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DETERMINATION OF HEAVY METALS IN GROUNDWATER OF DIFFERENT BLOCKS OF MAHENDRAGARH DISTRICT OF HARYANA, INDIA

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ABSTRACT

An effort was made to evaluate the groundwater quality in some rural areas of Haryana's Mahendragarh district in terms of heavy metal contamination. For this purpose, 20 groundwater samples were collected from the bore wells from some selected villages of each block in the study area where the groundwater is used for drinking and agricultural activities. ICP-MS was used to analyse the samples for eight heavy metals: As, Cu, Fe, Pb, Cd, Cr Zn, Mn, and Hg. To determine the suitability of groundwater for drinking, the results were compared to WHO standards. The present study showed the signs of a few heavy metals in the ground water sample, the study shows that the concentration of heavy metals in the local groundwater sources is below the desired level of WHO criteria in most of the areas studied and were judged fit for human consumption

Keywords: Ground Water, Heavy Metal, Mahendragarh, Haryana

INTRODUCTION

Water demand has risen dramatically as the world's population has grown (M. Alushllari and N. Civici.,2014). Water is polluted by both natural and anthropogenic sources. Human activity's impact on the environment has grown significantly in recent decades, and the types and sources of chemicals that pollute groundwater are numerous (G. Mebrahtu and S. Zerabruk,2011). Groundwater is an important source of drinking water in many rural areas, and it also plays an important role in the country's socioeconomic development (Yankey et al. 2011, Opong R.A.,et al 2021). Heavy metals are abundant in the environment as a result of both natural and anthropogenic activities, and living organisms are exposed to them via a variety of pathways (Wilson and Pyatt 2007, Mortvedt, 1995; Wei and Yang, 2010; Muhammad et al., 2011). Bedrock weathering is the most common natural source (Allan, 1975). Industrial production, fertiliser use, and sewage discharge are examples of anthropogenic sources (Ntengwe, 2006; Krishna et al., 2009; Bhuiyan et al., 2011). The presence of heavy metals in water poses serious risks to natural ecosystem management and public health (Umoren and Onianum 2005; Sharma M et al.,2009; Meng M et al.,2021). Heavy metal toxicity to humans, such as Cd, Pb, Cr (VI), and As, is widely recognised and documented (Jarup L.,2003; Krejpcio Z.et.al.,2005). Water quality assessment is thus a critical tool for managing water resources within a specific catchment. The study's objective was to assess the concentration of heavy metals in drinking water sources in the Mahendergarh district of Haryana.

MATERIALS AND METHODS

We collected the groundwater sample from wells, Handpump of eight blocks of Mahendragarh district. The twenty water sample was collected from different villages of each block of Mahendragarh district,Haryana.

Heavy metals were examined by using the Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS) technique. The Agilent Technologies 7700 was the instrument model. As a reagent, nitric acid (5% acidified) was used. For the preparation of blank solutions and standard stock solutions, milli Q water is used. The standards solutions were prepared at defined concentrations for calibrations. Initialization, mass calibration, gas flow optimization, and other instrument operating settings were done in accordance with the manufacturer's standard operating procedure. The values were stated in mg/l and the data were gathered in excel form (Milligram per litter).

RESULTS AND DISCUSSIONS

In the Mahendragarh District, five groundwater sampling sites and total twenty water samples of each block (Ateli,Kanina, Mahendragarh, Nangal Chaudhary, Narnaul, Nizampur, Satnali and Shima) were examined for the presence of heavy metals, and the results are shown in Table 9. The earth's crust naturally contains heavy metals. They can't be crushed or lowered. They enter our bodies through food, water, and air to a lesser extent. Some heavy metals act as trace elements and are necessary for the body's enzymes to function. However, they can poison people when present in large quantities. Heavy metal accumulation makes them hazardous. Acid rain and the flow of industrial and consumer waste into rivers, lakes, streams, and groundwater are other ways that heavy metals can get into water bodies (Midha, R., 2017).

Table-1 shows the results of the examination of the heavy metals in the ground water samples. Seven metals were examined in the lab, and the results for all the measured wells and boreholes are shown. Copper, zinc, cadmium, lead, iron, mercury, and manganese were among the metals analysed. They were compared to the requirements set by the World Health Organization (WHO), which are shown in table- 1. The range of copper values obtained, from 1.03 mg/L to 1.05 mg/L, is below the maximum allowable level of 2.0 mg/L. Even yet, it is just a little bit more than the WHO standard's highest recommended limit of 0.5mg/L.

The iron result reveals that the values obtained for the ground water samples range from 2.10mg/L to 2.44mg/L, which are far below the World Health Organization's maximum limits (WHO). The content of cadmium (Cd) varies from 0.00 to 0.02 mgL-1. This falls below the World Health Organization's upper limit. The findings show that lead concentrations in all studied areas vary from 0.00 mgL-1 to 0.002 mgL-1, which is below the WHO standard of 0.4 mg/l. Lead is a very hazardous metal that builds up in both human and animal skeletons. Not all of the examined samples contained manganese (Mn). When used in cooking, manganese imparts a harsh flavour to water, discolours clothing and metal objects, precipitates in food, and encourages the growth of algae in reservoirs. (Musa.O.K. et al., 2013).

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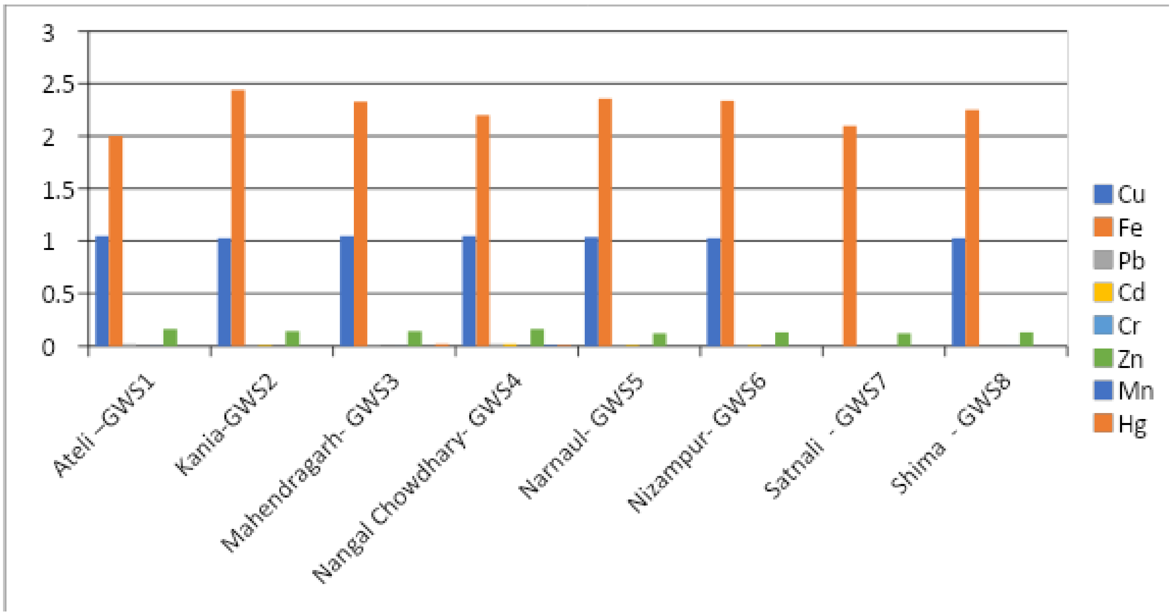
Although there were signs of a few heavy metals in the ground water sample, the study shows that the concentration of heavy metals in the local groundwater sources is below the desired level of WHO criteria in most of the areas studied and were judged fit for human consumption

Table-1: - Average Heavy metal concentration levels (mg/l) in ground water samples of selected sites in Mahendragarh District Haryana

SAMPLING BLOCK		HEAVY METAL CONCENTRATION IN GROUND WATER SAMPLES OF SELECTED SITES							
		Cu	Fe	Pb	Cd	Cr	Zn	Mn	Hg
Ateli –GWS1		1.05	2.00	0.02	0.00	0.002	0.16	0.00	0.00
Kania-GWS2		1.03	2.44	0.01	0.01	0.00	0.14	0.00	0.00
Mahendragarh-GWS3		1.05	2.33	0.01	0.00	0.001	0.14	0.00	0.02
Nangal Chowdhary-GWS4		1.05	2.20	0.02	0.02	0.002	0.16	0.01	0.01
Narnaul- GWS5		1.04	2.36	0.01	0.01	0.000	0.12	0.00	0.00
Nizampur-GWS6		1.03	2.34	0.01	0.01	0.000	0.13	0.00	0.00
Satnali - GWS7		1,03	2.10	0.00	0.00	0.000	0.12	0.00	0.00
Shima - GWS8		1.03	2.25	0.00	0.00	0.001	0.13	0.00	0.00
WHO Heavy Metal standard	Desirable	0.5	1.0	0.4	0.003	0.05	1.0	0.4	0.001
	Max. Limit	2.0	3.0	0.4	0.03	0.05	3.0	0.4	0.001

Fig-1: Average Heavy metal concentration levels (mg/l) in ground water samples of selected sites of Mahendragarh District Haryana



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