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Water Quality Assessment Drinking Water Sources and Its Impact on Health of Morena City (MP)

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Abstract – Water is significant endowment of nature to every single living thing. An existence without water can't be envisioned. The present investigation of drinking water sources of Morena city in Madhya Pradesh for physical analysis and chemical analysis, through faucet water, Hand siphon's and borewell destinations which incorporates tests for temperature, pH value, total solids, conductivity, Total Dissolved Solid, Chloride, Carbonate Nitrate, Sulfate, Calcium, magnesium, sodium, potassium, alkalinity to the fluoride, acidity, overall hardness, lead.

Keywords: Water Quality, Physical Parameters, Chemical Parameters, Health Impact.

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INTRODUCTION

At standard encompassing temperature and weight, water is a fluid yet it likewise coincides on earth with its solid (ice) and vaporous state (water vapor). Water assumes a fundamental job in human life. In spite of the fact that insights, the WHO reports that roughly 36% of urban and 65% of rustic Indian were without access to safe drinking water (1). Crisp water is one of the most significant resources critical for the endurance of all the living creatures. It is significantly increasingly significant for the person as they rely on it for nourishment creation, modern and waste transfer, just as social prerequisite (2). Human and environmental utilization of ground water relies on surrounding water quality. Human adjustment of the scene has a broad effect on watershed hydrology Gurunathan, 2006 (3).

Water is our life saver that washes and feeds us. In antiquated societies water represented the very quintessence of life and it has assumed an imported job throughout the entire existence of nations, religion, folklore, craftsmanship and in numerous religions the spirit washes down through sacred water. Water is a straightforward, odorless, colorless fluid which frames the world's streams, lakes, seas and downpour, and is the significant constituent of the fluids of living beings. (4,5)

The persistently developing populace is putting extra weight on the water resources and compromising the nature of water. So the present investigation has been intended to examine the nature of drinking water in Morena city. Morena City (M.P.) is provided drinking water from various sources.

Cobbina(6) et al. Demonstrated that complete iron, manganese, lead, arsenic and fluoride fastenings in 129 boreholes in northern Ghana's Sahelian region were over as far as possible. They proposed that the nearness of iron in these boreholes could be because of its permeation from granitic and metamorphosed rocks into groundwater.

Sharaky(7) et al. seen in the groundwater in the Nile delta region groupings of follow components lower than as far as possible, aside from iron, manganese and nickel. They recommended that iron was most likely delivered from iron oxides that happened in the Pleistocene silt and that the other follow components (Zn, Pb, Cd, Cr and Cu) were most presumably credited to optional minerals in the spring rocks.

Research by Ketchemen (8) on the surface waters in the farthest north of Cameroon found that nitrate levels were above the norm and this high substance was linked to human exercises.

METHODOLOGY:

3.1 Study Area

Morena is one of the districts forming part of the rivine system in Chambal. The district is bordered on its northeast by Rajasthan state. The rest of the sides are bounded by the Madhya Pradesh

Districts. Geographically, it lies between 26 ° 29'15 "N latitude and 78 ° 7'30"E longitude near the Kotwal village in district Morena. It is built on Aasan River, with a maximum depth of 10.95 m and a dam shoreline length of 294.13 m. The reservoir was named as Kotwal reservoir on village name.

Table 1: Description of study sites

S. no.	Study sites	Depth
1.	Tap water	200 FT
2.	Handpump's water	200 FT
3.	Water form borewell	200 FT

3.2 Methods of Collection

Both bottles were thoroughly cleaned and rinsed with water which was reagent. Collected water samples were taken to the laboratory and kept at 1-4 ° C temperature in refrigerator to prevent any major chemical changes. Such water samples were investigated to characterize the area's water quality and to understand the physico-chemical processes that regulate water mineralization. One way variance analysis (ANOVA) was performed to determine the heterogeneity of parameters of the water quality.

3.3 Analyses of Water Samples

The Water samples of selected tap water, hand pumps water and borewell from the Morena districts, Madhya Pradesh were collected and analyzed as prescribed by standards methods of water. The glass wares used were of borosil make and chemicals of analytical grade. The pipettes, burettes, beakers, conical flasks, standard measuring flasks and measuring cylinders were calibrated according to the standard methods.

3.4 Water Analysis Methods

The analysis for physico-chemical parameters in ground water samples was carried out according to the procedure outlines in standard methods and also prescribed by instrument manufactures. (433) In physical parameters the pH, Colour, Odour, Conductivity, Temperature and Total Dissolve Solid (TDS) were analyzed while in chemical parameters Chloride (Cl-), Carbonate, Nitrate (NO_3-), Sulphate (SO_4^{-2}), Calcium (Ca+2), Magnesium (Mg+2), Sodium (Na+) Potassium (K+), Fluoride, Total Alkalinity (TA), Total acidity, Total Hardness (TH) and Lead were measured in sample water.

RESULTS AND ANALYSIS

The physical and chemical parameters in the water samples (S1, S2 and S3) collected from different location in Morena districts, Madhya Pradesh were determined.

PHYSICAL PARAMETERS

1) pH

In the present study the pH of the water sample i.e., S1, S2 and S3 ranges from 6.74 to 7.18 (Fig. 4.1). Maximum value was recorded at S2 (7.18) while lowest value in S1 (6.74). The trends of pH values for study area reveal that water is slightly alkaline in nature. Lower the pH increases the corrosive nature of water. (Table 4.1)

Table 4.1: pH values of the water sample

S. No.	Sample	pH value
1	S1	6.74
2	S2	7.9
3	S3	7.18

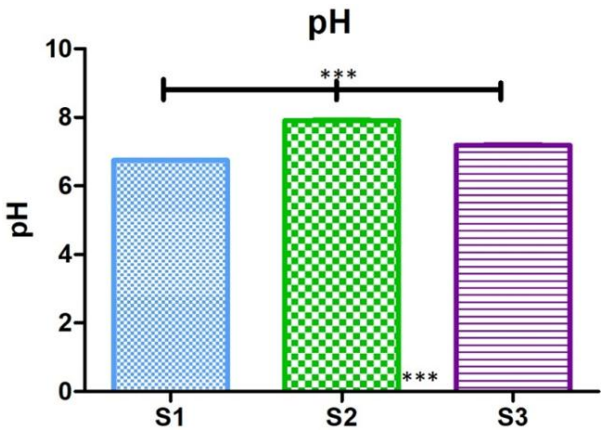

Figure 4.1: pH range among the different samples

2) Colour

APHA (2012) have recommended a desirable and permissible limit of colour for drinking waters is 5.0 Hazen unit. The colour of all water samples was found <1 in all the three samples. (Table 4.2)

Table 4.2: Physical parameters of the water sample

S. No.	Sample	Colour	Odour
1	S1	<1	Agreeable
2	S2	<1	Agreeable
3	S3	<1	Agreeable

3) Odour

APHA (2012) have recommended that ground water of totally sources should be Agreeable. In study area odour of all water samples was found Agreeable. (Table 4.2)

4) Conductivity

The electrical conductivity (EC) of the water samples of the study area ranged from 920 to 1786 µmho/cm. Maximum value was recorded at S1 (1786 µmho/cm) while lowest value recorded in (920 µmho/cm). It is important to note that high conductivity values indicate a high concentration of soluble salts contained in groundwater sources and represent the contribution made by mostly geogenic activities.

5) Temperature

Temperature of water samples was measured by mercuric thermometer. In the study area temperature of water samples ranged from 29°C to 30°C. The highest degree of temperature was recorded at S1 and S2 with 30°C and lowest in S3 with 29°C. The temperature of water samples collected from tap water, hand pumps was comparatively recorded more than the borewell water.

6) Total Dissolve Solid (TDS)

In S1, TDS was exceeded the Maximum permissible limit of while in S3 TDS was found within limit. The reason of these changes could be the dissolution of salts and minerals, which are present in soil due to rise in water table. TDS is one of the important factors that determine the suitability of water for various uses.

4.2 Chemical Parameters

1) Chloride (Cl-)

In S3 concentration of chloride was recorded below the permissible limit set by (APHA 2012) while in S1 samples was recorded within limit. As per the Indian Drinking Water standard IS 10500 (2012) the appropriate chloride level is 250 mg / L, the taste is salty, corrosive and the palatability is impaired beyond this point.

Table 4.6: Chloride concentration of the water sample

S. No.	Sample	Chloride Concentration
1	S1	172
2	S2	70
3	S3	41

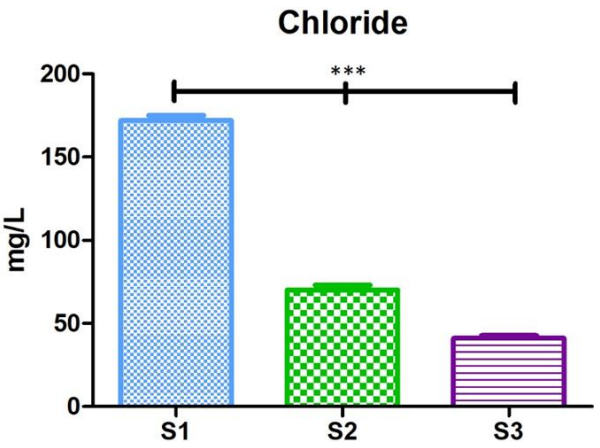

Figure 4.3: Chloride concentration among the different samples

2) Carbonate

When pH is less than 4.5 CO2 will be present as carbonic acid (H2CO3), pH between 4.5 to 8.2 then as HCO3 - and if pH is over 8.2 then as CO3 2-. Under usual conditions the HCO3 - concentration in ground water ranges from 100 to 800 mg/L.

3) Nitrate (NO_3 -)

Maximum value was recorded in S1 (55.05 mg/L) and lowest value recorded in S3 (4.5 mg/L). In drinking water the acceptable value for nitrate is 45 mg / L (APHA, 2012). In S1 nitrate concentration was recorded above the desirable limit of APHA while in S3 it was recorded below set by (APHA, 2012).

4) Sulphate (SO_4^{-2})

The concentration of sulphate in the water samples varies from 0.903 to 10.75 mg/L (Fig.4.5). The P value is < 0.0001, considered extremely significant (***P<0.001).Maximum concentration of sulphate recorded in S1 (10.75 mg/L) and minimum in S3 (0.903 mg/L). According to APHA sulphate was recorded 200 which is above to the samples. Under anaerobic conditions, sulphate reduces to sulphide, which forms hydrogen sulphide that causes corrosion of pipes (10).

Table 4.9: Sulphate (SO4-2) concentration of the water sample

S. No.	Sample	Sulphate (SO_4^{-2})
1	S1	10.75
2	S2	1.63
3	S3	0.903

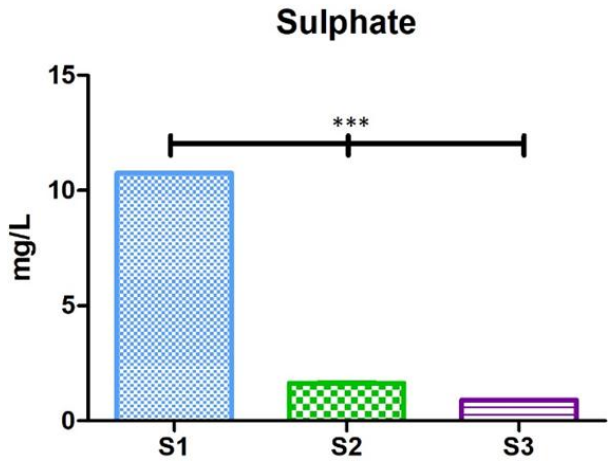

Figure 4.5: Sulphate concentration among the different samples

5) Magnesium (Mg+2)

Magnesium in water is occurring from natural sources like granitic terrain which contain large concentration of these elements. The concentration of Mg+2 in natural waters is generally less than Ca+2 .

The concentration of Mg+2 in the samples varies from 22 to 66 ppm which is maximum in S1 (66ppm) and Minimum at S2 (22 ppm) (table 4.11 Fig. 4.7). The P value is < 0.0001, considered extremely significant(***P<0.001; *P<0.05).

The desirable limit of Magnesium in drinking water is 30 mg/L (APHA, 2012). In S1 Magnesium concentration was recorded above the desirable limit of APHA while in S2 it was recorded below set by (APHA, 2012). In S3 Magnesium concentration was recorded exact in S2 (30ppm)

Table 4.11: Magnesium (Mg+2) concentration of the water sample

S. No.	Sample	Magnesium (Mg+2)
1	S1	66
2	S2	22
3	S3	13

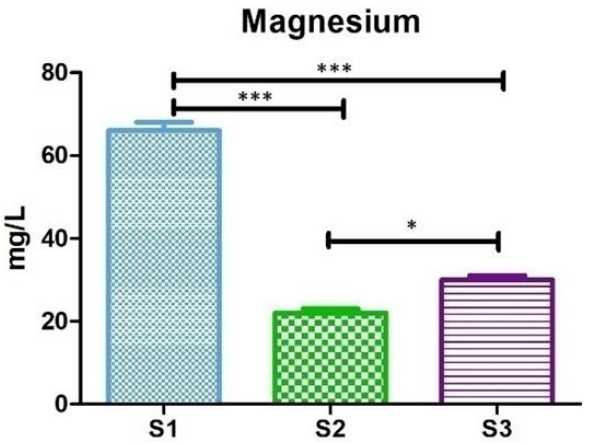

Figure 4.7: Magnesium concentration among the different samples

6) Sodium (Na+)

Sodium are the most important cations, the major source of both the cations may be weathering of rocks. The concentration of sodium in natural water is generally less than the calcium and magnesium. Sodium salts are highly soluble in water. The major source in natural waters is weathering of rocks.

Figure 4.8 showed that concentration of Na+ in water samples varies in range from 13 to 26. The P value is 0.0048, considered very significant(ns P>0.05; **P<0.01; *P<0.05). In S1 the value of Na+ was recorded maximum (26mg/L) and in S3 value of Na+ was recorded minimum (13mg/L).

Table 4.12: Sodium (Na+) concentration of the water sample

S. No.	Sample	Sodium (Na+)
1	S1	26
2	S2	25
3	S3	13

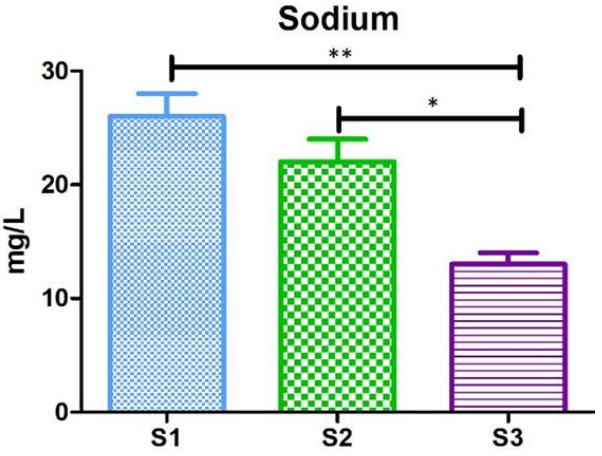

Figure 4.8: Sodium concentration among the different samples

7) Potassium (K+)

The P value is 0.2577, considered not significant(ns P>0.05). Figure 4.8 showed that concentration of K+ in water samples varies in range from 4 to 6. In S1 the value of K+ was recorded maximum (6 mg/L) and in S2 and S3 value of Na+ was recorded minimum (4 mg/L).

8) Fluoride

Maximum value of Fluoride was recorded in S1 and S2 (1 mg/L) and minimum in S3 (0.5 mg/L). In the result which fluoride was present at a concentration of 1mg/litre, a detection limit of 1.0mg/L was reported (APHA,2012).

9) Acidity:

The P value is < 0.0001, considered extremely significant (ns P>0.05; ***P<0.001). Figure 4.12 showed that the acidity in water sample. Here the maximum concentration of acidity was shown in S1 (36mg/L) where as in S2 and S3 it was nil.

Table 4.17: Total Hardness (TH) of the water sample

S. No.	Sample	Total Hardness (TH)
1	S1	560
2	S2	338
3	S3	340

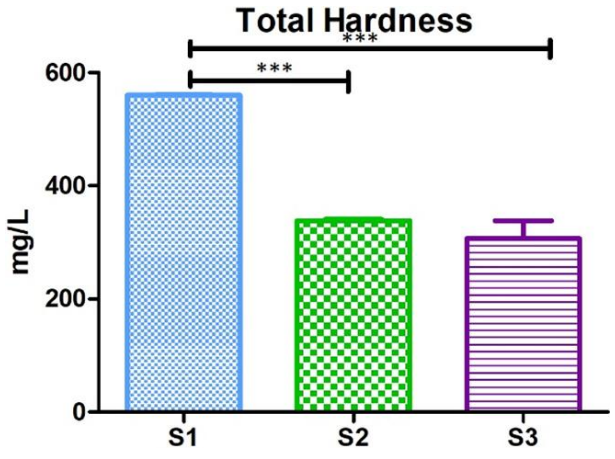

Figure 4.13: Total Hardness among the different samples

10) Lead

The concentration of soluble lead in uncontaminated fresh water is generally less than 0.05mg/l (APHA,2012). The Pb in all samples found within the permissible limit of 0.01mg/L.

Table 4.17: Lead of the water sample

S. No.	Sample	Lead
1	S1	0.0245
2	S2	0.0287
3	S3	0.0394

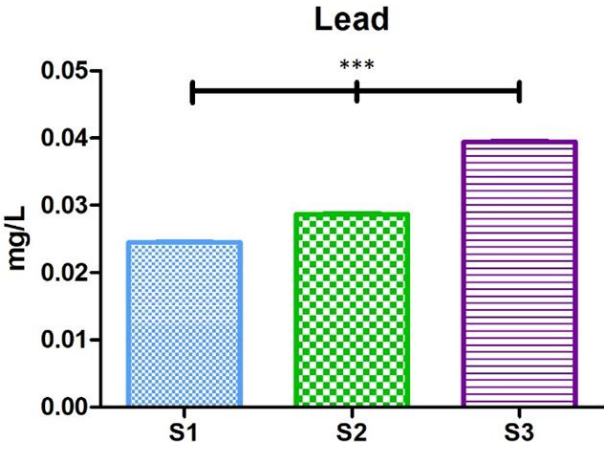

Figure 4.13: Lead among the different samples

Comparative Physio-Chemical analysis of S1, S2 and S3 water samples:

CONCLUSION

In the studies Colour found in all water samples was found <1 in and odour is Agreeable in all samples, (S1, S2 and S3) The highest degree of temperature was recorded at S1 and S2 with 30°C and lowest in S3 with 29°C. The temperature of water samples collected from tap water, hand pumps was comparatively recorded more than the borewell water. The electrical conductivity (EC) of the water samples of the study area ranged from 920 to 1786 µmho/cm, (Fig.4.2). Maximum value was recorded at S1 (1786 µmho/cm) while lowest value recorded in (920 µmho/cm). Lead concentrations less than the allowable levels specified by APHA in water samples, (2012). Lead is a dangerous element; it is toxic even in small quantities and, in many cases, reaches the human body. Some old homes may have pipes of lead water, which may then contaminate drinking water. It is also concluded by the result that the maximum concentration of calcium and chloride was recorded in tapwater (S1) while lowest concentration of Lead was recorded in all the three samples.

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