Opinion of the value of Water from Tube -Wells in Bilaspur Chhattisgarh, India

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Abstract: *This work deals by physico chemical analysis of Characteristics of Bore wells at rural area of Bilaspur Chhattisgarh. The physico chemical tests were conducted using standard scientific methods like conductivity, colorimetric, pH metric etc, so as to minimize the determinate errors. Assessment of the water sample values s made by the comparison of the assessed values of all the physico- chemical parameters with the corresponding standards for drinking water by World health organization.*

Keywords: *Bore-wells, physiochemical*

I. Introduction

The eminence drinking water is important for existence. Unluckily, in several countries around the world, water has become a limited product as only a small amount of the population has access to treated water. In India ground water has a most important function to satisfy the requirements of domestic and agriculture points. The natural water analyses for physical and chemical properties including trace element contents are very important for public health studies. These studies are also a main part of pollution studies in the environment. Diseases contacted through drinking water kill about 5 million children annually and make 1/6th of the world population sick[1]. Potable water is the water that is free from disease producing microorganisms and chemical substances that are dangerous to healt[2]. Due to Increased Human Population, Industrialization, Use of Fertilizers in Agriculture and Man-made activity. Pollution of water can cause water borne diseases. Quantitative analytical procedures can be done by gravimetric, volumetric and colorimetric estimations.
Material and Method.

II. Study Area

The sea-horse formed Chhattisgarh state came into reality on 1st Nov. 2000 by the Bill Madhya Pradesh reorganization Act 2000' passed in the parliament. It is important and fast growing district of Chhattisgarh. Bilaspur is the judicial capital and the second biggest city of Chhattisgarh state. The population of the city is around 4.5 lakhs and is located at $25\,^{\circ}.5'$ latitude and $82^{\circ}.25'$ longitude[3]. The district is situated in the Mahanadi river basin. The climate of Bilaspur is mostly tropical. Summer months are mostly hot and humid while the winter season is moderate and pleasant. However, main sources of drinking water are hand pumps and bore wells. Increased population and improper drainage system have potential to influence the ground water quality. The aim of this effort is to evaluate the quality of drinking water in nearby Bilaspur city.

2.1 Sample collection-The sampling locations consist of urban as well as rural areas. Ground water samples were collected from five under ground bore-wells at various locations within study area during pre monsoon, monsoon and post monsoon season. Samples were collected in plastic container to avoid unpredictable changes in characteristic as per standard procedure (APHA, 1998)[4].

Physicochemical analysis of ground Water:
The collected water samples were analyzed for various physicochemical parameters. The procedure for analysis was followed as per standard methods of analysis of water[5]. The parameters analyzed were temperature, pH, electrical conductivity, total dissolved solids, salinity, hardness, dissolved oxygen, electrode potential, nitrate and fluoride were also determined in collected five water samples. All the samples were collected in sterilized bottles and were stored at 4°C till further investigation.

2.2 Chemical reagents- All the chemicals and reagents used for the study were of analytical grade and instruments were of limit of precise accuracy.

III. Results And Discussion

The examined physio-chemical parameters showed considerable variations in different samples. The observations are depicted in table-2.

3.1Temperature: The temperature was found in the range of 19.70 – 21.20 ^{o}C in the during analysis. The variation in the water temperature may be due to different timing of collection and influence of Season[6].

3.2 pH: pH is affected not only by the reaction of carbon dioxide but also by organic and inorganic solutes present in water. Any alteration in water pH is accompanied by the change in other physic-chemical parameters[7].pH maintenance (buffering capacity) is one of the most important attributes of any aquatic system since all the biochemical activities depend on pH of the surrounding water. It was concluded that the pH of water were permissible limit (6.42 to 7.91) as per APHA.

3.3 Electrical Conductivity: Electrical conductivity is a measure of water capability to transmit electric current and also it is a tool to assess the purity of water. Electrical conductivity found in the range 342 - 1633 µS. One of the reason of salinity is the high concentration of cations such as sodium, calcium and magnesium whereas chloride, phosphate and nitrate as anions[8].

3.4 Total Dissolved Solids: The most amazing observation of analysis was the alarmingly high level of total dissolved solids The TDS of all the samples were in range of 185- 1585 mg / lit. while the maximum permissible limiting value of TDS for potable water is 500 mg/ lit., according to WHO. High level of TDS in water used for drinking purposes leads to many diseases which are not water-borne but due to excess salts9. The present investigation has provided a good platform for further study to analyze the types and amount of cationic/ anionic salts.

3.5 Hardness: Hardness is an important parameter in decreasing the toxic effect of poisonous element. The hardness was found to be in the range of 130- 510 mg/lit. It is within desirable limit. The hardness of water increases in the polluted waters by the deposition of calcium and magnesium salts10.

3.6 Dissolved Oxygen: DO is a very important parameter of water quality and an index of physical and biological process going on in water. In the present study, the maximum concentration of dissolved oxygen was observed in the pre monsoon season. The highest concentration (7.30 mg/l) was recorded on S_3 but the range was not narrow for other sites.

3.7 Nitrate: Natural nitrate levels in groundwater are generally very low (typically less than 10 mg/L NO3), but nitrate concentrations may be encountered in groundwater impacted by intensive fertilizer application, or septic effluents. This can lead to groundwater contamination that can never be rectified. Nitrate of samples was within the permissible limits for all in pre monsoon, monsoon and post monsoon season.

3.8 Fluoride: Fluorine is a common element that does not occur in the elemental state in nature because of its high reactivity. The amount of fluoride occurring naturally in groundwater is governed by climate, composition of the host rock, and hydrogeology[11].The fluoride concentration in the ground water of these areas varied from 0.40 to2.06 mg/l, causing dental fluorosis among people especially children of these sample stations.

Table 1 Sources of different water samples collected from in and around Bilaspur city,

S.N.	Sample No.	Location	Sources
1	S1	Nehru nagar	Bore-well
2	S2	Koni	Bore-well
3	S3	Dayalband	Bore-well
4.	S4	Sakari	Bore-well

Table-2 Physio-chemical characteristics of water sample Sampling Station S1 Nehru nagar

S.N.	Parameter	Unit	Pre monsoon	Monsoon	Post monsoon
1	Temperature	^{O}C	21.20	20.50	20.30
02	pH		7.51	6.65	6.79
03	Electrical conductivity	μS	973.00	513.00	570.00
04	Total dissolved solid	mg/l	617.00	291.00	327.00
05	Salinity	mg/l	1.42	0.91	1.02
06	Calcium hardness	mg/l	215.00	145.00	150.00
07	Magnesium hardness	mg/l	180.00	90.00	100.00
08	Total hardness	mg/l	395.00	235.00	250.00
09	Dissolved oxygen	mg/l	7.10	6.50	6.70
10	Electrical potential	mV	351.40	154.70	212.10
11	Nitrate	mg/l	7.53	2.22	3.54
12	Fluoride	mg/l	1.52	0.40	0.60

Table 3 Physico-chemical characteristics of water sample Sampling Station S2 Koni

S.N	Parameter	Unit	Pre monsoon	Monsoon	Post monsoon
1	Temperature	^{O}C	19.70	21.10	20.70
02	pH		7.30	6.74	7.30
03	Electrical conductivity	μS	754.00	342.00	567.00
04	Total dissolved solid	mg/l	416.00	192.00	315.00
05	Salinity	mg/l	1.28	0.95	1.16
06	Calcium hardness	mg/l	310.00	125.00	175.00
07	Magnesium hardness	mg/l	200.00	85.00	125.00
08	Total hardness	mg/l	510.00	210.00	300.00
09	Dissolved oxygen	mg/l	7.20	6.60	6.90
10	Electrical potential	mV	334.70	134.60	225.30
11	Nitrate	mg/l	10.63	2.22	3.54
12	Fluoride	mg/l	1.60	0.40	0.86

Table 4 Physico-chemical characteristics of water sample Sampling Station S3 Dayalband

S.N.	Parameter	Unit	Pre monsoon	Monsoon	Post monsoon
1	Temperature	^{O}C	20.60	20.80	21.20
02	pH		7.91	6.81	6.92
03	Electrical conductivity	μS	817.00	361.00	413.00
04	Total dissolved solid	mg/l	583.00	185.00	239.00
05	Salinity	mg/l	2.18	1.00	1.04
06	Calcium hardness	mg/l	200.00	85.00	100.00
07	Magnesium hardness	mg/l	170.00	60.00	70.00
08	Total hardness	mg/l	370.00	145.00	170.00
09	Dissolved oxygen	mg/l	7.30	6.50	6.70
10	Electrical potential	mV	305.70	112.80	172.30
11	Nitrate	mg/l	7.53	4.43	5.31
12	Fluoride	mg/l	1.60	1.12	0.98

Table 5 Physico-chemical characteristics of water sample Sampling Station S4 Sakari

S.N.	Parameter	Unit	Pre monsoon	Monsoon	Post monsoon
1	Temperature	^{O}C	19.70	21.00	21.10
02	pH		7.61	6.42	6.89
03	Electrical conductivity	µS	1633.00	825.00	890.00
04	Total dissolved solid	mg/l	1585.00	780.00	826.00
05	Salinity	mg/l	1.56	0.74	0.82
06	Calcium hardness	mg/l	220.00	80.00	100.00
07	Magnesium hardness	mg/l	165.00	50.00	80.00
08	Total hardness	mg/l	385.00	130.00	180.00
09	Dissolved oxygen	mg/l	7.30	6.40	6.80
10	Electrical potential	mV	450.20	115.20	240.90
11	Nitrate	mg/l	12.84	3.54	4.43
12	Fluoride	mg/l	2.06	0.80	0.86

IV. Conclusion

The observation of study strongly suggest that water of Gwalior region is of very high TDS and needs to be lowered down within prescribed limits before using it for drinking purposes. Also, the water samples were showing microbial content beyond the pot-ability range, which needs to be disinfected before consumption to avoid water-borne diseases. Although, the present investigation is essentially a primary work and needs to be further investigated to arrive at specified conclusion with respect to clinical implications.

References

[1]. WHO (2004)**.** Water Sanitation and Health Programe. Managing water in the home: accelerated health gains from improved water sources.World Health Organization. www.who.int.
[2]. Lamikaran, A. (1999).Essential Microbiology for students and Practitioners of Pharmacy, Medicine and Microbiology.2nd Edn.Amkra books, 406p.
[3]. Chandrakar ,P.L. and Tripathi, K.: Chhattisgarh Atlas. 2 Edn.,Beni Gupta Publication, Bilaspur. Pp.58-59 (2000).
[4]. Standard methods for examination of waters and waste waters, **16th Ed**., APHA, AWWA and WPCF Inc. New York, 1205 **(1985)**
[5]. Jayaraman P.R., Gangadevi T. and Vasuena N. T., Water quality studies on Kasmaneriver, Thiruvanthapuram, district, South Kerela, India, Poll. Res**., 32(1),** 89-100 (2003)
[6]. Wetzel R.G., Limology, W.B., Saunders Co., Philadelphia, USA, 743**(1975).**
[7]. Chauhan R., Chaudhary R., Singh A. and Singh P.K., Salt Tolerance of Sorghum bicolor Cultivars during Germination and Seedling Growth, Research Journal ofRecent Sciences, **1(3)**, 1-10, **(2012).**
[8]. Sabata B.C. and Nayar M.P., River pollution in India: A case study of Ganga river, 33 **(1995).**
[9]. Bhatt L.R., Lacoul H.D., Lekhak H. and Jha P.K., Physicochemical characteristics and phytoplankton of Taudaha lake, Kathmandu, Poll. Res., **18(4),** 353-358 (1999).
[10]. Gupta, S., S. Banerjee, R. Saha, J.K. Datta and N. Mondal, 2006. Fluoride Geo-chemistry of groundwater in Birbhum, West Bengal, India. Fluoride, 39: pp 318–320.