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# Physico-Chemical analysis of drinking water of Gandhinagar District

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# ABSTRACT

Physico-chemical analysis such as temperature, pH, dissolved Oxygen, TDS, Chloride, Total Alkalinity, Calcium and Magnesium hardness, Sulphate, Phosphate, Nitrate and fluoride of borewells, wells and lacks drinking water has been carried out from fifteen sampling stations of Gandhinagar territory area during June 2011 & Nov 2011 in order to assess water quality index.

Keywords: Physico-chemical analysis, Gandhinagar, complexometric, sulphate.

# INTRODUCTION

Physico-chemical analysis of drinking water of Gandhinagar district of Gujarat state has been investigated intensively[1-3]. Bore well 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 reported the physico-chemical analysis of bore wells drinking water. Fluoride is found in all natural water at some concentration. In ground water however low and high concentration of fluoride can occur depending upon the nature of the rocks and the occurrence of the fluoride – bearing minerals. Fluorosis has been described as an endemic of tropical climate[5]. The main sources of fluoride intake is water[6].

In low concentration of fluoride prevent dental caries. However it has been observed that when fluoride intake through water, food and air increases to a specific level (1.0-1.5 mg / l.) the beneficial effect is lost and in fact harmful effect being to show with increasing concentration (above 1.5 mg / l.). Excess intake of fluoride beyond permissible limit bring out dental and skeleton fluorosis along with some neurological disorder. Higher concentration of fluoride also

causes respiratory failure, fall of blood pressure and genera paralysis. Continuous investigation nonfatal dose of fluoride causes permanent inhibition of growth. Fluoride ions inhibit a variety of enzymes often by forming complexes with magnesium ion and other metal ions[7].

According to Water and River Commission Western Australia ground water occupies the pores and crevices in sand, sand stone and other rocks[8]. The crucial role which ground water plays as decentralized sources of drinking water for millions of rural and urban families cannot be overstated[9]. Rao et al. reported that about 80 percentage of the diseases in the world are created because of poor quality of drinking water[10]. The quality of the ground water cannot be restored by stopping the pollution if it is contaminated once. Water quality index is very important tool for the information on water quality[7-10]. Some important ratings are given below:

nonfatal dose of fluoride causes permanent inhibition of growth. Fluoride ions inhibit a variety of enzymes often by forming complexes with magnesium ion and other metal ions[7]. **Table – 1** 

### MATERIALS AND METHODS

Water samples from fifteen different areas located in and around Gandhinagar territory were collected in brown glass bottles with necessary precautions. All the chemicals used were of AR grade.

Double distilled water was used for the preparation of reagents and solutions. The water quality parameters considered for the examination in this study are Temperature, pH, Dissolved Oxygen, TDS, Total alkalinity, Calcium and Magnesium hardness, Sulphate, Phosphate and Nitrate contents measured by water analysis kit and manual methods. Calcium and Magnesium hardness of water was estimated by complexometric titration methods. Chloride contents were determined volumetrically by AgNO<sub>3</sub> titrimetric method using K<sub>2</sub>CrO<sub>4</sub> as an indicator and was calculated in terms of mg/L. sulphate contents were determined by volumetric method.

# **RESULT AND DISCUSSION**

The physico-chemical data of the bore wells water sample collected in June 2011 and Nov- 2011 are recorded in table 1 and Table -2 respectively. The results of the samples vary with different collecting places because of the different nature of the soil contamination[11-15].

**Temperature :** In the present study Temp. ranged from  $27.3^{\circ}$ C to  $33.0^{\circ}$ C.

 $\mathbf{P}^{\mathbf{H}}$ : In the present study pH ranged from 7.5 to 8.71. The tolerance pH limit is 6.5 – 8.5.

**TDS :** In the present study TDS ranged from 250 to 1470 mg/L. According to WHO and Indian standards, TDS value should be less than 500 mg/L for drinking water.

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

**Chlorides :** 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.

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 is 75 - 200 mg/L.

**Magnesium Hardness :** The Magnesium hardness ranged from 7.88 to 155.42 mg/L. The tolerance range for Mg hardness is 50 - 100 mg/L.

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

**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. The higher values of the 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.

Table –	1
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Doromotor	Desirable Limit	Permissible	Moderately	Unsafe	
rarameter		Limit	safe		
Fluoride(ppm)	1.0	1.5	1.5-2.0	>2.0	
RSC(Meq./L)	1.0	<1.25	-	>2.50	
SAR	5.0	<10	10-18	>26	
ECm moh/cm	0.0-0.5	0.0-0.75	0.25-0.75	>2.25	

Table – 2 Result of analysis of samples collected in month June- 2011

No	Sample	Temp	$\mathbf{P}^{\mathrm{H}}$	TDS	D.O.	Chloride	Total	$Ca^{+2}$	$Mg^{+2}$	$SO_4^{-2}$	$Po_4^{-3}$	NO <sub>3</sub> <sup>-1</sup>
	Station	$C^0$			mg/L	mg/L	Alkalinity	Hardness	Hardness	mg/ml	mg/L	mg/ L
							mg/L	mg/L	mg/L			
1	Gandhinagar	30.2	7.3	260	7.6	26.98	328	35.13	68.45	345.36	18.4	250
2	Unava	30.5	7.5	300	8.4	56.40	486	26.3	7.88	268.23	28.2	130
3	Mansa	30.1	7.3	415	6.7	63.15	514	8.02	45.32	269.54	14.5	75
4	Uvarsad	31.0	7.5	315	6.3	45.12	327	33.14	88.32	46.12	22.5	242
5	Balva	29.9	8.71	361	7.5	65.23	256	45.2	20.2	285.31	33.4	206
6	Randheja	29.4	7.2	500	8.1	104.30	487	54.3	56.18	301.25	27.6	304
7	Jundal	30.7	7.5	420	7.8	66.44	160	34.15	13.25	364.27	24.5	156
8	Vavol	31.1	7.6	530	7.4	67.15	652	55.23	29.36	287.65	32.9	183
9	Adalaj	30.8	7.5	413	7.5	63.15	584	63.14	23.65	263.29	12.8	272
10	Anjol	30.5	7.3	362	7.9	86.25	458	33.45	66.25	443.26	43.6	450
11	Kolavada	30.6	7.8	1355	8.2	74.14	549	36.16	32.23	256.32	7.0	334
12	Pilvai	29.9	7.4	412	4.4	55.32	358	88.70	81.36	348.36	19.3	182
13	Veda	31.2	8.0	1450	6.9	45.66	748	55.21	155.42	368.52	38.2	201
14	Ridrol	30.5	7.3	800	7.2	57.82	461	43.21	20.56	356.21	55.0	209
15	Mahudi	31.4	7.6	750	7.5	569.52	376	56.41	30.54	236.5	26.3	383

**Nitrate :** The Nitrate ranged from 75 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

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hydrogen as amino acids proteins and organic compounds in the bore wells water. If the nitrate reduces to nitrite, then it causes methaemoglobinaemia in infants and also diarrhea.

No	Sample Station	Temp C <sup>0</sup>	$\mathbf{P}^{\mathrm{H}}$	TDS	D.O. mg/L	Chloride mg/L	Total Alkalinity mg/L	Ca <sup>+2</sup> Hardness mg/L	Mg <sup>+2</sup> Hardness mg/L	SO <sub>4</sub> <sup>-2</sup> mg/ml	Po <sub>4</sub> -3 mg/L	NO <sub>3</sub> <sup>-1</sup> mg/ L
1	Gandhinagar	30.2	7.3	255	7.6	27.22	328	35.13	68.45	345.36	8.4	150
2	Unava	30.5	7.5	300	8.1	56.40	160	26.3	7.91	46.23	8.2	130
3	Mansa	30.1	7.3	415	6.7	63.15	514	27.5	45.32	269.54	4.5	100
4	Uvarsad	31.0	7.5	315	6.3	45.12	327	33.14	88.32	278.30	42.5	442
5	Balva	29.9	6.9	361	7.5	65.23	256	45.2	20.2	85.31	33.4	206
6	Randheja	29.4	7.2	500	8.1	304.30	487	54.3	156.18	301.25	7.6	404
7	Jundal	30.7	8.0	1420	7.8	316.44	345	35.15	13.25	364.27	24.5	156
8	Vavol	31.1	7.1	530	4.4	167.15	652	55.23	29.36	287.65	52.9	283
9	Adalaj	27.0	7.5	1413	7.5	163.15	584	63.14	123.65	263.29	22.8	172
10	Anjol	30.5	7.3	362	7.9	286.25	458	8.45	66.25	341.23	3.6	164
11	Kolavada	33.0	6.8	1355	8.2	174.14	549	36.16	132.23	256.32	55.0	334
12	Pilvai	29.9	7.4	412	6.8	555.32	748	48.14	81.36	348.36	49.3	450

Table – 3 Result of analysis of samples collected in month Nov- 2011

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