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Physico-Chemical and Microbial Analysis of Drinking Water of Kathalal Territory, Gujarat

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Subject: Analytical Chemistry

Abstract:

The aim of this research work is to highlight the condition of current situation of water of kathalal territory which can help in identification of status of the water used for drinking purpose, and to establish the base for further research by considering the analytical results and findings. Various samples of bore well water collected from different areas in and around the Kathalal taluka territory and analyzed for their Physico - chemical and Microbial analysis characterizations. The results of this analysis were compared with the water quality standards of WHO and CPHEEO. In this analysis the various physic-chemical parameters such as PH, TDS, Chloride, total alkalinity, calcium, magnesium hardness, sulphate,, nitrate and total hardness etc., were determined using standard procedures. The studies are was a total of 20 water samples from different 20 locations were collected and analyzed.

Key Words: Physico-chemical parameters, microbial analysis,Bore wall water, Water quality.Kathalal.

Introduction:

Parameters for drinking water quality typically fall under two categories: chemical/physical and microbiological. Chemical/physical parameters include heavy metals, trace organic compounds, total suspended solids (TSS), and turbidity. Microbiological parameters include Coliform bacteria, *E. coli*, and specific pathogenic species of bacteria (such as cholera-causing *Vibrio cholerae*), viruses, and protozoan parasites. In continuation of our earlier analysis on bore wells water[1-3], here we report the Physico-chemical analysis of bore wells drinking water of kathalal territory. kathalal is 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 forced to 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 sample from twenty difference areas located in and around kathalal territory were collected in brown glass bottles with necessary precautions

Physico-Chemical analysis

All the chemicals used water 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(T.D.S),total alkalinity, calcium and magnesium hardness, sulphate, phosphate and nitrate contents[6].

Temperature pH, dissolved oxygen (DO) total dissolved solid (T.D.S), phosphate, Nitrate values were measured by water analysis kit and manual methods. Calcium and

magnesium hardness of water was estimated by complexometic titration method[4,5]. Chloride contents were determined volumetrically by silver nitrate titration method using potassium chromate as an indicator. It was calculated in terms of mg/L. sulphate contents were determined by volumetric method[5].

Results and Discussion:

The Physico-chemical data of the bore wells water samples collected in Jan-Feb-2012 are present in table respectively. The results of the samples vary with different colleting places because of the different nature of soil contamination[6].All metabolic and physiological activities and life processes of aquatic organisms are generally influenced by water temperature.

Temperature.

In the present study temperature ranged was kept from 29.4^{o}cto 34.3^{o}c.

PH

In the present study PH ranged from 6.9to 8.3 which lies in the range prescribed byAPHA[1]. The pH value of drinking water is an important index of acidity, alkalinity and resulting value of the acidic basic interaction of a number of its mineral and organic components. pH below 6.5 starts corrosion in pipes. Toxic metals which are present in water increase the pH value of water. The tolerance pH limit is 6.5 to 8.5.

TDS:

In the present study TDS ranged from 185 mg/l to 1380 mg/l. according to WHO and Indian standards. TDS value should be less than 500 mg/l for drinking water. All the sample station except sample station no 14 higher ranged as prescribed by WHO and Indian standards[7,8].

D.O.

In the present study dissolved oxygen (D.O) ranged from 6.4 mg/l to 10mg/l. The minimum tolerance range is 4.0 mg/l for drinking water.

Chlorides:

The chlorides contents in the samples between 28.48mg/l to 285.40 mg/l natural water contain low chloride ions. In the present study sample No.7 shows 315.75 mg/l chloride which is highest value in twenty different sampling stations. The tolerance range for chloride is 200 to 1000mg/l.

Total Alkalinity:

In the present study total alkalinity range was from 148 mg/l to 856 mg/l.

Calcium Hardness:

The calcium hardness range is from 8.02 mg/l to 144.3mg/l. The tolerance range for calcium hardness is 75 to 200 mg/l. Calcium contents in all samples collected fall within the limit prescribed. Calcium is needed for the body in small quantities, though water provides only a part of total requirements.

Magnesium Hardness:

Magnesium hardness ranged from 19.44 to 182.74 mg/l. The tolerance range for magnesium is 50 to 100 mg/l.

Sulphate:

Sulphate raged from 19.41 mg/l to 384.30 mg/l. The tolerance range for sulphate is 200 to 400 mg/l. The high concentration of sulphate may induce diarrhea.

Phosphate:

In the present study phosphate ranged from 4.0 mg/l to 42 mg/l. The evaluated value of phosphate in the present study is much higher than the prescribed values.The higher values of phosphate are mainly due to use of fertilizers and pesticides by the people residing in this area. If phosphate is consumed in excess, phosphine gas is produce in gastro-intestinal tract on reaction with gastric juice. This could eve lead to the death of consumer.

Nitrate:

In the present study nitrate ranged from 60 mg/l to 450 mg/l. The tolerance range for nitrate 20mg/l to 45 mg/l. Nitrate nitrogen is one of the major constituents of organisms along with carbon and hydrogen as amino acid, protein and organic compounds present in the bore wells water. In the present study nitrate nitrogen levels show higher values than the prescribed values. This may be due the excess use of fertilizers and pesticides in this area.

Microbial:

Originally, fecal contamination was determined with the presence of coliform bacteria, a convenient marker for a class of harmful fecal pathogens. The presence of fecal coliforms (like *E. Coli*) serves as an indication of contamination by sewage. Additional contaminants include protozoan oocysts such as *Cryptosporidium sp.*, *Giardia lamblia*, *Legionella*, *Entamoeba histolytica* and viruses (enteric).[33] Microbial pathogenic parameters are typically of greatest concern because of their immediate health risk.Throughout most of the world, the most common contamination of raw water sources is from human sewage and in particular human faecal pathogens and parasites. In 2006, waterborne diseases were estimated to cause 1.8 million deaths each year while about 1.1 billion people lacked proper drinking water.[34]

Analysis result of the sample collected in Jan-Feb-20

No.	Sample Station	Temp C	pH	TDS	D.O. m/l	Chloride mg/L	Total Alkalinity mg/L	Ca Hardness mg/L	Mg Hardness mg/L	SO_4^{-2} mg/L	PO_4^{-3} mg/L	NO^{-3} mg/L	coliform bacteria
1.	Jamni	30.5	7.5	200	7.6	27.67	328	35.13	68.45	345.84	8.5	50	- nt
2.	Sarali	30.7	7.62	800	8.5	78.65	486	26.15	73.26	236.45	2.5	150	- nt
3.	Pithai	31.3	8.01	350	6.7	43.35	525	27.56	45.36	119.65	6.8	260	- nt
4.	Abhripur	31.6	7.13	410	6.3	85.64	373	52.39	88.14	84.59	6.5	250	- nt
5.	Bagdol	29.8	7.4	560	7.5	110.36	416	43.78	19.26	169.36	3.5	210	- nt
6.	Chhipadi	29.4	7.05	380	6.7	92.35	629	17.23	76.94	349.74	4.5	205	- nt
7.	Bhaner	30.5	6.85	480	8.1	115.68	548	8.02	12.84	72.36	7.0	220	- nt
8.	Bhatera	30.9	7.62	980	7.8	98.37	360	28.85	29.64	48.64	15.0	70	- nt
9.	Chelavat	31.8	7.25	710	7.4	83.47	338	33.46	27.39	276.41	10.0	225	- nt
10.	Kakarkhad	31.3	6.5	185	6.8	145.10	624	72.68	64.22	265.95	12.0	235	- nt
11.	Manor Ni Muvadi	31.7	7.82	670	8.3	55.01	580	44.69	31.15	122.35	6.0	80	- nt
12	Khadal	30.4	7.55	730	7.8	61.56	470	11.29	81.25	268.95	7.0	185	- nt
13	Gugalia	30.8	7.3	460	7.2	126.35	683	13.56	95.29	249.69	9.5	305	- nt
14	Badarpur	29.7	7.98	1250	6.7	62.54	690	14.60	20.47	345.35	4.0	240	- nt
15	Ravdavat	30.3	6.8	570	7.3	129.5	438	33.4	42.3	165.6	5.5	102	- nt
16	Mundel	31.2	7.3	360	6.2	85.6	488	23.5	34.1	350.3	12.5	135	- nt
17	Ladvel	33.0	7.6	410	8.3	53.4	512	11.09	16.8	246.5	7.3	126	- nt
18	Bhagat Na Muvada	31.5	8.1	390	6.9	46.9	632	15.96	27.9	168.7	10.5	85	- nt
19	Anara	32.6	7.4	680	7.1	105.3	355	36.9	30.2	210.8	8.5	98	- nt
20	Porada	29.8	7.1	870	8.4	89.3	256	10.56	17.3	54.5	6.5	165	- nt

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