

Analysis of Water Quality of Hazaribag Lake, Charwa Dam and Drinking water Tank in Hazaribag

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Abstract

This paper illustrates about the study of various bio-chemical parameters of water at various places in Hazaribag district viz areas of Lake of Hazaribag, Charwa Dam and running tap water. Bacterial and fungal load and others parameters were analyzed for the period of three months (1st January 2016 to 31st March 2016). Comparative study of the above water samples suggest that running tap water meets some parameters of drinking water and are within the permissible limit (detailed mentioned in full paper)

I. INTRODUCTION

Water is the most important amenity of life. It is subjected to all forms pollution, from the point and non point sources, with every developing step of the country. Water quality reflects the composition of water as affected by the natural and anthropogenic activities expressed in terms of measurable quantities and related to intended water use [1]. The physicochemical properties and biodiversity of aquatic body governs the quality of water and hence the quality of life. They are helpful in determining the structural and functional status of natural water. However, the limnological study about the lentic water body, suggests that this form of water is prone to a rapid decline in quality due to of detergents, animal bathing, idol immersion, aquaculture etc. This deterioration has not only adversely affected the health of the surrounding people but also has ruptured the aquatic life and fishing. Several physicochemical and biological factors may impart a stress on fish growth and reproduction [6] [7]. The water quality, hydrology and habitat conditions reflect the impact of the urban drainage of the receiving water body [8]. The present study was carried out to assess the quality of water from first study site is "Lake" located in Hazaribag. Hazaribag having a series of artificial lakes with seven parts, all on different levels, so that water spills over to the other lake through a spilling channel. It is an engineering marvel which conserves water and

supplies to people living in as compared to water samples from Charwa Dam and lake. The result indicates that the running tap water is useable for drinking purpose.

Keywords-; water analysis Bio-chemical, Chemical Parameters, Charwa Dam

Overburden from various sectors of society. Industrial, sewage and municipal wastes are being continuously added to the water body which affect the physicochemical properties of water body making them unfit for use by the livestock and other organisms [2]. The global freshwater resource is facing serious threats and pressure of sustaining in nature. Industrialization, urbanization and modern agricultural practices influence the water quality quantitatively and qualitatively. It is therefore very important to assess the various conditions and have relevant information about the quality of water to formulate various management strategies for the resources [4] [5].

The quality of Dam water has deteriorated due to discharge of waste water from domestic pipelines, use

Hazaribag. It was constructed by Britishers in 1831 when they were colonising Hazaribag. Second study site is "Charwa dam" located near Hazaribag. It is 15km from the town Hazaribag. Charwa reservoir constructed in 1952 by Damodar Valley Corporation (DVC) and over to the public work department in 1954, sprawl across 100 acres while 200 acres are still lying unused. The 65 acres that the land sharks are trying to grab since 2011 fall under the unused portion. The dam supplies water to the urban population. Third study site is running supply tap water from the tank located in Nawabgunj of Hazaribag. This tank supplies water to most of the house located in Hazaribag.

II. MATERIALS & METHOD

The study area belongs to Hazaribag Lake, Charwa dam & Hazaribag water tank

Nawabgunj, Hazaribag, district Hazaribag, Jharkhand and it lies between 23.98° N, 85.35° E. Hazaribag lake is located in the vicinity of the Hazaribag town, whereas the Charwa dam are located away from the town. The sampling was done thrice in three month i.e. at January, February, March. Three.

III. RESULTS AND DISCUSSION

In the present study, water samples from various spot were taken in three month and were subjected for various physicochemical and biological analyses. The values of various parameters in three month (January, February and March)

In the present study, the pH of water are neutral with minimum pH being 7 in running tap water during January, February and March and maximum pH being 8.5 in Charwa Dam during March.

The highest temperature was found in Charwa Dam (30°C) during March and lowest temperature was observed in Lake of water tank of Hazaribag during in January.

The maximum TDS was found in Hazaribag Lake (445 mg/l) during month March and minimum TDS was found in Charwa Dam (100 mg/l) during March. Here the maximum TSS was found in Hazaribag lake (205mg/l) January and minimum TSS was found in Hazaribag water tank (102mg/l) during March. The maximum TS was found in Hazaribag lake (745 mg/l) March and minimum TS was found in Charwa dam (300mg/l) during March.

Maximum Nitrate content was found in Charwa dam (55 mg/l) during March and minimum nitrate content was found in Hazaribag Lake (10.3 mg/l) during January.

Maximum DO content was found in water tank of Hazaribag (9.25 mg/l) during January and minimum DO content was found in Charwa Dam (3.25 mg/l) during March.

water samples from each spot were collected in plastic bottles and were tightly capped inside the water. The bottles were then immediately transported to laboratory for analysis of water quality parameters. However, the temperature was recorded on the spot and water samples to be used for DO analysis was also fixed on the spot. The other parameters were analyzed as per the standard [8].

Maximum COD was found in Hazaribag Lake (98 mg/l) during March and minimum COD was found in Hazaribag water tank (12 mg/l) during March. The present study found out high COD values in the Hazaribag Lake and Charwa dam thereby suggesting the fact that the both lake and Charwa dam are contaminated with large amount of non biodegradable waste. This might have been due to the agricultural runoff and cultural practices like idol immersion.

Maximum Total Alkalinity was found in Charwa dam (227 mg/l) January and minimum Total Alkalinity was found in Hazaribag lake (88.6mg/l) during March. From the present study, it was found that large population is dependent on Charwa dam for the domestic use

Maximum Turbidity was found in Hazaribag Lake (66.64 NTU) during February and minimum Turbidity was found in Hazaribag tank water (10 NTU) during January.

Maximum Chloride was found in Hazaribag water tank (10.2 mg/l) during February and minimum Chloride was found in Hazaribag Lake (5 mg/l) during February. In the present study, the chloride content in the water samples were found to be within the permissible limit.

Maximum Total Hardness was found in Hazaribag lake (230 mg CaCO₃/l) during January and minimum Total Hardness was found in Hazaribag tank (78.5 mg CaCO₃/l) January .

Besides these parameters, the water samples were also tested for few qualitative characteristics like taste and odour. The taste of these water samples was not agreeable and the odour of the samples was also objectionable.

Table (I). Physico-Chemical Parameter and Biological Parameters of Charwa Dam

Parameters	January	February	March	Mean ± SD
pH	8.1	8	8.5	8.2±0.2645
Conductivity	549.1	742	451	580.87±147.832
Temperature(°C)	22.1	24	30	25.36±4.123
TDS (mg/l)	400	275	100	258.33±150.692
TSS (mg/l)	178	150	200	176±25.059
TS(mg/l)	578	425	300	434.33±139.234
Nitrate (mg/l)	40	26	55	40.33±14.50
DO (mg/l)	4.66	6.24	3.25	4.71±1.495
COD (mg/l)	75.2	60	76	70.4±9.0155
Total Alkalinity (mg CaCO3/l)	227	107	126	153.33±64.500
Turbidity (NTU)	59.1	54	51.6	54.9±3.830
Chloride (mg/l)	8.8	9.2	8.8	8.93±0.230
Total Hardness (mg CaCO3/l)	110	120	126	118.66±8.08
Fe (mg/l)	0.49 4	0.41 4	0.44 2	0.450±0.040
Cu (mg/l)	0.10 4	0.11 2	0.12 1	0.112±0.0085
Ni (mg/l)	0.03 9	0.05 1	0.06 5	0.052±0.0130
Co (mg/l)	0.02 6	0.04 1	0.05 1	0.039±0.01258
Zn (mg/l)	0.00 4	0.00 1	0.00 8	0.004±0.0035
Pb (mg/l)	0.26 3	0.22 1	0.23 2	0.239±0.0217
Cd (mg/l)	0.04 7	0.02 1	0.03 2	0.033±0.0130

Bacterial and fungal load:-

DILUTIONS	NUMBER OF COLONIES OF MICROBES (Bacterial)	NUMBER OF COLONIES OF MICROBES (fungal)
	Sample of Charwa Dam	Sample of Charwa Dam
10 ⁻¹	176	169
10 ⁻²	143	156
10 ⁻³	122	137
10 ⁻⁴	108	121
10 ⁻⁵	92	98

Table(II).Physico-Chemical Parameter and Biological Parameter of Hazaribag Lake.

Parameters	January	February	March	Mean
pH	7.85	7.5	7	7.45±0.4513
Temperature	19.8	23.9	31	24.9±5.6665
Conductivity	943.3	1472	745.7	1053.67±375.517
TDS (mg/l)	420	325	445	396.66±63.316
TSS (mg/l)	205	175	300	226.66±65.225
TS (mg/l)	625	500	745	623.33±123.0706
Nitrate (mg/l)	10.3	13.5	22.9	15.56±6.549
DO (mg/l)	7.84	6.27	8.34	7.48±1.08011
COD (mg/l)	64	76	98	79.33±17.243

Total Alkalinity (mg CaCO ₃ /l)	34.66	90.7	88.6	71.32±31.765
Turbidity (NTU)	52.55	66.64	41.23	53.47±12.730
Chloride (mg/l)	5.31	5	6.56	5.62±0.8258
Total Hardness (mg CaCO ₃ /l)	230	104.7	204.67	179.79±66.229
Fe (mg/l)	0.528	0.411	0.418	0.452±0.0656
Cu (mg/l)	0.075	0.043	0.087	0.068±0.02274
Ni (mg/l)	0.042	0.023	0.028	0.031±0.009848
Co (mg/l)	0.037	0.031	0.035	0.034±0.003741
Zn (mg/l)	0.014	0.011	0.012	0.012±0.001414
Pb (mg/l)	0.185	0.132	0.123	0.147±0.031976
Cd (mg/l)	0.018	0.008	0.012	0.013±0.017320

Bacterial and fungal load:-

DILUTIONS	NUMBER OF COLONIES OF MICROBES(bacterial)	NUMBER OF COLONIES OF MICROBES(fungal)
	Sample of lake	Sample of lake
10 ⁻¹	125	1 2 9
10 ⁻²	117	1 1 3
10 ⁻³	102	1 0 2
10 ⁻⁴	97	9 5
10 ⁻⁵	83	8 9

Table (III).Physico-chemical parameters and biological parameter of running tap water of Nawabgunj tank, Hazaribag.

Parameters	January	February	March	Mean
Ph	7	7	7	7
Conductivity	449.1	442	451.5	447.53±4.939
Temperature	19.5	24	32	25.16±6.331
TDS (mg/l)	200	206	297	234.33±54.353
TSS (mg/l)	104	106	102	104±2
TS (mg/l)	304	312	399	338.33±63.462
Nitrate (mg/l)	25.63	18.22	24.13	22.66±3.917
DO (mg/l)	9.25	9	13.20	10.48±2.3559
COD (mg/l)	56.2	50	44	50.06±6.0102
Total Alkalinity (mg CaCO ₃ /l)	110	115	122	115.66±6.0276
Turbidity (NTU)	10	11	14	11.66±2.8797
Chloride (mg/l)	8.86	10.2	8.5	9.18±0.8958
Total Hardness (mg CaCO ₃ /l)	78.5	81	94	84.5±8
Fe (mg/l)	0.042	0.063	0.072	0.059±0.0153
Cu (mg/l)	0.053	0.024	0.009	0.028±0.0021
Ni (mg/l)	0.039	0.051	0.065	0.052±0.0130
Co (mg/l)	0.026	0.041	0.051	0.039±0.0216
Zn (mg/l)	0.009	0.067	0.049	0.041±0.06264
Pb (mg/l)	0.06	0.09	0.14	0.096±0.0404
Cd (mg/l)	0.001	BDL	BDL	B

Below the detection limit

Bacterial and fungal load:-

DILUTIONS	NUMBER OF COLONIES OF MICROBES(Bacteria)	NUMBER OF COLONIES OF MICROBES(Fungus)
	Sample of tap water of tank	Sample of tap water of tank
10 ⁻¹	107	1
10 ⁻²	93	1 0
10 ⁻³	85	9 6
10 ⁻⁴	69	8 4
10 ⁻⁵	57	7 9

Table(IV). Comparison of the Water Quality of All Aamples with Different Water Quality Standards.

Parameters	Charwa Dam			Hazaribag lake			Tank running tape water			Permissible limit of drinking water			
	jan	feb	mar	jan	Feb	mar	jan	Feb	mar	CPCB	BIS	CPHEFO	WHO
Ph	8.1	8	8.5	7.85	7.5	7	7	7	7	6.5-8.5	6.5-8.5	7-8.5	7-8.5
Conductivity	549.1	742	451.5	943.3	1472	745.7	449.1	442	451.5	-	-	-	-
Temperature	22.1	24	30	19.8	23.9	31	19.5	24	32	-	-	-	-
TDS (mg/l)	400	275	100	420	325	445	200	206	297	500ppm	-	500ppm	500ppm
TSS (mg/l)	178	150	200	205	175	300	104	106	102	-	-	-	-
TS (mg/l)	578	425	300	625	500	745	304	312	399	-	-	-	-
Nitrate (mg/l)	40	26	55	10.3	13.5	22.9	25.63	18.22	24.13	45mg/l	45mg/l	45mg/l	45mg/l
DO (mg/l)	6.6	6.24	3.25	7.84	6.27	8.34	9.25	9	13.20	6mg/l	6mg/l	6mg/l	8-10mg/l
COD (mg/l)	75.2	60	76	64	76	98	56.2	5	44	-	-	-	-
Total Alkalinity (mg CaCO3/l)	227	107	126	34.66	90.7	88.6	110	115	122	-	-	-	-
Turbidity (NTU)	59.1	54	51.6	52.55	66.64	41.23	10	11	14	5NTU	5NTU	2.5NTU	5NTU
Chloride (mg/l)	8.8	9.2	8.8	5.31	5	6.56	8.86	10.2	8.5	-	-	-	-
Total Hardness (mg CaCO3/l)	110	120	126	230	104.7	204.67	78.5	81	94	-	-	-	-
Fe (mg/l)	0.494	0.414	0.442	0.528	0.411	0.418	0.042	0.063	0.072	-	-	-	-
Cu (mg/l)	0.104	0.112	0.121	0.075	0.043	0.087	0.053	0.024	0.009	-	-	-	-
Ni (mg/l)	0.039	0.051	0.065	0.042	0.023	0.028	0.039	0.051	0.065	-	-	-	-
Co (mg/l)	0.026	0.041	0.051	0.037	0.031	0.035	0.026	0.041	0.051	-	-	-	-
Zn (mg/l)	0.004	0.001	0.008	0.014	0.011	0.012	0.009	0.067	0.049	-	-	-	-
Pb (mg/l)	0.263	0.221	0.232	0.185	0.132	0.123	0.06	0.09	0.14	-	-	-	-
Cd (mg/l)	0.047	0.021	0.032	0.018	0.008	0.012	0.001	BDL	BDL	-	-	-	-

IV. CONCLUSION AND RECOMMENDATIONS

1. On the basis of the physicochemical parameters examined in this study, the water supply source Nawabgunj Tank water suitable for domestic uses and drinking as at the time of investigation. However, the Charwa dam and Lake of Hazaribag are not usable for the domestic uses and

drinking purposes and raises serious health concern microbiologically.

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