

Assessment of Water Quality in Chirimiri Colliery of Korea District, Chhattisgarh, India

PRATIMA RANI DWIVEDI¹, M. R. AUGUR², and ANITA AGRAWAL³

¹Research scholar Deptt. of Chemistry, Dr. C.V. Raman University, Bilaspur, C.G. (INDIA)

²Asstt. Prof, Deptt. of Chemistry, Govt. Agrsen College, Bilha, C.G. (INDIA)

³Asst. Prof. & Head, Deptt. of Chemistry, RITEE, Raipur, C.G. (INDIA)

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Abstract

Ground and surface water are the source of drinking water in Chirimiri colliery, Korea district. In present study, 10 sample's water quality of selected 03 areas of Chirimiri colliery, Korea district is evaluated using standards methods and procedures of sampling and estimation. Represented water samples have been collected and assessed for their suitability for drinking purpose. The various physical and chemical parameters are studied are pH, Total dissolved solids, Total hardness, Total alkalinity, calcium, magnesium and iron. The present study revealed that the physico-chemical characteristics of the samples were within the permissible drinking water standards limits prescribed by W.H.O. The quality of ground and surface water is suitable for drinking purpose in terms of physical and chemical characteristics.

Key words: Ground water, physico-chemical analysis, Total hardness, TDS.

Introduction

Water plays an essential role in human life. Although statistics, the WHO reports that approximately 36% of urban and 65% of rural Indian were without access to safe drinking water. Fresh water is one of the most important resources crucial for the survival of all the living beings. It is even more important for the human being as they depend upon it for food production, industrial and waste disposal, as well as cultural requirement. Human and ecological

use of ground water depends upon ambient water quality. Human alteration of the landscape has an extensive influence on watershed hydrology. Ground water plays a vital role in human life. The consequences of urbanization and industrialization leads to spoil the water for agricultural purposes ground water is explored in rural especially in those areas where other sources of water like dam and river or a canal is not considerable. During last decade, this is observed that ground water get polluted drastically because of increased human activities¹⁻¹⁰.

Consequently number of cases of water borne diseases has been seen which a cause of health hazards. An understanding of water chemistry is the bases of the knowledge of the multidimensional aspect of aquatic environmental chemistry which involves the source, composition, reactions and transportation of water. The quality of water is of vital concern for the mankind since it is directly linked with human welfare. It is a matter of history that facial pollution of drinking water caused water-borne diseases which wiped out entire population of the studied area. The present work is an attempt to measure the water quality of Chirimiri colliery, Korea district, Chhattisgarh, India⁶⁻¹⁰.

Study area :

The study area comprises of Korea district of Chhattisgarh state. Korea is one of the North-West District of Chhattisgarh State. Korea district's administrative head quarter located in Baikunthpur town. The District came into existence on 25th May 1998 in Madhya Pradesh State. Its parent District was Surguja. After the formation of New State of

Chhattisgarh on 1st November 2000, the District falls under the Chhattisgarh State. The District has derived its Name from the Korea State, the former princely State Korea. Chirimiri is a town of Korea district which is subdivided into 9 colliery including underground mine and open cast mine.

Geographical location of Experimental Site:

Korea district is situated between 23° 02'42" to 23° 44'46" north Latitude and between 81°46'42" to 82°33'43" east Latitude and 176.362 mts above from sea level. It is situated on the bank of Hasdeo River. The population of Korea district is about 659,039. It gets around 939.0mm rainfall a year. The present piece of investigation is concerned with the studies of 3 community surface, dug wells as well as and bore wells of 10 wards of Chirimiri colliery, Korea district. Much information is not available on the water quality, pollution load and biotic community structure of these water sources. So keeping all these facts in mind 3 community were chosen for detailed study.

S.N.	Community	Wards	Sample Number
1	N.C.P.H. colliery	Ward number 10 Ward number 11 Ward number 13 Ward number 14	W S-1 W S-2 W S-3 W S-4
2	Kurasiya colliery	Ward number 32 Ward number 33 Ward number 34	W S-5 W S-6 W S-7
3	Dumanhill	Ward number 42 Ward number 43 Ward number 44	W S-8 W S-9 W S-10

Water sampling :

Ten water samples were collected randomly from the study area during the warm season of months of April and May 2012. The samples were collected from boreholes

and tap water which are being used extensively for drinking and other domestic purposes. The water samples were collected using previously cleaned polythene bottles. The water samples are chemically analyzed. The analysis of water was done using procedure of standard methods⁷⁻¹⁵.

Figure1 - Location of Chhattisgarh in India & Koria in C.G.

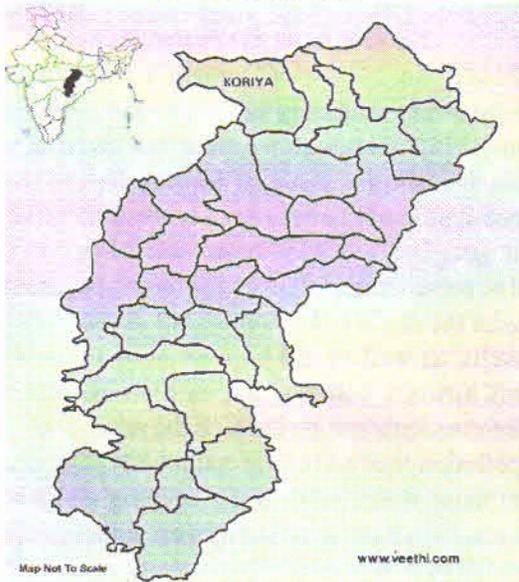


Figure 2- Map of Koria



PHYSICOCHEMICAL ANALYSIS:

All the samples were analyzed for the following physicochemical parameters; pH, temperature, turbidity, Electrical Conductivity (EC), Total Dissolved Solid (TDS), Total Alkalinity (TA), Chloride, Total Hardness (TH), Ca hardness, Mg hardness, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Nitrate, Fluoride, Phosphate, Sulphate. The physicochemical analysis of water samples were carried out in accordance to standard analytical methods.

Results and Discussion

The data obtained from the current investigation showed in table no.1 which was followed.

Temperature :

The temperature of groundwater sample slightly varied ranged from 25.11 to 27.31.

PH

The pH of the groundwater samples were about neutral, the ranged from 7.02 to 7.85.

Turbidity :

Turbidity of groundwater samples obtained from 2.1 to 6.2 which showed limits under the CPCB.

TDS :

Total dissolved solids are a measure

of total inorganic substances dissolved in water. TDS indicates the general nature of water quality or salinity. During the study TDS is found between ranged 546 mg/l to 907 mg/l. The TDS concentration was found to be above the permissible limit may be due to the leaching of various pollutants into the ground water which can decrease the potability and may cause gastrointestinal irritation in human and may also have laxative effect particularly upon transits¹⁰⁻¹³.

Table 1

S. N.	Parameter	W S 1	W S 2	W S 3	W S 4	W S 5	W S 6	W S 7	W S 8	W S 9	W S 10
1	Temperature	25.52	25.31	27.03	26.29	25.11	25.39	26.71	27.31	27.21	26.81
2	Ph	7.81	7.02	7.75	7.51	7.22	7.20	7.45	7.50	7.60	7.71
3	Turbidity (NTU)	6.1	4.1	5.8	3.4	2.1	5.8	4.2	6.2	5.8	5.3
4	TDS(mg/l)	897	791	838	878	546	874	756	907	751	869
5	T.A.(mg/l)	189	167	121	98	76	101	113	198	129	106
6	Cl (mg/l)	140	285	213	109	121	148	169	252	278	201
7	TH(mg/l)	298	307	282	296	150	205	197	247	261	212
8	Ca (mg/l)	110	265	145	234	102	167	129	196	201	182
9	Mg (mg/l)	58	42	35	64	48	33	68	51	59	37
10	DO(mg/l)	4.12	3.9	4.03	3.91	5.13	4.97	6.29	6.23	4.57	4.38
11	BOD(mg/l)	1.3	1.9	1.7	2.1	3.8	2.3	1.4	1.2	1.1	3.6
12	COD(mg/l)	9.2	5.7	2.8	11.6	9.4	23.6	12.3	8.9	13.7	12.4
13	NO ₃ (mg/l)	2.1	ND	ND	22.1	6.9	54	ND	7.8	ND	7.17
14	F (mg/l)	1.1	2.2	0.1	0.5	ND	ND	0.7	ND	0.2	0.9
15	PO ₄ (mg/l)	0.01	ND	ND	0.01	0.05	ND	ND	0.07	ND	0.02
16	SO ₄ (mg/l)	11.2	6.9	2.9	8.1	12.7	122	46	171	49	78

*WS- Water sample. ND: Not Detectable

Alkalinity :

The total alkalinity was found to be in the range of 76 to 198 mg/l in ground water samples which are caused mainly due to OH,

CO₃, HCO₃ ions.

Chlorides :

The value of chloride obtained 121 to

285 mg/l as presented in table which is further compared with the standard values 250 mg/l. Department of National Health and Welfare, Canada reported that chloride in ground water may result from both natural and anthropogenic sources such as run-off containing salts, the use of inorganic fertilizers, landfill leachates, septic tank effluents, animal feeds, industrial effluents, irrigation drainage and seawater intrusion in coastal areas. Chloride is not harmful to human at low concentration but could alter the taste of water at concentration above 250 mg/l.

Total Hardness :

The total hardness of ground water samples were found in the range of 150 up to 307 mg/l which is further compared with the standard value ranged 300 mg/l. Water hardness is usually due to the multivalent metal ions, which comes from minerals dissolved in the water. However, Dzik has reported an inverse relationship between water hardness and cardiovascular disease¹⁻¹³.

Calcium and Magnesium hardness :

Calcium and Magnesium hardness of groundwater samples were found maximum in sample no. 2 and 7 and minimum in sample no. 5 and 6 respectively which are further compared with the standard value of CPCB.

Dissolved Oxygen :

DO of ground water samples were found in the range of 4.22 to 5.74 mg/l. due to the capacity of water to hold oxygen.

Biological Oxygen Demand :

The BOD ranges values from 1.4 to

3.8 mg/l. which represent the amount of oxygen that microbes need to stabilize biologically oxidizable matter.

Chemical Oxygen Demand :

The chemical oxygen demand ranged from 2.9 to 34.2 mg/l. The test is commonly used to indirectly measure the amount of organic compounds in water. Most applications of COD determine the amount of organic pollutants found in surface water, making COD a useful measure of water quality.

Nitrate :

The concentration of nitrate was found in water sample up to 54 mg/l. Although only one sample no. 6 exceeds the permissible limit but it shows a moderately high concentration. Jawad *et al.*, have also reported increase in nitrate concentration in ground water due to waste water dumped at the disposal site and likely indicate the impact of leachate.

Fluoride :

The concentration of fluoride in the studied water samples ranged from 0.01 to 1.1 mg/l. The concentration of fluoride at low concentration in ground water has been considered beneficial but high concentration may causes dental fluorosis (tooth mottling) and more seriously skeletal fluorosis.

Phosphate :

Phosphate concentration showed under the permissible limit varied up to 0.05 mg/l.

Sulphate :

Concentration of sulphate in water sample ranged from 2.9 mg/l to 171 mg/l. Sulfate is a nontoxic anion but ailment like catharsis, dehydration and gastrointestinal irritation have been linked with it when concentration is high.

Conclusion

On the basis of current investigation we can conclude that the ground water near the MSW dumping areas most of the under permissible limit of CPCB but some of the achieving near permissible limit, so far there we can follow the safety recommend the following. The study assessed the evolution of water quality in ground water of Jabalpur near MSW. A comparative study of ground water i.e. bore well and hand pump water carried out by taking certain important parameters like pH, TDS, TA, COD, Nitrate, Cl⁻, PO₄⁻, F- etc. In this present investigation it was found that the maximum parameters were not at the level of pollution except few parameters like nitrate, TDS and TH in ground water. So ground water of this district is satisfy the requirement for the use in¹¹⁻¹⁵.

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