

# STUDY OF PHYSICO- CHEMICAL PARAMETERS OF GROUNDWATER SHEKHAWATI DIVISION OF RAJASTHAN (PRE-MONSOON), 2021.

## ABSTRACT:

The Shekhawati region consisting of Sikar, Neemkathana and Khandela of Rajasthan has various types of groundwater problems. The various diseases found in these regions such as Fluorosis, methaemoglobinaemia etc. For our purpose we took samples from the Shekhawati region in Rajasthan state and by determining various parameters such as pH, EC, TDS, Total Hardness, Total Alkalinity, Calcium Hardness, Magnesium Hardness, Chloride,  $\text{NO}_3^-$ , and  $\text{F}^-$  the study showed that many of the all given parameters were either lower or higher than the ideal limits prescribed by WHO and ISI and are causing health problems to the people living in the region.

**KeyWords:** Groundwater; Physico-Chemical Parameters; pH; EC; TDS; TH; ALK; Ca-H; Ma-H; Cl;  $\text{NO}_3^-$ ; methaemoglobinaemia; and Fluoride; Fluorosis; shekhawati region;

## INTRODUCTION

Water is the precious natural resources, and is used for drinking, irrigation, washing, bathing and without it, we can not think of life on earth.<sup>1</sup>

97 % of the earth's water supply is in the oceans. Only 3% of fresh water, one third is inaccessible being locked up in the mountains, glaciers and difficult terrains. Only 1 % available in fresh water.<sup>2</sup>

Groundwater is easily available to us for drinking, agricultural, industrial and domestic purposes. Groundwater resources are the resource of water that useful to animals and humans.<sup>3</sup> The only resource of water is fresh water. Surface water is water in rivers or lakes and fresh water wetland. Surface water is naturally replenishment by precipitation or naturally lost through discharge to the oceans, evaporation and ground seepage. Surface water combination  $\text{O}_2$ , inorganic nutrients leached, from the terrain and sunlight supports a life forms in the water, including algae, bacteria, fungi small insects and fish.<sup>4</sup>

Rajasthan state climate of prominently low rain-fall, intense summers with very high temperatures, high day to day variation of temperatures and low dimness and high evaporation. Rajasthan states, one such Indian with complex agro-climatic zones and in urgent need of enlarge groundwater resources.<sup>5</sup> Moreover, increase in population and urban leads to groundwater depletion. Thus, groundwater study plays an important role in estimation, observation, planning, development and combined Water Resources Management in Rajasthan state. The Rajasthan State of 33 districts have been affected area by fluorosis.<sup>6</sup>

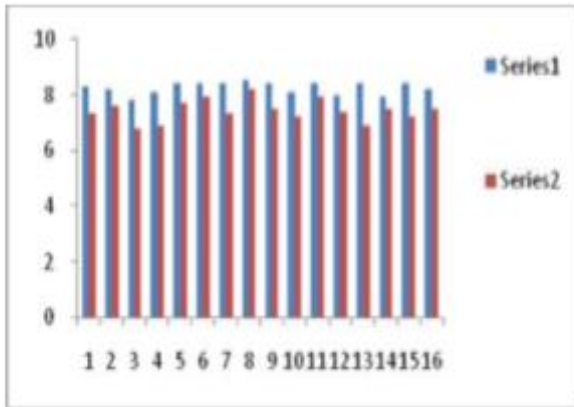
The Blocks of Sikar district, (Sikar, Neemkathana and Khandela), groundwater is the main always hotspot for drinking water. In this special position, the quick increment in the human populace. For the drinking water, management, a quantitative study is not sufficiency. A qualitative study of drinking water is need to be done.<sup>7</sup>

The man objective, studies areas find out the groundwater critical zones in Rajasthan There are no Surface water Sources in the Sikar District. The only Source of Drinking water is underground water. The underground water table varies from 50 meter to 250 meter. Due to scanty rain- fall the recharging of groundwater is much less.<sup>8</sup> The available groundwater quality in some Blocks (Sikar, Neemkathana and Khandela)of the district is very poor.

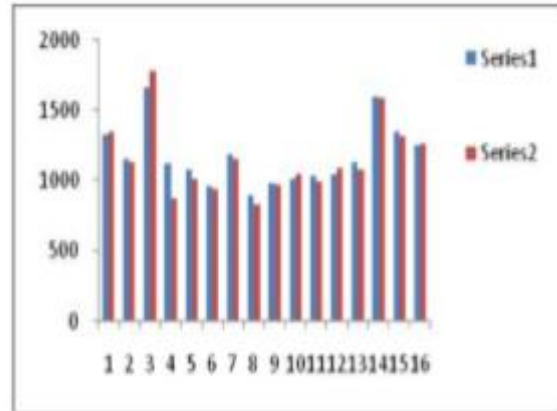
**Area of Study.** Study area Shekhawati region (27,527 km<sup>2</sup>) includes the districts of Sikar, Jhunjhunu and Churu in Rajasthan state of India.

Shekhawati division of Rajasthan is administered by 13 blocks and 13 tehsils has been a geographical and hystorical area of 11,151 sq. km that constitutes the north eastern part of Rajasthan state. The total area of Rajasthan State which covers approximately 3.3% of the State.<sup>9</sup>

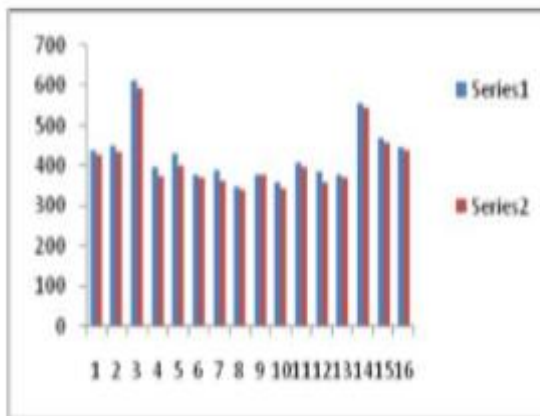
Figure 1 : Variation in parameter



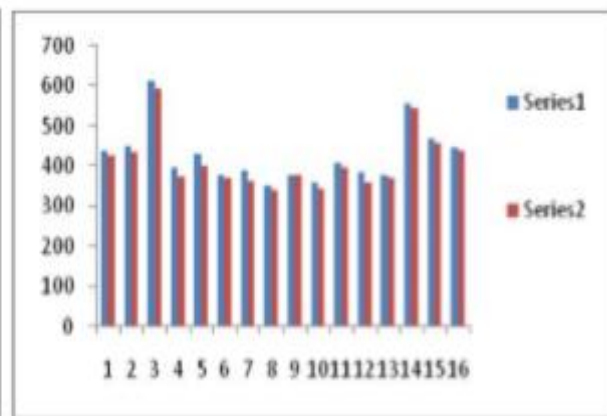
pH variation



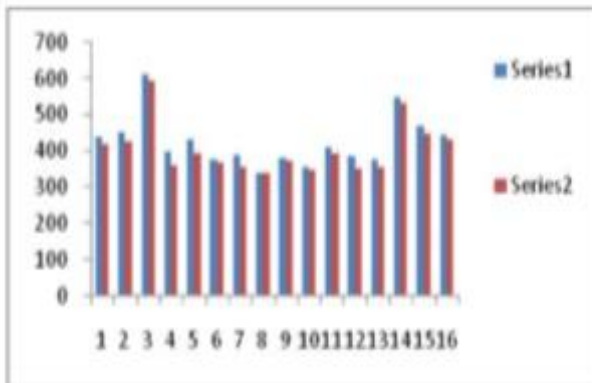
EC variation



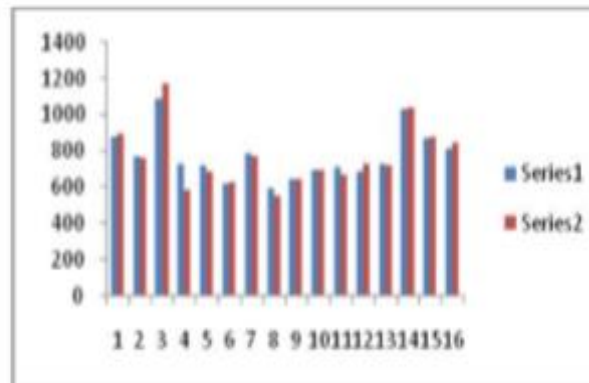
Total Alkalinity variation



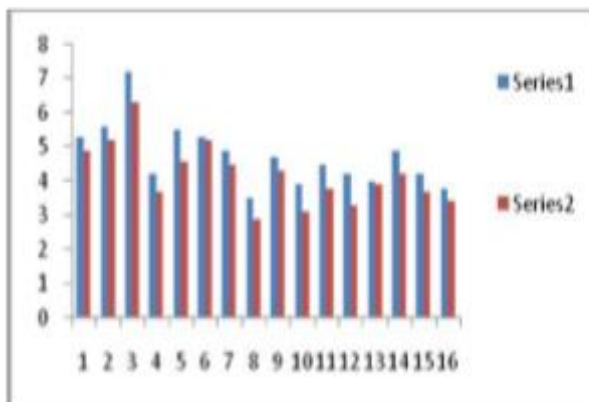
Total Hardness variation



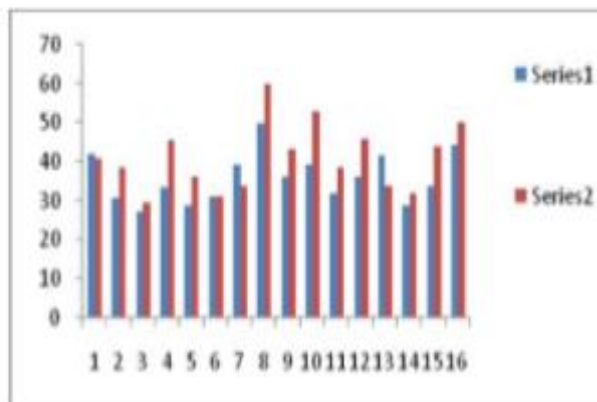
Bicarbonate variation



TDS variation



Fluoride variation



Calcium variation

## 2. REVIEW OF LITERATURE:-

1. Radhey Shyam, Kalwania.G.S. (2011).<sup>10</sup> Ground water samples were collected from Sikar District and they were researched for different water quality parameters, such like pH, Electrical Conductivity, TDS, TH, DO, calcium, magnesium, sodium, potassium, carbonate, bicarbonate, chloride, sulfate, nitrate and fluoride, Electrical Conductivity TDS, nitrate, chloride and fluoride content in some samples are found to be more than desired range in sikar district.
2. **Suruchi Gupta And Praveen Kumar(2013)**<sup>11</sup>. The present study selected in 136 villages during the period Jan. 2009 to Jan. 2012 in Jhunjhunu district, Rajasthan. It was found that 152 patients were suffering from Blue baby syndrome (methemoglobinemia). Methemoglobinemia is caused by the decreased ability of blood to carry vital oxygen around the body
3. **Madhuri S kurdi (2016)**<sup>12</sup>. Physico-chemical and fitful variations under anthropogenic activities, in two consecutive years. While the bacteriological analysis included total viable counts (TVC), total coli forms (TC), fecal coli forms (FC) and fecal streptococci (FS), the physicochemical factors included pH, temperature, conductivity, TDS, dissolved oxygen (DO), (BOD) and (COD). The pure bacterial isolates belonged to the families enterobacteriaceae, micrococcaceae, pseudomonadaceae and bacillaceae .
4. **Urmila barwar, (2018)**<sup>13</sup>The present work of study area. Fatehpur (district sikar), groundwater samples were collected from the different locations and analyzed for their physico-chemical parameters such as Temperature, pH, EC, TDS, Total hardness, dissolved oxygen, Calcium hardness, Magnesium hardness, Bicarbonate, Carbonate, Na<sup>+</sup>, K<sup>+</sup>, Cl<sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, NO<sub>3</sub><sup>-</sup> and F<sup>-</sup>. The study was carried out to demonstrate the advantage of multi- component data analyses.
5. **Himmat Kanwar et. al.(2021)**<sup>14</sup>. A present study of Pre- and Post-monsoon variation, in physico-chemical parameters in groundwater quality of Amer tehsil, Jaipur in Pre- and Post-monsoon phase of the year 2017. Groundwater quality of parameters such as pH, Electrical conductivity, Hardness, Alkalinity, Phosphate, Cl<sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, NO<sub>3</sub><sup>-</sup> and F<sup>-</sup> were study to analyze the drinkable groundwater quality of the area.

6. **Santosh Kumar Verma. et al. (2022).**<sup>15</sup> Ground Water Quality Index of Drinking Water in Ganeshwar and Chala Villages of Neemkathana Block, Sikar District. It is not a good quality for drinking purpose. The drinking water quality TDS level of Ganeshwar and Chala villages found higher than the sufficient limit of 500 mg/l. This study is given a direction for researchers in this area and facilitates to analyze the sickness area due to these Physico-chemical parameters.

### **3. MATERIALS AND METHODS**

#### **Sample collection and physiochemical investigations**

In present investigation 24 ground water samples were collected in Blocks (Khandela, Neemkathana and Sikar) from the tube wells and bore wells. Polythene bottles of 2.5 litre capacity were thoroughly cleaned with hydrochloric acid, washed with tap water until rendered free of acid and then with distilled water twice and finally rinsed with the water sample to be collected in the session (July 2019 to January 2019) Pre and post Monsoon. For complete chemical analysis.<sup>16</sup> including determination of Electrical Conductivity, pH, T.D.S, Total Hardness, Total Alkalinity, Calcium Hardness, Magnesium Hardness, Chloride,  $\text{NO}_3^-$ , and  $\text{F}^-$  were also calculated.

Trends in groundwater levels at different districts, during pre-monsoon season, use of Method.

In present investigation various parameters like, pH, EC, T.D.S, are calculated by meters, and Total Alkalinity, Total Hardness, Calcium + Magnesium Hardness, and Chloride by Titrametric Method. Where as  $\text{NO}_3^-$ , and  $\text{F}^-$  were determined by Spectrophotometric method and Ion Selective method.

#### 4. RESULTS AND DISCUSSIONS

**TABLE NO. -1**

**Physicochemical parameters of groundwater of Shekhawati region, Sikar.(mg/litre)**

Sr No.	SAMPLE NO.	PH	EC	TDS	ALK.	T.H	Ca-H	Mg-H	NO <sub>3</sub> <sup>-</sup>	CL <sup>-</sup>	F <sup>-</sup>
1	W1	7.2	1820	1410	420	310	120	190	40	310	2.2
2	W2	7.2	1810	1415	440	320	110	210	52	290	2.2
3	W3	7.6	2050	1750	530	410	165	245	35	290	2.5
4	W4	7.4	1960	1680	510	390	175	215	30	420	2.4
5	W5	7.5	1960	1680	550	370	145	225	45	380	2.4
6	W6	7.6	1970	1700	470	410	200	210	22	350	2.2
7	W7	8.0	1990	1750	680	320	100	220	49	340	3.8
8	W8	8.1	1980	1750	650	320	120	200	78	360	2.7

**TABLE NO. -2**

**Physicochemical parameters of groundwater of Shekhawati region, Khandela. (mg/litre)**

Sr No.	NAME	PH	EC	T.D.S	ALK.	T.H	Ca-H	Mg-H	NO <sub>3</sub> <sup>-</sup>	CL <sup>-</sup>	F <sup>-</sup>
1	W1	7.9	2210	1490	910	240	110	130	46	410	2.1
2	W2	7.3	2190	1450	750	205	95	110	72	410	1.9
3	W3	7.8	2240	1770	610	210	105	105	62	511	2.2

4	W4	7.7	2230	1890	615	215	110	105	66	390	3.6
5	W5	8.1	2140	1410	710	235	115	120	48	510	2.6
6	W6	8.2	2205	1800	650	240	115	125	43	420	1.9
7	W7	8.0	2180	1590	570	225	110	115	69	460	2.5
8	W8	7.9	2280	1420	580	185	90	195	52	390	2.7

**TABLE NO. -3**

**Physicochemical parameters of groundwater of Shekhawati region, Neemkathana.  
(mg/litre)**

Sr No.	NAME	PH	EC	T.D.S	ALK.	T.H	Ca-H	Mg-H	NO <sub>3</sub> <sup>-</sup>	CL <sup>-</sup>	F <sup>-</sup>
1	W1	7.4	1810	1350	410	310	90	220	97	350	2.9
2	W2	7.9	1790	1310	450	330	80	250	49	320	2.8
3	W3	7.1	1750	1460	390	300	90	210	22	415	2.3
4	W4	7.8	1800	1470	440	380	120	260	44	340	2.1
5	W5	7.7	1680	1370	580	300	110	190	56	360	1.6
6	W6	7.9	1670	1510	510	370	120	250	66	410	3.7
7	W7	7.4	1715	1290	380	370	80	290	32	380	2.6
8	W8	7.5	1595	1280	390	360	80	280	43	390	2.7

Analysis of physic-chemical parameter results are reported in table no. 1- 3 figr.

1. **PH:-** pH regulates biological functions and can inhibit some biological processes. The pH. range of 6.5-8.5 is considered normal and in the Shekhawati region of Rajasthan state consisting of Sikar, Neemkathana and khandela the pH. varies from 7.1 to 8.2 which is considered as normal.
2. **Electrical Conductivity:-** The permissible limit of EC is 2100ms/cm and in the Shekhawati region consisting of Sikar and Neemkathana normal range -1595-2050 ms/cm and khandela high range 2140-2280 ms/cm of Rajasthanstate, which is High range of specific conductivity is responsible for heart stroke and disturbing osmotic pressure of body regions.
3. **TDS:-** The desirable concentration of TDS is less than 500ppm and maximum allowable limit is 1500ppm and in Shekhawati region consisting of Sikar, Neemkathana and Khandela of Rajasthan state it varies from 1280-1750ppm which is slightly lower and higher than the allowable limit. The high TDS. Indicates that drinking water is highly mineralized. Large amount of TDS Drinking water use for long time will be expose body to various chemical, toxic and may cause chronic health problems, lilk, lever, kidney and cancer.
4. **Total Alkalinity:-** According WHO and ISI standards for drinking water, the desirable limit of alkalinity is 200-600mg/l and in Shekhawati region consisting of Sikar, Neemkathana and Khandela of Rajasthan state it varies from 390-910ppm which is considered as high range drinking water. High concentration, the alkalinity associated with alkalinity can be of concern to people suffering from nausea and vomiting disease.
5. **Total Hardness:-** Hardness is one the important properties of drinking water. According to WHO and ICMR Permissible limit of drinking water, total Hardness is 500mg/l.<sup>17</sup> Total hardness in Shekhawati region consisting of Sikar, Seemkathana and Khandela of Rajasthan state it varies from 185-410ppm which is quite higher than the ideal limit. Hard water is harmful upon the health of consumer. Use of hard water increases capacity of soap consumption in home, laundries and textile. Effect on human bodies, muscle and blood pressuse.
6. **Calcium hardness:-** Calcium essential element of drinking water and important rolls in bone building. According WHO and ISI standards for drinking water, the desirable limit of calcium is 75mg/l and in Shekhawati region consisting of Sikar, Neemkathana and Khandela

of Rajasthan, investigational area calcium concentration found from 80-200ppm which is a bit higher than ideal range. Large amount up takes of calcium this may negatively influences human health. High dose of calcium also affects intake of other minerals by body. It causes corrosion\_of skin eyes and mucous membrane

7. **Magnesium hardness:** - As the maximum relaxable limit of magnesium is 100ppm and in Shekhawati region consisting of Sikar, Neemkathana and Khandela of Rajasthan, investigational area it varies from 190-290ppm which is slightly above than the Ideal limit. After Calcium it is the most commonly found cation in oceans. Human body contains about 25 g of magnesium, of which 60% present in the bones and 40% present in muscles and other tissue.<sup>18</sup> At large oral doses magnesium may cause vomiting and diarrhea
8. **Chloride (Cl<sup>-</sup>):** - Chloride is one of the major inorganic anions in drinking water. The highest desirable limit of chloride for drinking water is 250-1000ppm and in Shekhawati region consisting of Sikar, Neemkathana and Khandela of Rajasthan state, it varies from 290-511ppm which is considered as desirable limit, water.
9. **Nitrites (NO<sub>3</sub><sup>-</sup>):**-According ISI and WHO Permissible limit of nitrate in drinking water is 45mg/l. These NO<sub>3</sub><sup>-</sup> then combine with the hemoglobin of blood to form methemoglobinemia, which interferes with the O<sub>2</sub> carrying capacity of the blood. The disease produced is called methaemoglobinaemia (Blue Baby Syndrome). Symptoms include shortness of breath and blue coloration of skin. The ideal range is of 5-10ppm and in shekhawati region consisting of Sikar, Neemkathana and Khandela of Rajasthan state it varies from 22-97mg/l. Nitrite high concentration found present in this area. It was found that effected 204 patients in this area.
10. **Fluoride (F<sup>-</sup>):** - According ISI and WHO Permissible limit of nitrate in drinking water is 1.0 - 1.5mg/l. High concentration of fluoride, cause fluorosis which affects the teeth and bones. Chronic high-level of fluoride can lead to skeletal fluorosis, include stiffness and pain in the joints<sup>19</sup>. Fluoride above 4ppm is considered as hazardous. In Shekhawati region consisting of Sikar, Neemkathana and Khandela of Rajasthan state it varies from 1.6-3.8mg/l. The present research study revealed that fluoride concentration was found more than 1.5ppm water samples From the total, 1139 patients were affected by the fluorosis (Dental Skeletal and leg fluorosis ).

## CONCLUSION:

The current study is focused on the study of physico-chemical parameters of Shekhawati region (pre-monsoon) and in this study we used various parameters consisting of PH, EC, TDS, T.H, ALK,  $\text{NO}_3^-$ , Ca-H, Mg-H,  $\text{Cl}^-$ ,  $\text{F}^-$  and we found that in Sikar region. pH, EC,  $\text{Cl}^-$ ,  $\text{F}^-$  are lying in normal range whereas Mg-H, Ca-H, TDS, TH,  $\text{NO}_3^-$ , ALK are higher than the desirable limits. Whereas in the Khandela region PH, TDS,  $\text{Cl}^-$ ,  $\text{F}^-$  are lying in normal range and MG-H, Ca-H,  $\text{NO}_3^-$ , ALK, EC, T.H are higher than the desirable limit and at last in Neemkathana region PH, EC, TDS,  $\text{Cl}^-$ ,  $\text{F}^-$  are lying in normal range whereas Mg-H, Ca-H,  $\text{NO}_3^-$ , ALK, T.H are higher than desirable limit which is ultimately causing various diseases and health problems in Shekhawati region of Rajasthan state.

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