

Quality of drinking (surface and sub-surface) water in relation to human health of Sehore town, M.P. (India)

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ABSTRACT

Water is most essential to life next to air only. Surface water and Sub-surface water both are very important for water supply for irrigation, industries and drinking purpose. Safe drinking water is primary needs of every person. Most of person mainly depends upon ground water sources. Some of these have problems such as excess hardness, Sodium, Potassium, Calcium, Nitrate etc. The natural quality of surface water and Sub-surface water tends to be degraded by human activities and geo environmental changes. Physico-chemical analysis of rivers and bore well and hand pumps has been collected in pre-monsoon (Aug-08) and Post-monsoon (Dec-08). Different parameter of water has been analyzed and assessed the suitability of drinking water in public hygiene scenario. Some parameters are with in the range as prescribed by ISI and WHO while other are beyond the limits.

Keywords: Surface water, subsurface water, Physico-chemical parameters, human health.

INTRODUCTION

Now a day's ground water is primary sources of drinking water. The quality of ground water depends on the ion, which are dissolved in ground water. The major ions which are responsible to maintain the quality of ground water are carbonate, bicarbonate, chloride, sulphate, nitrate etc. These ions are present in ionic form. The cation and anions must be equal to maintain the quality of water. Cation such as calcium ion, magnesium ion, sodium, potassium etc. are also present in ground water in the form of hardness and salinity. The natural quality of ground water tends to be degraded by human activities. Municipal and Industrial water entering into an aquifer are the major sources of organic and inorganic pollutants. The water level of underground water has been full down to 30-40 meters in most of areas. Eight surface water samples and eight Sub-surface water samples collected from Sehore town and they were analyzed for parameters such as pH, total alkalinity, total hardness, and calcium ions, magnesium ion, Na⁺, K⁺, NO₃⁻ etc.

MATERIAL AND METHODS

Water samples of various hand pumps and tube wells from eight stations were collected in polythene bottles as per the standard procedure and were transported to laboratory for various chemical analysis.

The physico-chemical parameters such as pH, Temperature, Turbidity, Total Alkalinity (TA), Total hardness (TH), Calcium (Ca²⁺), Magnesium (Mg²⁺), Sodium (Na⁺), Potassium (K⁺), Chloride (Cl⁻), Sulphate (SO₄²⁻), Nitrate (NO₃⁻), were determined using standard method Reagents used for the present investigation were AR grade and double distilled water was used for preparing various solution.

RESULTS AND DISCUSSION

The average values of physicochemical parameters during Aug-08 and December 2008 are presented in Table 1, 2, 3, and 4. Determination of chemical characteristics is essential for assessing the suitability of water drinking, industrial and household uses.

The observed pH values show that almost all the water samples are in permissible limit as prescribed by WHO.

Turbidity is higher/greater in samples taken in post monsoon season then those of pre-monsoon samples. The possible reason may be the depletion of groundwater level.

Alkalinity also increases along with all other parameters and these are shown in the Fig. 1 and Fig. 2.

Table 1: Sampling Points and Places of surface water

Sampling No.	Name of the Site
B1	Parvati River
B2	Bhagvan pura Dam
B3	Jamunia Dam
B4	Sewan River

Table 2: Sampling Points and Places of subsurface water

Sampling No.	Name of the Site
X1	Machli pull
X2	Jangli Ahata
X3	Indore naka
X4	Gang
X5	Kasba
X6	Mandi
X7	English pura
X8	Housing Board

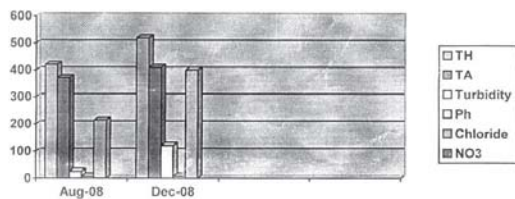


Fig 1: Comparative plot of various results of different parameters in pre-monsoon and post-monsoon season 2008.

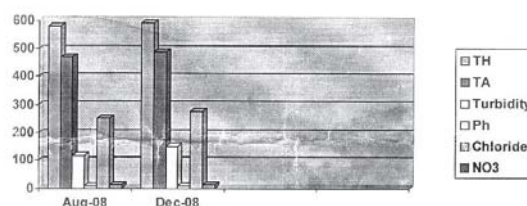


Fig 2: Comparative plot of various results of different parameters in pre-monsoon and post-monsoon season 2008.

Table 1: For Sub-Surface water Samples (Pre-monsoon-Aug-08)

S. No.	Parameters	Sample Points								WHO 1993		ISI 10500-91	
		X1	X2	X3	X4	X5	X6	X7	X8	Min	Max	Max	Min
1	pH	7.76	7.82	7.79	7.18	7.12	7.82	7.18	7.09	6.7	7.7	8.5	6.5
2	Turbidity	117	121	6.2	1.1	1.9	0.8	150	20	3.8	8.6	-	10
3	Alkalinity	64	78	69	348	370	64	152	69	140	614	200	120
3	T.H.	68	82	96	420	400	68	420	64	168	923	500	300
4	Mg ²⁺	28	27	36	216	162	28	216	42	25.34	153.2	150	30
5	Ca ²⁺	40	55	60	204	238	40	204	42	25.65	117.8	100	75
6	Cl ⁻	16	20	22	214	80	15	16	60	69.02	477.5	250	250
7	SO ₄ ²⁻	45	52	40	8.4	7.2	55	42	7.2	39.73	93.39	250	200
8	Na ⁺	20	18	20	15	16	19	14	13	15	73	200	200
9	K ⁺	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.5	0.6	3.4	-	-
10	NO ₃ ⁻	13	14	12	Nil	Nil	Nil	Nil	Nil	0.035	0.158	45	45

Table 2: For Sub-Surface water Samples (Post-Monsoon-Dec-08)

S. No.	Parameters	Sample Points								WHO 1993		ISI 10500-91	
		X1	X2	X3	X4	X5	X6	X7	X8	Min	Max	Max	Min
1	pH	7.5	7.6	7.4	8.1	7.4	7.5	7.5	7.8	6.7	7.7	8.5	6.5
2	Turbidity	6.0	1.7	0.2	24.2	17.7	1.8	16	0.1	3.8	8.6	-	10
3	Alkalinity	320	280	410	90	360	300	80	360	140	614	200	120
3	T.H.	500	96	480	90	520	80	450	500	168	923	500	300
4	Mg ²⁺	80	08	130	46	40	40	150	250	25.34	153.2	150	30
5	Ca ²⁺	420	188	350	44	480	40	200	250	25.65	117.8	100	75
6	Cl ⁻	200	150	100	220	240	400	215	300	69.02	477.5	250	250
7	SO ₄ ²⁻	50	16	50	9.4	9.5	9.0	1.2	20	39.73	93.39	250	200
8	Na ⁺	22	20	22	18	17	19	15	15	15	73	200	200
9	K ⁺	0.2	0.2	0.2	0.3	0.2	0.1	0.3	0.2	0.6	3.4	-	-
10	NO ₃ ⁻	14	12	11	Nil	Nil	Nil	Nil	Nil	0.035	0.158	45	45

Table 3: For Surface water Samples (Pre-Monsoon-Aug-08)

S. No.	Parameters	Sample Points								WHO 1993		ISI 10500-91	
		X1	X2	X3	X4	X5	X6	X7	X8	Min	Max	Max	Min
1	pH	7.09	7.00	7.08	8.3	8.0	8.2	7.7	7.8	6.7	7.7	8.5	6.5
2	Turbidity	0.6	0.6	0.5	0.5	0.6	0.5	117	100	3.8	8.6	-	10
3	Alkalinity	220	110	450	90	310	200	470	360	140	614	200	120
3	T.H.	580	550	560	150	160	150	68	80	168	923	500	300
4	Mg ²⁺	384	380	375	90	75	95	28	40	25.34	153.2	150	30
5	Ca ²⁺	196	170	185	60	85	55	40	40	25.65	117.8	100	75
6	Cl ⁻	240	250	220	60	55	60	16	20	69.02	477.5	250	250
7	SO ₄ ²⁻	20	22	20	18	16	18	15	15	15	73	200	200
8	Na ⁺	13	13	11	Nil	Nil	Nil	12	10	0.035	0.158	45	45
9	K ⁺												
10	NO ₃ ⁻	14	12	11	Nil	Nil	Nil	Nil	Nil	0.035	0.158	45	45

[All parameters in mg/l except pH, Turbidity (NTU)]

Table 4: For Sub-Surface water Samples (Post-Monsoon-Dec-08)

S. No.	Parameters	Sample Points								WHO 1993		ISI 10500-91	
		X1	X2	X3	X4	X5	X6	X7	X8	Min	Max	Max	Min
1	pH	8.0	7.8	8.0	8.4	8.3	8.2	7.7	7.8	6.7	7.7	8.5	6.5
2	Turbidity	10	10.6	5.5	7.5	9.6	11.5	150	120	3.8	8.6	-	10
3	Alkalinity	250	150	480	120	340	250	490	460	140	614	200	120
3	T.H.	590	605	580	250	180	175	80	100	168	923	500	300
4	Mg ²⁺	390	420	105	150	95	105	40	60	25.34	153.2	150	30
5	Ca ²⁺	200	185	185	100	95	70	40	40	25.65	117.8	100	75
6	Cl ⁻	305	276	260	100	105	90	25	50	69.02	477.5	250	250
7	SO ₄ ²⁻	60	61	56	10.6	10.0	12.5	22.2	28	39.73	93.39	250	200
8	Na ⁺	22	25	24	21	19	19	17	16	15	73	200	200
9	K ⁺	0.2	0.2	0.2	0.3	0.3	0.5	0.2	0.2	0.6	3.4	-	-
10	NO ₃ ⁻	14	13	14	Nil	Nil	Nil	13	11	0.035	0.158	45	45

[All parameters in mg/l except pH, Turbidity (NTU)]

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