Physico-Chemical Analysis of Bore Wells Drinking Water of Nadiad Territory

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Physico-chemical analysis such as temperature, pH, dissolved oxygen, total dissolved solids, chloride, total alkalinity, calcium and magnesium hardness, sulphate, phosphate, nitrate of bore wells water was carried out from twenty sampling stations of Nadiad territory area during February 2003–July 2003 in order to assess water quality index.

Key Words: Physico-chemical analysis, Bore wells drinking water, Nadiad, Gujarat.

INTRODUCTION

In continuation of our earlier analysis on bore wells drinking water[1-3], here we report the physico-chemical analysis of bore wells drinking water of Nadiad, located in Kheda district of Gujarat. Bore wells water is generally used for drinking and other domestic purposes in this area. The use of fertilizers and pesticides, manure, lime, septic tank, refuse dump, etc. are the main sources of bore wells water pollution[4]. In the absence of fresh water supply, people residing in this area use bore wells water for their domestic and drinking consumption. In order to assess water quality index, we have carried out the physico-chemical analysis of bore wells drinking water.

EXPERIMENTAL

In the present study bore wells water samples from twenty different areas located in and around Nadiad territory were collected in brown glass bottles with necessary precautions[5].

All the chemicals used were of AR grade. Double distilled water was used for the preparation of reagents and solutions. The major water quality parameters considered for the examination in this study are temperature, pH, dissolved oxygen (DO), total dissolved solid (TDS), total alkalinity, calcium and magnesium hardness, sulphate, phosphate and nitrate contents[6].

Temperature, pH, DO, TDS, phosphate, nitrate values were measured by water analysis kit and manual methods. Calcium and magnesium hardness of water was estimated by complexometric titration methods[7]. Chloride contents were deter-

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mined volumetrically by silver nitrate titrimetric method using potassium chromate as indicator and was calculated in terms of mg/L. Sulphate contents were determined by volumetric method[7].

RESULTS AND DISCUSSION

The physico-chemical data of the bore wells water samples collected in February 2003 and July-2003 are presented in Tables 1 and 2 respectively. The results of the samples vary with different collecting places because of the different nature of soil contamination[7].

Temperature: In the present study temparature ranged from 27.3 to 33.0°C.

pH: In the present study pH ranged from 7.5 to 8.71. The tolerance pH limit is 6.5–8.5. The sample station No. 9 shows higher pH than the prescribed range[8].

TDS: In the present study TDS ranged from 250 to 1470 mg/L. According to WHO[9] and Indian standards, TDS values should be less than 500 mg/L for drinking water. The sample station nos. 2, 6, 7, 8, 9, 11, 12, 14, 15, 18, 20 and higher ranged as prescribed by WHO and Indian standards[10].

D.O.:   The D.O ranged from 4.4 to 8.4 mg/L in present samples. The minimum tolerance range is 4.0 mg/L for drinking water.

Chloride: In the present study chloride ranged from 26.98 to 569.42 mg/L, while the tolerance range for chloride is 200–1000 mg/L[10].

Total Alkalinity: The total alkalinity content in the samples is in between 160 to 748 mg/L.

Calcium Hardness: The calcium hardness ranged from 8.02 to 88.70 mg/L. The tolerance range for Ca-hardness[11] is 75–200 mg/L.

Magnesium Hardness: Magnesium ranged from 7.88 to 155.42 mg/L. The tolerance range for Mg hardness[11] is 50–100 mg/L.

Sulphate: Sulphate ranged from 46.12 to 443.26 mg/L. The tolerance range for sulphate is 200–400 mg/L12.

Phosphate: Phosphate ranged from 7.0 to 55 mg/L. The evaluated values of phosphate in the present study are higher than the prescribed values[13]. The higher values of phosphate are mainly due to the use of fertilizers and pesticides by the people residing in this area. If phosphate is consumed in excess, phosphine gas is produced in gastro-intestinal tract on reaction with gastric juice.

Nitrate: Nitrate ranged from 75.0 to 450 mg/L. The tolerance range for nitrate is 20–45 mg/L. Nitrate nitrogen is one of the major constituents of organism along with carbon and hydrogen as amino acids proteins and organic compounds in the bore wells water[14]. If the nitrate reduces to nitrite, then it causes methaemoglobinaemia in infants[15, 16] and also diarrhea.

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TABLE-1

ANALYSIS RESULT OF THE SAMPLES COLLECTED IN FEBRUARY 2003

No.	Sample station	Temp (°C)	pH	TDS (mg/L)	DO (mg/L)	Chloride (mg/L)	Total alkalinity (mg/L)	Ca hardness (mg/L)	Mg hardness (mg/L)	Sulphate (mg/L)	Phosphate (mg/L)	Nitrate (mg/L)
1.	College	33.0	7.66	250	6.2	26.98	172	14.43	18.47	269.00	55.0	320
2.	Fatepura	27.6	8.20	697	6.6	66.74	552	12.82	15.55	307.44	12.0	380
3.	Uttarsanda	27.4	8.15	442	4.6	34.08	400	32.06	68.04	288.23	10.0	210
4.	Narsanda	27.4	8.00	488	5.8	166.44	388	59.31	58.32	384.30	18.0	430
5.	Bhumel	27.4	8.00	412	7.6	63.90	368	40.10	64.15	238.27	11.0	325
6.	Vanipur	27.4	8.23	558	6.6	113.60	428	20.84	73.87	176.79	18.0	400
7.	Piplag	27.5	8.32	633	6.8	120.70	388	11.22	36.94	122.98	11.0	300
8.	Piplata	27.7	8.66	737	6.6	92.30	592	9.62	36.94	226.74	21.0	90
9.	Akhdol	27.3	8.56	1108	5.0	213.00	748	16.03	35.96	434.26	21.5	100
10.	Kaloli	27.4	8.33	396	8.2	42.60	352	35.27	20.41	92.23	14.0	320
11.	Dumral	27.4	8.50	869	4.2	191.70	520	62.52	7.88	219.05	22.0	330
12.	Tudel	27.4	8.44	1454	6.4	468.60	600	30.46	62.21	199.84	22.0	130
13.	Dabhan	27.4	8.30	358	8.0	36.92	300	9.62	15.55	188.31	20.5	400
14.	Davada	27.4	8.35	1420	6.6	431.68	628	56.11	51.52	365.10	20.5	120
15.	Kanjoda	27.4	8.18	747	4.4	177.50	432	32.06	114.70	199.84	19.0	120
16.	Ajaypura	27.7	7.60	442	5.4	92.30	360	88.17	58.32	180.62	11.0	310
17.	Valapura	27.7	8.19	373	6.8	59.64	300	38.47	56.38	46.12	14.0	320
18.	Alindra	27.5	8.43	626	4.2	117.86	392	20.84	45.68	134.51	7.0	75
19.	Khushalpura	27.7	8.52	376	5.6	42.60	328	14.43	49.57	211.37	35.0	400
20.	Salun	27.7	8.46	524	7.0	56.80	440	12.82	17.50	192.15	36.0	410

TABLE-2

ANALYSIS RESULT OF THE SAMPLES COLLECTED IN JULY-2003

No.	Sample station	Temp (°C)	pH	TDS (mg/L)	DO (mg/L)	Chloride (mg/L)	Total alkalinity (mg/L)	Ca hardness (mg/L)	Mg hardness (mg/L)	Sulphate (mg/L)	Phosphate (mg/L)	Nitrate (mg/L)
1.	College	32.10	7.70	280	7.0	28.40	160	9.62	19.44	226.74	23.0	280
2.	Fatepura	32.00	8.18	700	6.8	72.42	524	14.43	18.47	315.13	11.0	395
3.	Uttarsanda	30.30	8.10	490	4.8	36.92	392	33.66	61.24	303.60	12.0	250
4.	Narsanda	32.00	8.01	500	5.2	102.24	264	24.05	60.26	349.71	15.0	405
5.	Bhumel	32.20	8.10	502	6.8	68.16	372	27.25	56.38	222.89	18.0	390
6.	Vanipur	32.20	8.25	580	6.2	102.24	372	9.62	70.96	172.94	21.5	450
7.	Piplag	32.10	8.40	620	6.8	129.22	348	16.03	34.02	119.13	11.0	310
8.	Piplata	33.00	8.50	725	6.8	82.36	516	8.02	50.54	207.52	15.0	105
9.	Akhdol	32.20	8.71	1050	5.4	156.20	744	11.22	28.19	318.97	28.0	95
10.	Kaloli	32.20	8.35	380	8.4	42.60	296	32.06	9.72	111.45	13.0	250
11.	Dumral	32.20	8.10	852	4.4	213.00	484	41.68	31.10	238.27	35.5	270
12.	Tudel	32.30	8.22	1470	6.2	427.42	584	30.46	62.21	276.70	16.0	105
13.	Dabhan	32.30	8.28	380	8.4	44.02	344	12.82	20.41	207.52	17.0	235
14.	Davada	32.40	8.20	1052	7.0	569.42	588	56.11	74.84	388.14	15.0	95
15.	Kanjoda	32.00	8.16	740	4.6	171.82	420	49.69	155.42	199.84	20.0	105
16.	Ajaypura	32.10	7.50	422	5.6	71.00	292	52.90	52.49	188.31	18.0	280
17.	Valapura	32.30	8.10	356	7.0	73.84	292	8.02	43.44	111.45	10.0	270
18.	Alindra	32.20	8.22	615	4.4	71.00	376	19.24	70.96	149.88	19.0	130
19.	Khushalpura	32.20	8.30	350	5.8	41.18	316	14.43	40.82	188.31	20.0	300
20.	Salun	32.00	8.25	510	7.2	56.80	424	30.46	22.36	199.84	13.0	250

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