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website:- www.journalofchemistry.org**A Study on Groundwater Quality in and Around the Pologround Industrial Area of Indore City, M.P. (India)**MUKESH GUPTA¹ SHRADDHA BAIS¹ RUCHI SHRIVASTAVA¹ H.C. KATARIYA²¹Department of Chemistry ISR, IPS academy Indore²Department of Chemistry Govt. Geetanjali Girls College Bhopal<http://dx.doi.org/10.22147/juc/210101>

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Abstract

Safe and pure drinking water is the primary need of people, depends upon groundwater sources that have problems of hardness, calcium, nitrate, phosphate, fluoride, D.O., B.O.D., C.O.D. and Heavy metals copper and zinc and excess of MPN count. Different samples have been collected in premonsoon and past monsoon seasons during 2022-23. Different parameters of water has been analysed and evaluated to the suitability of drinking water for human consumption and public hygiene scenario and health impacts. Some of the parameters are observed within the prescribed limits of IS:10500 while others are beyond the limits of WHO and ISI.

Key words : Parameters, Suitability, Groundwater sources, observed, WHO/ ISI / NEERI**Introduction**

Water is the most essential commodity for all living creatures. Organisms cannot survive without water. It is used for many purposes e.g. industrial supply, irrigation, drinking, propagation of fish and other aquatic systems and hydropower. Out of 1.45 billion cubic km world's water only 13 million cubic km water is available in the form of streams, lakes wells and tube well.

The global environment is changing continuously due to unfavourable alteration of surroundings. These changes may affect man directly or through supplies of water and of agricultural and other biological products. The most common types of pollution and pollutants discharged, encountered in domestic and industrial waste waters, along with their possible effects on the water resources are discussed. Chemicals are a major source of water contamination that

introduced during water movement through geological materials, manufactured chemicals may cause problems. Fertilizers and pesticides are major contributors to water pollution. Among the metals, the severe pollutants are lead, cadmium, arsenic, copper, zinc, manganese, iron and calcium. There are a number of pathogenic micro-organisms which cause water born disease in man.

Indore is located geographically between 22°37'29.66"N 75°46'28.6"E and 22°48'23.4"N 75°56'32"E at an average altitude of 553 Meters from the Sea Level. It is located 190 KM away from the State Capital, Bhopal on NH - 3. The Indore District is spread in an area of 3898 KM². The Indore city area is 13717 hectare.

Total generation of sewage in Indore city is 200 MLD on the basis of present population. Indore Municipal Corporation is treating only 90 MLD of sewage, the rest is disposed without treatment into Khan River. The Khan River passes from Indore city and travelling a distance of 50 Km., confluences into Shipra River at Ujjain. Following are the important point and drains of Khan river which are important for water quality monitoring.

- Kanh River near Pologround.
- Kanh river at Kabitkhedi, before STP
- Kanh river at Shakkarkhedi, down stream of STP
- Kanh river near Sanwer town.

Sanwer road industrial area is the main industrial area of the Indore. Trade and domestic effluent of the Sanwer Road Industrial area is discharged into the Narvar Nala, presently wastewater in the drain is not reaching upto confluence point with Khan river. Pologround industrial area drain is to be monitored before its

confluence into, the local Nala. Other industrial cluster does not any common out fall.

Sampling Stations :

Five sampling stations have been chosen for present study during study year 2022-23 selected sampling stations are as follows-

Sampling Station 1 (SS1) Polo ground industrial area

Sampling Station 2 (SS2) Snehlataganj near Bhandari Bridge

Sampling Station 3 (SS3) Ban ganga residential area

Sampling Station 4 (SS4) Polo ground residential area

Sampling Station 5 (SS5) Mill area near Patnipura

Material and method

Samples for analysis with standard procedure in accordance with standard method of American Public Health Association⁸ and National Environmental Engineering Research Institute²⁰, Nagpur. The instruments have been used in the limit of precise accuracy and chemical used of G.R. grade. Temperature, pH, TDS were measured. The T-H, Ca-H, Mg-H has measured titrimetrically using EDTA, chlorides by Mohr's Argentometric titration and K₂CrO₄ as indicator, D.O. by Winkler's method. Total alkalinity was determined by Titrimetric methods using phenolphthalein and methyl orange indicators. Nitrates, sulphates and phosphate were measured by spectrophotometer.

Observation's :

The overall results of the study during the year 2022-23 has summarised here in table 1

Table-1. Water Quality of Kanh River at polo ground, Indore During 2022-23

S. No.	Parameters	Unit	WHO (2019) Permissible limit	SS ¹	SS ²	SS ³	SS ⁴	SS ⁵
1	Temperature	°C	-	26	26.4	27	26.5	27.6
2	pH	-	6.5-8.5	8.1	8.0	7.24	8.3	7.7
3	D.O.	ppm	5-8.6	2.93	2.84	2.90	2.75	2.85
4	B.O.D.	ppm	250	2.80	2.40	2.85	3.45	3.50
5	C.O.D.	ppm	50	64.25	88.40	80.60	70.80	86.40
6	Chloride	ppm	200-300	415	270	335	425	230
7	Nitrate	ppm	50	5.70	4.30	3.60	6.60	3.50
8	Phosphate	ppm	-	4.60	3.70	3.40	4.80	3.90
9	Alkalinity	ppm	200	585	580	825	715	735
10	Total Hardness	ppm	500	380	382	475	315	405
11	Ca. Hardness	ppm	75	225	215	210	230	260
12	Mg. Hardness	ppm	50	175	185	170	125	110
13	Sulphate	ppm	-	47.55	19.80	34.90	47.90	38.35
14	Fluoride	ppm	1.5	0.10	0.60	0.20	0.10	0.92
15	Copper	ppm	2	.10	.01	.06	.05	.06
16	Zinc	ppm	-	.03	.02	.08	1.2	1.4
17	MPN	No./100ml	-	46	32	19.4	36.6	54.4

Result and Discussion

Temperature has significant impact on growth and activity of ecological life and affects the solubility of oxygen in water. The temperature of bore well's water found in the range of 26°-29°C in present study

pH value is the best indicator of presence of acid and alkali in water samples. pH in the present study varied from 7.24-8.3 at different sampling stations. A comparative analysis of pH and temperature of sampling station is given in figure 1.

The various types of hardness has been given in figure 2 & 3.

Chlorides are common constituents of all natural water. Higher values of it impart a salty taste to water, making it unacceptable for human consumption. As per ISI the desirable limit of chloride for drinking water is 250mg/l and the permissible limit is 1000mg/L. the chloride value in the present study varied from 217-415mg/l.

Total hardness of water is caused by the presence of Ca & Mg salts. Hardness of samples varied from 315-475, Ca-H 210-260 & Mg-H 110—185 ppm. Desirable limit of T-H for drinking water is 300 mg/l & permissible limit in the absence of alternate source is 600 mg/l.

The comparative study of various parameters mentioned in table 1 is given in figure 4-7.

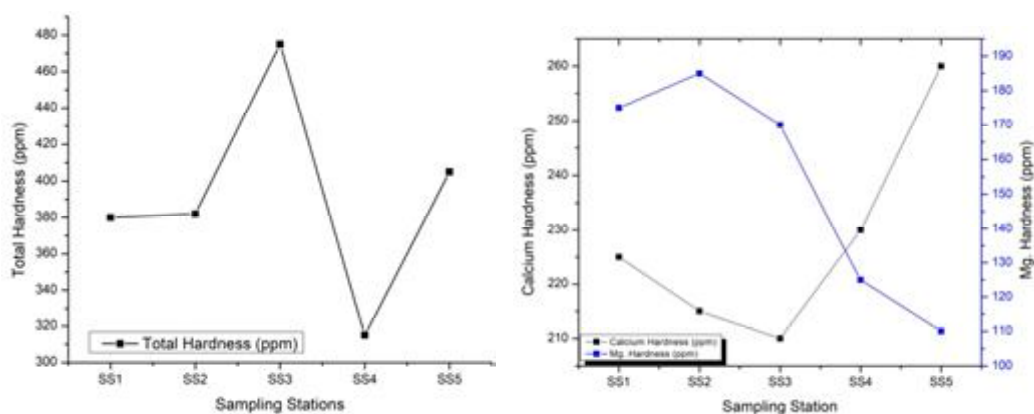
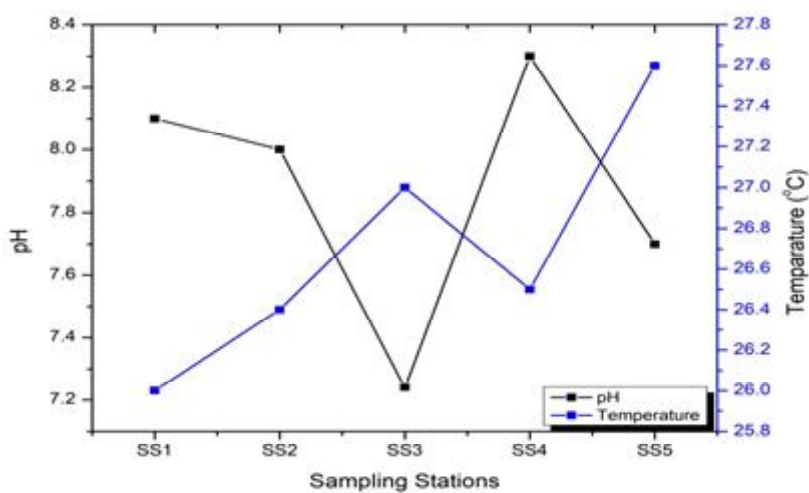


Figure 2 & 3. Hardness of Water in various sampling stations

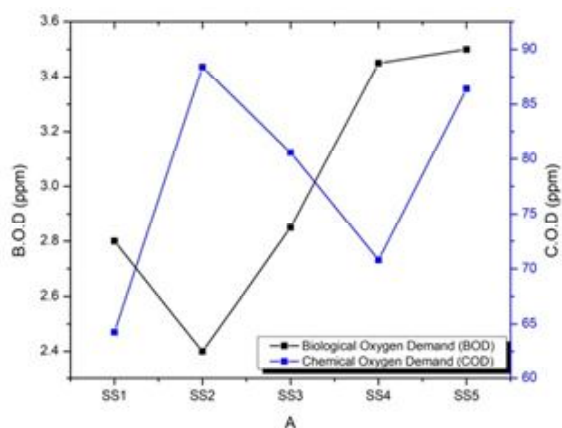


Figure 4. Biological Parameters of water samples collected from different sampling stations

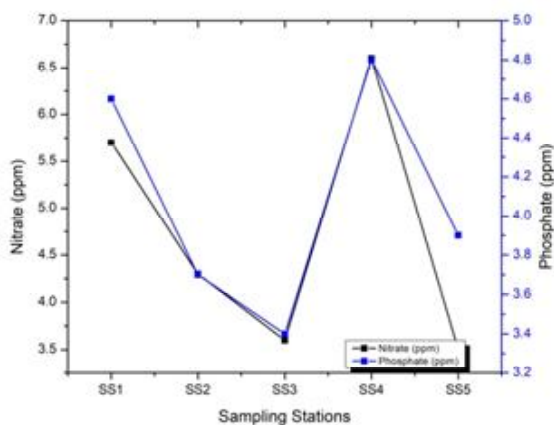


Figure 5. Nitrate and phosphate concentration in the water from different sampling stations

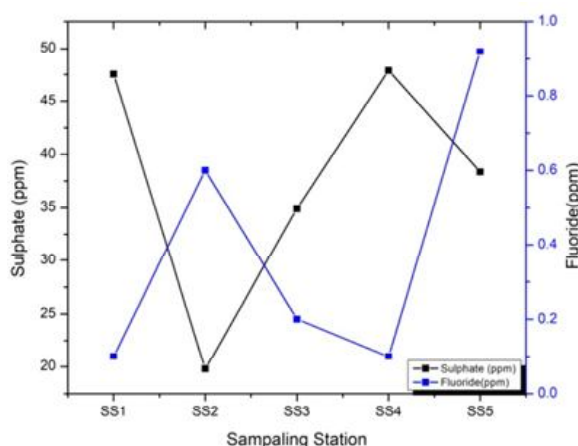


Figure 6. Sulphate and Fluoride concentration in the water from different sampling stations

Dissolved Oxygen Demand, Biological Oxygen Demand, and Chemical Oxygen Demand in the present study ranged from 2.75-2.90, 2.40-3.50 and 64.25-88.40 ppm respectively.

Nitrates, sulphate, phosphate and fluoride have ranged from 3.50-6.60, 19.80-47.90, 3.40-4.80 and 0.10-0.92 ppm respectively. The prescribed limit of nitrate by WHO is 50 mg/l for domestic water. Nitrates are significant for plant growth. The presence of sulphate has less effect on the taste of water than chloride. The desirable limit of sulphate is 200-400 mg/l by ICMR. The high concentration of sulphate may induce diarrhoea and intestinal disorders.

Phosphate in water occurs in the form of orthophosphate, polyphosphate and organophosphate. Excess amount of phosphate in water has cathartic effect of human health. Concentration of fluoride between 0.6-1.1 mg/l in potable water protects tooth decay and enhances bone development.

Copper and Zinc found in the range of

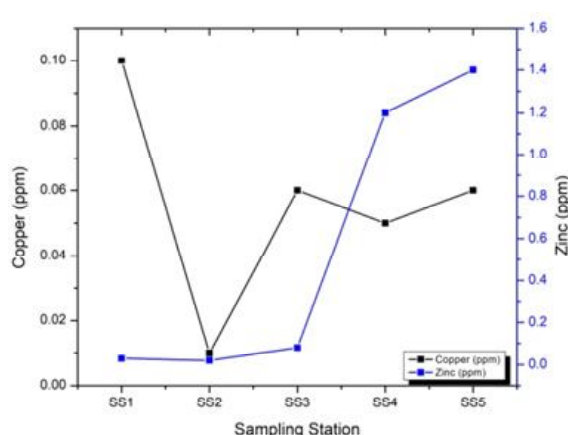


Figure 7. Concentration of (Trace metals) Copper and Zinc in water collected from different sampling stations

0.01-.06, 0.02-1.4 ppm respectively, In the present study most of the parameters are found within the prescribed limits of ISI.

Conclusion

Water is essential for all living things, without water life is not possible. Ground water quality study in and around Indore city found that all ground water sources of Indore city are contaminated and require purification before using as domestic purpose. The city has done more work on purification and treatment of sewage and waste water but city needs to improve its sewage and waste water treatment management system to reduce the amount of untreated sewage enters the ground water in and around the city.

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