



“Detergents Impacts On Surface Water Quality In Sidhi City District-Sidhi, Madhya Pradesh, India”

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ABSTRACT

Ground water samples collected from 24 different wards of Sidhi city (Nagarpalika) district-Sidhi locations and analyzed for the physical properties, chemical properties and heavy metals contents in it. Findings of the laboratory work and proposed experimental area to confirm surface water quality with the help of various physico-chemical parameters. This is a method of check water quality which is an effective tool to assess spatial and temporal changes in groundwater quality. Hydrosphere includes all types of water such as oceans, seas, creeks, rivers, streams, ponds, canals, wells, tube wells, hand pumps, motor pumps and glaciers etc. Five groundwater samples were collected from open areas during monsoon and post monsoon seasons in the year 2020-2022. The laboratory work was conducted by considering five surface water samples collected for comprehensive physico-chemical analysis using various standard parameters of the experiment. Parameters such as pH, total dissolved solids, nitrates, sulphates, chlorides, calcium hardness, magnesium hardness, total hardness, fluorides etc have been considered for the analysis of physico-chemical properties.

Key words: Various, water quality index, between, parameters, physico-chemical and comprehensive.

1. Introduction

Ground water is a part of hydrological cycle and the populations of the world depend on ground water for their drinking purposes. Water is a highly significant need of every single living being. With an increase in the human population, the requirement for preserving water assets is acquiring greater significance. Several parameters are used for identifying water quality based on the samples water level Parameters such as pH, total dissolved solids, nitrates, sulphates, chlorides, calcium hardness, magnesium hardness, total hardness, fluorides etc and salt content¹. Various physio-chemical and biological parameters for measuring and monitoring the Water quality index (WQI) exist worldwide.

The assessment procedure of WQI is analyzed and summarized in this section. Analyses of various water quality measurement parameters have been made using traditional methods that help to calibrate the physical changes. Wu et al., 2021 carried out experimental work on the critical parameters that affect water quality.² Only two to three percent of total water on earth is fresh water. Water pollution is classified into four classes likewise- Physico-chemical, biological and physiological pollution of water. Physical water pollution brings about changes in water with regard to its color, density, test, turbidity and thermal properties etc. The industrial waste water, sewage sludge, detergents and solid waste materials are currently being discharged into the environment indiscriminately. These materials enter subsurface aquifers resulting in the pollution of irrigation and drinking water³ (2007). High rates of mortality and morbidity due to water borne diseases are well known in India. Access to safe drinking water remains an urgent necessity, as 30% of urban and 90% of rural households still depend completely on untreated surface or groundwater. Jeffrey J. Scheibel et al., while access to drinking water in India has increased over the past decade, the tremendous adverse impact of unsafe water on health continues (WHO, 2004)⁴.

The water quality⁵ of this study samples was assessed using the weighted arithmetic index method, taking into account the nine important parameters such as temperature, pH, Total Hardness, TDS, DO, BOD, COD, Calcium, Magnesium, Sulphates, Chlorides, Fluorides, Nitrates. WQI is calculated from the point of view of the suitability of groundwater for human consumption. WQI is a mathematical equation used to transform large number of water quality data into a single number.

2. MATERIALS AND METHODS

1. Study area

Sidhi is a district of Madhya-Pradesh an image of proud history and culture. It forms the northeastern boundary of the state. Sidhi is well known for its natural beauty, historical importance and rich cultural roots. Sidhi possesses abundant natural resources with the river Son draining the district and with coal deposits which feed major industries across the country. Sidhi district is located on the northeastern boundary of the state between 22.475 and 24.4210 north latitudes 81.1840 and 82.4830 east longitudes. The district has Singrauli district in the east and Korea district of Chhattisgarh on the south and the Rewa district on the north. Sidhi district is sharing border with Korea district to south, Satna district to the west, Shahdol district to the south-west. It is sharing border with Chhattisgarh state to the south.

The Sidhi is a municipality city in district of Sidhi Madhya Pradesh. The Sidhi city is divided into 24 wards for which elections are held every five years. The Sidhi municipality has population of 54,331 of which 28,521 are females as per report released by census India 2011. Population of children with age of 0-6 is 7177 which is 13.21% of total population of Sidhi municipality.

2. METHODOLOGY

The water samples were collected from 10 different locations such as ponds, river, nallas and dams (ground water) during monsoon and post monsoon season, ground water sampling locations were located on the basis of above areas. The water samples were collected in acid washed plastic container to avoid unpredictable changes in characteristic as per standard procedures⁶ (2012). The WHO (2004) standards for drinking purposes have been considered for the calculation of WQI. The standards for drinking purpose⁷ (2009) have been considered for calculation of WQI. In this method the weight age for various water quality parameters is assumed to be inversely proportional to the recommended standards for the corresponding parameters⁸ (2012).

The whole study was under study throughout the year including all season and sample taken from different site for the analysis. The analysis of the water sample done as per the standard analytical methods for the various parameters illustrated in the study. The thresholds limit for various parameters has been consistent according to the WHO norms fixed for. The detergent analysis has been done using spectrophotometer by making various sample solutions various detergent with various water of the study area.⁹

The physical and chemical analysis of the water samples were done in accordance with the procedure described in standard methods for the examination of water and waste water, practical methods in chemical and biological methods for water pollution (Trivedy et. al. 1986),¹⁰ work book on limnology (Kaul V. 1997).¹¹

Bacteriological examination of drinking water samples was done with the help of method as described in standard methods for the examination of water and wastewater. Details of the methods adapted for the assessment of water quality are mentioned below:-

3. RESULT AND DISCUSSION

- **pH**

The reference value of pH in drinking water is 6.5-8.5 according to Bureau of Indian Standard. The value of pH in samples of the study area is between 7.80-8.53. The seasonal variation shows the pH values fluctuating minimum during monsoon and maximum in post monsoon at all locations.

- **Total dissolved solids**

Solids may affect water or effluent quality adversely in a number of ways. Waters with high dissolved solids generally are at inferior waters. The reference range of TDS of the study area is from 930.84-1140.89 mg/l in samples. The seasonal fluctuation shows that to dissolved solids

are higher in monsoon due to leaching of surrounding rain water and minimum in post monsoon in most of the locations.

- **Total Hardness**

The values ranged from 139.18-199.29mg/l of all type of hardness were quiet high with their prescribed standards. The seasonal fluctuation of total hardness in shows minimum in monsoon and maximum in post monsoon. The higher value is mainly found owing to abundant availability of limestone rocks in the surrounding area consequently more solubility of Ca^{++} and Mg^{++} salts under anaerobic conditions.

- **Calcium**

The maximum concentration of calcium in drinking water in study area ranges between 91.00-.136.01mg/l. Calcium is a major constituent of various types of rock. Calcium is a cause for hardness in water and incrustation in boilers. Calcium is an essential constituent of human being. The low content of calcium in drinking water may cause rickets and defective teeth. It is essential for nervous system, cardiac function and coagulation of blood.

- **Chlorides**

The Chloride concentration in the study area ranges from 12.77-18.93 mg/l. The permissible limit of chloride is 250 mg/l. Chlorides in excess imparts the salty taste to water and people are not accustomed to high chloride are subjected to laxative effect¹² (2011). The seasonal average of chloride values shows maximum in monsoon and minimum in post monsoon in most of the locations.

- **Magnesium**

The concentration of magnesium in the study area ranges between 48.18-67.80 mg/l. chemical softening, reverse osmosis, electro dialysis, or ion exchange reduces the magnesium and associated hardness to acceptable levels.

- **Nitrates**

The concentration of nitrate in the study area ranges from 0.77-1.60 mg/l. The reference limit of nitrate is 45 mg/l. Nitrates generally occur in trace quantities in surface waters but may attain high levels in some ground waters. The seasonal average of nitrate values shows maximum in monsoon and minimum in post monsoon in most of the locations.

- **Fluorides**

The fluoride concentrations were found to be in the range of 1.60-3.58 mg/l. In study area fluoride concentrations vary with the type of rock that the water flows through but do not

usually exceed 10mg/l. The maximum seasonal value of fluoride in the area was post monsoon and the minimum in monsoon.

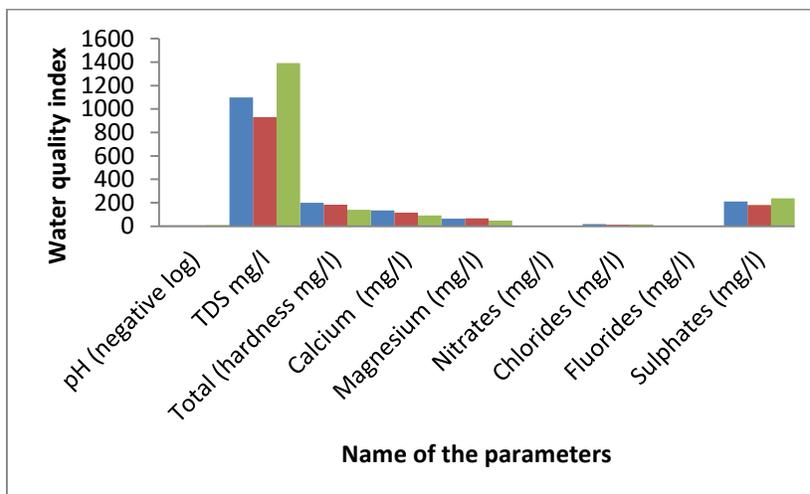


Fig No. 1: Graph plot between WQI vs different physico-chemical parameters in various seasons.

Table no.-1

Average values of water quality in various seasons classification based on WQI value

S. No.	Parameters (unit)	Winter	Summer	Rainy
1.	pH (negative log)	8.58	7.8	9.22
2.	TDS mg/l	1098	931.84	1392.84
3.	Total (hardness mg/l)	199.29	184.46	139.18
4.	Calcium (mg/l)	136.01	116.66	91.00
5.	Magnesium (mg/l)	63.28	67.80	48.18
6.	Nitrates (mg/l)	1.132	0.77	1.60
7.	Chlorides (mg/l)	18.93	12.77	15.83
8.	Fluorides (mg/l)	1.60	3.58	2.32
9.	Sulphates (mg/l)	212.06	181.72	238.62

- Sulphates**

Sulphate may contribute to the corrosion of distribution systems. The sulphate concentrations were found to be in the range of 181.72-238.62 mg/l. The seasonal average of sulphate values shows maximum in monsoon and minimum in post monsoon in all water sample stations.

4. CONCLUSION

The ground water samples were taken from the various sites of Sidhi city, district-Sidhi area were analyzed and the analysis reports that the water quality parameters like pH, total dissolved solids, total hardness, calcium, magnesium, nitrate, chloride, fluoride and sulphate lies within the maximum permissible limit prescribed by WHO and ICMR.

Table no.-2

Average values of water quality parameters in various seasons

S. No.	Parameters (unit)	Winter	Summer	Rainy	Average
1.	pH negative log	8.58	7.80	9.22	8.53
2.	TDS mg/l	1098.0	931.84	1392.84	1140.893
3.	Total hardness mg/l	199.29	184.46	139.18	174.31
4.	Calcium mg/l	136.01	116.66	91.00	114.5567
5.	Magnesium mg/l	63.28	67.80	48.18	59.75333
6.	Nitrates mg/l	1.13	0.77	1.60	1.166667
7.	Chlorides mg/l	18.93	12.77	15.83	15.84333
8.	Fluorides mg/l	1.60	3.58	2.32	2.5
9.	Sulphates mg/l	212.06	181.72	238.62	210.8

The analysis of experimental investigation on quality of groundwater using nine physico-chemical parameters of the study area indicate that in general about the water quality is low for drinking purpose. The Percentage of water quality index¹³ shows that maximum in post monsoon and minimum in monsoon period. The overall view of the Water Quality Index of the present study zone had a higher WQI value indicating the deteriorated water quality. Apart from ground water assessment, the WQI model can be used for wide ranging of applications. Among other uses, it can help the planner and policy maker when selecting is as for waste disposal and industrial sites.

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