ANALYSIS OF WATER BY PHYSICO-CHEMICAL PARAMETERS ADJACENT RUSTIC AREAS IN BILASPUR CHHATTISGARH, INDIA

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Abstract

Water intended for human consumption should be safe and wholesome i.e. free from pathogenic agent and harmful chemicals, pleasant to taste and usable for drinking and other purpose. Present paper report a study on water quality. Water samples were collected from four drinking water source viz. Jonki, Deorikala, Pondi, Bharani. Every month during july 2017 to june 2018. These samples were then analyzed for their physic-chemical characteristics like Temperature, Ph, Electrical conductivity, Total dissolved solids, salinity, total hardness, calcium hardness, magnesium Hardness, dissolved oxygen electrode ,potential, nitrate, fluoride. These parameter are the most important ecological factor which play significant role on the determination of the water quality. All parameter were within the permissible limits prescribed by the various monitoring agencies. The results indicate that the all sample stations is not detect harmful pollutant and can be used for drinking irrigation and domestic.

Keywords: Bore-wells, physiochemical, water quality.

INTRODUCTION

Good quality water is very necessary for good and healthy life. It is an essential part of proto-plasama and creates a state for metabolic activities to occur smoothly; therefore, no life can exist without water [1]. Water plays an essential role in the ecosystem. However due to increasing anti-environmental human activities and some natural processes the quality of water is decreasing continuously and isposing a great threat to all forms of life including humans. Polluted water is the major cause for the spread of many epidemics and some serious diseases like cholera, tuberculosis, typhoid, diarrhea etc. Although several attempts have been made by a number of researchers[2-5] to study various aspects of water quality and the factors responsible for its degradation in order to formulate a significant control strategy all over the globe yet the problem is on rise. The need of the hour is to take immediate steps to treat the water and minimize its negative impacts. Water plays a key role in prevention of diseases, drinking eight glasses of water daily can decrease the risk of colon cancer by 45% and bladder cancer by 50% as well as reducing the risk of other cancers.[6] Ground water is ultimate, most suitable fresh water resource with nearly balanced concentration of the salts for human consumption. High content of sodium in combination with chloride and nitrate in water raises the blood pressure and often damage the kidney of the body. The problems of ground water quality are much more acute in the areas which are densely populated, thickly industrialized. The rapid growth of urban areas has further affected ground water quality due to overexploitation of resources and improper waste disposal practices. Hence, there is always a need for and concern over the protection and management of ground water quality.[7]

The department of drinking water supply, government of India is now in the process of preparing a strategic plan for rural drinking

water sector to set the aspiration, goals, objectives, strategy and implementation plan for the sector and the various stakeholders to achieve the goal by 2022 i.e the remaining two years of the current XI five year plan the next two plan periods. The intention of this work is to evaluate the quality of drinking water in these sample stations.

Experimental

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 ^{o}.5' latitude and 82° .25' longitude[8]. 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.

S. No	Sample stations	Habitat	Source
1	Jonki (S1)	Rural	Bore-wells
2	Deorikala (S2)	Rural	Bore-wells
3	Pondi (S3)	Rural	Bore-wells
4	Bharni (S4)	Rural	Bore-wells

The sampling locations consist of rural areas. Ground water samples were collected from four under- ground bore-wells at various locations within study area during every month in two year. Samples were collected in plastic container to avoid unpredictable changes in characteristic as per standard proceed. The collected water samples were analyzed for various physicochemical parameters. The procedure for analysis was followed as per standard methods of analysis of water[9-10]. 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. Physicochemical parameters were analyzed as per standard methods.

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

Results and Discussion

The examined physico-chemical parameters showed considerable variations in different samples.

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. 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 . 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 salt. Dissolved Oxygen 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. 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 season. 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.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 .

Physico-chemical characteristics of water sample Sampling Station S1

S.No.	Parameter	Unit	July-17-oct-17	Nov-17-Feb-17	Mar-17-June17
1	Temperature	^{O}C	21.20	20.50	20.30
02	pH		7.51	6.65	6.79
03	E.C.	µS	973.00	513.00	570.00
04	T.D.S	mg/l	617.00	291.00	327.00
05	Salinity	mg/l	1.42	0.91	1.02
06	Ca hardness	mg/l	215.00	145.00	150.00
07	Mg hardness	mg/l	180.00	90.00	100.00
08	Total hardness	mg/l	395.00	235.00	250.00
09	D. O.	mg/l	7.10	6.50	6.70
10	E. P.	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

Physico-chemical characteristics of water sample Sampling Station S2

S.No.	Parameter	Unit	July-17-oct-17	Nov-17-Feb-17	Mar-17-June17
1	Temperature	^{O}C	19.70	21.10	20.70
02	pH		7.30	6.74	7.30
03	E.C.	µS	754.00	342.00	567.00
04	T.D.S	mg/l	416.00	192.00	315.00
05	Salinity	mg/l	1.28	0.95	1.16
06	Ca hardness	mg/l	310.00	125.00	175.00
07	Mg hardness	mg/l	200.00	85.00	125.00
08	Total hardness	mg/l	510.00	210.00	300.00
09	D. O.	mg/l	7.20	6.60	6.90
10	E. P.	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

Physico-chemical characteristics of water sample Sampling Station S3

S.No.	Parameter	Unit	July-17-oct-17	Nov-17-Feb-17	Mar-17- June17
1	Temperature	^{O}C	20.60	20.80	21.20
02	pH		7.91	6.81	6.92
03	E.C.	µS	817.00	361.00	413.00
04	T.D.S	mg/l	583.00	185.00	239.00
05	Salinity	mg/l	2.18	1.00	1.04
06	Ca hardness	mg/l	200.00	85.00	100.00
07	Mg hardness	mg/l	170.00	60.00	70.00
08	Total hardness	mg/l	370.00	145.00	170.00
09	D. O.	mg/l	7.30	6.50	6.70
10	E. P.	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

Physico-chemical characteristics of water sample Sampling Station S4

S.No.	Parameter	Unit	July-17-oct-17	Nov-17-Feb-17	Mar-17-June17
1	Temperature	^{o}C	19.70	21.00	21.10
02	pH		7.61	6.42	6.89
03	E.C.	µS	1633.00	825.00	890.00
04	T.D.S	mg/l	1585.00	780.00	826.00
05	Salinity	mg/l	1.56	0.74	0.82
06	Ca hardness	mg/l	220.00	80.00	100.00
07	Mg hardness	mg/l	165.00	50.00	80.00
08	Total hardness	mg/l	385.00	130.00	180.00
09	D. O.	mg/l	7.30	6.40	6.80
10	E. P.	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

Conclusion

The observation of study strongly suggest that water is of high TDS and needs to be lowered down within prescribed limits before using it for drinking purposes. 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.

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