International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Physico-Chemical Analysis of Groundwater of Kotra Village of Neemkathana Block Sikar, (Rajasthan) India

Suresh Kumar Verma[1], Santosh Kumar Verma[2]

[1]Government Science (PG) College, Sikar (Rajasthan) India

[2]Kamla Modi Govt. Girls College Neemkathana, Sikar (Rajasthan) India
Corresponding Author: vermask76[at]gmail.com, +91-9460004395

Abstract: ***This paper observes, describes and statistically analyses, certain physico-chemical parameters as fluoride, chloride, nitrate, sulphate, suspended solids, pH, total alkalinity, and total hardness which show groundwater quality during the period of January 2020 to December 2020. Samples from selected source were collected as per BIS recommendation and all parameters were compared with the acceptance and desirable limits prescribed by BIS (IS10500: 2012).***

Keywords: Groundwater, physio-chemical parameters, Fluoride, BIS, permissible limit, WHO

1. Introduction

Theoccurrence, availability and movement of groundwater is mainly controlled by topographic features, physical characteristics and structural of the geological formation. Particularly in rural areas, groundwater is a valuable natural resource, and not to be neglected (Maheshwari2019). In all regions of the district groundwater is almost the only source of water for the survival of flora and fauna. Naz et al (2016) state that groundwater is a very valuable resource in dry and semi-arid areas where surface water and rainfall is not regular. However, some people, particularly in the developing world, lack access to safe drinking water. The reduction in surface water likely reduces the rate of replenishment of groundwater, resulting in the depletion of underground aquifers (Woodhouse, et al, 2010). The physico-chemical parameters should belong to quality standard given, out of these one or more are more or less than the standard limits, then it is polluted. Omaka et al (2015) state that increasing population; urbanization and industrialization caused an increase in water pollution on a global scale that why the need to determine the quality of public water supply has been intensified. Natural occurrence of fluoride in groundwater is mostly influenced by the geological setting and hydrogeological factors of the aquifer of the region. Fluoride-bearing rocks of aquifers are frequently the primary causes of fluoride concentrations in groundwater (Jha et al 2013).

Study Area

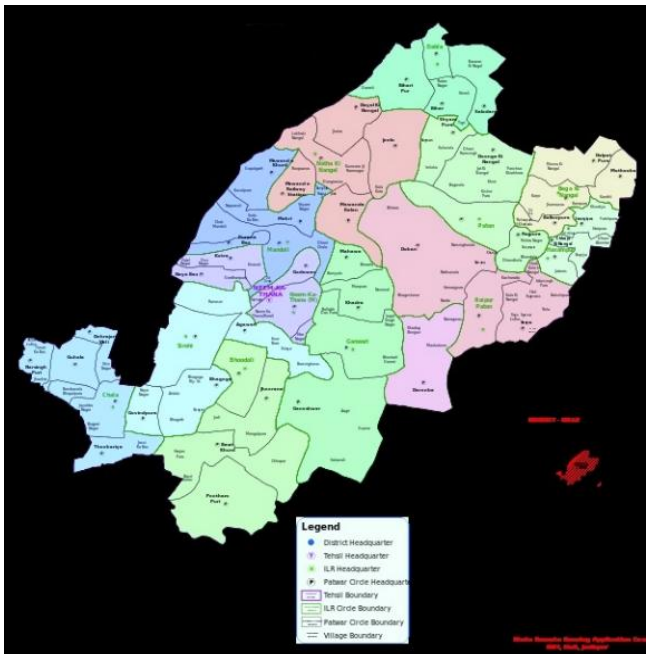

Figure 1: Kotra village Neemkathana block (source: election commission)

The geographical location kotra village 27.73800N and 75.832514° E, geographical area of village is 808.25 hectares, and Kotra Village Total population is 1653 and number of houses are 323. Neemkathana is nearest town to

Kotra village which is 6 km away. Neemkathana block and hydrological formation of Kotra village is Older Alluvium. Due to unavailability of surface water peoples of Kotra village are dependent on groundwater.

2. Material and Methods

Table 2: 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^-(mg/l)	UV Spectrophotometric Method
SO42-(mg/l)	Turbidmeter Method
NO3-(mg/l)	Spectrophotometer

3. Results and Discussions

Assessment of groundwater of Kotra village in Neemkathana block

Groundwater samples of Sirohi village collected from Month of Aug-2020 to July-2021 and tested for different physico-chemical parameters. The results of physico-chemical parameters shown in the table 3

Table 3: Water testing data of Kotra village in Neemkathana block

Water testing data of Kotra village in Neemkathana block								
Para. / Month	Ph	Total alkalinity, mg/L	Total hardness, mg/L	Cl^-, mg/L	SO_4^{2-}, mg/L	NO_3^-, mg/L	F^-, mg/L	TDS, mg/L
Jan-20	7.5	480	600	200	282	40	1.91	2232
Feb-20	7.5	540	580	160	290	35	1.90	2120
March-20	7.6	420	490	120	250	50	1.64	2210
April-20	7.5	500	480	110	235	38	1.85	2005
May-20	7.8	480	650	130	220	35	1.84	1945
June-20	7.8	450	610	160	215	44	1.82	2210
July-20	8	580	620	150	220	35	1.93	1960
Aug-20	7.5	575	590	150	260	40	1.92	1950
Sept-20	7.6	520	520	130	260	41	1.92	1980
Oct-20	7.4	510	490	110	270	38	1.93	1970
Nov-20	7.3	510	495	130	260	42	1.80	1955
Dec-20	7.4	515	490	110	265	46	1.98	1945

Table 2 includes the testing results of groundwater in Kotra village for selected parameters, for the assessment period of Jan.-2020 to Dec-2020. Parameter pH has no unit while all the selected parameters are shown in mg/L. For the assessment of the groundwater parameters, BIS (IS 10500: 2012) is selected which have accepted, and permissible limits for each parameter, with no relaxation for nitrate

pH

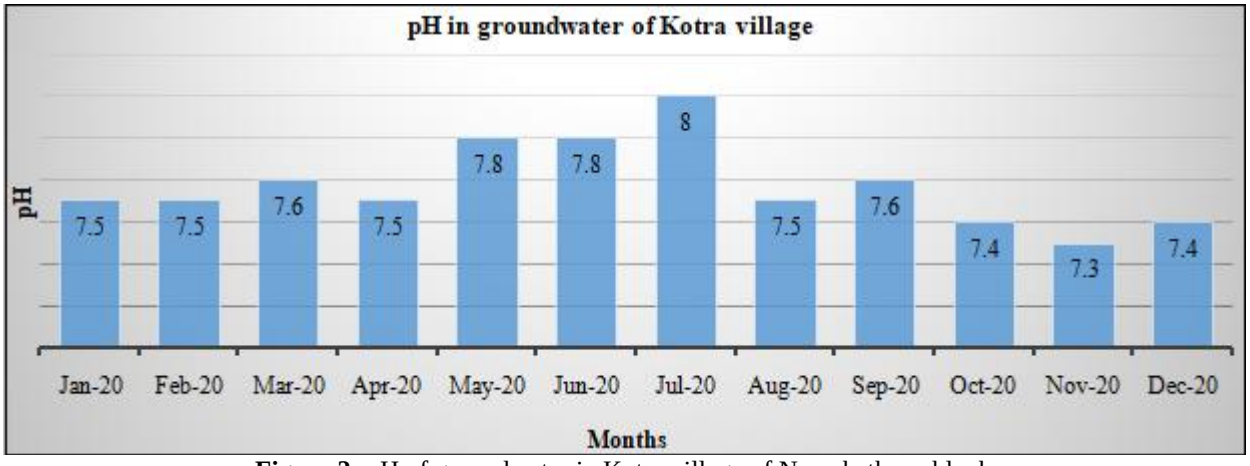

Figure 2: pH of groundwater in Kotra village of Neemkathana block

Figure 2 shows that the pH of the groundwater of Kotra village found within (BIS IS 10500: 2012) acceptable limit of 6.5 – 8.5 for the assessment year from Jan-2020 to Dec-2020**.** A minimum of 7.3 was observed in the month of Nov-2020, and a maximum of 8was observed in the month of July 2020.

Total alkalinity

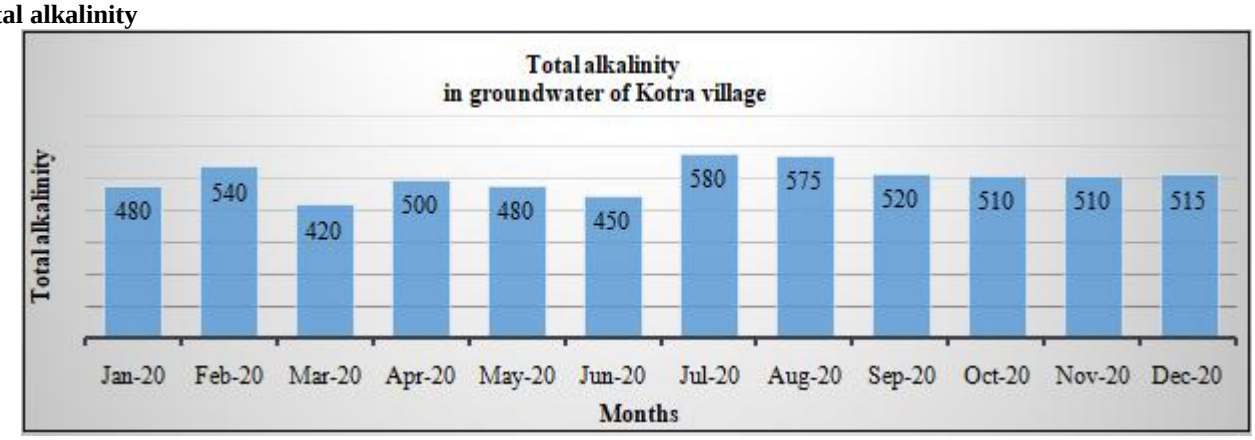

Figure 3: Total alkalinity in groundwater of Kotra village in Neemkathana block

Figure 3 shows that The total alkalinity for the groundwater of Kotra village found beyond BIS (IS 10500: 2012) acceptable limit of 200 mg/L, but all the results are within the permissible limit 600 mg/L, the results of test indicates that the value is maximum in month of July2020while minimum in month of march 2020.

Total hardness

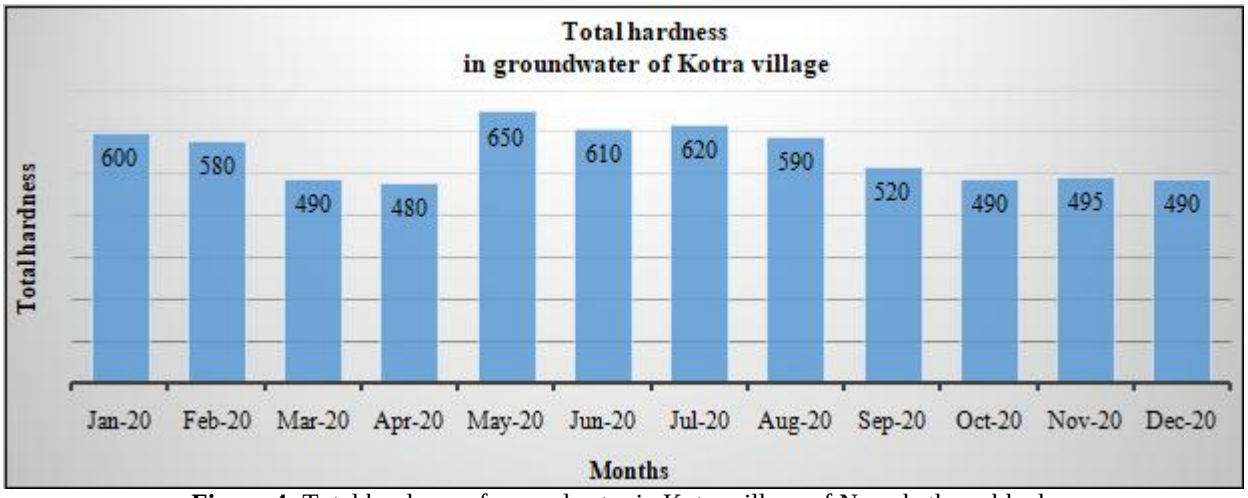

Figure 4: Total hardness of groundwater in Kotra village of Neemkathana block

Figure 4 shows the assessment of parameter total hardness for the assessment period and results states that the maximum total hardness 650 mg/L found in the month of May2020 and the minimum total hardness 480 mg/L is observed in the month of April 2020.

Chloride

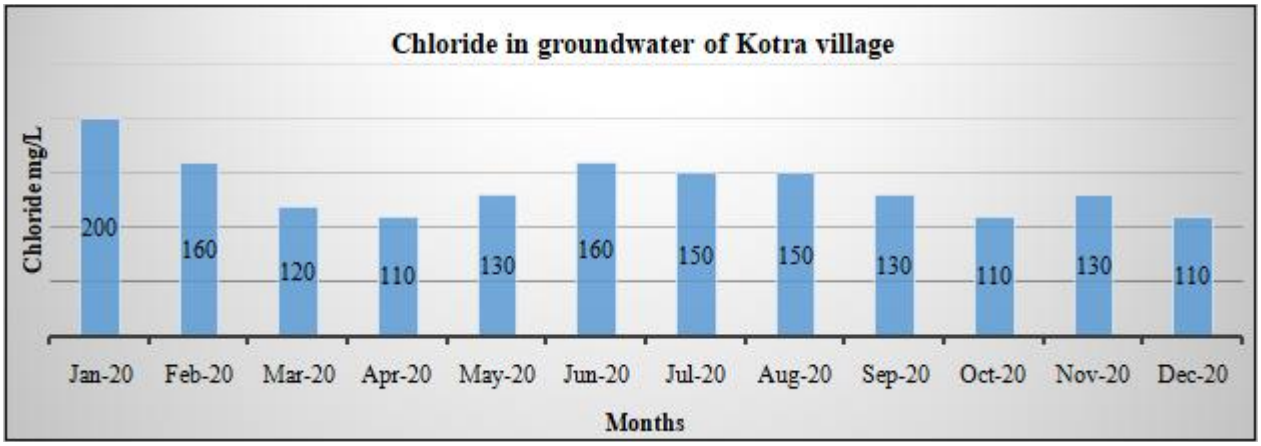

Figure 5: Chloride in groundwater of Kotra village in Neemkathana block

Figure 5 shows that maximum chloride 200 mg/L found in the month of Jan-2020 and the minimum chloride conentration110 mg/L is observed in the month of April, Oct, and Dec-2020. The chloride concentration of groundwater in the Kotra village observed lower than the BIS (IS 10500: 2012) acceptable limit of 250 mg/L.

Sulphate

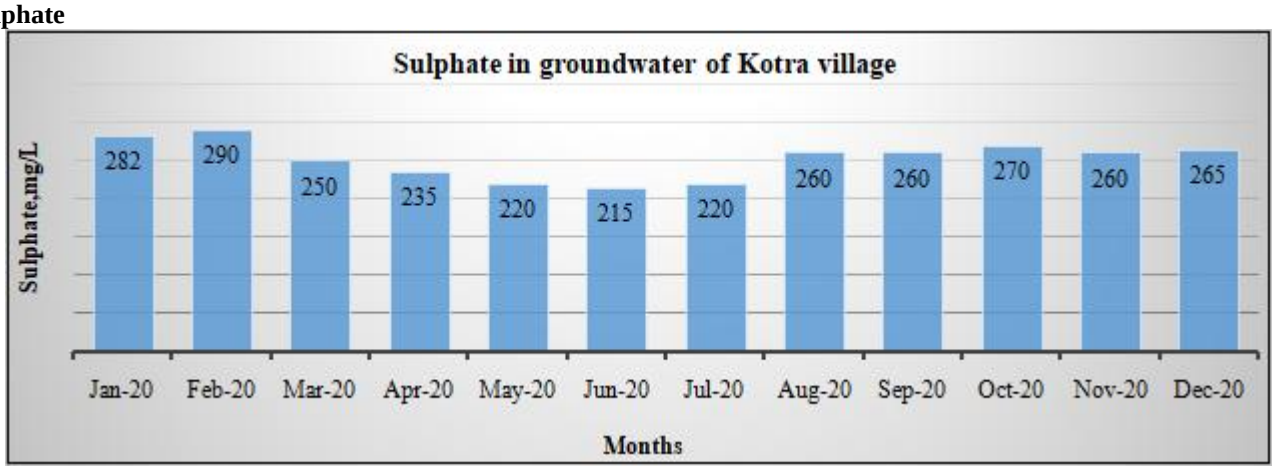

Figure 6: Sulphate in water of Kotravillage of Neemkathana block

Figure 6 shows that the maximum sulphate 290 mg/L found in the month of Feb-2020 and the minimum 215 mg/Lsulphate is found in the month of June2020. The sulphate concentration in groundwater of Kotra village is observed higher than the BIS (IS 10500: 2012) acceptable limit of 200 mg/L.

Nitrate

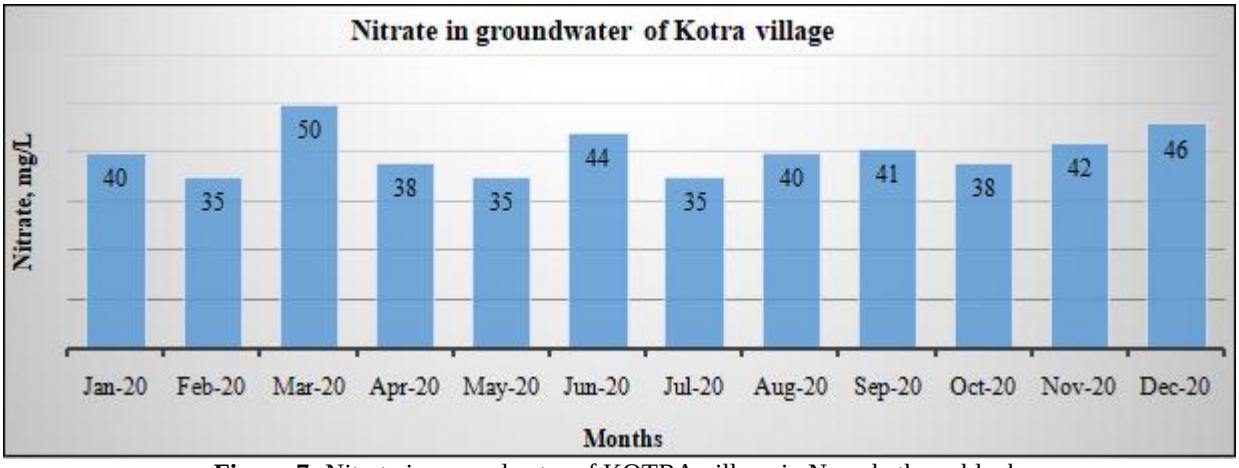

Figure 7: Nitrate in groundwater of KOTRA village in Neemkathana block

Figure 7 shows that maximum nitrate 50 mg/L found in the month of March 2020 and the minimum35 mg/L nitrate is found in the month of Feb, May, July2020. Test result reveals that the nitrate concentration of groundwater in the Kotra village observed are within the BIS (IS 10500: 2012) acceptable limit of 45 mg/L except March month of the assessment period.

Fluoride

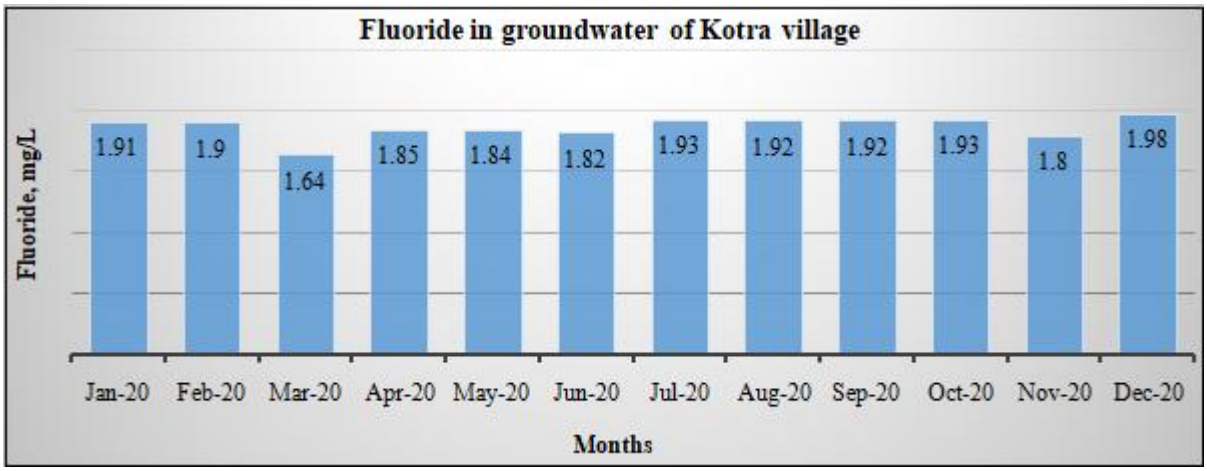

Figure 8: Fluoride in groundwater of Kotra village of Neemkathana block

Figure 8 shows that the fluoride concentration variation for the assessment period Aug-20 to Jul-21 is 0.63 mg/L-0.91mg/L. The maximum fluoride 1.98 mg/L found in the month of Dec-2020 and the minimum fluoride 1.64 mg/L is found in the

month of March 2020. Results of test reveals that the fluoride concentration in groundwater of the Kotra village observed are above the BIS (IS 10500: 2012) acceptable limit of 1.0 mg/L which is harmful for human health

Total Dissolved Solids

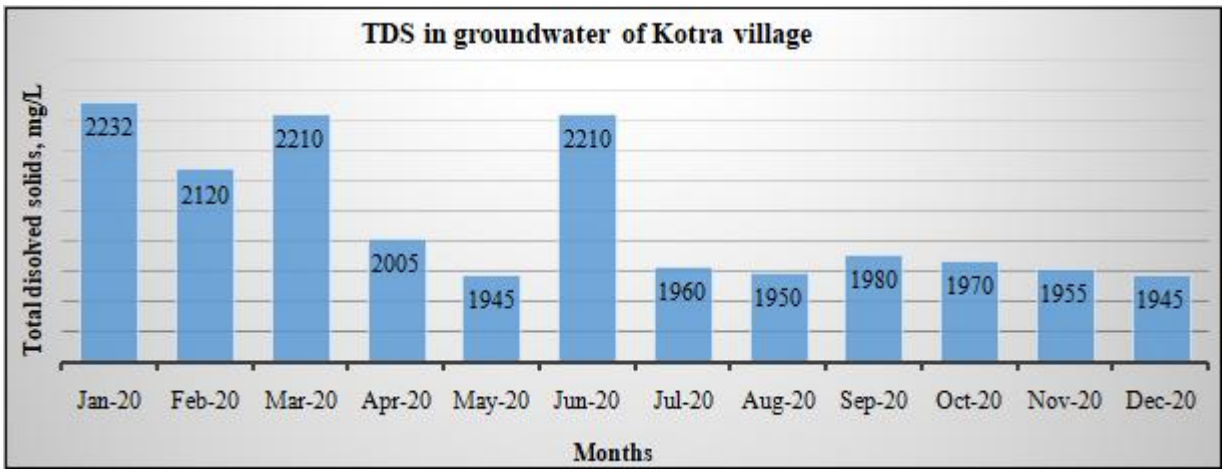

Figure 9: TDS in groundwater of Kotra village of Neemkathana block

Figure 9 shows that the Total Dissolved Solids (TDS) variation for the assessment period Jan 2020 to Dec-2020 is 1945 mg/L-2232 mg/L. The maximum TDS 2232 mg/L found in the month of Jan-2020 and the minimum TDS 1945 mg/L is found in the month of May and Dec-2020. Test result reveals that the total dissolved solid (TDS) in groundwater of the Kotra village observed higher than the BIS (IS 10500: 2012) acceptable limit of 500 mg/L. BIS, set a standard for drinking water as alternate, have limit 2000 mg/L for TDS so all the tested results of groundwater for Kotra village are above the permissible limit.

The purpose of this paper is to examine the groundwater quality in Kotra Village of Sikar district of India and compare groundwater quality parameters with BIS (IS10500: 2012) standards. The sulphate concentration in groundwater of Kotra village is observed higher than the BIS (IS 10500: 2012) acceptable limit of 200 mg/L. Results of test reveals that the fluoride concentration in groundwater observed are above the BIS (IS 10500: 2012) acceptable limit of 1.0 mg/L which is harmful for human health. TDS of groundwater for village samples are also above the permissible limit. The chloride concentration of groundwater observed was lower than the BIS (IS 10500: 2012) acceptable limit of 250 mg/L and results for nitrate concentration of groundwater observed are within the BIS (IS 10500: 2012) acceptable limit of 45 mg/L except March month of the assessment period. The excess concentration for water samples of some parameter makes water harmful for health for humans so it is suggested to the state government to take action to control the groundwater quality for the selected village and provide the villagers potable water from alternative source.

References

[1] Jha, S. K., Singh, R. K., Damodaran, T., Mishra, V. K., Sharma, D. K., & Rai, D. (2013). Fluoride in groundwater: toxicological exposure and remedies, J. Toxicol. Environ. Health Part B Crit. Rev.16.52–66, https: //doi.org/10.1080/10937404.2013.769420.

[2] Maheshwari, L. K., Memon, S. A., Imran, E., &Tunio, A. (2019). Analysis of Groundwater Quality Parameter of Hand-Dug Well and Their Health Risk Assessment of Study Area Tharpakar,, pp.41–48.

[3] Naz, A., Mishra, B. K., Gupta, S. K. (2016). Human health risk assessment of chromium in drinking water: a case study of sukinda chromite mine, Odisha, India, Expo, Health 8.253–264, https: //doi. org/10.1007/s12403-016-0199-5.

[4] Omaka, O. N., Offor, I. F., & Onwe, I. M. (2015). Hydrogeochemical attributes and ground water quality of Ngbo Community in Ohaukwu Area Council, Ebonyi State, Nigeria. *Revista Ambiente & Água*, *10*, 35-47.

[5] Woodhouse, C. A., Meko, D. M., MacDonald, G. M., Stahle, D. W., E. R. &Cook, E. R. (2010). A 1, 200-year perspective of 21st century drought in southwestern North America, Proc. Natl. Acad. Sci. U. S. A.107.21283–21288, https: //doi.org/10.1073/ pnas.0911197107.