

Ground Water Quality Assessment In Satna District(M.P)

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ABSTRACT

Natural water is one of the most important substance for the maintenance of life. It was called “a primary source of all that exist” by an anciently Greek philosopher Thales of Miletus 2,600 years ago. water is the one of the most astonishing compounds on earth, and even now has not yet been fully deciphered. It is characterized by a complex of anomalous properties that make it very different from other substance (e.g. high melting, boiling, and evaporation points, and dissolving ability)The main part of the Earths water is concentrated in the hydrosphere is not a continuous water cover of the Earth.The result clearly reveal that the water in the studied area is not highly contaminated but the concentration of the various parameter are going towards higher side which indicates the increasing pollution of water which may be due to discharge of industrial effluents on land and surface water bodies, so protective measures should be taken to Check water pollution.

KEYWORDS:Contamination physical and chemical properties, water quality.

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I. INTRODUCTION

Natural water is one of the most important substance for the maintenance of life. It was called “a primary source of all that exist” by an anciently Greek philosopher Thales of Miletus 2,600 years ago. water is the one of the most astonishing compounds on earth, and even now has not yet been fully deciphered. It is characterized by a complex of anomalous properties that make it very different from other substance (e.g. high melting, boiling, and evaporation points, and dissolving ability).The main part of the Earths water is concentrated in the hydrosphere is not a continuous water cover of the Earth Oceans and seas make up about 96.4 percent of the hydrosphere by volume, and underground waters from 1.68 percent . About 2 percent is composed of snow and ice, and 0.059 percent is surface fresh water, saline lakes, and inland seas. The atmosphere and living organisms also contain water, but in insignificant quantities.

All water masses are transformed from one to another in the course of the hydrological cycle, a continual shift of water on the Earth that occurs under the influence of solar radiation and gravity (M. G. Khublaryan -1991)¹. The main expressed problems affecting water quality and aquatic ecosystems were untreated domestic sewage, uncontrolled industrial discharges, deforestation and poor agricultural practices that result in soil erosion and leaching of nutrients and pesticides. During its 6th session in 1998. Rio marked improvements in water quality had occurred in a number of river basins and groundwater aquifers where action had been taken.

However, overall progress had not been sufficient to reduce general trends of deteriorating water quality and growing stress on freshwater ecosystems. Organic pollutant are easily decomposed in water and consume dissolved oxygen, leading ultimately to eutrophication. They mainly originate from industrial wastewater and domestic sewage, as well as from seepage of old and new landfills. Nutrient included mainly phosphate and nitrate and their increased concentration can lead to eutrophication. They originate from human and animal waste, detergents and run-off from agricultural fertilizers.

Heavy metals are such pollution that tends to be localized around industrial and mining centers. Heavy metals also originate from military activities and through leaching of decommissioned industrial sites and former military areas.The group of persistent organic pollutants (POPs), such as endocrine disrupting chemicals, cyan toxins, and organic compounds contained in paints, continue to be used in large quantities . Many POPs are difficult and costly to analyze and monitor, therefore their potential effects on humans are difficult to establish.Traces of chemicals and pharmaceutical drugs from medical wastes are hazardous substances that are not necessarily removed by conventional drinking water treatment processes They are now being recognized as carcinogens and endocrine disrupters and pose a great threat to water quality. Suspended particles can be either inorganic or organic matter and originate mainly from agricultural practices and land use change such as deforestation, and

conversion to pasture at steep slopes leading to erosion (R. Andreas Kraemer, KeyaChoudhury & EleftheriaKampa – 1992)². Seeing the polluting condition of water for the present study. I have taken Physico-chemical characteristics of ground water quality in Satna district (M.P.).

Satna is a town and district in the state of Madhya Pradesh India. It is a town of religious culture, historical and archaeological importance. Situated in the Baghelkhand region. Satna is geographically located at coordinated 24.16° N latitude & 80.83° longitude. 7,502 Km². total area and population 22,28,619 census (2011) of Satna district. The normal annual rainfall of Satna district is 1092.1 mm. The district receives maximum rainfall during south-west monsoon period (i.e. June to September) and about 87.7% of annual rainfall is received during this period. Only 12.3% of the annual rainfall takes place between periods October to May (Central Ground Water Board- 2013)³. In the present study various physico-chemical parameters were detected like pH, Temperature, TDS, TH, TS, TSS, Ca, Mg, Cl, DO, COD, BOD, EC and Alkalinity.

II. MATERIAL AND METHODS

The sampling stations were chosen at different sites of the study area, water samples were collected from industrial area, residential area of Satna district (Madhavgarh). For testing the water samples were collected in sterile plastic bottles. After collection the sample bottles were tightly capped and were immediately transported to the laboratory to avoid any unpredictable changes in the physico-chemical characteristics. All the sampling locations are shown below in Table-1. Survey was conducted during the months of April to June of year 2018.

Table-1. List of sampling locations

SN	Sampling location	Water Source	Depth in fit	Description of sampling location
1	Chowk Bazar (RW-1)	Hand pump	350	Ward No.4 in cowk bazaar Madhavgarh.
2	Ward No.2 (RW-2)	Hand pump	275	Near by muktidham Madhavgarh.
3	Higher Sec. School (RW-3)	Hand pump	500	Near by NH-75 Madhavgarh.
4	Konyan Mohalla (RW-4)	Hand pump	370	Near Hamuman Mandir Madhavgarh.
5	Gangnath Stadium (RW-5)	Tube well	425	Near by NH-75 Madhavgarh.
6	Sarswati School (RW-6)	Hand pump	400	Near by sabjimandi Madhavgarh.
7	Hospital (RW-7)	Tube well	585	In front of NH-75 Madhavgarh.
8	Bus Stand (RW-8)	Hand pump	465	Bus stand Madhavgarh.

III. RESULT AND DISCUSSION

The ground water samples were analysed for temperature, pH, TDS, TH, DO, BOD, COD, TS, TSS, Ca, Mg, Cl, Alkalinity and EC. All the results are shown in Table-2, Table-3.

Table - 2. Physico-chemical Parameters

Parameter SN	RW1	RW2	RW3	RW4	RW5	RW6	RW7	RW8
Temp. (°C)	25	24	29	27	24	25	26	23
pH	7.06	7.18	8.13	7.26	7.54	8.12	7.54	8.55
TH	760	320	460	480	420	400	462	446
TDS	320	328	292	393	408	407	462	468
TS	462	488	402	558	592	580	644	668
TSS	142	160	110	165	184	175	182	200
Ca	108.5	75	84.8	101.3	89.2	87.8	107.5	89.2
Mg	83.2	27.2	54.0	78.3	49.6	48.9	25.6	51.5
Cl	41	27	71	42	16	26	28	17
DO	5.68	5.44	4.50	4.26	4.20	4.60	4.30	3.90
COD	17.33	29.00	22.60	9.32	25.38	20.00	9.44	6.66
BOD	4.50	4.35	5.00	5.90	5.81	5.05	5.86	7.02
EC	398	418	412	414	447	457	432	464
Alkalinity	180	189	200	194	196	199	196	200

All the parameters are expressed in mg/l except pH and temperature.

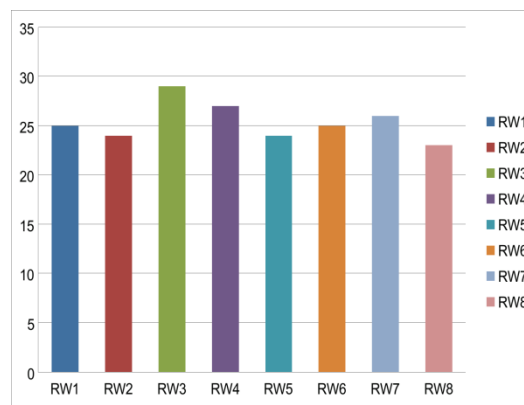
Table – 3. WHO guideline for drinking water quality, 1984

Parameters	Standard value
Temperature	25°C to 35°C
pH	8.5 mg/l
TDS	500mg/l
Total hardness	300-600mg/l
DO	4mg/l
BOD	6 mg/l
COD	10mg/l
Nitrate	45 mg/l
Sulphate	250mg/l

The results of ground water quality of Satna District are given below in detail.

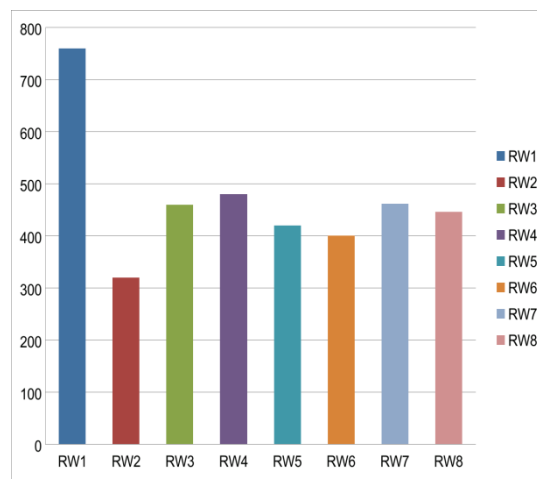
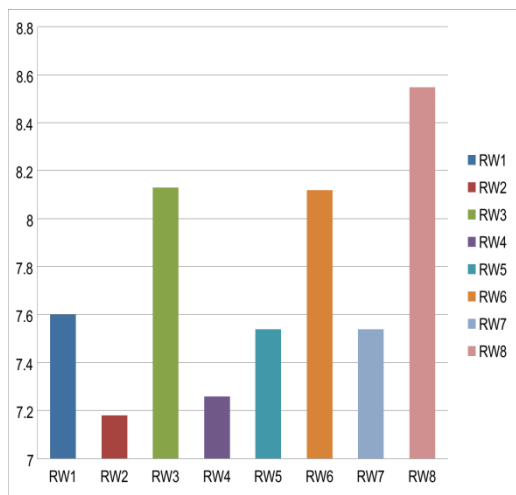
Temperature:

Temperature of the samples were found between 23°C to 29°C, the highest temperature was recorded 29°C at sampling station RW3 (Higher sec. School Madhavgarh) and lowest was 23°C at RW8 (Bus Stand).



pH:

The pH values ranges between 7.06 to 8.55. High pH value associated with small amount of mineral acid from carbonate source or with inorganic acid. Maximum value is 8.55 and lowest value is 7.06.

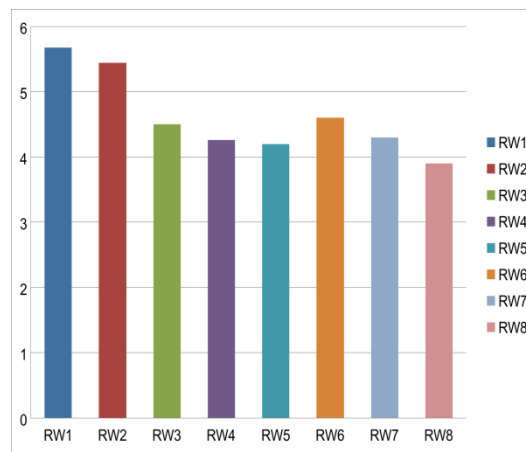
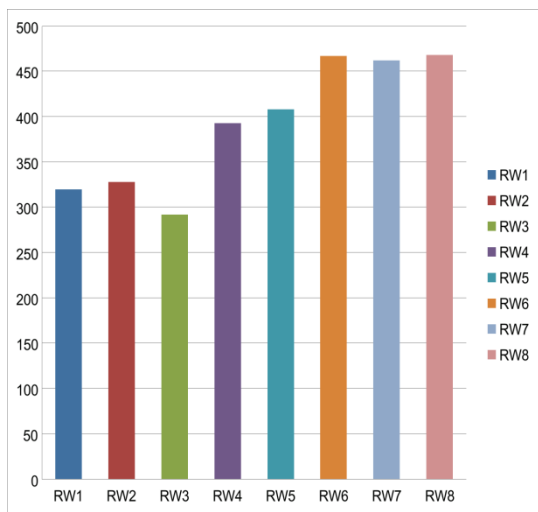


DO:

The DO value ranges from 3.90 mg/l to 5.68mg/l the highest DO was observed at(5.68mg/l) RW1(Chowk Bazar Madhavgarh) and lowest value was recorded at sampling station RW8(Bus Stand).

Total Dissolved solid:

Total dissolved solid content of a sample of water is important in deciding whether the water is suitable for drinking purpose or not. In the present studing the lowest value of TDS is 292mg/l and the highest value is 468mg/l. All the result were below the permissible limit prescribed by WHO(1994) as 600 mg/l.

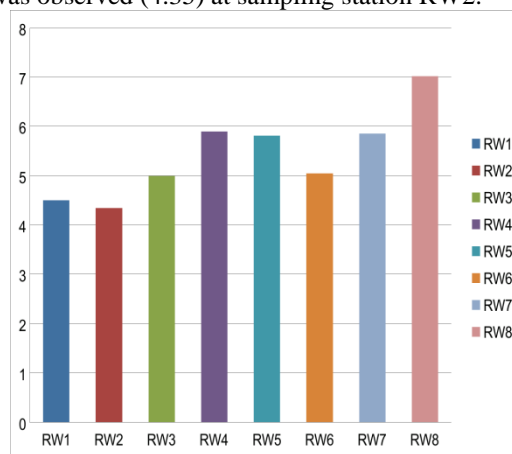


BOD.

The BOD value ranges from 4.35mg/l to 7.02 mg/l, the highest BOD was observed (7.02 mg/l) at sampling station RW8 while lowest value was observed (4.35) at sampling station RW2.

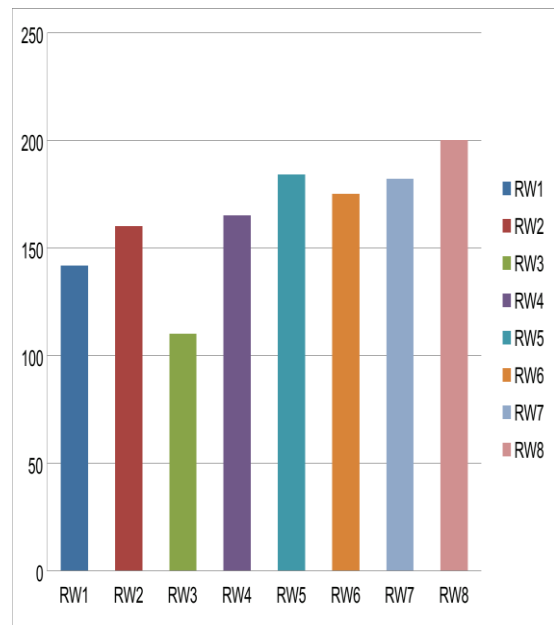
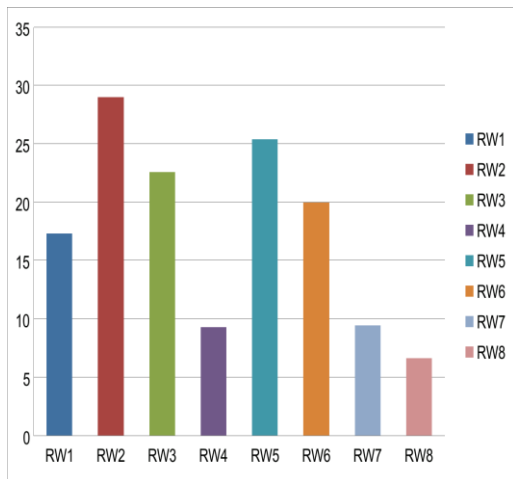
Total Hardness:

TH of water was fluctuating between 320 to 760 mg/l. The highest value was found to be 760 mg/l at sampling location RW1 (Chowk Bazar Madhavgarh) and lowest value was found to be 320 mg/l at sampling location RW2 (Ward No.2) most of the sampling stations have higher values of hardness.



COD:

The COD value ranges from 06.66 mg/l to 29.00 mg/l. The value of COD at sampling stations RW1 Chowk Bazar (17.33), RW6 Sarswati School (20.00), RW3 Higher Sec. School (22.60), RW5 Gangnath Stadium (25.38), RW4 KoriyanMohalla (9.32) and RW7 Hospital (9.44) are higher than the permissible limit prescribed by WHO as 10mg/l.

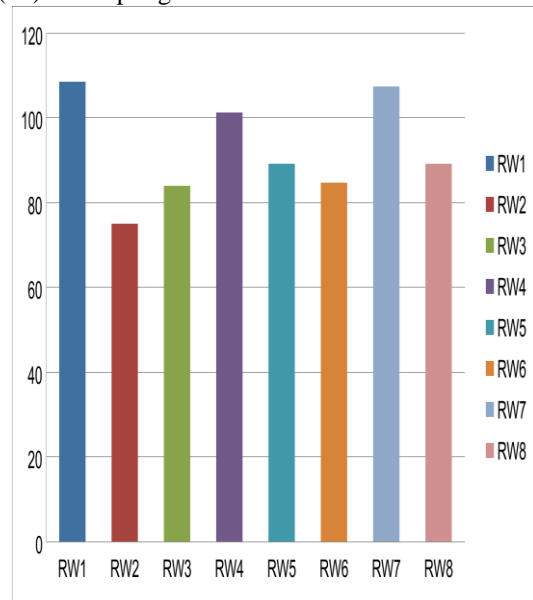
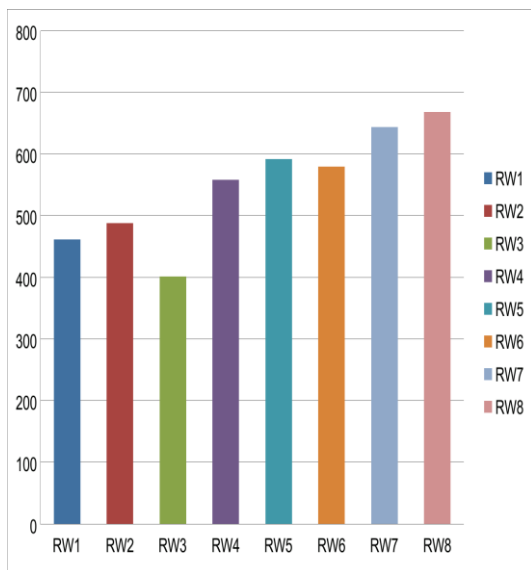


Ca (Calcium):

The Ca value ranges from 75 to 108.5, the highest Ca was observed (108.5) at sampling station RW1 while lowest value was observed (75) at sampling station RW2

TS (Total Solid):

The TS value ranges from 402 to 668, the highest TS was observed (668) at sampling station RW8 while lowest value was observed (402) at sampling station RW3

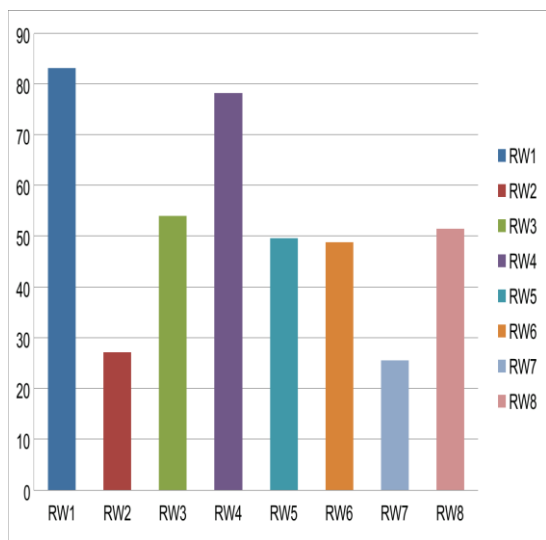


Mg (Magnesium):

The Mg value ranges from 25.6 to 83.2, the highest Mg was observed (83.2) at sampling station RW1 while lowest value was observed (25.6) at sampling station RW7

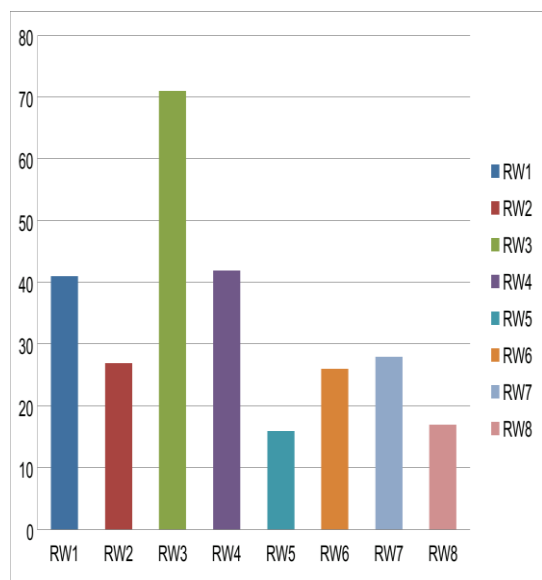
TSS (Total Suspended Solid)

The TSS value ranges from 110 to 200, the highest TSS was observed (200) at sampling station RW8 while lowest value was observed (110) at sampling station RW3



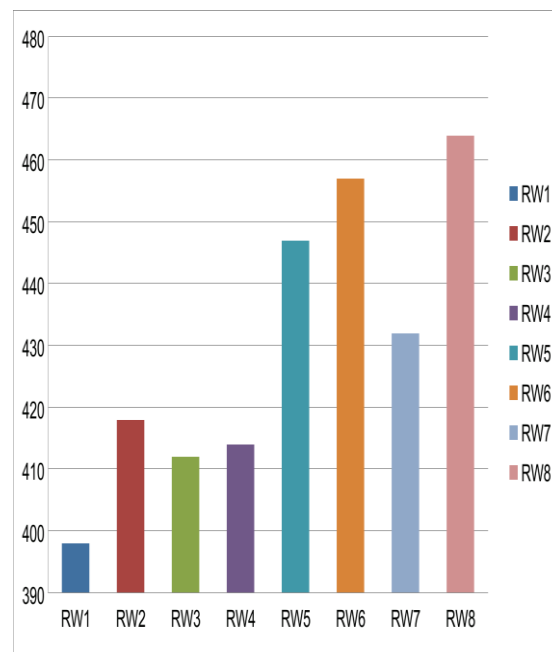
Cl (Chloride):

The Cl value ranges from 16 to 71, the highest Cl was observed (71) at sampling station RW3 while lowest value was observed (16) at sampling station RW5



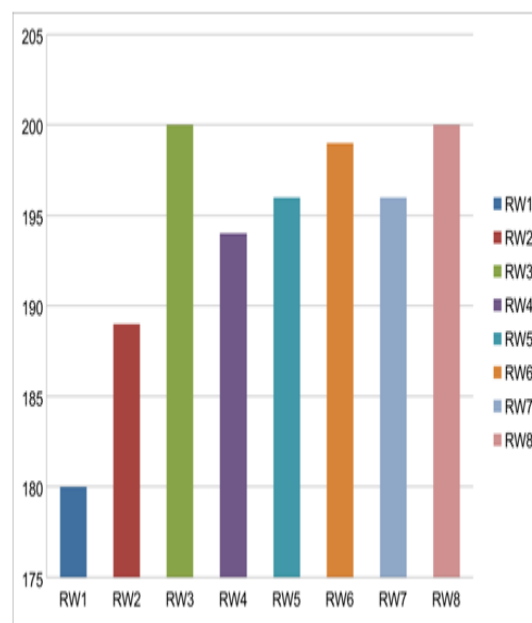
EC (Electrical Conductivity):

The EC value ranges from 398 to 464, the highest ES (464) was observed at sampling station RW8 while lowest value (398) was observed at sampling station RW1



ALKALINITY

The Alkalinity value ranges from 180 to 200, the highest Alkalinity (200) was observed at sampling station RW3 while lowest value (180) was observed at sampling station RW1



Values of table (2) when compared with standard table (3) reveals that:-

- pH of all the sampling station are with in permissible limit while RW3, RW6 and RW8 sampling station exceeds the permissible limit.
- Except for RW2 and RW6 all the sampling station TH shows higher values i.e exceeding the permissible limit.

- TDS of all the sampling station are within permissible limit.
- Except RW8 all the sampling station DO shows higher values i.e. exceeding the permissible limit.
- BOD of all the sampling station are within permissible limit while RW8 sampling station exceeds the permissible limit. COD values of RW4, RW7 and RW8 are within the permissible limit while all other sampling station exceeds the permissible limit.

IV. CONCLUSION

The result clearly reveals that the water in the studied area is not highly contaminated but the concentration of the various parameters are going towards higher side which indicates the increasing pollution of water which may be due to discharge of industrial effluents on land and surface water bodies, so protective measures should be taken to check water pollution. Some of the suggestions are:-

- Proper and regular monitoring of water.
- To make people aware of the drastic condition.
- Proper treatment of water should be carried out.

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