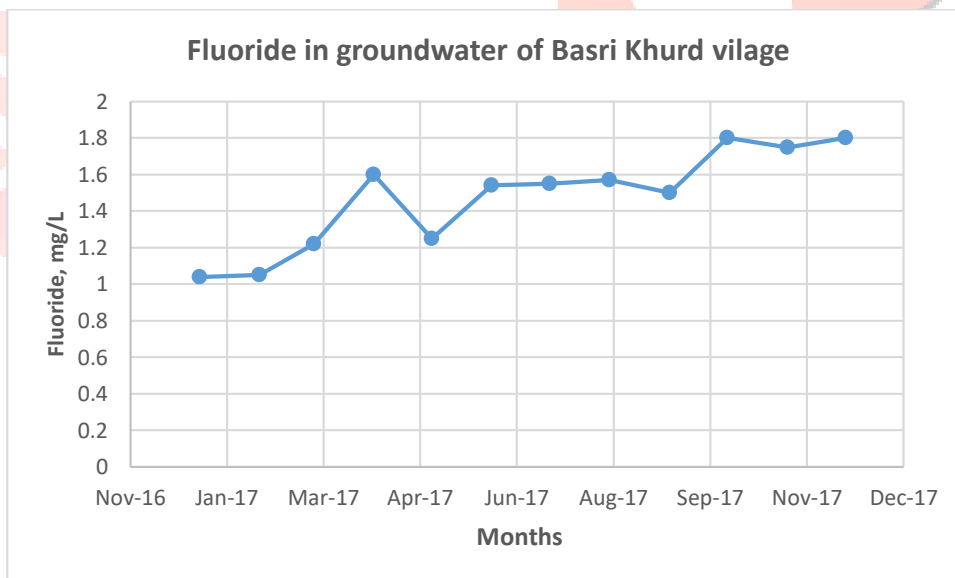
**Nitrate**



**Figure 6: Nitrate in groundwater of BASRI KHURD village in Neemkathana block**

Figure 6 shows that maximum nitrate 75 mg/L found in the month of July 2017 and the minimum 65 mg/L nitrate is found in the month of Jan-2017. Test result reveals that the nitrate concentration of groundwater in the Basri Khurd village observed are within the BIS (IS 10500: 2012) acceptable limit of 45 mg/L.

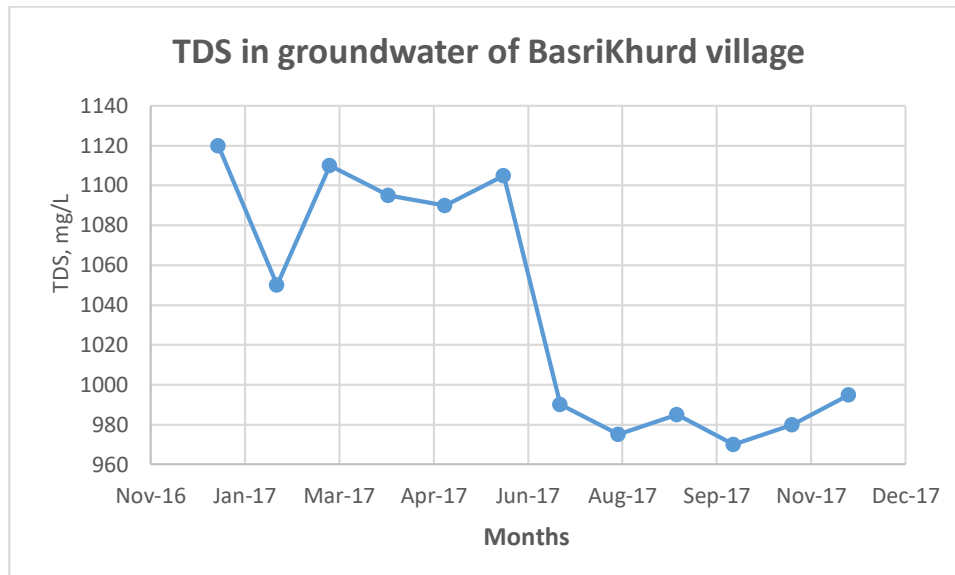
**Fluoride**



**Figure 7: Fluoride in groundwater of Basri Khurd village of Neemkathana block**

Figure 7 shows that the fluoride concentration variation for the assessment period Aug-20 to Jul-21 is 1.04 mg/L -1.8 mg/L. The maximum fluoride 1.8 mg/L found in the month of Dec-2017 and the minimum fluoride 1.04mg/L is found in the month of July 2017.

## Total Dissolved Solids



**Figure 8: TDS in groundwater of Basri Khurd village of Neemkathana block**

Figure 8 shows that the Total Dissolved Solids (TDS) variation for the assessment period Jan 2017 to Dec-2017 is 970 mg/L-1120 mg/L. The maximum TDS 1120 mg/L found in the month of Jan-2017 and the minimum TDS 970 mg/L is found in the month of Oct-2017. Test result reveals that the total dissolved solid (TDS) in the groundwater of the Basri Khurd village observed higher than the BIS (IS 10500: 2012) acceptable limit of 500 mg/L.

### Conclusion

Some areas of the Neemkathana block is highly irrigated, and farmers are using fertilizers and over-exploiting the groundwater to increase the production of crops. Improper collection of animal manure, and agricultural runoff becoming major causes for the deterioration of the limited groundwater resources at a large scale. Anthropogenic, and geogenic are both factors continuously deteriorate the quality of groundwater. the total alkalinity, total hardness, nitrate, fluoride, and TDS for the groundwater of Basri Khurd village were found beyond the BIS (IS 10500: 2012) acceptable limit. The present study for the water parameters will be helpful for the state body to monitor the quality of the selected source for drinking water.

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