

# Physicochemical Analysis of Bore Well Water in Rural Area, Gram Panchayat Sitapur, District Rewa, Madhya Pradesh State, India

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## Abstract

Bore well water is a major source of Gram Panchayat Sitapur, changing lifestyle and intense competition among uses- forming, agriculture and domestic sector. Especially in to the developing countries like India, has to affected the quality and availability of bore well water, like its over exploitation and improper waste disposal, unscientific agriculture and forming techniques. According to WHO Last decade's organization, 60-70% of disease in human beings is caused by water.

The present work is mainly aimed to the assessing of water quality index. To study the impact of seasonal variation on physicochemical parameters. The bore well (underground) water, sample of Gram Panchayat Sitapur. The sample about Rainy season (July-September) we are collected to a subject for a comprehensive Physicochemical analysis. This purpose of the investigation to provide of present bore well water quality of the 12 parameters such as PH, calcium, total hardness, magnesium, chloride, total dissolved solid, nitrate, sulphate, iron, fluoride, alkalinity are considered and calculate the (WQI) Analyzed (Water Quality Index) method and for the predicting of water quality and this index is communicating the information of overall quality of water.

Usable for finding a

**Keywords:** Gram Panchayat Sitapur, Water Quality Standards, Water Quality Index, World Health Organization, Physicochemical Analysis

## Introduction

Water is a natural and intensive resource on the earth planets. Earth surface about is 71% covered by water. Pore and fresh drinking water is also 4% is present in underground reservoir of the earth, 60% oceans, glaciers, ice caps and 7% surface and rivers. To since long time bore well is important resource on the earth and present time increasing population pressure on the available source also increase, surface water is not sufficient to the fulfill are increasing demand. India is largest user of underground water presently about 60-65% of the irrigation and also about 90% use of domestic and agriculture requirement of rural aria. Water quality index is one of the most effective tools to communication information on the quality of water to the concerned citizens and police makes.

Groundwater for various unsuitable can be contaminated of purpose and its difficult remediation, time-consuming and expensive. It may be the harmful of human health as well as environ health ( Chatterjee R. Et Al, 2009)<sup>[1]</sup>. The objective of the present work is to discuss the suitability of groundwater for human consumption based on computed, characteristics, quality assessment and water quality index value (Shivaprashad H Et al, July 2014)<sup>[2]</sup>.

Water play an essential role in human life. Although statistics, the WHO reports that approximately 36% of urban and 65% of rural Indian were without access to safe drinking water (Dr. C. Nagamani et al, January, 2015)<sup>[3]</sup> Largely bore well water is the rainwater that seeps deep into the ground and gets trapped between the rock layers. The use of fertilizers and pesticides, manure, lime, septic tank, refuse dump, etc. are the main sources of bore well water pollution (Kharodawala M.J. et al, 2004)<sup>[4]</sup>

## **Materials and methods**

### **Description of the study area**

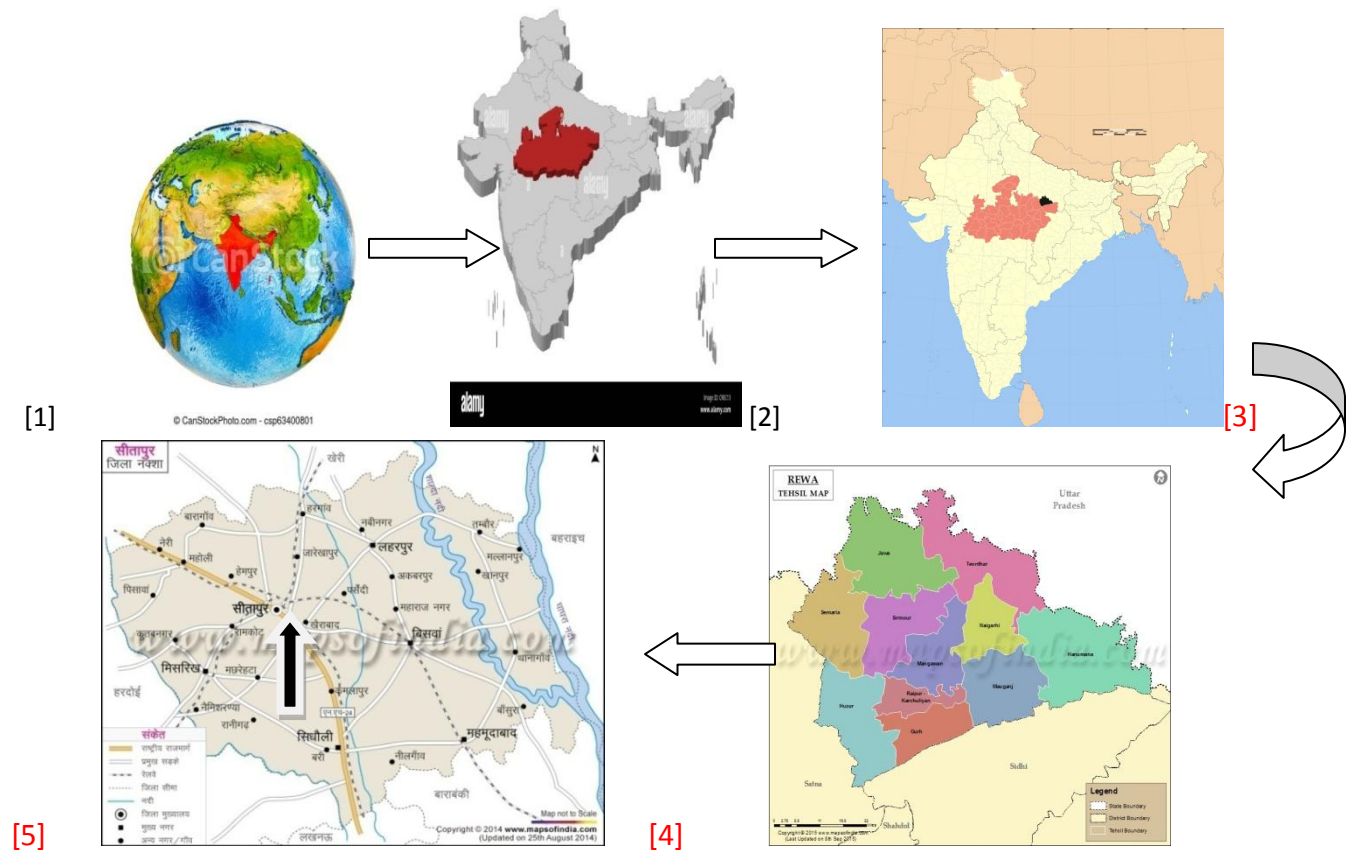
Gram Panchayat sitapur is located in tehsil mauganj district Rewa, Madhya Pradesh, state in India. Belong to Rewa Division is located 55 KM towards and 543 KM from state capital of Bhopal. It lies between North latitude and East longitudes and is bounded on south by Shidhi district, on the north and northeast by Uttar Pradesh state, on the east by Pravatganj district up state and south by Shidhi district. Total geographical area of the district is 10.5 Sq km. The gram panchayat sitapur is situated at an elevation of 669.47 m above MSL. The panchayat is divided into four villages taluks coming under two sub divisions. Sub division comprises. The total area are 23% forest and 45% are farming and 32% area of planet<sup>[5]</sup>.

**Analysis of Underground water Samples:** The bore well water quality was assessed by the analysis of chemical parameters such as pH, temperature, Electrical Conductivity (EC), Total Dissolved Solids (TDS), Total Alkalinity (TA), Chlorides, Total Hardness (TH), Calcium Hardness (CH), Nitrates, Sulphates, Iron and Fluorides as per standard procedure (APHA, 2003)<sup>[6]</sup>. The Bureau of Indian Standards (BIS) for drinking water quality for various parameters is presented in the table 1. The analytical methods used to measure chemical parameters of groundwater samples collected from all the sampling stations are listed in the table. 2. The water samples were analyzed adopting standard methods in the Environmental Laboratory.

### **Geomorphology:**

The gram panchayat sitapur tehsil mauganj district Rewa, is located in the eastern part of Madhya Pradesh, the of 750- 900m above MSL. The soil, types are mainly three, 1. Red - yellow, 2. black & laterite for suitable for farming and agriculture. There are few sporadic outcrops of rocks as hills and few fertile shallow valleys. In the south-eastern parts<sup>[7]</sup>.

Study area is in a map location<sup>[8]</sup>



**Fig. 1 Study area of sampling collection**

Sample collecting time to carefully planning and preparation of bore well (underground) water sampling trip to made and save time preparation in the college and laboratory before sample collection. The collecting time of different 2season, in 2 liter capacity bottle were collected in polythene containers.

**Methods analysis of Bore well Water**

**(Laboratory analytical method)<sup>[9]</sup>**

SL.NO.	Physicochemical Parameters	Methods
1	Ph	Potentiometry (PH) meter
2	Electric Conductivity (mg/L)	Conductivity probe
3	Alkalinity(mg/L)	Argentometry (Titration)
4	Chloride(mg/L)	Argentometry (Titration)
5	Total Hardness (mg/L)	Complexometry by EDTA titration

6	Calcium (mg/L)	Argentometry (Titration)
7	Magnesium (mg/L)	Argentometry (Titration)
8	Total Dissolved Solid (ppm)	TDS Probe
9	Fluoride (mg/L)	Ion Analyser
10	Iron(mg/L)	Spectroscopy
11	Nitrate(mg/L)	Spectroscopy
12	Sulphate(mg/L)	Spectroscopy

**Table 1 Laboratory analysis method**

**Standards for drinking Water <sup>[10]</sup>**

P= Permissible Limit

E= Excessive Limit

Parameters	ISI		ICMR		WHO	
	P	E	P	E	P	E
<b>Physical</b>						
Colour	10	50	5	25	5	25
Taste	Unobjected		Unobjected		Unobjected	
Turbidity	10	25	10	25	10	25
<b>Chemical</b>						
Ph	6.5-8.5	6.5-9.2	7.0-8.5	8.5-9.2	7.0-8.5	8.5-9.2
Conductivity	-	-	-	-	500	1500
Alkalinity	6.0	9.0	6.0	9.0	8.8	9.5
Chloride	250	1000	250	1000	250	600
Total Hardness	300	600	300	600	-	-
Calcium	75	200	75	200	75	200
Magnesium						
Total Dissolved Solid	_300	600_	300_	600_	500	1500
Fluoride	0.6-1.2	-	1.0	2.0	0.5	1.0-1.5
Iron	0.3	1.0	-3	0.1	1.0	1.5
Nitrate	45	-	30	50	-	100
Sulphate	150	400	200	400	200	400

**Table 2 Standards for drinking Water**

## Result and Discussion

From the result, is evident that the pH is well within Permissible limit. (6.5-8.5) has no direct adverse effects on health. According to Standard parameters for published by ISI, ICMR and WHO is the total 300 mg/L (Permissible) and 500 mg/L (Excessive) for the Lon Analyzer and Fluoride. The Standard for chloride for 250mg/L-1000mg/L associate with sodium exerts. Iron Sulphate and Nitrate of the determine the help of Spectroscopy (Digital) systeronic (340um-960um ) type 106 chemical method<sup>[11]</sup>.

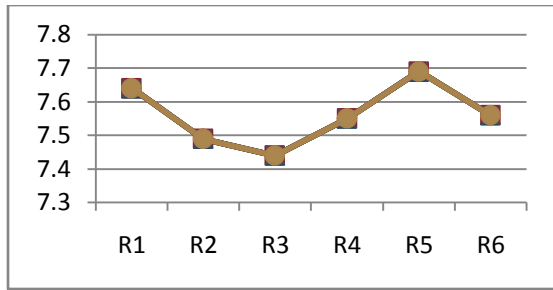
### Physicochemical analysis of bore well water of Gram Panchayat Sitapur.

UO=Unobjectible.

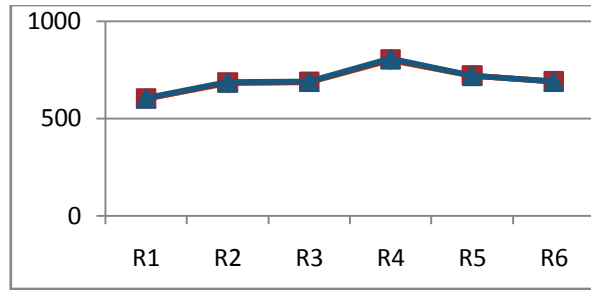
#### Rainy season (July-octouber,) 2021

Physical	R1	R3	R3	R4	R5	R6
Colorur	10	12	10	16	20	20
Taste	UO	UO	UO	UO	UO	UO
Turbidity	12	9	11	9	10	12
<b>Chemical</b>						
Ph	7.64	7.49	7.54	7.1	7.23	7.43
Electric Conductivity	$1.44*10^{-3}$	$1.51*10^{-3}$	$1.36*10^{-3}$	$1.12*10^{-3}$	$1.43*10^{-3}$	$1.56*10^{-3}$
Alkalinity	20	34	43	29	41	35
Chloride	180	210	198	200	235	220
Total Hardness	240	210	210	195	194	200
Calcium	36	28	31	55	42	49
Magnesium	5.2	6.6	5.5	5.7	6.6	9.8
Total Dissolved Solid	765	795	820	780	755	690
Fluoride	0.06	0.3	0.4	0.9	0.09	0.8
Iron	0.4	0.3	0.8	0.8	0.4	0.6
Nitrate	20	27	23	34	33	23
Sulphate	188	195	195	180	200	175

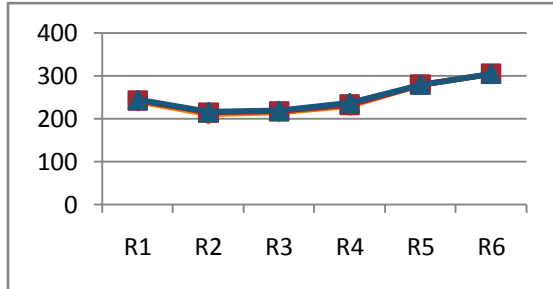
**Table 3 result of Physicochemical analysis of bore well water of Gram Panchayat Sitapur**



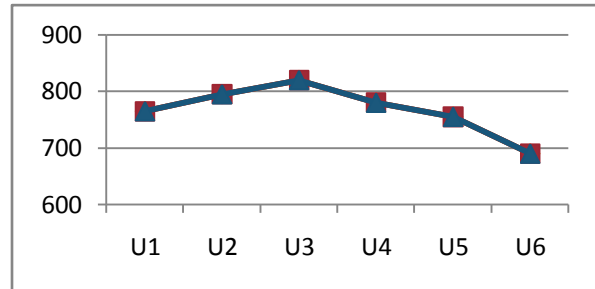
**Fig. 2 pH of collected sample**



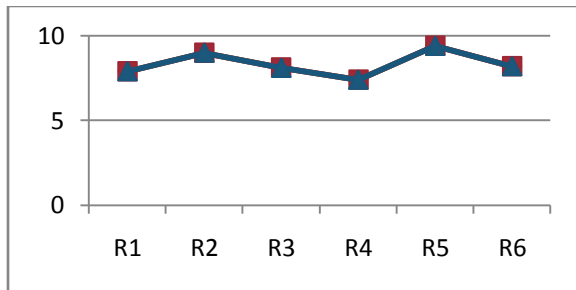
**Fig. 3 Total Alkalinity of the sample**



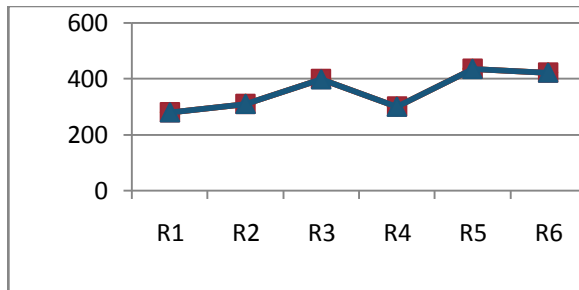
**Fig. 4 Total Hardness of the sample**



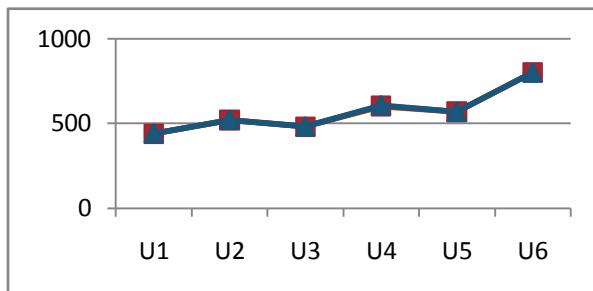
**Fig. 5 Total Dissolved Solid of the sample**



**Fig. 6 Turbidity of the sample**



**Fig. 7 chloride of the sample**



**Fig. 8 Electric Conductivity of sample**

Graph between various highest and lowest reading points<sup>[12]</sup>

**Potential of Hydrogen (PH):** Its important ecological parameters in aquatic habitat, since most of the organism is adapted to optimum pH range to not change. The sample value is show. On Fig: 2 between 7.1 - 7.64. pH value of samples in the study area varied from 4.91 to 7.2 with mean 6.13 indicating slightly acidic in nature. The limit of pH value for drinking water is a specified as 6.5 to 8.5. (IS 2012). pH below 6.5 causes corrosion in pipe. Their by realizing toxic metals such as cadmium, zinc, copper (Shrivastava and Patil, 2002)<sup>[13]</sup>.

**Temperature:** The most essential parameters in water. Its affects the Physical and chemical properties of the water sample. Both season, rainy and winter are sample of temperature is 27<sup>0</sup>C-24<sup>0</sup>C and 20<sup>0</sup>C-17<sup>0</sup>C ranged between as shown. It affect the Physical and chemical properties and their biological activities (Mali Vidya C, et, Al, 2018)<sup>[14]</sup>.

**Electric Conductivity (EC):** An ability of aqueous solution of conduct the electric current is known as Electric Conductivity (EC) is shown Fig: 8. The receiving units between  $1.56 \times 10^{-3}$  and  $1.12 \times 10^{-3}$  lowest, It's a useful tool to evaluate the purity of water (Acharya, 2008)<sup>[15]</sup>. Generally, bore well water tends to have a high electrical conductivity due to the presence high amount of dissolve salts. Electric Conductivity is Quantitative measure of the ability of water to conduct electric current. It can also be define as a numerical expression of the ability (C. H. Lkeme, et., al., August 2014)<sup>[16]</sup>

**Total Alkalinity (TA):** Alkanity is the measure of mostly hydroxide and carbonate ion content of water sample. The water sample is titrated and standard of using HCL indicator. Fig: 3 The mean alkalinity was found to be 573.4 ppm. The IS limits of alkalinity 200ppm – 600ppm. The alkalinity values of samples collected at S1, S8 and S9 are above the standard limits. The excess of alkalinity could be due to the minerals, which dissolved in water from mineral rich soil (Sawyer et. al., 2000)<sup>[17]</sup>.

**Total Hardness (TH):** in the present study is range between 240ppm to 194ppm in (July-december 2021). The mean of total hardness was found to be 240ppm is highest. The IS limits of total hardnes shown in Fig : 4. Hardness in water is caused by certain salts held in solution Total hardness of water is caused by the presence of Ca & Mg salts. The tolerance range for total hardness is 300-600ppm<sup>[18]</sup>.

**Total dissolved Solids (TDS):** Total dissolved solids (TDS) denote mainly the various kinds of minerals present in water. We the investigated how water quality could be improved by utilizing water boiling, activated carbon and sodium bicarbonate additives as well as electrolysis

method (Bill B. Wang, 2021)<sup>[19]</sup>. Total dissolved solids of water sample ranges from between 690ppm to 820ppm. The mean value of total dissolved solid was found to be as shown in Fig: 5. The IS limits of total dissolved solid 500ppm – 1500ppm units According To WHO. All total dissolved solids of water samples are in safe level. It elevates the density of water and reduces solubility.

**Turbidity:** Turbidity is measure of the loss of transparency or clarity of a solution. The presence of colloidal solid gives water a cloudy appearance which reduces its transparency shown is Fig: 6 widely used parameter around the world for the describing of a drinking water quality. Sometimes, turbidity of water treatment plant outlets may be a reach high value during short periods of to some time. Quality of water improvement of alkali condition in an irrigated area.( G. D. Acharya Et. Al., 2008)<sup>[20]</sup>

**Chloride:** In the present study of chloride in the sample of July 2021-december 2021, has been 235-180 ppm 250 mg/l water. While the tolerance range for chloride is 200 - 600 mg/l ( Gazeette of India, 1996)<sup>[21]</sup>.Magnesium, fluoride , Iron Nitrite and sulptate are under the permissible limit

### **Conclusion:**

After the carefully study and analysis, interpretation and discussion the numerical data to following conclusion have been drawn for the Physicochemical analysis of Bore Well Water in Gram Panchayat Sitapur, during 2021-22. The collected sample for rainy season in same bore well water of different days R1, R2, R3, R4, R5 & R6 are collected. ISS, ICMR & WHO as per standard in shown normal pH, Total Dissolved Solid TDS are some extra little units. Though alkalinity is high but under the Permissible limit.

According to standard of WHO, total hardness are 300-600 ppm mg/l, the received ridings of total hardness 610-705 while total hardness are all reading units is high of the WQI Water Quality Index, for by of TDS. The result that chemical parameters such colour, turbidity, orodor and taste in change of a few difference. Overall observation is good in the permissible limit but therefore water is not good from the suitable for drinking but useable for domestic purpose, overall total hardness and total dissolved solid are cross the permissible limit. Further detailed



analysis in different season other related parameters to throw more status are characteristic of Bore well water. . Further detailed analysis in different season and other more status and light characteristic properties of these bore well water.

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