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Assessment of Water Quality Index of Ground Drinking Water in Ganeshwar and Chala Villages of Neemkathana Block of Sikar India

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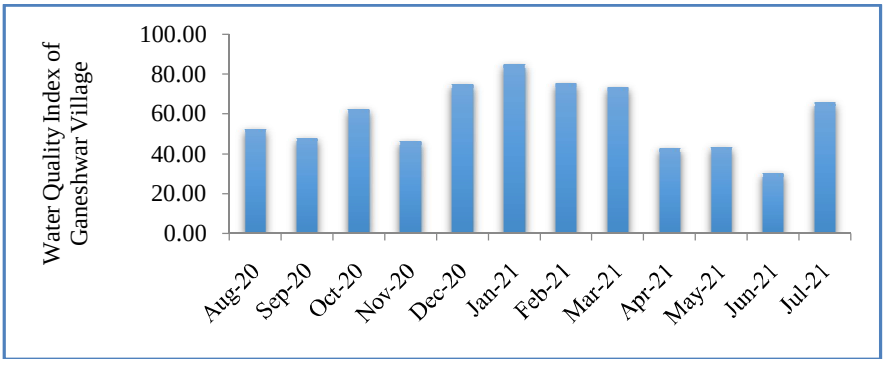
ABSTRACT

In this communication, the water quality index of Ganeshwar and Chala villages of Neemkathana block in Sikar District of Rajasthan state has been uttered. The water samples were collected from the sampling points strictly as per BIS recommendations. It is observed that the WQI of Ganeshwar village is found below 100 and in Chala Village is observed sometimes above the 100. The quality of water in Chala village is not a good quality for drinking purpose. The TDS level of Ganeshwar and Chala villages found higher than the acceptable limit of 500 mg/l. This study is given a direction for researchers in this area and facilitates to identify the sickness area due to these Physico-chemical parameters. The authors have been recommended the five stage R.O. type filtration system for reducing the Fluoride, Nitrate and TDS in these villages.

Graphical Abstract



WQI of water in Ganeshwar Village of Neemkathana block.

Keywords: Water, Physico-chemical study, Water Quality Index.

INTRODUCTION

Water and air (Oxygen) are the survival needs of human body. As per Mitchell, the human adult body consists 60% of water where as the brain and heart are composed of 73%, lungs are about 83%, skin 64% muscles and kidneys are 79%, and even the bones are watery with 31%. According to Dr. Jeffrey

"The water contents in the born babies have the most, being born at about 75% by one year of age the amount drops to about 65%, and the women are fatter than man so they have about 55% water of their body weight". Each day an adult human body must consume approx 2-3 liters a certain amount of water to survive [**1**].

Rajasthan is desert state in India and the most of population is depends on the ground water for industrial agriculture and domestic uses . The average annual rainfall is 580mm with 30 rainy days. Ground water level is in range of 250 feet to 400 feet. The impurities or the incidentals in underground water is explained in chapter one. The testing and monitoring of water is very important and the water impurities are time varying parameters and it is also affected by the use of Chemicals in agriculture and Industrialization.

BIS [**2**] specifies the acceptable limits and the permissible limits in the absence of alternate source. BIS recommended that the acceptable limit is to be implemented as values in excess of those mentioned under 'Acceptable' render the water not suitable. Khandelwal and Singh [**3**] attempted to predict the chemical parameters, chemical oxygen demand, TDS and total suspended solids in mine water using artificial neural network (ANN) by incorporating the pH, temperature and hardness. Somwanshi and Akuskar [**4**] analyzed the physico-chemical parameters of the effluents of Tulja Bhavani Cooperative Sugar Factory Ltd. Naldurg Dist. Osmanabad and Nearby dug well and bore well waters of pre- and post monsoon seasons carried out. The methods for the analysis were as per the standard methods recommended by APHA, WHO, ICMR, IS 3307-1977.Tank and Chippa [**5**] analyzed water quality of Bharatpur, Rajasthan by standard method as suggested by APHA (1995) and compared with the values as guided by ICMR and said that high concentration of TDS water loss its potability. Thambavani and Mageswari [**6**] analyzed various physico chemical parameters with the help of different water quality indices, and stated the quality degraded of ground water. Singh *et al.* **[7**] assessed environmental impact of open cast mining activities in Jhansi-Utter Pradesh. Asraf *et al.*, [**8**] studied that physical impacts of sand mining includes reduction of water quality and destabilization of the stream bed and banks. Karmakar and Das [**9**] studied impact of mining on groundwater and surface water. Lowering of water table is continuous due to mining and lowering of water table.Rao *et al*., [**10**] stated that man–made activities are responsible for the groundwater contamination.

Gopal *et al.*, [**11**] selected arid districts of Rajasthan, India for the assessment of the fluoride and nitrate levels of groundwater. 760 groundwater samples of arid zone were analyzed, and found that, fluoride and nitrate toxicity was present in 55% and 37% waters, respectively, as per drinking water standards of WHO. Choubisa [**12**] investigated physico–chemical parameters in 21 villages of Banswara, Dungarpur, and Udaipur districts of southern Rajasthan, where fluoride concentrations in drinking waters range from 1.5 to 4.0 ppm, and found Chronic fluoride intoxication in the form of osteo-dental fluorosis The prediction by ANN was also compared with Multivariate Regression Analysis (MVRA). Sabal and Khan [**13**] assessed the fluoride contamination status of groundwater in Phulera tehsil of Jaipur district, Rajasthan. After the pilot survey symptoms of skeletal and gut fluorosis have been found in almost every inhabitant and alkalinity of all the water samples were found to be more than the permissible limit. Meena *et al.*, [**14**] analyzed the groundwater of villages of Deoli Tehsil (Tonk District) Rajasthan, with special reference to fluoride. The fluoride content of groundwater ranged from 0.26 to 9.60 ppm.Arif *et al.*, [**15**] analysed fluoride concentration of groundwater samples from 40 villages of Ladnu Block and found that 31 villages were found to have a fluoride concentration above 1.5 mg L^{-1}. The maximum fluoride concentration (7.1 mg L^{-1}) was recorded in groundwater of the Roja. As per the desirable and maximum permissible limit for fluoride in drinking water, recommended by the WHO and BIS, the groundwater of 31 villages was found unfit for drinking purpose. Jangwan *et al*., [**16**] analyzed catchment area of Krishni River and found that water samples have the Cd and Se concentration higher than permissible limit. Behera *et al.*, [**17**] gave an assessment of groundwater pollution due to fluoride concentration and water quality in and around Puralia district, West Bangal, india and found that the fluoride concentration varies from

0.126 ppm to 8.16 ppm. The favourable factor which contributes to rise of fluoride in groundwater is presence of fluoride rock salt system. Navale *et al.,* [18] stated that lakes and wells of Chembur of Mumbai, Maharastra are getting polluted due to the industrial discharge of big industries like BPCL, HPCL RCF, etc. industrial pollutants directly enters into lakes and wells and destroying the groundwater water quality.Kumar *et al.,* [19] analyzed physico-chemical parameters of Jaipur city and its De-fluoridation by using brick powder and marble slurry powder: A green approach to utilize industrial wastes. Suthar *et al.,* [20] evaluated the level of nitrate in some agro-economy based rural habitations of northern Rajasthan, India. A total of 64 groundwater samples from 21 different Villages/sub-villages of district Sri Ganganagar, India were collected and analyzed for nitrate, sulphate and few other parameters. NO_3^- level in groundwater was 7.10–82.0 mg L^{-1} for individual samples, but average NO_3^- for total samples was 60.6 ± 33.6 (SD) mg L^{-1}, which indicates the non-suitability of groundwater for drinking purposes, they considered BIS standard (22.6 mg L^{-1}) is as reference level. Hussain *et al*., [21] analysed fluoride in drinking water in Rajasthan and its ill effects on human health. Agarwal [22] assessed nitrate contaminations in groundwater of Jaipur district, Rajasthan and it's impact on human health and said about the sources of nitrate in groundwater which are geological or man-made. Maurya [23] analyzed water quality with special reference to sikar district, Rajasthan and its impact on human health. Anuradha, and Rao, [24] stated that awareness, planning and proper management is required to protect water quality.

Bureau of Indian Standards developed Indian standards for drinking water 10500:2012 which consists with 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 [25]. World Health Organization (WHO) produces the water quality standards or international norms on water quality and human health in the form of guidelines. The water quality index of Ganeshwar and Chala villages is studied in this communication which will be very useful for the future research in this area.

MATERIALS AND METHODS

Selection of Site: It observed that total 40 NHS monitored in Sikar out of which only 2 NHS (Barala and Patan villages) have been monitored from Neemkathana the incidental parameters of both the places are shown in table 1.

Table 1. Water Incidental parameters of two NHS Barala and Patan [26]

S.No.	Incidental parameters	Qty/Remark	
		Barala	Patan
1	Longitude	75.882	75.983
2	Lattitude	27.748	27.8
3	pH	7.78	7.5
4	EC in µS	1415	5360
5	CO_3^{2-}	0	0
6	HCO_3^-	390	415
7	Cl^-	213	1354
8	SO_4^{2-}	73	340
9	NO_3^-	3	140
10	PO_4^{3-}	0	0.45
11	TH	470	1485
12	Ca	124	168
13	Mg	39.05	259.14
14	Na	105	565
15	K	3.4	6
16	F	1.2	1
17	Fe	0.1	0.26
18	TDS	919.75	3483

The above observed / monitored data having drastic difference for the values of EC, Cl^-, SO_4^{2-}, NO_3^-, TH, Ca, Mg, Na, K, and TDS respectively. The incidental parameters are floating in Sikar and can't be plays the average data for whole Neemkathana. That's why more number of samples is required for feasible study of underground water. The authors have been selected the two new sampling villages such as Ganeshwar and Chala because both are having two different geographical conditions. Semi-arid climate over the tehsil is having low rainfall, low relative humidity, high evaporation rate and high temperature. The highest mean annual rainfall in Sikar district is 536.6mm. Almost 95% of the total annual rainfall is during the South-West Monsoon, humidity is the highest in August with mean daily relative humidity of 80%.

Groundwater Sampling: The sampling of water is very important in implementation of water testing and monitoring system. The table 2 is presenting the types of container used, preservation and maximum storage recommended for water, where P= Plastic (Polyethylene or Equivalent), G= Glass, P(A) or G(A)= Rinsed with 1+1 HNO_3

Table 2. Types of container used, preservation and maximum storage recommended as per characteristic of testing of water **[27]**

S. No.	Characteristic	Container	Preservation	Maximum Storage Recommended
1	PH Value	P, G	Analyse Immediately	0.25 Hours
2	Total Dissolved Solids (TDS)	P, G	Analyse Same Day	6 Hours
3	Turbidity	P,G	Analyse Same Day, Store in Tank	24 Hours
4	Chloride	P,G	Not Required	
5	Total Alkalinity	P,G	Cool ≤ 6 C	24 Hours
6	Total Hardness	P,G		
7	Sulphate	P,G	Cool ≤ 6 C	28 Hours
8	Iron	P(A), G(A)	For Dissolved Metals Filter immediately, Add HNO_3 to PH<2	6 Months
9	Total Arsenic	P(A), G(A)	For Dissolved Metals Filter immediately, Add HNO_3 to PH<2	6 Months
10	Fluoride	P	Not Required	28 Days
11	Nitrate	P, G	Analyse as soon as possible Cool<60C	48 Hours
12	Residual Chlorine	P, G	Analyse immediately	0.25 Hours
13	Presence/Absence of Bacteriological Contamination	G		

The water samples was collected in bottles as shown in Figure 1; and material of these bottles are as par the BIS norms.

Water Sampling.

Instrumentation: The Knvio Neer brand digital pH test meter make of Knvio RO water solutions is used for testing the pH of water. The pH meter is shown in figure 1. The accuracy level of the pH meter is ± 0.1pH and it can measure from 0 to 14.00 pH.

The EC/TDS hydro tester brand name HM DIGITAL COM-80 of make HM Digital India Pvt. Ltd is used to measure the conductivity and TDS of water. The TDS meter is shown in figure 2. The range of testing for Conductivity is 0-9999/9.9 µS (µS cm^{-1}) and TDS is 0-5000/5.0 ppm/ppt and the best feature of the equipment is push button type digital calibration. The accuracy level of the system is ±2%. The other parameters were tested in the testing laboratory public health engineering department PHED) which govern by state government of Rajasthan.

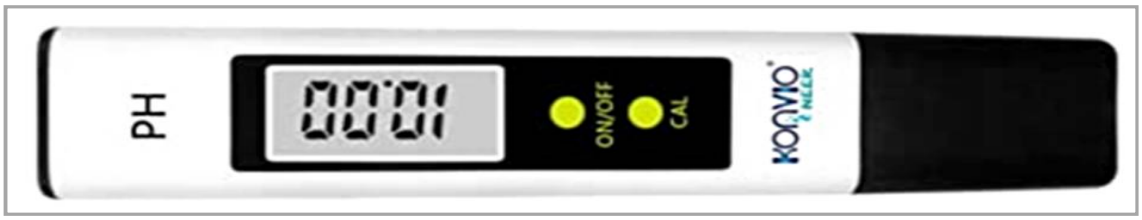


Figure 1. pH test meter.

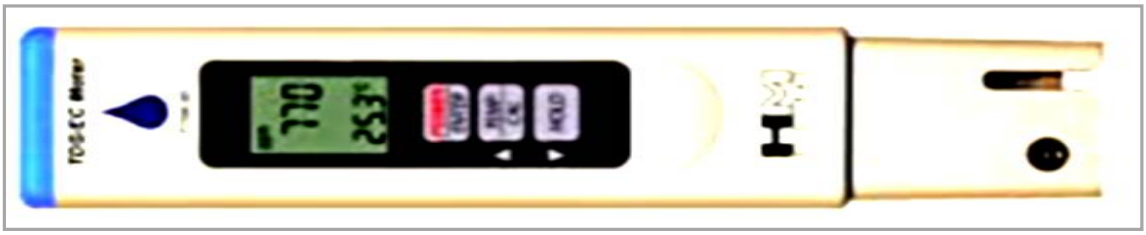


Figure 2. Conductivity and TDS meter.

Uncertainty Analysis: There is no such thing as a perfect measurement; all the measurements have errors and uncertainties. The errors and uncertainties may occurred during the experiments & sampling due to the climate conditions, calibration method, observation and testing method, space conditioning method and the purity of chemical used in the testing [**28**].

Let be consider a general case in which an experimental result r, is a function of j measured variables X_i; than

$$r = r(X_1, X_2 \dots \dots \dots \dots, X_j) \qquad \dots(1)$$

Above equation is the data reduction equation used to determining r from the measured values of the variables X_i.Then the uncertaintyin the result is given by Coleman and Steele [**29**] as;

$$U_r = \left[\left(\frac{\partial r}{\partial X_1}\right)^2 . U_{x1}^2 + \left(\frac{\partial r}{\partial X_2}\right)^2 . U_{x2}^2 + \cdots \dots \dots \dots \dots \left(\frac{\partial r}{\partial X_j}\right)^2 . U_{xj}^2\right]^{1/2} \dots(2)$$

Where U_{xj} are the uncertainties in the measured variable X_i. The calculation of experimental uncertainties of each section was given by Leito etal, in this uncertainty source is the uncertainty originating directly from the operation of pH measurement of the Water / unknown solution. It includes the following components [**30**].

1. Repeatability of pH measurement.
2. Uncertainty originating from the finite readability of the pH-meter scale.
3. Uncertainty originating from the drift of the measurement system.

4. Temperature effect: temperature influences the slope of the electrode system. This has not been taken into account by the uncertainties of the pH standards. The pH value of water most important which decided the condition of water and its uses. So many parameters can affect the pH of water out of these four main important are as follows: Temperature, Moisture & Pressure, Mechanical disruption and Electrical disruption.

The total uncertainty in the pH measurement of water may be calculated as follows:

$$U_{pH} = \left[(U_{Electrode})^2 + \left(U_{Temperature}\right)^2 + \left(U_{\text{Mechanical disruption}}\right)^2 + \left(U_{reading}\right)^2\right]^{1/2} \quad \ldots(3)$$

$$= [(0.01)^2 + (0.01)^2 + (0.01)^2 + (0.01)^2]^{1/2}$$

$$= \pm 0.02$$

The uncertainty during Physical Testing (Colour, Odour etc.) of water can be given by;

$$U_{PT} = \left[\left(U_{ColourTesingbyEyes}\right)^2 + \left(U_{OdourTesing}\right)^2 + (U_{Test})^2\right]^{1/2} \quad \ldots.(4)$$

$$= [(0.1)^2 + (0.1)^2 + (0.1)^2]^{1/2}$$

$$= \pm 0.173$$

The uncertainty during Turbidity measurement of water may be calculated as follows [**31, 32**]:

$$U_{Turbidity} = \left[(U_{sensor})^2 + \left(U_{reading}\right)^2 + (U_{colour})^2 + (U_{Chemical})^2 + (U_{Bacteria})^2\right]^{1/2} \quad \ldots (5)$$

$$= [(0.1)^2 + (0.1)^2 + (0.1)^2 + (0.1)^2 + (0.1)^2]^{1/2}$$

$$= 0.224$$

The uncertainty and error are also caused by various sources in chemical testing of water which are given as follows:

- Uncertainty due to improper Sampling (Stability, Contamination, etc.),
- Uncertainty due to improper Storage Conditions,
- Uncertainty due to improper Sampling Preparations (Weighing, Sub-sampling, extraction etc.),
- Uncertainty due to improper Instrument effect (Analytical Balance, etc.),
- Uncertainty due to Reagent Purity,
- Uncertainty due to Calibration effect (Linearity of calibration, weighing, temperature, etc.),
- Uncertainty due to Blank Correction,
- Uncertainty due to Analyst effect (Minor variation in applying methods, lack of knowledge

Mathematical Modeling for WQI: The quality rating of ith parameter (from the tested parameters) can be calculated by:

$$Q_i = \frac{C_i - C_{id}}{C_s - C_{id}} \times 100 \quad \ldots[7]$$

Where, Ci is the measured concentration for ith parameter, Cid is the ideal concentration value for ith parameter and Cs is the standard concentration for ith parameter (BIS, IS 11624–1986)

$$K = \frac{1}{\sum_{i=1}^{i=n} s_i} \quad \ldots[8]$$

Where, Si is the standard value for the i th parameter

The Weightage of the parameter can be evaluated by

$$W_i = \frac{K}{S_i} \qquad \ldots[9]$$

The Water quality index (WQI) can be calculated by

$$WQI = \sum_{i=1}^{i=n} W_i \times Q_i \qquad \ldots[10]$$

The parameters required for calculating the water quality index are taken from presented in table 3.

Table 3. Drinking water standards and Unit weight [33]

S.No.	Parameter	Standard Permissible Value (Si)	Ideal Value C_{id}	1/Si	Recommended Agency	1/Cs	Unit weight (Wi)
1	pH	8.5	7	0.18	ICMR/BIS	0.118	0.083
2	Total Alkalinity	120	0	0.008	ICMR	0.008	0.006
3	Total Hardness	300	0	0.003	ICMR/BIS	0.003	0.002
4	Chloride	250	0	0.004	ICMR	0.004	0.003
5	Sulphate	150	0	0.0067	ICMR/BIS	0.007	0.005
6	Nitrate	45	0	0.022	ICMR/BIS	0.022	0.016
7	Fluoride	1.2	0	0.833	BIS	0.667	0.471
8	TDS	500	0	0.002	ICMR/BIS	0.002	0.001

RESULTS AND DISCUSSION

The water quality index is the measured or calculated value which decided the quality of water in a particular area. The Weightage value of Wi for all tested parameters is also presented in table 3 and the water quality classes as per water quality index score is taken from which is presented in table 4.

Table 4. Water quality classes as per water quality index score [34]

S.No.	Water Quality Index	Description
1	<50	Excellent Water
2	50-100	Good Water
3	100-200	Poor Water
4	200-300	Very Poor Water
5	>300	Very Bad/unsuitable for drinking

Physio-chemical parametric study of drinking water of Ganeshwar and Chala Villages: The tested results of Ganeshwar and Chala villages are presented in the table 5 and 6 respectively and it reveals that the pH is varying between 7.2 to 8 in Ganeshwar village and 7.6 to 8.3 in Chala village. The drinking water of Chala village is more alkaline than Ganeshwar village. The observed value of pH of Ganeshwar village found Lowest 7.2 in month of April 2021 and highest in the January 2021. In the winter season (December - January - February), the pH value of water in Ganeshwar is higher than the other seasons or months. The pH value is very close to the neutral (7.0) observed in June 2021. In Chala village, the Lowest P^H of 7.6 is observed in month of June 2021 and highest pH is 8.3 in the October 2020.

The total alkalinity variation for whole year of Ganeshwar village is shown in table 5, and it reveals that the highest alkalinity 400 mg L^{-1} $CaCO_3$ is found in the month of January. The lowest alkalinity is observed in the month of March, May, August and November. The total alkalinity of water in the

Table 5. Water testing data of Ganeshwar village in Neemkathana

Water testing of Ganeshwar Village in Neemkathana								
Month	**pH**	**Total Alkalinity, mg L^{-1} $CaCO_3$**	**Total Hardness, mg L^{-1}**	**Chloride, mg L^{-1}**	**Sulphate, mg L^{-1}**	**Nitrate, mg L^{-1}**	**Fluoride, mg L^{-1}**	**TDS, mg L^{-1}**
Aug	7.4	250	470	160	25	118	0.52	1030
Sept	7.2	380	350	90	69	45	0.71	695
Oct	7.7	270	340	140	35	103	0.39.	905
Nov	7.3	250	420	130	25	105	0.52	885
Dec	7.8	330	400	140	29	109	0.53	945
Jan	8.0	400	310	140	31	119	0.5	910
Feb	7.9	300	200	110	31	110	0.43	670
March	7.6	240	400	110	34	141	0.48	855
April	7.2	470	260	180	34	130	0.53	920
May	7.2	240	360	110	39	138	0.55	790
June	7.1	270	360	90	36	107	0.46	925
July	7.6	360	270	100	39	127	0.56	910

Table 6. Water testing data of Chala village in Neemkathana

Water testing of Chala Village in Neemkathana								
Month	**pH**	**Total Alkalinity, mg L^{-1} $CaCO_3$**	**Total Hardness, mg L^{-1}**	**Chloride, mg L^{-1}**	**Sulphate, mg L^{-1}**	**Nitrate, mg L^{-1}**	**Fluoride , mg L^{-1}**	**TDS, mg L^{-1}**
Aug	8.2	350	350	100	26	2	0.91	805
Sept	8.0	310	140	130	53	2	0.61	715
Oct	8.3	310	120	120	41	1	2.49	665
Nov	8.2	310	310	120	40	1	2.81	650
Dec	7.9	280	250	140	43	2	2.4	775
Jan	8.0	280	270	260	40	2	2.6	920
Feb	8.0	310	160	260	37	6	2.79	840
March	8.0	430	250	100	42	1	3.2	980
April	8.0	330	330	410	42	2	2.97	1285
May	8.0	430	250	100	37	1	3.07	845
June	7.6	430	250	100	41	1	1.98	1045
July	8.0	410	220	80	44	3	2.79	995

Ganeshwar village observed higher than the acceptable limit (200 mg L^{-1} $CaCO_3$) for whole year of 2020-21. The total alkalinity variation of Chala village in Neemkathana block for whole year and it reveals that the highest alkalinity 430 mg L^{-1} $CaCO_3$ is found in March, May and June 2021. The lowest alkalinity 280 mg L^{-1} $CaCO_3$ is observed in the months of December 2020 and January 2021. The total alkalinity of water in the Chala village observed higher than the acceptable limit (200 mg L^{-1} $CaCO_3$) for whole year of 2020-21. Higher alkalinity has a bad effect on human health.

In Ganeshwar village the highest Hardness 470 mg L^{-1} is found in the month of August 2020 and lowest hardness is observed in February 2021. The total hardness of water in the Ganeshwar village is observed higher than the acceptable limit (200 mg L^{-1}) for whole year of 2020-21.The total Hardness in the water of Chala village is expressed highest 350 mg L^{-1} is found in the month of August 2020. The lowest Hardness (120 mg L^{-1}) is observed in October 2020. The total hardness of water in the Chala village is observed higher than the acceptable limit (200 mg L^{-1}) as per BIS10500: 2012 for year round except from September and October. Higher hardness has a bad effect on human health.

As per the monthly variation of Chloride in ground water of Ganeshwar, the highest chloride is found 180 mg L^{-1} in the month of April 2021 and the lowest (90 mg L^{-1}) in the September 2020 and June 2021. The chloride of water in the Ganeshwar village is observed lower than the acceptable limit (250 mg L^{-1}) for whole year of 2020-21.The highest chloride in drinking water of Chala village is observed by 410 mg/l in the month of April 2021 and lowest Chloride (80 mg L^{-1}) is observed in the

July 2021. The chloride of water in the Chala village is observed lower than the acceptable limit (250 mg L^{-1}) for whole year of 2020-21 except from April and in two months of Jan and February it is slightly higher but very close to acceptability.

The Sulphate in ground water of Ganeshwar is found highest 69 mg/l in the month of September 2020 and lowest (25 mg L^{-1}) in the August and November 2020. The Sulphate in ground water of Chala is found highest Sulphate 53 mg L^{-1} in the month of September 2020 and lowest (26 mg L^{-1}) in the August 2020. The Sulphate of water in the Ganeshwar and Chala village is observed lower than the acceptable limit (200 mg L^{-1}) for whole year of 2020-21.

The Nitrate in ground water of Ganeshwar village in Neemkathana is found highest (141 mg L^{-1}) is found in the month of March 2021 and lowest (45 mg L^{-1}) in September 2020. The Nitrate in ground water of Chala village in Neemkathana is found highest (6 mg L^{-1}) in the month of February 2021 and lowest (1 mg L^{-1}) in the many months of the year. It reveals that the Nitrate in ground water of Ganeshwar village found more than the acceptable limit (45 mg L^{-1}) other than two months (June and September) and the Nitrate in ground water of Chala village found lower than the acceptable limit (45 mg L^{-1}) for whole year.

It is observed that the Fluoride in the drinking water of Ganeshwar and Chala villages is found under the acceptable limit prescribed by the BIS10500: 2012 which is 1.0 mg L^{-1}. The TDS in the ground water is observed always more than the limit or acceptability (500 mg L^{-1}) in the Ganeshwar as well as in Chala village. In Ganeshwar village it observed that the highest TDS is found in the month of August and the lowest in the February and in the remaining eight months the TDS found more than 800 mg/l. The TDS in the ground water of Chala village is observed always more than the limit or acceptability (500 mg L^{-1}). The highest TDS is observed in the month of April 2021 (1285 mg L^{-1}) and the lowest (650 gm L^{-1}) in November 2020. The higher TDS has a bad effect on human body.

Water Quality Index of Ganeshwar and Chala Villages in Neemkathana: The water quality index of drinking water of Ganeshwar and Chala villages are calculated based on Physio-chemical parameters (expressed in table 5 and 6) is presented in the table 7 as well as in the figure 3 and 4. It is reveals that It reveals that the drinking water of Ganeshwar village is a good and excellent quality which can be defined as par the table 4, where the value of WQI is less than 50 in the month of September, November and April to June; and above 50 in the months of August, October, December to March, and in July month. The Fluoride and TDS in water is slightly higher in the months where the WQI is indicated the good quality water.

Table 7. Water Quality Index and class of Ganeshwar and Chala Village in Neemkathana

Water Quality Index and Class of Ganeshwar and Chala Village in Neemkathana				
Month	**Water Quality Index (WQI)**	**Water Quality Class (WQI)**	**Water Quality Index (WQI)**	**Water Quality Class (WQI)**
Aug	52.50	Good Water	53.45	Good Water
Sept	48.02	Excellent Water	35.84	Excellent Water
Oct	62.35	Good Water	125.94	Poor Water
Nov	46.39	Excellent Water	140.64	Poor Water
Dec	74.92	Good Water	119.61	Poor Water
Jan	85.05	Good Water	129.77	Poor Water
Feb	75.41	Good Water	139.92	Poor Water
March	73.40	Good Water	158.25	Poor Water
April	42.81	Excellent Water	147.67	Poor Water
May	43.35	Excellent Water	152.09	Poor Water
June	30.21	Excellent Water	98.74	Good Water
July	65.84	Good Water	138.90	Poor Water

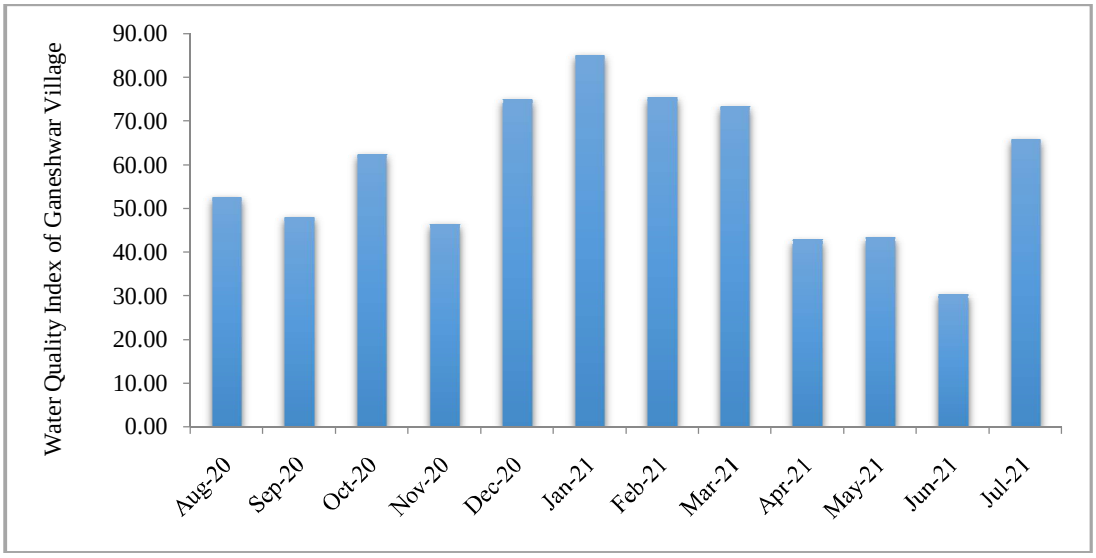


Figure 3. WQI of water in Ganeshwar Village of Neemkathana block.

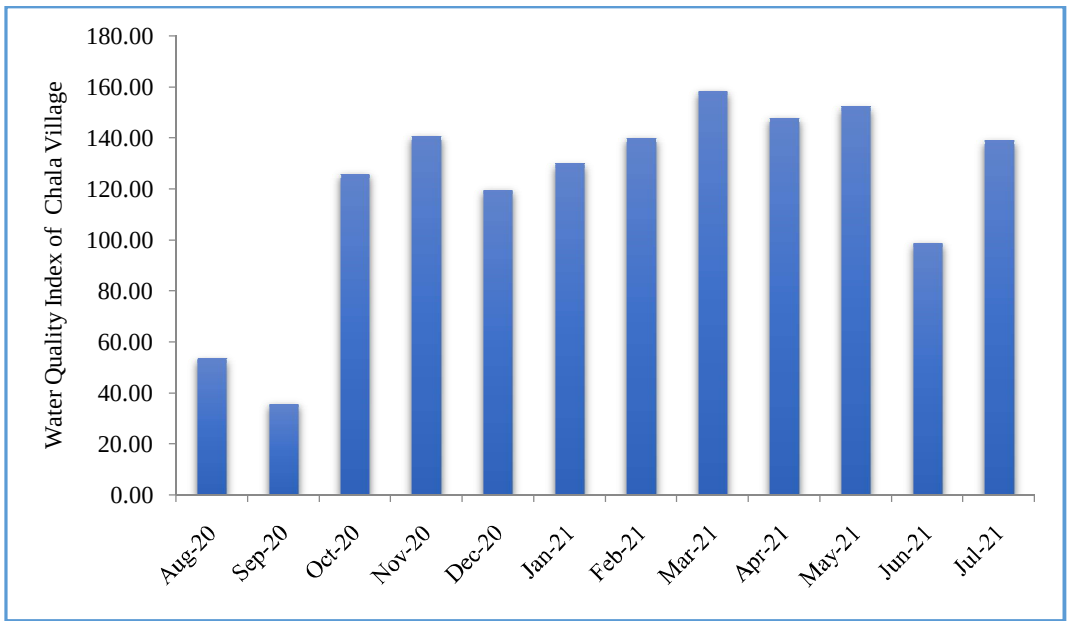


Figure 4. WQI of water in Chala Village of Neemkathana block.

The five stage reverse osmosis filters are prescribed to improve the water quality of Chala village. because the water TDS and other parameters can be removed by the R.O.system [35].

APPLICATION

The Neemkathana block of Sikar district is over-exploited block. Open cast mining activities are going on a large scale due to a rich zone regarding minerals. Groundwater resource have been over-exploited due to domestic and agricultural activities. Now day by day ground water table level is going downwards, and getting contaminated. Increased level of contamination creating groundwater polluted, due to which its drinking, and domestic use creating human health hazards. My present work on water quality parameters will be helpful to create awareness among local peoples and water quality control bodies. It will be very helpful for the groundwater resource management.

CONCLUSION

The Physio-chemical study drinking water of both the villages has been carried out in this paper and it is observed that the pH value of Chala village is more than the Ganeshwar village. It reveals that the water Chala village is more alkaline than Ganeshwar village. The TDS level is also higher of Chala village. The total water quality is taxonomy by WQI which is higher of Chala village and also observed that the drinking water quality of Chala village is poor than the Ganeshwar village. To reduce the problem of sickness due to poor water quality are only to use R.O.filtration system in Chala village.

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