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A Study on Quality of Water with Industrial Development near Mundra area of Gujarat

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Abstract: *The primary goal of the current study is to evaluate the quality of the Water Quality Study with Industrial Development in the Mundra District. To acquire information on pollution levels, 50 water samples were taken from several villages in the Mundra area in October, 2023. The factors examined were chosen based on their clinical importance. pH, electrical conductivity, TDS, salinity, total dissolved solids, total hardness, fluoride, sulphate, calcium and magnesium hardness, potassium, nitrate, silicate chloride, and metals such as iron, cadmium, copper, cobalt, zinc, manganese and nickel were studied. Various water quality indices revealed pollution of groundwater, potable water, and surface water in the chosen areas of Mundra district.*

Key words*: Water Quality, ground water, surface water, Mundra.*

1. INTRODUCTION:

Humans, animals, and plants all need on water to survive. According to studies, more than one billion people worldwide do not have access to safe drinking water, and two to three billion do not have access to basic sanitary facilities. Water-related illnesses kill an estimated three to five million people each year. According to our research, we studied surface water and ground water. Surface water consists of fresh water lakes, rivers, and streams, whereas ground water consists of borehole and well water. We investigated several parts of Mundra. The main focus of this research is water pollution. Heavy metal levels in the aquatic environment are rising rapidly, particularly in industrial zones, causing widespread worry. Also, certain of these metals are required for the growth, development, and health of living beings, while others are non-essential since they are indestructible, and the majority of them are classified as harmful species to organisms. Heavy metals leak into groundwater and soil solutions when their concentrations rise in the environment and soils' ability to hold them declines. The hazardous metals can then collect in living tissues and concentrate through the food chain problem of water.

2. Study area of this survey:

Mundra is a Town in Mundra Taluka in Kachchh District of Gujarat State, India. It is a Taluka head quarter. Jarpara, Pargpara, Nanakpaya, Zarpara, Pratappar, Sadau, and Borana. are the nearby Villages to Mundra. It is near to arabian sea. There is a chance of humidity in the weather. Mundra is a Census Town city in district of Kachchh, Gujarat. Population of Children with age of 0-6 is 2981 which is 14.80 % of total population of Mundra In Mundra Census Town, Female Sex Ratio is of 879 against state average of 923. Moreover Child Sex Ratio in Mundra is around 899 compared to Gujarat state average of 898. Literacy rate of Mundra city is 83.5 % higher than state average of 80.30 %. In Mundra, Male literacy is around 90.6% while female literacy rateis 77.5%. Mundra Census Town has total administration over 4,981 houses to which it supplies basic amenities like water and sewerage.

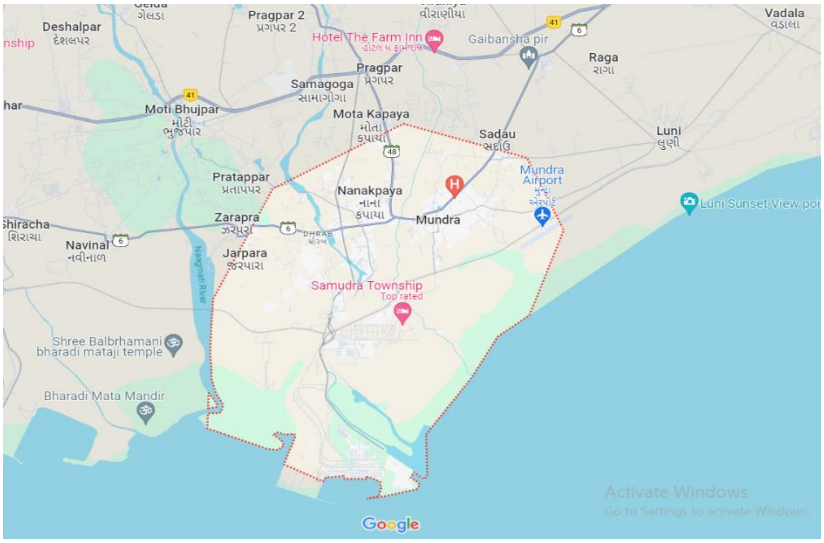

Fig . Mundra location at kachchh Gujarat with google map.

3. Sample collection of this study : In October 2023, a total of thirty samples were gathered from several settlements situated in Mundra. Chemistry were used throughout the study. Samples were gathered and stored in cleaned, sterilized polyethylene bottles. They were then brought to the laboratory and analyzed for characteristics like - pH, salinity, color, electrical conductivity, odor, turbidity, total hardness, total dissolved solids, magnesium hardness, calcium hardness, alkalinity, luoride, calcium, sulphate, lithium, potassium, bromide, magnesium, chlorides, nitrite, sodium, ammonium, phosphate, and lithium. Following a three-month trial, we monitor and record the findings of the laboratory analysis..

Therefore, the goal of the current study is to evaluate the groundwater's properties in order to determine whether or not it is suitable for agricultural and drinking purposes. The following eight villages provided ground water samples: Jarpara, Pargpara, Nanakpaya, Zarpara, Pratappar, Sadau, and Borana. The samples came from bore and dug wells. The sites were chosen to represent the general groundwater quality and to encompass the majority of the taluka. 40 samples total—24 from the study area's groundwater, 8 from its surface water, and 8 from its drinkable water—were gathered and examined.

4. Analysis Methods: We're accustomed to Chemicals of analytical quality were employed to analyze the samples that were gathered. Double-distilled water and NIST (National Institute of Standards and Technology) standards were employed during the investigation. While total dissolved solids (TDS), nitrate, and fluoride were evaluated using the conventional techniques advised by the American Public Health Association, pH and electrical conductivity (EC) were assessed on-site. Additionally, we are employed Instrument/Apparatus for Parameter Method - EC Conductometry Model - LabIndia pH potentiometry, digital TDS meter, and TDS conductometry pH/EC digital meter.

Method of Nitrate Brucine Spectrophotometer in UV-VIS Ascorbic acid phosphate technique Fluoride Sulfate Turbidimetry SPADNS Method Method of Silicate Molybdosilicate Calcium Sodium AAS Potassium Heavy metals (Pb, Cu, Cd, Ni, Fe, Mn, Ni and Co, etc.), alkalinity carbonate and bicarbonate, total hardness free CO2 titration technique, and EDTA titration method for magnesium Method of solvent extraction and preconcentration The atomic absorbance spectrum.

5. Results and Discussion: The information showed that groundwater had a pH between 7.5 and 8.5. The average pH value was discovered to be 7.5, with the largest range being found in sample 9 and the minimum being seen in sample 20. Municipalities supply potable water with a pH of 6.5 to 7.9. Samples 10 and 12 showed the greatest range, sample 20 showed the minimum, and an average pH value of 7.38 was discovered. Surface water has a pH of between 8.1 and 8.9. The sample with the highest range was number eight, the sample with the lowest range was number twelve, and the average pH value was 7.39. All of the samples' pH values are within the suggested BIS limit. The range of values for electrical conductivity was 289.80 µS to 3013.10 µS. The average electrical conductivity is displayed in the range of 1796.25 µS, with the largest value of EC detected in sample 20 and the least value obtained in samples 9 and 11.

Approximately 76% of the sample above the BIS-recommended allowable limits of 1400 µS. The range of Total Dissolved Solids was 185.5 mg/L to 20,084 mg/L. Sample 6 contained the largest amount, whereas sample 28 contained the lowest. The TDS value is 1058 mg/L on average. A little over 94.4% of the sample had a BIS level over 500 mg. Sample 10 exhibits the highest total hardness of 3465 mg/L, while sample 17 shows the lowest total hardness of 59 mg/L. Calcium hardness was measured in sample 14 at a maximum of 332 mg/L and at a minimum of 15 mg/L in sample 27. Likewise, sample 19 had the lowest magnesium hardness value of 65 mg/L, while sample 8 had the highest value of 3269 mg/L. Total hardness, calcium hardness, and magnesium hardness were found to have average values within the range of 562.4 mg/L, 408.7 mg/L, and 541.3 mg/L, respectively. Approximately 80% of the samples exceeded the 300 mg/L allowable limit set by BIS because of the hardness of the water contaminants, which include carbonate and bicarbonate. The fluoride levels in the 20 samples ranged from 4.19 mg/L at the greatest to 0.411 mg/L at the lowest in the 18 samples. The mean values found were 0.691 mg/L. Roughly 42% of samples do not fall under the BIS-recommended limit of 1 mg/L. The average potassium content was between 17.88 mg/L and the potassium levels varied between 0.551 mg/L for samples no. 15 and 27. Higher potassium concentrations of 130 mg/L were found in the potable samples, according to the study that was done. According to BIS guidelines, 96% of water samples are over the acceptable levels (1 mg/l: Fifteen samples had sodium levels ranging from 17 mg/L. The average sodium content ranged from 648.96 mg/L to 1481 mg/Lin 14 sample. 90% of the water samples are over the desired BIS limit.

We also discovered heavy metals like zinc, manganese, lead, copper, and cadmium in the laboratory analysis. It is extremely detrimental to human life and falls short of BIS guidelines. (shown in table 1)

Table 1. Testing results of parameters and characteristics of water samples.

Sample	Ph	EC	TDS	Co	Tu	Ca.	mg	cu	NH4	Br	F	K	Ca	S	Ta	Cl	Mg	NO2	NO3	P	sal	Na
1	7.1	2326	510	8	4	303	201.4	300.2	0.02	2.27	4.50	165	171	310	411	352.2	70.2	5.6	0.02	.30	.2	601.5
2	7.5	2203	604	8	3	606	301.4	52.2	0.01	2.34	4.52	11.2	147	320	425	330.2	52.3	6.3	0.01	0.00	.1	210.2
3	8	2105	740	8	4	502	120.3	63.3	0.02	2.44	4.23	10.3	47	210	325	322.2	50.2	4.5	0.02	000	.0	530.4
4	7.3	1500	810	8	3	402	123.5	60.3	0.02	0.02	3.25	14.5	61	100.2	123	321.2	45.3	4.5	0.01	.32	.1	81.3
6	7.5	541	770	8	4	411	22.5	200.1	0.01	0.01	2.25	12.3	59	123.5	411	221.3	44.3	5.6	0.02	00	.2	83.3
7	7.8	853	920	8	3	407	112.4	123.5	0.02	2.24	4.21	11.2	48	320.1	320	200.1	50.2	6.3	0.01	.55	.1	88.3
8	7.5	957	1100	8	4	525	111.4	123.4	0.02	2.34	4.12	16.3	83	222.1	332	211.2	52.1	4.5	0.02	.22	.01	82.3
9	8	963	780	8	3	211	121.4	124.2	0.01	2.44	5.23	11.2	112	222	450	212	45.3	4.5	0.01	.32	.1	86.3
10	7.2	1003	740	8	4	238	125.2	165.3	0.02	2.24	3.22	10.	47	21	123		44.3	5.6	0.0	00	.2	71.4
11	8	1017	1010	8	3	710	123.5	123.5	0.02	2.34	2.22	14.5	11.2	211	450	123.2	46.3	6.3	0.01		0.2	47.3
12	8.5	1014	920	8	4	250	211.3	145.3	0.01	2.44	2.12	16.3	123.2	211	450	45.1	45.2	5.6	0.02	.32	.2	29.3
13	8	1017	830	8	3	610	222.3	300.2	0.02	2.24	2.22	11.2	114.5	35	450	52.3	36.5	6.3	0.01	00	.1	211.3
14	7.2	890	790	8	4	505	221.5	321.2	0.02	0.02	3.25	10.3	22	36	330	50.2	40.3	4.5	0.02	.32	.01	223.3
15	8	960	1050	8	3	530	220.1	300.1	0.01	0.01	3.22	14.5	65	37	330	45.2	41.2	4.5	0.01	00	.1	125.2
16	8.3	859	1100	8	4	610	220.6	321.5	0.02	0.02	3.21	12.3	56	53	321	45.3	45.3	5.6	0.02	.32	.2	156.3
17	7	459	640	8	3	510	222.5	214.5	0.02	0.01	3.21	11.2	45	55	325	125.5	42.2	6.3	0.01	00	.1	125.
18	7.3	113	880	8	4	550	222.4	222.5	0.01	0.02	3.30	16.3	63	45	325	123.5	45.2	4.5	0.02	.32	.0	123.1
19	8	1238	910	8	3	410	123.5	222.1	0.02	0.01	3.12	11.2	56	65	321	123.5	46.3	4.5	0.01	.32	.1	153.2
20	8.2	2201	1060	8	4	620	321.4	212.1	0.02	0.02	3.12	10.3	58	85	200	154.2	43.1	5.6	0.02	00	.2	123.2
21	7	2115	1090	8	3	520	125.6	245.1	0.01	0.01	2.23	14.5	75	65	211	124.5	42.2	6.3	0.01	.32	.1	152.2

22	7.5	2551	630	8	4	510	123.5	123.5	0.02	0.02	2.53	12.3	95	75	200	123.4	45.2	4.5	0.02	00	.0	125.1
23	7.2	2521	910	8	3	220	124.3	212.1	0.01	0.01	2.54	11.21	100	56	222	45.2	45.3	5.6	0.02	.32	.2	145.2
24	7.3	2665	950	8	4	350	124.5	45.3	0.02	0.02	5.23	112.3	123.5	45	245	45.3	41.3	6.3	0.01	00	.1	452.2
25	7.1	2121	1120	8	3	520	135.4	556	0.02	0.01	5.30	11.2	10.2	46	245	55.3	45.1	4.5	0.02	.32	.0	123.2
26	7.4	2000	590	8	4	470	136.5	100.2	0.01	0.02	5.21	10.3	12	100	263	55.6	45.5	4.5	0.01	00	.1	45.2
27	7.5	2300	820	8	3	320	124.2	122.3	0.02	0.01	5.23	14.5	123.4	123	266	56.3	42.3	5.6	0.02	.32	.2	45.3
28	7.6	2400	1030	8	4	240	123.5	152.3	0.02	0.02	5.34	12.3	123.4	124	256	57.2	45.2	6.3	0.01	00	.1	45.6
29	7.5	758	580	8	3	120	123.4	125.4	0.01	0.01	5.35	11.2	123.2	125	262	56.3	46.3	4.5	0.02	.32	.0	56.3
30	7.8	2000	300	8	4	450	126.3	145.2	0.02	0.02	5.36	16.3	124.2	211	230	45.2	45.3	4.5	0.01	00	.1	58.3
31	8.3	858	290	8	4	630	220.6	321.5	0.02	0.02	3.21	12.3	56	53	321	45.3	45.3	5.6	0.02	.32	.2	156.3
32	7.1	2121	260	8	3	220	135.4	556	0.02	0.01	5.30	11.2	10.2	46	245	55.3	45.1	4.5	0.02	.32	.0	123.2
33	7.4	2000	440	8	4	350	136.5	100.2	0.01	0.02	5.21	10.3	12	100	263	55.6	45.5	4.5	0.01	00	.1	45.2
34	8	1014	590	8	3	430	222.3	300.2	0.02	2.24	2.22	11.2	124.5	35	450	52.3	36.5	6.3	0.01	00	.1	111.3
35	7.2	899	710	8	4	425	221.5	321.2	0.02	0.02	3.25	10.3	22	36	330	50.2	40.3	4.5	0.02	.32	.01	123.3
36	7.5	758	840	8	3	270	123.4	125.4	0.01	0.01	5.35	11.2	123.2	125	262	56.3	46.3	4.5	0.02	.32	.0	56.3
37	7.8	2000	860	8	4	410	126.3	145.2	0.02	0.02	5.36	16.3	124.2	211	230	45.2	45.3	4.5	0.01	00	.1	58.3
38	8.2	2200	930	8	4	640	321.4	212.1	0.02	0.02	3.12	10.3	58	85	200	154.2	43.1	5.6	0.02	00	.2	123.2
39	7.6	2400	1010	8	4	260	123.5	152.3	0.02	0.02	5.34	12.3	123.4	124	256	57.2	45.2	6.3	0.01	00	.1	45.6
40	7.4	2000	1070	8	4	440	136.5	100.2	0.01	0.02	5.21	10.3	12	100	263	55.6	45.5	4.5	0.01	00	.1	45.2

6. Conclusion:

According to the study's findings, the majority of the criteria are higher than what BIS guidelines allow. Certain parameters, notably fluoride, were discovered to be higher than allowed limits for sodium, lead, zinc, manganese, cadmium, and copper. Additional characteristics related to mobility, including total hardness, total dissolved solids, chloride, sodium oxide, and sodium monoxide, were also measured at elevated levels in the water sample. The majority of the chemical constituents in the various parameter evaluations do not meet the BIS-mandated water quality criteria. The quality of the water that people consume should be known to them, and the issue of groundwater has received international attention because of its significant effects on human physiology and concentrations, which can cause health problems at greater concentrations.

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