International Journal of Advanced Research in Engineering Technology & Science
ISSN: 2349-2819
Email: editor@ijarets.org June- 2015 Volume 2, Issue-6 www.ijarets.org

Analysis of Physiochemical Parameter of Ground Water Atru Tehsil In Baran Rajasthan India

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ABSTRACT

Fluoride and nitrate are the two geogenic pollutants that are most frequently found in groundwater. Nitrate, on the other hand, is the most prevalent anthropogenic contamination in the south-eastern plains of Rajasthan, India. This is due to the rapid speed of agricultural growth, industrialisation, and urbanization. The total salinity of the groundwater ranges between 211 and 1056 mg L-1, according to samples that were collected in November of 2012 utilizing a tube well and a manual pump. NaCl was found to be the predominant salt in the groundwater. In addition, the measured values for the sodium adsorption ratio (SAR) and the residual sodium carbonate (RSC) were between 0.87 and 26.22 meq L-1 and between -12.5 and 30.5 meq L-1, respectively. The findings of the study also indicate that 6% of the total samples had significant levels of nitrate and that 49% of the samples include fluoride. A water quality index, also known as a WQI rating, was calculated by making use of nine different characteristics in order to measure the total groundwater quality state of the area. Using a method called LED fluorimetry, uranium contents in ground water samples were analyzed. These samples were taken from a few different villages in the Atru tehsil of the Baran districts of Rajasthan. The water comes mostly through hand pumps, tube wells, and open wells. The water comes from the earth, which is the source of the water. The uranium concentration in ground water samples was found to range from 1.1 ppb to 13.1 ppb in pre-monsoon conditions, with a mean, median, mode, and standard deviation value of 4.09 ppb, 3.91 ppb, 4.10 ppb, 2.66 ppb, and 2.4 ppb, respectively, and from 15.6 ppb in post-monsoon conditions, with a mean, median, mode, and standard deviation value of 5. Along with uranium, its associated physico-chemical parameters of water were also determined by using standard protocols from the Bhabha Atomic Research Centre (BARC). These parameters include pH, electrical conductivity, temperature, total alkalinity, phenolphthalein alkalinity, total hardness, magnesium hardness, calcium hardness, chloride, fluoride, sulphate, phosphate, nitrate, total dissolved solids (TDS), and oxidation reduction potentials

Keywords: *Groundwater quality, shallow aquifers, physicochemical parameters*

INTRODUCTION

The problem of not having sufficient water supplies for future generations is one that affects not only a certain location but also the entire world. According to research done by Gupta et al. (2006), the quantity of groundwater in India is in danger due to a number of factors, both natural and anthropogenic. According to Gleick (1993), during the course of the previous two decades, water levels in a number of regions across the country have been quickly decreasing as a result of an increase in extraction. In the most recent few years, there has been a quick and unfocused rise in the number of wells that have been dug for the purpose of irrigating food crops as well as cash crops.

The growing number of people living in India as well as the country's shifting lifestyles have contributed to an increase in the country's need for water (Rao, 1997). In general, there is also an increase in the amount of water that is required by industry. The groundwater table is falling as a direct result of the intense rivalry that exists among consumers, namely the agricultural, industrial, and household sectors. In addition, the extensive contamination of surface water, air, and land is having a significant negative impact on the quality of groundwater (Ciaccia, 1972). This is a significant issue that now affects 45 million people all over the world. If the solid, liquid, and gaseous waste that is produced is not managed correctly, this will result in the pollution of the environment, which will also have an effect on the groundwater owing to the hydraulic connectivity that is present in the hydrological cycle (Bandy, 1984).

In addition, the discharge of untreated wastewater through bores, as well as leachate from industrial waste and municipal solid waste, both contribute to the contamination of groundwater, which in turn lowers the quality of the fresh water resources available. In all of India's several types of hydro-geological environments, trace amounts of nitrates, fluoride, and heavy metals can be found as small elements of the groundwater. According to the yearly reports of the Central Groundwater Board in Delhi (Groundwater Scenario of Rajasthan), the high concentration of these inorganic pollutants is currently becoming a worry in the rural and urban regions of Rajasthan. This information may be found in the Groundwater Scenario of Rajasthan. The majority of the blame for the excessive levels of nitrates found in drinking water and water used for agriculture goes to human activities. According to the Groundwater Department in Jodhpur, the total amount of nitrogenous fertilizer used in Rajasthan in 2011–2012 was 1,488,938 million tons. Methemoglobinemia is one of the health issues that can arise as a result of drinking water with a high nitrate concentration that is beyond the allowed limit of 45 mg L-1. Because fluoride is often derived from rocks that are rich in fluoride, it is also obvious from earlier studies that the groundwater is also polluted with a large level of fluoride.

This is due to the fact that the typical source of fluoride is fluoride-rich rock (Ozha, 2012). Fluorospar ($CaF2$, found in sedimentary rocks like limestones and sandstones), cryolite ($Na3\ AIF6$, found in volcanic rocks like granite), and fluorapatite ($Ca5\ (PO4)\ 3\ (FClOH)$, are all examples of fluoride-rich rocks that may be found in Rajasthan. According to Ozha (2012), fluoride may be extracted from rocks by water that has been allowed to percolate through them. A significant number of people suffer from dental, skeletal, and non-skeletal abnormalities as a direct consequence of the high fluoride content that is found in groundwater. When it comes to establishing whether or not a certain type of groundwater is suitable for a given application, the quality of the groundwater is of the utmost significance. Very little is known about the water quality in the humid plain that is to the south and east of Baran, which is located in the Indian state of Rajasthan. In light of the aforementioned information, the current inquiry was carried out with the goal of determining the parameters of the water quality in the district of Baran for the purposes of drinking and irrigation.

In terms of its worldwide contribution as an unfrozen fresh water reservoir, ground water is an essential natural resource for the provision of residential and drinkable water (2). In the process of delivering water for drinking, agricultural, and industrial applications, ground water is an extremely important component (3-5). Uranium is a naturally occurring heavy actinide element that is radioactive, lithophilic, and a lithophilic heavy trace element (6). It is most commonly found in igneous rocks, soils, granites, and the earth's crust. Uranium may be found in nature predominantly in its tetravalent form, which is an insoluble species, and its hexavalent form, which is a very soluble form. Due to the unpredictable nature of precipitation and the nearly full use of surface water resources, the obligation to protect ground water from contamination is growing (CGWB, 2014). Since precipitation is the primary source of ground water, this responsibility is growing along with it. (7) .

Several writers (Javed and Wani, 2009; Gopalan, 2011; Sivaramakrishnan et al, 2014; Vittala et al, 2005) have produced research that documents the presence of ground water and the potential for groundwater in hard rock sites in different regions of India. (8-11) . (Michel et al. 1991; Ortega et al. 1996; Kumar et al. 2011) (12-14). The application of uranium in ground water is dependent on lithology, geomorphology, and other geology characteristics of the location. Uranium concentrations in the vast majority of ground water are typically rather low, ranging from 0.1 to 1 parts per billion (ppb). Despite this, uranium is capable of leaching, quickly dissolving, and being transported in oxidizing groundwater due to the presence of oxygen. As a result, it is able to be moved to locations that are quite far away from where it first occurred (Bucur et al. 2006) (15). Due to the fact that uranium is more commonly found in ground water than in surface water, it is necessary to conduct an analysis of the quantity of uranium that is present in ground water.

Brugge and Oldmixon et al. (2005) found that increased concentrations of uranium content might have an effect on some regions of the body. According to research by Kurttio et al. (2006), a higher uranium level can have an adverse effect on the kidneys, but this is not because of the radioactive property of uranium; rather, it is because of the chemical composition of uranium. (17). Uranium isotopes produce beta and gamma radiation as they disintegrate into other radioactive elements and, eventually, into stable lead isotopes (Fontes et al. 1983) (18). This process occurs during the decay of uranium isotopes along their course of disintegration. The existence of beta and gamma radiations in pure natural uranium may be traced back to the decay products of 238U, which are composed of 234Th and 234 Pa, and 234 U, which is composed of 231Th (Bleise et al. 2003) (19). In spite of the fact that climate change has an influence on ground water, the potential for buffering makes it more resistant to the effects of climate change than surface water. As a result, the function of ground water in the provision of water supplies is anticipated to assume a more preeminent position in dry regions that experience large-scale climatic changes (Jac, 2012) (20). In light of this, the purpose of this study was to explore the quality of the ground water, the analysis of uranium, and its association with some of the physico-chemical parameters of drinking water samples from the Atru tehsil in the Baran districts of Rajasthan, India.

METHODOLOGY

Evaluation of the Amount of Uranium Found in Samples of Ground Water LED fluorimeter LF-2, manufactured by Quantalase Enterprises Pvt. Ltd. in India, was utilized for the uranium analysis. It is necessary to calibrate the fluorimeter using four different uranium standards in order to evaluate both the performance of the instrument and its linear dynamic range. To eliminate the possibility of making an error while preparing standards for lower ppb levels, one uranium standard with a concentration of 500 ppb may be made by continually adding a volume of 50 microliters to a volume of 5 milliliters of ultrapure water and 0.5 milliliters of buffer. Additionally, the ppb level requirements need for freshly prepared samples before being analyzed. If the total dissolved solids (TDS) level in clear drinking water samples is low (less than 1500 ppm), then the water sample may be directly examined for uranium using a fluorimeter; no chemical processing is necessary. This allows for faster results. Take 5 ml of the water sample and place it in a suprasil quarts cuvette that has been cleaned and dried. Then, add 0.5 ml of the buffer, which is a fluorescence boosting agent that is a 5% sodium pyrophosphate solution with a pH that is almost 7. The pH should be adjusted using phosphoric acid. Only the fluorescence response of the sample should be recorded, and a minimum of four repetitions should be performed. Add fifty microliters of the 500 ppb uranium standard onto the cuvette that already contains the sample and the buffer, and then record the fluorescence response of the first standard added (the number of standard additions is determined by the number of fluorescence counts in the sample). Once more, transfer 50 microliters of the 500 ppb uranium standard onto the cuvette, and then record the fluorescence response. An analysis of the physicochemical characteristics of groundwater samples The in-situ measurements of ORP, TDS, EC (electrical conductivity), pH, Temperature, Salinity, DO, and resistivity were taken with an in-situ meter from the technology made easy cyber scan series 600 that was waterproof and employed portable electrode sensors. The nitrate, chloride, and fluoride levels were determined with the use of a eutech instruments technology made easy cyber scan series 600 waterproof portable meter that made use of portable electrode sensors. The EDTA Complex metric titration technique was used to conduct the measurements of total hardness and Ca hardness in groundwater and drinking water samples. In this case, the Mg hardness is going to be determined by taking the difference in values between the Total hardness and the Ca hardness. The measures of total alkalinity that were discovered in the groundwater samples were attributable to bicarbonatealkalinity solely. These results were determined via the $H2SO4$ titration technique, which used methyl orange as an indicator. UV-Visible Spectrophotometer Instrument (Lab India UV/VIS Spectrophotometer) was utilized in order to ascertain the phosphate and sulphate amounts, respectively. All of the aforementioned procedures required the use of a UV-Visible spectrophotometer.

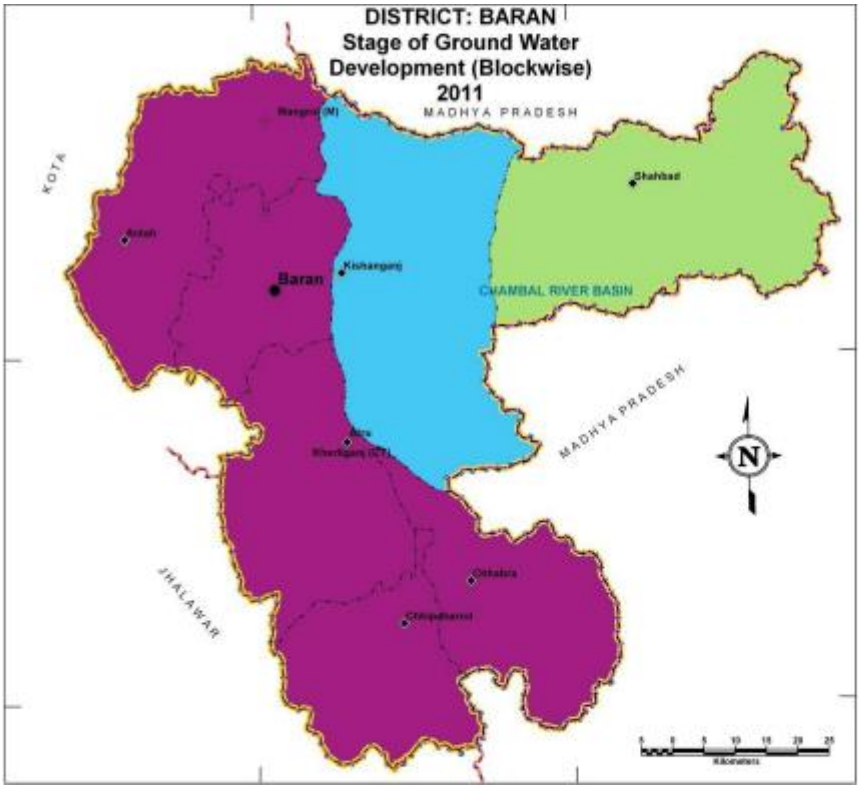
RESULTS AND DISCUSSION

STAGE OF GROUND WATER DEVELOPMENT

The different blocks of the district fall into three categories of ground water development stages. Shahbad, the easternmost block falls into ‘safe’ category whereas further west the Kishangarh block is under ‘semi-critical’ category. The rest of the blocks constituting a strip along the western part of the district, fall under over-exploited category indicating the areas where steps need to be taken to reduce stress on ground water due to exploitation.

Categorization on the basis of stage of development of ground water	Block Name
Safe	Shahbad
Semi- Critical	Kishanganj
Over Exploited	Antah, Baran, Atru, Chhipabarod, Chhabra.

Basis for categorization: Ground water development less than or equal to 70% safe; greater than 70%; greater than 90% semicritical; and greater than 100% overexploited.



LOCATION OF EXPLORATORY AND GROUND WATER MONITORING WELLS DISTRICT –

BARAN The district has a well distributed network of large number of exploratory wells (47) and ground water monitoring stations (170) in the district owned by RGWD (43 and 154 respectively) and CGWB (4 and 16 respectively). The exploratory wells have formed the basis for delineation of subsurface aquifer distribution scenario in three dimensions. Benchmarking and optimization studies suggest that ground water levels are being well monitored through existing network but for better monitoring of ground water quality five wells need to be added to existing network in Baran block. T

Table: Block wise count of wells (existing and recommended)

Block Name	Exploratory Wells			Ground Water Monitoring Stations			Recommended additional wells for optimization of monitoring network	
	CGWB	RGWD	Total	CGWB	RGWD	Total	Water Level	Water Quality
Antah	1	9	**10**	2	31	**33**	-	-

Atru	1	7	**8**	3	25	**28**	-	-
Baran	1	6	**7**	2	24	**26**	-	5
Chhabra	1	5	**6**	1	15	**16**	-	-
Chhipabarod	-	5	**5**	3	19	**22**	-	-
Kishanganj	-	7	**7**	2	19	**21**	-	-
Shahbad	-	4	**4**	3	21	**24**	-	-
Total	**4**	**43**	**47**	**16**	**154**	**170**	**0**	**5**

GROUND WATER FLUORIDE DISTRIBUTION

DISTRICT – BARAN

Plate - XIV displays the fluoride concentration map that was calculated before. The locations that have a low concentration (that is, more than 1.5 mg/l) are displayed in yellow on the map, and they comprise around 97% of the total district area. This indicates that the ground water in this district is, for the most part, acceptable for use in residential settings. The places with moderately high concentrations (1.5–3.0 mg/l) are depicted in green, and the majority of these sites are located in the district's northeastern corner. There is no region that had demonstrated an exceptionally high quantity of fluoride in the ground water.

Table: Block wise area of Fluoride distribution

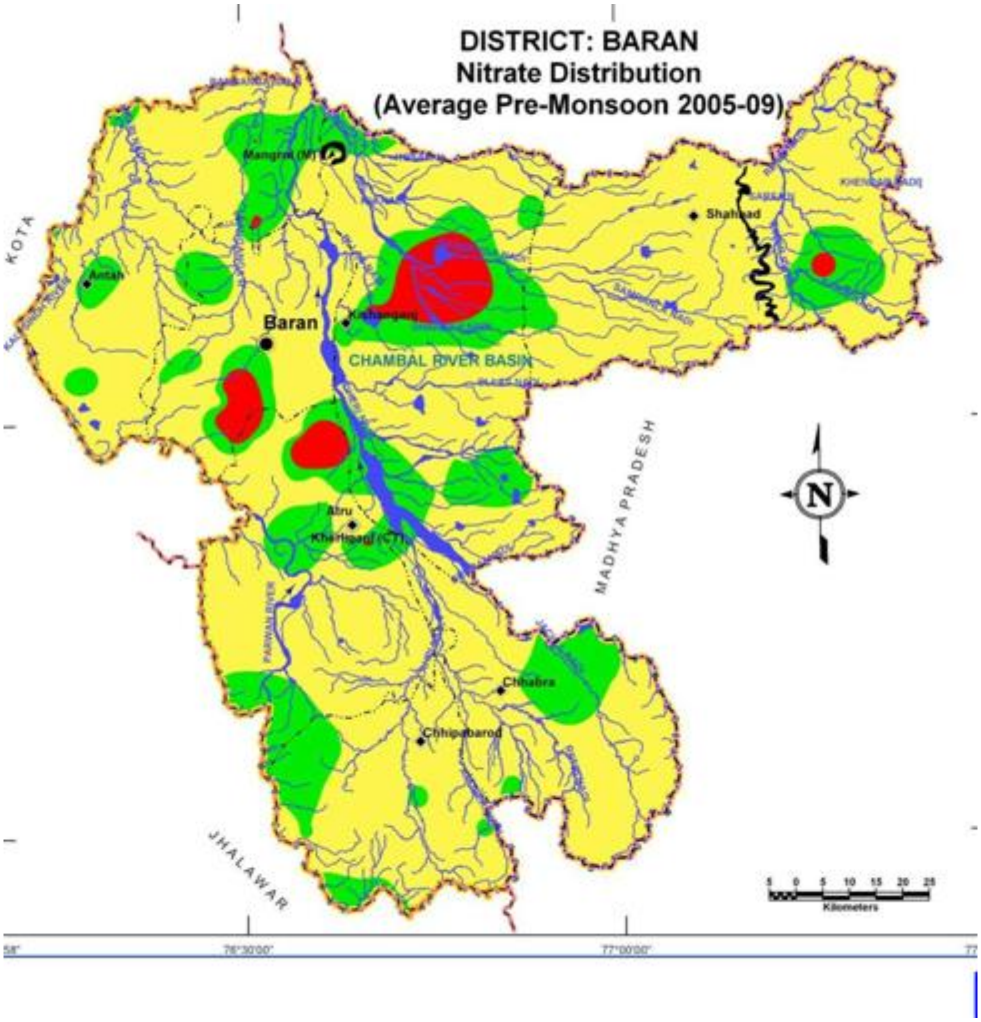
Fluoride concentration Range (mg/l) (Ave. of years 2005-09)	Block wise area coverage (sq km)														Total Area (sq km)
	Antah		Atru		Baran		Chhabra		Chhipabarod		Kishanganj		Shahbad		
	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	
<1.5	1,032.7	100.0	946.2	100.0	638.8	100.0	798.9	100.0	684.2	100.0	1,444.7	100.0	1,180.0	83.1	6,725.5
1.5-3.0	-	-	-	-	-	-	-	-	-	-	-	-	240.4	16.9	240.4
Total	1,032.7	100.0	946.2	100.0	638.8	100.0	798.9	100.0	684.2	100.0	1,444.7	100.0	1,420.4	100.0	6,965.9

GROUND WATER NITRATE DISTRIBUTION

Nitrate concentrations in several ground water samples are depicted on Plate XV. The region of the district that has a low nitrate content (less than 50 mg/l) is depicted in yellow and accounts for about 77 percent of the land that may be used for agricultural purposes. The locations that have a nitrate concentration that is relatively high (50-100 mg/l) are depicted in green on the map. These areas cover roughly 19% of the total district area and are located mostly in the eastern portion of Chhabra and the areas around Kishanganj, Mangrol, and Atru. That leaves just around 4% of the district area that has high nitrate concentration (>100 mg/l), which is represented in red colored patches. These high nitrate concentration areas are mostly located in the northern portion of Atru and the eastern half of Kishanganj, and the ground water there is not suitable for cultivation..

Table: Block wise area of Nitrate distribution

Nitrate concentration Range (mg/l) (Ave. of years 2005-09)	**Block wise area coverage (sq km)**														**Total Area (sq km)**
	Antah		**Atru**		**Baran**		**Chhabra**		**Chhipabarod**		**Kishanganj**		**Shahbad**		
	Area	**%age**	**Area**	**%age**	**Area**	**%age**	**Area**	**%age**	**Area**	**%age**	**Area**	**%age**	**Area**	**%age**	
<50	825.6	79.9	674.4	71.3	500.3	78.4	656.7	82.2	551.0	80.5	883.3	61.1	1,283.0	90.3	**5,374.3**
50-100	205.3	19.9	224.4	23.7	101.2	15.8	142.2	17.8	132.8	19.4	423.3	29.3	129.0	9.1	**1,358.2**
>100	1.8	0.2	47.4	5.0	37.3	5.8	-	-	0.4	0.1	138.1	9.6	8.4	0.6	**233.4**
Total	**1,032.7**	**100.0**	**946.2**	**100.0**	**638.8**	**100.0**	**798.9**	**100.0**	**684.2**	**100.0**	**1,444.7**	**100.0**	**1,420.4**	**100.0**	**6,965.9**



Except for a few regions in which a high concentration of certain of the elements is observed, the groundwater quality in shallow aquifers is generally adequate for use in a variety of applications. However, there are a few areas in which this is not the case. The quality of the water in the deeper aquifers differs from one location to the next, and there is ongoing exploration effort to determine whether or not the water in these aquifers is suitable for a variety of applications. There have been reports of a high occurrence of components like as fluoride and nitrate coming from some of the locations, and the majority of the researchers believe that this may be related to geogenic reasons. at a similar vein, salinity measurements were taken at a variety of locations around the country, both inland and along the coasts. Important elements include nitrate, fluoride, and heavy metals; the high concentrations of these constituents cause serious health risks, which may be related to human activities. Nitrate is the most common of these constituents.

CONCLUSION

The preceding research makes it abundantly evident that the quality of the ground water as well as its distribution across the various areas of Rajasthan is unequal, which results in issues about its shortage and its appropriateness. Due to the fact that the local geology is considered to be positive in the environment and does not really react with rainwater, the above hydro-chemical study reveals that the majority of the samples have good water quality parameters that are suitable for drinking, agriculture, and industrial purposes. This is a direct result of the good hydro-geological and hydrological system that is in place, and it is a result of the fact that most of the samples have good water quality parameters. Some of the samples were found to have questionable irrigation water quality, particularly with regard to fluorine and nitrate levels. This was discovered in a handful of the samples.

REFERENCE

1. Aher, H.R. – Zinjad, D.G. – Gunjal, P.S. – Kuchekar, S.R. (2002) Impact of human activities on the quality of water in Pravara river basin and Pravara left bank canal. Chemical Environment Research 11, pp. 101-109.
2. American Public Health Association (1992) Standard methods of examination of water and water. APH (18th ed.) Washington DC, USA.
3. Baran district profile (2012) An official website of Baran-district, Rajasthan, India. Available at http://www.baran.nic.in (accessed December 19, 2012).
4. Allen, R.G., Pereira, L.S., Raes, D., Smith, M. (1998). Crop Evapotranspiration: A Guideline for Computing Crop Water Requirements. FAO Irrigation and Drainage Paper No 56. FAO Water Resources, Development and Management Service, Rome, Italy.
5. Dash SK, Kulkarni MA, Mohanty UC, Prasad K (2009) Changes in the characteristics of rain events in India. J Geophys Res 114:D10109.
6. Dwivedi, J.L. (2012) Status Paper on Rice in Uttar Pradesh. Rice Knowledge Management Portal http://www.rkmp.co.in.
7. E.A. Siddiq (2000) Bridging the rice yield gap in India http://www.fao.org/docrep/003/x6905e/x6905e09 .htm