

PHYSICO-CHEMICAL STUDIES ON HEAVY METAL CONTAMINATION IN GROUNDWATER OF IN AND AROUND COAL FIELD AREA, MANENDRAGARH (C.G.)

P. K. Singh¹, I. P. Tripathi², Renu Prajapati³

¹Department of Chemistry, TCL Govt. PG College, Janjgir, Champa (C.G.)

²Dean, Faculty of Science and Environment, M.G.C.G.V. Chitrakoot Satna (M.P.)

³Research Scholar, M.G.C.G.V. Chitrakoot Satna (M.P.)

tripathi.ip@gmail.com, iptripathi.chemistry@gmail.com,
jhokhura@rediffmail.com

Abstract— The Physico-chemical parameters of groundwater samples collected from various places in jhagrakhand, ledri, khongapani, coal field area of manendragarh, C.G. The physico-chemical parameter like temperature, pH, total dissolved solids, electrical conductivity, chloride, total hardness and trace metals like copper, iron, Manganese were analysed. Standard methods were followed for the investigation of physicochemical parameter the trace metal were analysed in atomic absorption spectrophotometer. The results were compared with standard arranged by WHO and ICMR. It was found that the water sample collected from various places was found contaminated by some parameter. All sampling of places showed physicochemical parameter above the water quality standards and the quality of water are very bad at some places and it is unfit for drinking purpose. Because of lack of water quality, different diseases frequently affect local people. Hence, suitable water quality management is essential to avoid contamination..

Index terms- Manendragarh, coalfield area, groundwater, trace metal.

I. INTRODUCTION

Water is life, no life can exist without water, water is absolutely essential not only for survival of human beings, but also for animals, plants and all other living being. It has many beneficial uses such as drinking, irrigation, navigation, propagation, of wild life, fisheries aesthetics recreation etc¹. Groundwater is one of the prime natural resources which depends the survival of mankind as well as the social and economic development of the nation; it is an important source of water supply throughout the world². The population pressure on the city as ever growing. The behavior of heavy metals in the environment depends on their inherent chemical properties. Trace metal contaminations are important due to their potential toxicity for the environment and human beings. The use of untreated or inadequately treated ground water has been accountable for water borne diseases including gastroenteritis, hepatitis cholera, fever giardiasis and typhoid. The causative agents are bacterial and viral pathogens as well as protozoan

parasites³. In contrast to chemical hazards that may pollute ground water, resulting in a long-range influence on public health in terms of time microbiological pollution of ground water source has an instant effect on large number of nation.

II. MATERIALS AND METHOD

Ground water sample were collected from different places (September 2015), sampling is done at each location in polythene cans of 2 liter capacity these polythene bottle were first washed tap water it soaked in chromic acid solution for about 10-15 minutes, to remove any impurities, over washed with tap water and finally polythene canes were rinsed with deionised water, then the polythene canes were taken for sample collection. The APHA method used for estimation of various physico-chemical parameters are tabulated in table 1

Table-1. List of Methods used for Estimation.

S.N.	Parameter	Used method for estimation
1.	Temperature	Thermometer
2.	pH	Digital pH meter
3.	Total hardness (TH)	EDTA titration method
4.	TDS	Filtration method
5.	Chloride	Silver nitrate method
6.	Dissolve oxygen (DO)	DO Digital meter (water analysis kit)
7.	Electric conductivity (EC)	EC Digital meter (water analysis kit)
8.	Trace metal (Cu, Fe & Mn)	Flame AAS (model SL176 company ELICO) Double beam

III. RESULT AND DISCUSSION:

In the present study we were analyse fifteen water samples of Manendragarh, C.G. Results of the analysis is given in table-2 and graphical representation of the data is shown in fig-1 to fig-6.

A. TEMPERATURE

The maximum water temperature was observed 32°C at GW-8 and minimum 26.5°C at Gw-6 with an average value of 28.6°C. The variation in temperature may be due to different timing of collection and manipulate of season. The water temperature contrasts the rate of all chemical reaction and

affects fish growth, reproduction and protection. No other factor has so much influence as temperature.

B. pH

In the present study pH value ranges from 6.99 to 7.12. The limit of pH value for drinking water is 6.5 to 8.5 by ICMR that indicates the all sample were found to be alkaline.

C. DO & EC

Dissolved oxygen ranged from 2.5 to 11.4 mg/l. The recommended DO limit for all the domestic purpose is 4-6 ppm. The observed value in the most sample are slightly above the limit set by WHO and these high values may be probably due to the recharge of the groundwater by the surface water and electrical conductivity is lower value compared to WHO permissible limit. EC is a useful parameter as water quality for indicating salinity hazards.

D. TDS

In the study area TDS ranged from 115 mg/l to 720 mg/l. Water containing more than 500 mg/l of TDS is not desirable for drinking water purpose.

E. CHLORIDE AND TOTAL HARDNESS

In the study area chloride ranged from 4.9986 mg/l to 19.9940 mg/l. WHO permissible limit of chloride is 200 mg/l. In all the samples chloride concentration is less than the WHO permissible limit. In the study area total hardness ranged from 14.0157 mg/l to 108.114 mg/l. Total Hardness in all the samples is less than the WHO permissible limit.

F. COPPER

Cu is an essential element for human body, but excessively much large does may be lead to mucosal irritation and corrosion hepatic and renal damage and central nervous system. The Cu concentration in the ground water sample varies from 0.824 to 1.062 mg/l, a few sample Gw-13, Gw-5, Gw-7, GW-3, Gw-10 exceed the WHO permissible limit of 1 mg/l. The groundwater of some areas cannot be safely used as a source of drinking water supplies.

G. IRON

The concentration of iron in groundwater of the study area ranges from 0.261 to 5.761 mg/l. All the sample of exceed the BIS permissible limit of 0.3 mg/l.

H. MANGANESE

Mn content in study area ranged from 1.754 to 3.142 mg/l. The permissible limit of manganese is 0.1 mg/l. All the samples exceed the BIS permissible limit; water in this area is not safe for domestic purpose.

Table-2. Physico-chemical characteristics of water sample.

S.N.	Temp	pH	TH (mg/l)	EC (µscm-1)	Chloride (mg/l)	TDS (mg/l)	DO (mg/l)	Cu (mg/l)	Fe (mg/l)	Mn (mg/l)
Gw1	27	7.03	18.0192	0.6	4.9989	725	2.5	0.971	0.000	0.043
Gw2	30	7.02	40.0425	0.3	9.9972	315	9.7	0.971	1.619	2.983
Gw3	31	7.12	56.0592	0.7	14.9956	625	3.4	1.007	1.452	2.710
Gw4	29	7.04	74.078	0.3	4.9587	365	9.9	0.923	2.666	3.003
Gw5	27	7.03	48.0515	0.5	14.9958	570	7.9	1.062	6.952	3.069
Gw6	26.5	7.00	78.0825	0.5	4.9988	525	10.0	0.948	0.000	2.205
Gw7	29	7.01	36.038	0.2	4.9986	215	7.1	1.019	2.54	0.000
Gw8	32	7.06	30.032	0.5	9.9975	450	11.4	0.946	1.333	2.877
Gw9	28	7.09	46.0485	0.2	4.9986	285	6.6	0.935	2.690	3.142
Gw10	28	7.10	14.0157	0.2	4.9989	215	7.3	1.005	2.119	2.724
Gw11	27.5	7.10	24.0253	0.4	4.9987	115	7.0	0.824	0.404	1.754
Gw12	29.5	7.06	78.0825	0.9	nil	715	7.9	0.940	5.761	0.046
Gw13	28	6.99	80.0842	0.9	19.9940	500	10.9	1.005	4.690	2.186
Gw14	28.5	7.10	108.114	0.7	9.9969	490	7.6	0.998	0.261	1.780
Gw15	28	7.07	86.0912	0.6	4.9985	300	8.2	0.931	4.190	2.019

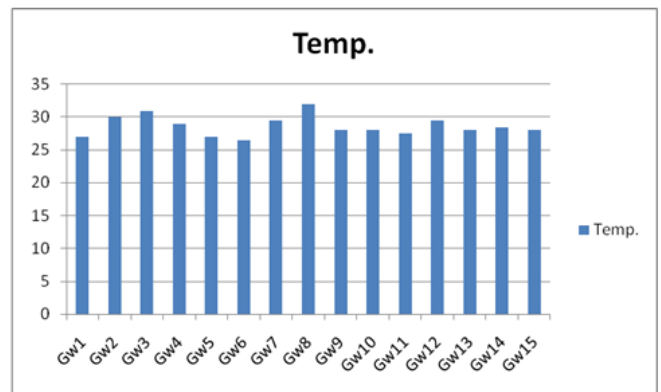


Fig-1: Temperature of water samples

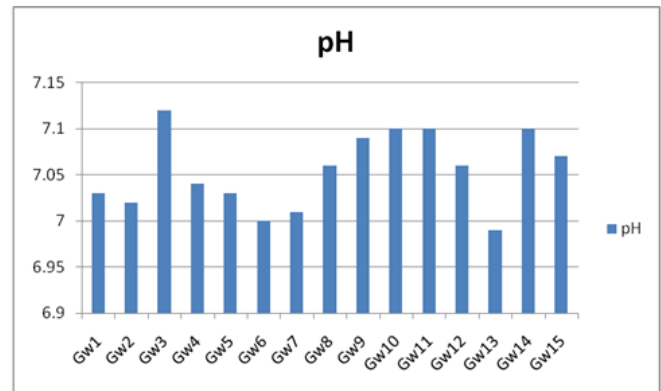
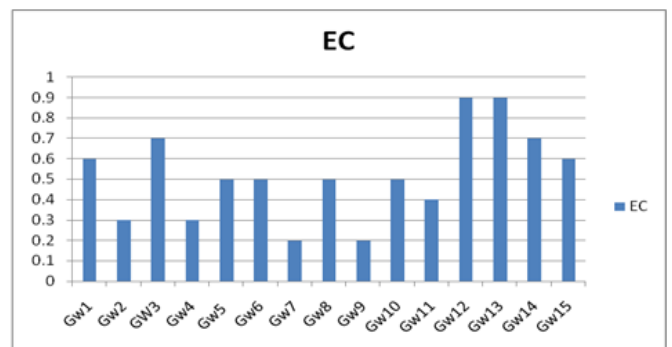


Fig-2: pH of water samples



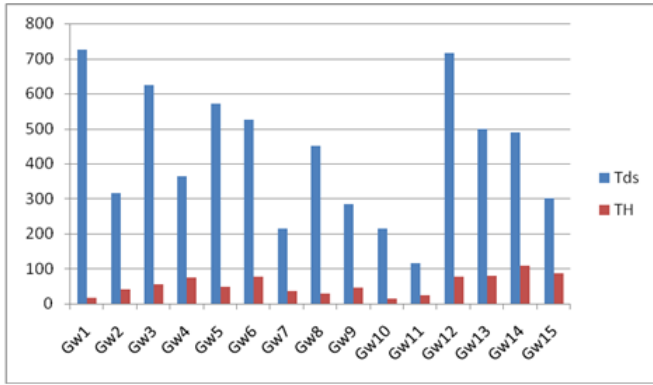


Fig-4. Total dissolved solid and total hardness of water samples

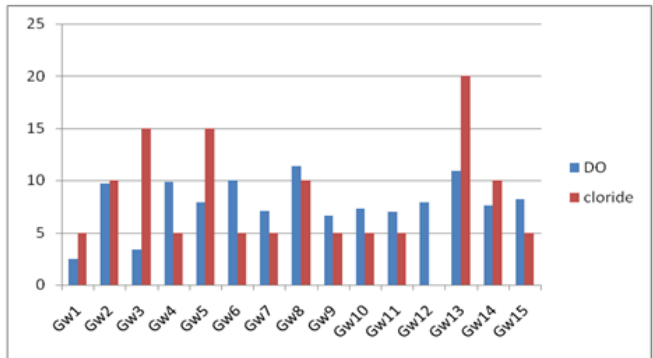
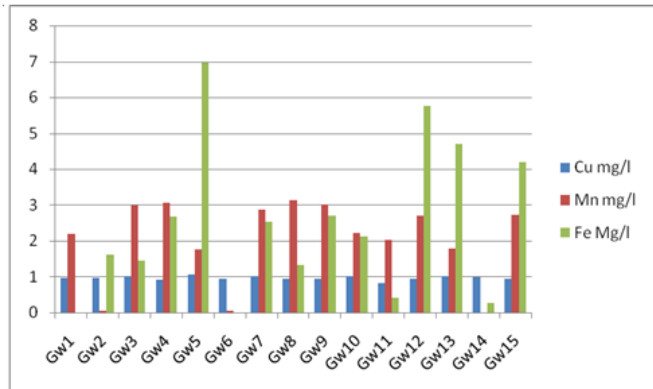


Fig-5. Dissolved oxygen and Chloride of water samples



IV. CONCLUSION

Heavy metal toxins supply to a variety of adverse health effect and each toxin will produce different behavioral physiological and cognitive changes in an exposed being in all the areas surveyed was found to be unfit for human

consumption and water quality management is critical to keep away from any further contagion. Hence the groundwater sample requires treatment before being used.

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