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Physicochemical Study of Ground Water of Shahdol City (Madhya Pradesh) With Special Reference to Status of WQI

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Abstract - Water is one of the most indispensable resources and known for the elixir of life. It is believed that groundwater must possess degree of purity free from chemical contamination and micro-organisms. Groundwater is the main source for living organism, where crisis comes due to short period of rainfall, failure of monsoon and improper management of rain water. During last decade, this is observed that the groundwater get polluted drastically because of increased human activities. Hence, a continuous monitoring on groundwater becomes mandatory to minimize and also control on the pollution causing various contaminated factors. The present analytical investigation reveals the study of physico-chemical parameters of groundwater such as pH, total dissolved solids(TDS), total suspended solid (TSS), temperature ,total hardness, total solid (TS), nitrate, alkalinity ,iron, chloride, fluoride, dissolved oxygen, biochemical oxygen demand and turbidity. The experimental values of water samples were compared with standard values given by world health organization (WHO). Water quality index (WQI) was calculated from these analytical results and to find the range of all quality of water samples which comes under the slightly polluted in characteristics.

Keywords - Groundwater Quality, Water Quality Index, Physico-chemical Parameters, and Water Quality Rating.

I. INTRODUCTION

Among the various sources of water, specially groundwater should be the safest water for drinking and domestic purposes. Nevertheless, several factors like improper discharge of agricultural, domestic and industrial waste waters, haphazardly land use practices, geological formation as well as rainfall patterns and also infiltration rate are reported to effect the quality of groundwater in an area (Suresh and Kottureshwar, 2009, Mishra, *et al.* 2009, Tewari, *et al.* 2010, Sirajudeen, *et al.*2014, Kumar and Kumar 2015).

According to WHO estimate about 80% of water pollution in most of the developing country. The improper management of water system may cause serious problems *in availability and quality of water (Subba Rao and Subba Rao, 1995). It has been seen that the water quality by the alternative optional sources like hand pumps and wells have been deteriorating* the water quality and its responses are noticed in the form of yellowish and uncommon odor of the water. People in this area are using chlorine tablets and other treatment method for disinfected the drinking water.

The degree of pollution is generally assessed by studying physical and chemical characteristics of the water bodies (Duran and Sucicnz 2007). The objective of this work is to assess the physico-chemical property with respect to water quality index of drinking water of Shahdol city Madhya Pradesh.

II. MATERIAL AND METHODS

A. Study Area

District Shahdol lies between 23°15' N latitude to 24° N Latitude and 81°E longitude to 81°45' Longitude. The xpanse of the district is 110 km N-S and 30 km E-W thus comprising an area of about 5642 sq. km. which is 1.83% of the total area of the M.P. Shahdol lies on Katni-Bilaspur railway line and is approachable by road from Jabalpur, Rewa, Bilaspur, Mandla, Sidhi and Koria district (C.G.). The roads are motorable in all weather. District Shahdol lies in the heart of the country. The district is surrounded by Sone river and Satna and Sidhi district in north, Dindoi in South, Koria (Sarguja), Anuppur in east and Jabalpur and Umaria in the West. It is situated 489 mts. above the sea surface.

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In the study area, fifteen groundwater samples were collected from different localities during January to June, 2015. All samples were analyzed for physicochemical parameters like temperature (°C), pH, total dissolved solids(TDS), total suspended solid (TSS), total hardness(TH), total solids (TS), alkalinity, iron (Fe), chloride (Cl^-), fluoride(F), Nitrate (NO_3-), dissolved oxygen (DO), biochemical oxygen demand (BOD), turbidity and total alkalinity (TA) which follows the standard procedures (APHA, 2005) and Hi Media (WT 023) kit and their specific range for water analysis are presented in Table-1.

Table 1 : Methodologies of physico-chemical water analysis (Hi-Media Kit)

Type of test	Range	Reagent Provided
pH	pH test strips of range 2.0 to 10.5	
Turbidity (visual comparison method)	0-25 NTU standards	5 Bottles : bottle market sample bttle for standards of 0, 5, 10 and 25 NTU for turbidity comperision.
Chloride (Titration method)	-------	4 Reagent bottles: marked CHL-A, CHL B, CHL-c (2 bottles)
Total hardness (Titration method)	25-600 mg/1 (ppm) $CaCO_3$	4 Reagent bottles : marked TH-A, TH-B, CH-C (2 bottles)
Fluoride (visual color comparison method)	0-2.5 mg/1(ppm)	2 Reagent bottles : marked reagent FL-A. FL-B
Nitrate (visual color comparison method)	0-100 mg/1(ppm)	One reagent bottle : market reagent Fe
Iron (visual color comparison method)	0-2 mg/1(ppm)	One reagent bottle : market reagent Fe
Residual free chlorine (Titration method)	0-3 mg/1(ppm)	4 Reagent bottles : market reagent RCL-A, RCL-B, RCL-C

B. Calculation Of WQI

Octa-aqua HI-media kit having eight water parameters and also applying another methods for other parameters were considered for calculation of water index (Kesharwani *et al.*, 2004; Padmanabha and Belagalli, 2005)

$$\text{Water quality Index (WQI)} = \sum GQiWi$$

Where,

Qi (water quality rating)= 100x (Va-Vi)/(Vs-Vi)

When Va= actual value present in the water sample

Vi= ideal value (0 for all parameters except pH and DO which are 7.0 and 14.6 mg-1 respectively)

Vs= Standard value.

If quality rating Qi = 0 means complete absence of pollutants

While 0<Qi<100 implies that the pollutants are prescribed standard.

When Qi> 100 implies that the pollutants are above the standards.

Wi (Unit weight)= K/Sn

$$\text{Where K (constant)} = \frac{1}{1/Vs_1+1/Vs_2+1/Vs_3+1/Vs_4.....+1/Vs_n}$$

Sn= 'n' number of standard values.

According to Sinha *et al.*, (2004), the range of water quality index (WQI) is given in Table-2.

Table 2: Categories the water quality index (WQI) with range of pollution.

Category	WQI	Range of Polluted
I	< 50	Slightly polluted
II	51-80	Moderately polluted
III	80-100	Excessively polluted
IV	Above 100	Severely polluted

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III. RESULTS AND DISCUSSION

The status of water quality index is obtained by analytical results of various physico-chemical parameters of all samples given in Table-3 which marked specific range of differences were observed. Highly exploitation of groundwater conditions and exerted pressure of anthropogenic activities leads to the adverse impact on water quality.

Hydrochemistry of Shahdol city area which indicates that the water quality is more or less in suitable averages for all purposes. The water samples No. 7 showed poor quality as compared to other water samples. It shows high alkalinity as compared to other sample. Sample 1 shows high TDS as compared to other samples. High concentrated of TDS in water shows the loses its potability and indicating the reduces the solubility of oxygen in water. Water of almost all study points are show the hard and contaminated in nature. People of Shahdol city area are prone for the immediate effect of health problems such as stomach disease, gastric troubles etc. Continuous water quality monitoring in the study area is encouraged, increasing the frequency of sampling and also analysis on the study area is needed to effectively monitor the impact on Shahdol city area, particularly on environment and human health.

Table 3 : Water quality index (WQI) with using specific physico-chemical parameters in Shahdol city Madhya Pradesh.

No.	Parameters	Temp. ^{0}C	pH	Turbidity (NTU)	Chloride (mg/1)	TH (mg/1)	Iron (mg/1)	Nitrate (mg/1)	F (mg/1)	T.S. (mg/1)	T.S.S. (mg/1)	T.D.S. (mg/1)	BOD (mg/1)	DO (mg/1)	Alkalinity (mg/1)	Water Quality Index (WQI)
	Standard (WHO)	----	6.5-8.5	5	200	500	0.1	45	1.5	500	500	500	6	5	----	
	Wi (Unit weight)	----	----	0.0177	.0004	.0001	.8874	.0019	.059	.0001	.0001	.0001	0.0178	.0176	----	
1.	S1	25	7.4	5	110	325	0.001	10	0.7	450	360	90	2.4	2.8	215	15.1588
2.	S2	25	7.2	5	110	350	0.001	12	0.5	410	370	40	2.6	3.8	200	14.43073
3.	S3	27	7.3	8	80	200	0.001	10	1.5	425	320	105	3.4	2.7	250	18.67885
4.	S4	25	8	5	40	275	Nil	10	.5	420	310	110	3.8	4	220	5.86366
5.	S5	22	7.4	10	110	325	Nil	10	1.5	475	340	135	3.5	4.2	210	9.9014333
6.	S6	27	7	25	150	325	0.006	45	0.5	450	330	120	2.7	3.4	245	11.656673
7.	S7	26	8.2	5	140	425	Nil	45	1.5	430	300	130	3.8	4.2	275	9.8892733
8.	S8	24	7	5	60	250	Nil	10	1.0	400	320	80	3.7	4.1	260	7.8037833
9.	S9	26	7	25	70	250	0.004	10	.5	425	310	115	2.9	3.2	265	41.84375
10.	S10	26	8	5	110	375	Nil	10	1.5	410	300	60	2.6	3.0	250	9.4720133
11.	S11	25	7.2	10	130	400	Nil	10	1.0	450	370	80	3.5	3.9	220	7.9396167
12.	S12	27	7	5	80	325	0.001	10	1.0	420	360	60	3.6	4.1	230	16.67076
13.	S13	24	7.3	5	140	425	0.001	10	0.5	490	330	160	2.6	4.4	235	14.44092
14.	S14	27	7.2	10	90	400	0.002	10	0.5	415	310	150	2.9	3.3	220	23.5689
15.	S15	24	7	25	80	250	Nil	10	0.5	410	340	70	3.5	3.8	250	6.46513

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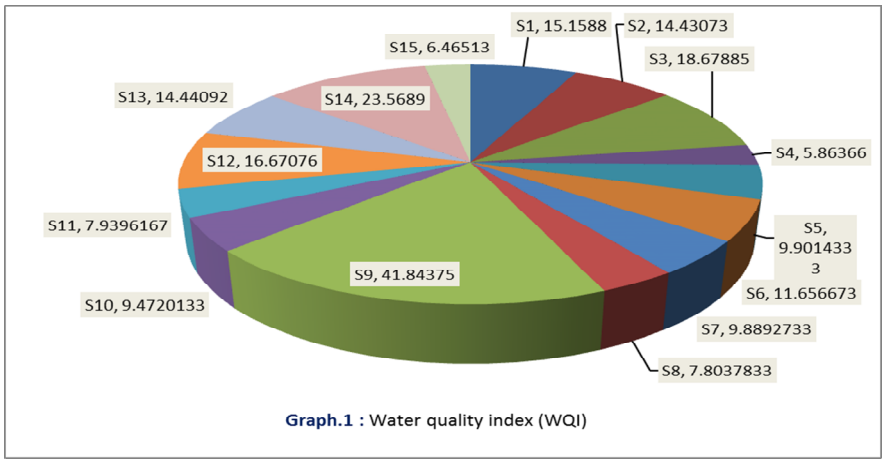

Graph.1 : Water quality index (WQI)

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REFERENCES

[1] APHA (2005): standard methods for the examination of water and waste water; 21st edition, American Public Health Association, Washington, DC, U.S.A.
[2] Duran, M. and Sucicnz, Mendres (2007): Utilization of both benfhic macr invertebrates and physic chemical parameters for evaluating water quality of the stream cekrek (Tokat, Turky). J. Environ. Bio. 28, 231-236.
[3] Kesharwani, S., Mandoli, A.K. and Dude K.K. (2004). Determination of water quality Index (WQI) of Amkhera pond of Jabalpur city (M. P.). Ntl. J. Life Sci., 1, 61-66.
[4] Kumar, Ravindra and Jha, Arvind Kumar (2015). Physico-chemical studies on Kamla River Water, IJARCSSE, 5(5), 1411-1415.
[5] Mishra, Deepti, Mudgal, Manish, Khan, Mohd Akram, Prabha Padmakaran and Chakradhar, B. (2009). Assessment of ground water quality of Bhavnagar region (Gujarat). Journal of Scientific & Industrial Research, 68, 964-966.
[6] Padmanabha, B. Belagali, S.L. (2005).Comparative study on the water quality index of fur lakes in the Mysore city. IJEP, 25, 873-876.
[7] Sinha, A. K., Saxena, S. and Sexena, R. (2004). Water quality Index for Ram Ganga river water at Muradabad. Pollut. Res., 23, 527-531.
[8] Sirajudeen, J and Yahith, R. Abdul (2014). Water quality assessment of groundwater resources between Tamilnadu and Pondicherry states, India. World Journal of Pharmacy and Pharmaceutical Sciences, 3(7), 881-893.
[9] Subba Rao, C. and Suba Rao, N. V. (1995): Ground water quality in residential colony. Ind. J. Environ. Hlth., 37(4), 295-300.
[10] Tewari, Anurag, Dubey, Ashutosh and Trivei, Aviral (2010). A study on Physico-chemical characteristics of ground water quality. J. Chem. Pharm. Res., 2(2), 510-518.

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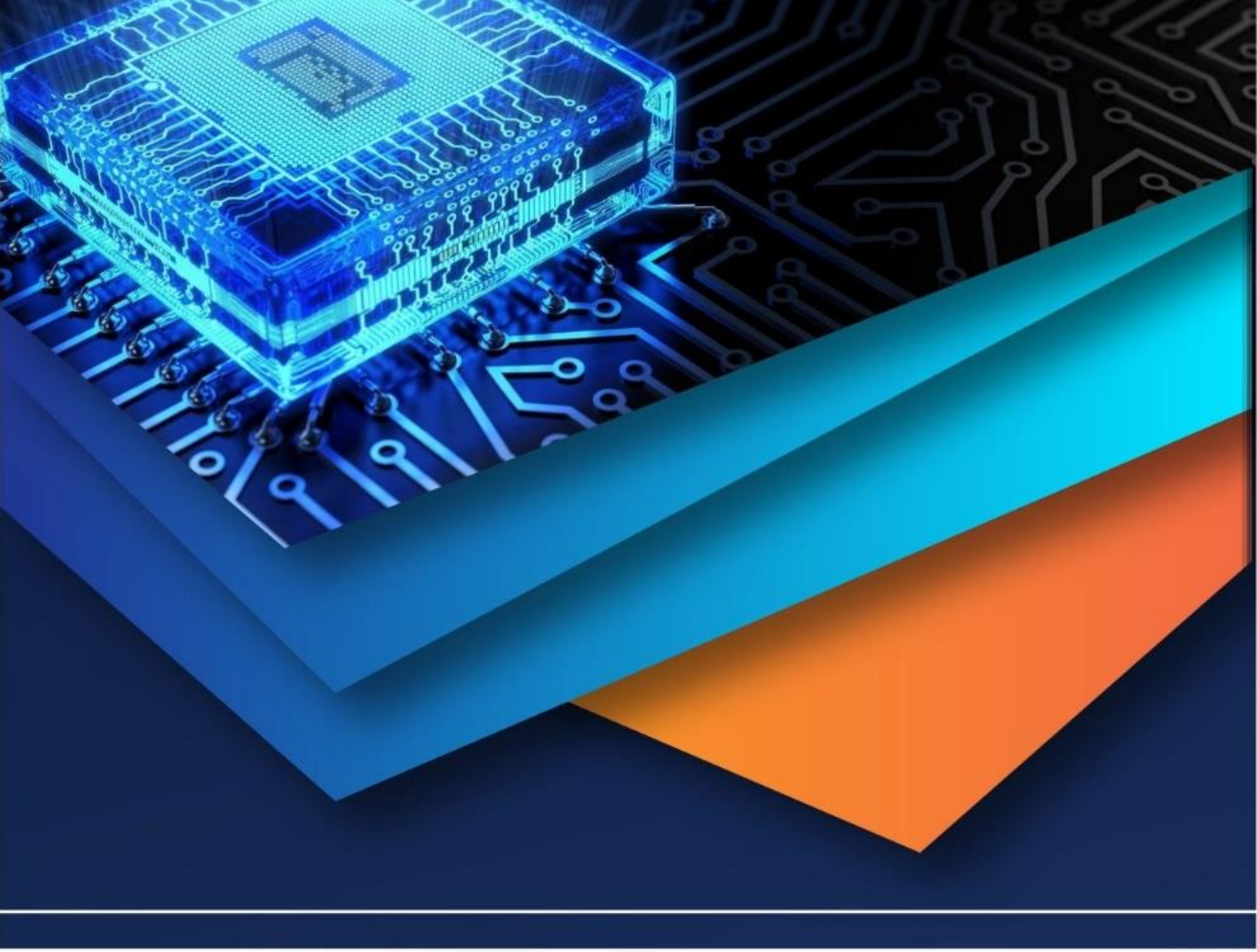

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