Heavy Metal Analysis of Ground Water in Chitrakoot Region, District Satna

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Abstract: *The Chitrakoot is geographically located at coordinated -25.000N latitude 7 -80.830Elongitude. It borders the Chitrakoot District in Uttar Pradesh, whose headquarters chitrakoot Dham (Karwi) is located nearby. The town lies in the historical chitrakoot region, which is divided between the present-day Indian states of Madhya Pradesh and Uttar Pradesh. The Procedures followed to analyze the Heavy metal concentration were from Standard Methods All the water sample are leaving very little concentration of Iron and showing good quality of water as for as Iron is concerned.*

Keywords: Water, Heavy Metals, Chemical Analysis, Chitrakoot Region

1. INTRODUCTION

Chitrakoot is a town and a nagar panchayat in satna District in the state of Madhya Pradesh, India.It is a town of religious, cultural, historical and archaeological importance, situated in the Bundelkhand region. The Chitrakoot is geographically located at coordinated -25.000N latitude 7 -80.830Elongitude. It borders the Chitrakoot District in Uttar Pradesh, whose headquarters chitrakoot Dham (Karwi) is located nearby. The town lies in the historical chitrakoot region, which is divided between the present-day Indian states of Madhya Pradesh and Uttar Pradesh. It is known for a number of temples and sites mentioned in Hindu scriptures. Many people gather here on each Amavasya. Somwati Amavasyas, Deepawali, Shard- Poornima, Makar Sankranti and ramanavami are special occasions fpr such gatherings and celebrations. It attracts crowds' through the year including above occasions and for free Eye Hospital Camps. Noted Ayurvedic and yoga centers like Arogyadham and MGCG University are located in chitrakoot. Chitrakoot means the Jill of many wonders.Chitrakoot falls in the northern Vindhya Range of mountains spread over the states of Utter Pradesh and Madhya Pradesh. Chitrakoot District in Uttar Pradesh was created on 4 September 1998.

The aim of the study is to determine the relationship between the contaminant ground water and its impact on human health in some of chitrakoot at Satna in India. Heavy metals are sometimes called trace element (Pb, Fe, Ni, Cu, Cd and Cr). They are the metallic elements of the periodic table. Heavy metals have become of particular interest in recent decades within the framework of environmental investigation. This has without doubt been due to the fact that highly sensitive analytical procedures are available for determining and detecting metal content with high precision [1].

Water pollution is the contamination of water bodies (e.g. lakes, river, oceans, aquifers and ground water). Water pollution occurs when pollutants are discharged directly or indirectly into water bodies without adequate treatment to remove harmful compounds. Water pollution affects plants and organisms living in these bodies of water. In almost all case the effect is damaging not only to individual species and populations, but also to the natural biological communities. Water pollution is a major global problem which requires ongoing evaluation and revision of water resources policy at all levels (international down to individual aquifers and wells). It has been suggested that it is the leading worldwide cause of deaths and diseases and that it accounts for the deaths of more than 14,000 people daily. An estimated 700 million Indians have no access to a proper toilet, and 1000 Indian children die of diarrheal sickness every day some 90% of china's cities suffer from some degree of water pollution, and nearly 500 million people lack access to safe drinking water. In addition to the acute problems of water pollution in developing countries, developed countries to struggle with pollution problems as well. In the most recent national report on water quality in the United States, 45 percent of assessed stream miles, 47 percent of assessed lake acres and 32 percent of assessed bays and estuarine square miles were classified as polluted. The Chemical Contamination do not cause immediate acute health problems uncles they are present in massive quantities through some accident and use of chemical fertilizer and pesticides in crop near the drinking water sources [2]. According to WHO, nearly 80% of all the diseases in human beings are caused by water [3-6].

2. MATERIAL AND METHODS:

2.1 Sample Collection: The Sampling stations were chosen at different place of the chitrakoot region. The present study is focused on water quality assessment for period of April 2013. For testing the water sample were collected in different sterile plastic bottle and jerry cans from each station. After collection of the sample the bottles were tightly capped and were immediately transported to the laboratory to avoid any unpredictable change in the physic-chemical Characteristics

2.2 Sample Preparation and Analysis:

All study area water samples collected in laboratory and then the water samples filtered (any 250 ml) by filter, and preserved by adding 1.5 ml Conc. $_{HNO3}$ to each sample by which pH was lowered to 1-2 preserved samples were analyzed using atomic absorption Spectrophotometer (AAS) (Model- CE 4141). The Procedures followed to analyze the Heavy metal concentration were from Standard Methods (APHA 1984) [7].

Atomic Spectrometry converts each metal in the water sample to a particulate emission that can then be weighed. Extrapolations are made to determine each metal concentration in each water sample taken. The complicated analysis requires preserving the sample with acid, heating the sample to convert to a particulate emission and then identifying each metal and its weight. A Simple analogy is to capture the steam from a pot of water, separate every atom in the steam, identify each atom, weigh each atom and then apply these numbers back to the original volume of water contained in the pot. The result is an accurate picture of what is in the water [7].

Table-1: List of Sampling Stations

S.No.	Sampling Station with code	Water Source	Depth in fit	Description of sampling location
1	Govt. School Rajola R_1	Hand Pump	80	Village Rajola Chitrakoot
2	Hanuman JiMandir R_2	Hand Pump	70	Raja Rajiv Mahal Rajola Chitrakoot
3	University Campus R_3	Tubal	130	MGCGV Chitrakoot
4	Sphtik Sila Mod R_4	Hand Pump	70	Sphetik Silas Mod
5	Police Mace R_5	Hand Pump	70	Police Mace Chitrakoot
6	DRI Campus R_6	Tubal	140	DRI Campus Chitrakoot
7	Dubay House R_7	Hand Pump	80	Adarsh Nagar Chitrakoot
8	PHE office R_8	Tubal	180	PHE Office Arogya Dham Chitrakoot
9	Satna Bus Stand R_9	Hand Pump	70	Satna Bus Stand Chitrakoot
10	Janki Kund Hospital R_{10}	Tubal	160	Janki Kund Eye Hospital Chitrakoot Siya Ram Kuti ram Ghat Chitrakoot
11	Siya Ram Kuti R_{11}	Hand Pump	70	Siya Ram Kuti Ram Ghat Chitrakoot
12	Samaj Bodi Party Office R_{12}	Hand Pump	80	Bi Pass Road Ram Ghat Chitrakoot
13	Duatiya Mukhar Bindu Kamda Nath R_{13}	Hand Pump	90	Duatiya Mukharbind Kamda Nath Chitrakoot
14	Nisha Dhar Daram Shala Kamtan Chitrakoot R_{14}	Tubal	120	Pramukh Mukharbind Kamda Nath Chitrakoot

3. RESULT AND DISCUSSION:

The present research work identifies ground water quality of Chitrakoot region. The result of ground water qualities of chitrakoot region are given in table-**1& figure-1** and standard are given in **table-2**.

Lead:

In present study the lead concentration ranged from 0.01- 0.03 mg/l. The result of the analysis for lead content of various water samples are given in table-2 A Discussion on the data is being presented below the permissible limit prescribed by WHO (1984). [8] Tripathi *et al.*2013, characterization of Diffuse chemical pollution in Satna District of Vindhya Region, India, lead concentrations was found ranged between 0.036 to 9.04mg/l.

Cupper:

Cupper concentrations were found ranged between 0.00 to 0.02 mg/l. All the water samples were below the permissible limit prescribed by WHO (1984). High value of Cu 0.02 mg/l was detected at sampling station R_{14} (Nisha Dhar Dharma Shala Kamtan). Khan et al. (1998) reported that concentration of Cu is this GBM estuary ranged from 0.00024- 0.00344 mg/l. [9] Mahaboob Vali Shaik *et al.* 2014, the role pollution in coastal area to effect on quality of essential trace elements (Copper, Zinc, Selenium) and pH levels of ground water of Nellore District, and the observed Copper levels in costal surface area ranged from 1.8 to 2.4 mg/l.

Cadmium and Chromium:

In the present work about 14 water sample analyzed for Cd and Cr which is not detected in ground water sources (hand pump and tubal) of Chitrakoot Satna region. It is therefore concluded that Cd and Cr is absent in Chitrakoot region. [10] Tripathi *et al.* 2014 studied diffuse cadmium pollution of ground water in Vindhaa Pradesh, India and reported concentration of cadmium content in all the samples of study area found raged between 0.0009 to 2.25 ppm. [11] Gupta *et al.* 2009 studied analysis of heavy metals in the river and water sediment and fish from river Ganges at Allahabad and found to be 0.0 to 0.018 ppm.

Iron and Nickel:

The present study concentration of Iron ranged from 0.08-0.40 mg/l. The maximum concentration of Iron 0.40 mg/l at sampling station R_{10} (Janki Kund Eye Hospital),while minimum concentrations (0.08 mg/l) of Iron was detected at sampling station R_8 (PHE Office Arogya Dham). [12] H.C. Katariya *et al.* 2012 studied the trace element detection of river parbati in narsingh garh area of Madhya Pradesh and reported that Iron content is 0.08 to 1.33 mg/l.

Nickel Concentration ranged between 0.00-0.01 mg/l. Nickel concentrations were found in all the sampling stations are below the limit prescribed by WHO as 0.02 mg/l. [13] Tripathi *et al.* 2015, multivariate analysis of soil and ground water quality in Sidhi district of Vindhya Plateau and reported the Nickel concentrations are found to be 0.007 to 0.042 mg/l.

Table-2: Concentration of Heavy Metal in mg/l from Various Ground Water Sampling Station.

| Sample Station	Heavy Metal Concentration in Water					
	Pb	Fe	Cu	Cd	Cr	Ni
R_1	0.00	0.10	0.01	0.00	0.00	0.00
R_2	0.01	0.12	0.00	0.00	0.00	0.00
R_3	0.00	0.30	0.00	0.00	0.00	0.00
R_4	0.01	0.11	0.01	0.00	0.00	0.01
R_5	0.00	0.13	0.00	0.00	0.00	0.00
R_6	0.00	0.10	0.00	0.00	0.00	0.00
R_7	0.01	0.08	0.00	0.00	0.00	ND
R_8	0.00	0.11	ND	0.00	0.00	0.00
R_9	0.01	0.10	0.00	0.00	0.00	0.00
R_{10}	0.00	0.40	0.01	0.00	0.00	0.01
R_{11}	0.01	0.14	0.00	0.00	0.00	0.00
R_{12}	0.00	0.12	0.00	0.00	0.00	0.00
R_{13}	0.00	0.22	0.00	0.00	0.00	0.00
R_{14}	0.00	0.16	0.02	0.00	0.00	0.00
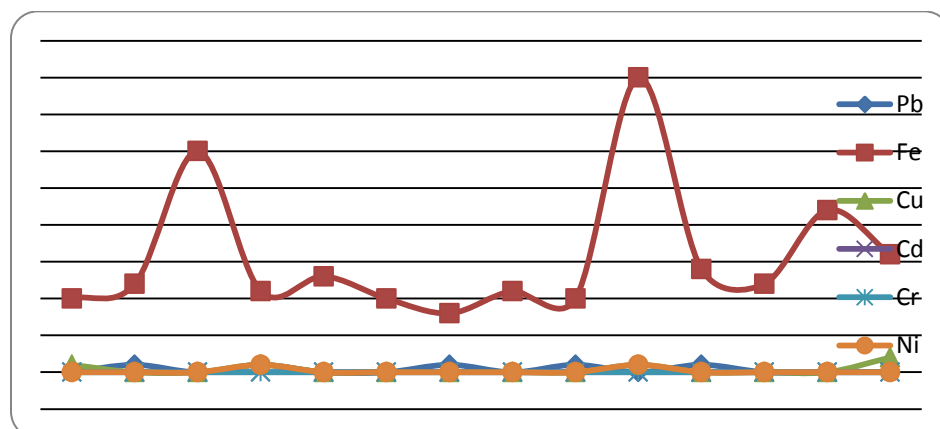
Figure-1: Metals Concentration in the Ground water of Chitrakoot Region

Table-3: Guideline for Drinking Water Quality

S.N.	Heavy Metal	Permissible Limit
1	Pb	0.05 mg/l
2	Cu	1.0 mg/l
3	Cd	0.01 mg/l
4	Fe	0.30 mg/l
5	Cr	0.05 mg/l
6	Ni	0.02 mg/l

4. CONCLUSION:

The Present study, ground water quality in selected sampling locations of chitrakoot region was assessed. All the water sample have containing Pb, Fe, Cu, Cd, Cr and Ni concentration in trace and within the permissible limit prescribed by WHO [14] (1984). Cr and Cd are absent in chitrakoot region. All the water sample are leaving very little concentration of Iron and showing good quality of water as for as Iron is concerned.

5. ACKNOWLEDGEMENT:

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