



ASSESSMENT OF WATER QUALITY INDEX FOR PHYSICO CHEMICAL ANALYSIS OF DRINKING WATER IN AHMEDNAGAR CITY

Deshmukh S. R*

Gandhi College of Arts, Commerce & Science Kada, Dist. Beed

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ABSTRACT

The water bodies, lakes and estuaries are continuously subject to a dynamic state of change with respect to their geological age and geochemical characteristics. The physico-chemical characteristics of the aqueous phase have direct influence on the types and distribution of aquatic biota as well as on the health of the human being. With this pace the present study is carried out for determination of indicator parameters, in the ground water bodies of Ahmednagar city. To study extent of pollution in water and its quality; Water Quality Index (WQI) is calculated for its physico-chemical analysis. Water in Ahmednagar City is found to be safe as all samples have shown Water Quality Index less than 50.

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INTRODUCTION

One of the most precious and important natural resource is water. It is essential for survival of all living beings from simplest herbs and microorganisms like bacteria, viruses upto complex systems of human body (1-3). Physico- Chemical analysis is the first consideration of water quality for its best usage i.e. for drinking, bathing, fishing, industrial processing and soon. Ahmednagar City comes under draught prone area. The weather of the city is dry. It is found that because of the reckless use & misuse of ground water resources as well as surface water, the water have become dangerously impure. River in the city is being used as dust-bin for the disposal of city refuse as well as industrial effluents. Drainage system in the city is open drainage system. The untreated domestic water from human settlement find their way into the river through outfall, drain etc. This in turn results in organic, bacterial, pollution of natural water resources and its aggravation day by day. Water which is to be utilized for human consumption should be free from pathogens as it may create epidemics also it should be free from hazardous chemicals as are risky to health. Demand analysis includes demand of oxygen to oxidize organic matter present in water bodies as pollutant. Thus the main aim of present study is to estimate the extent of water pollution and thereby to assess the water quality status of Ahmednagar City by determining its Water Quality Index.

Experimental

Survey of the city have been done and on the basis of topography. Samples from four sources i.e. stagnant water bodies, flowing water bodies, open dug well and tube well, have been collected. Study has been carried out in the month of August. The water samples have been analysed for study of water quality assessment and physico-chemical parameters. The analysed values have been then compared with permissible standard according to the Indian Standards IS 10500 & IS 2490. The analytical methods applied for determination of indicator parameters were also according to these standards. Six samples from different parts of central region of the city were collected. These were respectively from Tap water (Delhigate), Tube well (Kalyan Naka), Tube well (Swastik Chowk), Drainage (Chandani Chowk), Drainage (Zendigate), River (Sina River). Water Quality Index, indicating the water quality in terms of a index number, offers a useful representation

METHOD AND REAGENTS

All Reagents used are of Anal R Grade, and Instruments like pH Meter, Spectrophotometer are Systronics Make Model. Methods used for analysis are according to IS:10500 and IS: 2490

Method for Calculation of sub index or quality rating: Let there be 'n', water quality parameters and quality rating or sub index (q_0) corresponding to nth parameters is a number reflecting the relative value of this parameters in the polluted water with respective to its standard permissible value.

The q_n is calculated using following expression. $q_n = 100(V_n - V_{io}) / (S_n - V_{io})$

*Corresponding author: **Deshmukh S. R**

Gandhi College of Arts, Commerce & Science Kada, Dist. Beed

Where, q_n = Quality rating for the n^{th} water quality parameter.
 V_n = Estimated value of n^{th} parameters at a given sampling station.

S_n = Standard permissible value of the n^{th} parameter
 V_{io} = Ideal value of n^{th} parameters in pure water, i.e. 7.0 for pH, 14.6mg/L for DO, and 0 for all other parameters.
 For instance, $q_{pH} = 100(V_{pH} - 7)/(8.5 - 7)$ where V_{pH} is the observed value of pH, and pH 7.0-8.5 is the permissible value of water. Likewise $q_{DO} = 100(V_{DO} - 14.6)/(5 - 14.6)$.

Calculation of Unit Weight: $W_n = K/S_n$ where W_n = unit weight for the n^{th} parameters, K = constant of proportionality. The overall Water Quality Index was calculated by aggregating the quality rating (q_n) with the unit weight linearly,
 $WQI = \sum q_n W_n / \sum W_n$

Table 1 Water Quality Rating For Drinking Purpose

WQI	Water Quality	Possible Usage
0-25	Excellent Quality	Drinking, Irrigation, Industrial
26-50	Good	Domestic, Irrigation Industrial
51-70	Fair	Irrigation and Industrial
76-100	Poor	Irrigation
101-150	Very Poor	Restricted use for Irrigation.

Table 2 Drinking Water Standards Recommended by Standard Agencies and Unit Weights

Standards (S_n)	Standards(S_n)	Recommended	Unit
1. Conductance	300	WHO	0.00095
2. TDS	500	ICMR	0.00057
3. pH	7 – 8.5	ICMR	0.03365
4. Chlorides	250	ICMR	0.00114
5. Nitrates	45	WHO/ICMR	0.00636
6. Phosphates	25	USPH	0.01144
7. Sodium	20	ISO	0.01430
8. Potassium	20	USPH	0.01430
9. Sulphate	150	ICMR	0.00191
10. Alkalinity	120	ICMR	0.00238
11. Hardness	300	ICMR	0.00095

RESULT AND DISCUSSION

The collected water samples have been tested for determination of indicator parameters and the results obtained for six samples were tabulated as below. Following steps of evaluation of Water Quality Index WQI, have been used from the point of view the surface water for human consumption, and it is calculated by Weight Arithmetic Index Method as discussed by Brown *et al.*

Results

Table 3 Observed Values of Physico Chemical and Demand Analysis

Parameters	Sample I	Sample II	Sample III	Sample IV	Sample V	Sample VI
Temperature °C	25	21	23	21	20	18
Turbidity (NTU)	4.4	6.0	5.7	7.7	8.56	11.9
pH	7.5	7.32	7.7	7.9	7.9	7.6
Alkalinity (mg/L)	121.4	117.65	125.20	232.0	247.11	223.60
TDS (mg/L)	560	440	600	880	720	520
Chloride (mg/L)	99.27	42.54	141.82	99.3	85.1	212.7
Total Hardness (mg/L)	270	470	385	578	644	835
Sulphate (mg/L)	337.5	445	360	331	409	466
Sulphide (mg/L)	0.225	0.375	1.27	1.4	2.57	3.9
Nitrate (mg/L)	1.0	1.3	1.5	2.1	2.3	2.2
Phosphate (mg/L)	0.80	0.96	1.07	0.98	1.26	1.35

Table 4 Water Quality Index of Drinking Water In Ahmednagar City Tap Water

Parameters	Sample I	Standards S_n	R. Agency	Unit Weight, W_n	Quality Rating q_n	$W_n \times q_n$
pH	7.50	7.0-8.5	ICMR	0.03365	33.33	0.99
Chlorides	99.27	250	ICMR	0.00114	39.708	0.0453
TDS	560	500	ICMR	0.00057	112	0.0638
Nitrates	1.00	45	ICMR	0.00636	2.22	0.014
Phosphates	0.80	25	USPH	0.01144	3.2	0.0366
Sulphate	337.5	150	ICMR	0.00191	224.66	0.427
Alkalinity	121.4	120	ICMR	0.00238	101.16	0.240
Hardness	270	300	WHO	0.00095	90	0.0855

Table 5 Quality Rating, q_n , of Other Samples of Drinking Water in Ahmednagar City

Sample II	q_n ; Sample III	q_n ; Sample IV	q_n ; Sample V	q_n ; Sample VI	q_n ; Sample VII	q_n ; Sample VIII	q_n ; Sample IX	q_n ; Sample X	
pH 7.32	21.3	7.7	46.66	7.9	60	7.9	60	7.6	40
Chlorides 42.54	17.06	141.82	56.728	99.3	39.72	85.1	34.04	212.7	85.08
TDS 440	88	600	120	880	176	720	144	520	104
Nitrates 1.3	2.88	1.5	3.33	2.1	4.67	2.3	5.11	2.2	4.89
Phosphates 0.96	3.84	1.07	4.28	0.98	3.92	1.26	5.04	1.35	5.4
Sulphate 445	296.6	360	240	331	220.67	409	272.67	466	310.67
Alkalinity 117.66	98.0	125.2	104.33	232.0	193.33	247.0	205.83	223.6	185.82
Hardness 470	156.6	385	128.33	578	192.66	644	214.67	835	278.33

Table 6 Quality ratings Other Samples of Drinking Water in Ahmednagar City

Parameters	Sample II $W_n \times q_n$	Sample III $W_n \times q_n$	Sample IV $W_n \times q_n$	Sample V $W_n \times q_n$	Sample VI $W_n \times q_n$
pH	0.072	0.157	0.202	0.202	0.132
Chlorides	0.019	0.065	0.045	0.039	0.097
TDS	0.050	0.068	0.100	0.082	0.059
Nitrates	0.018	0.021	0.029	0.032	0.031
Phosphates	0.044	0.048	0.044	0.058	0.061
Sulphate	0.566	0.4584	0.424	0.521	0.593
Alkalinity	0.222	0.248	0.556	0.492	0.444
Hardness	0.148	0.122	0.183	0.203	0.264

The mathematical expression of Water Quality Index, WQI is calculated as below:

Water Quality Index, $WQI = \sum W_n Q_n / \sum W_n$

Table 7 WQI For Water Samples Of Ahmednagar City

Sample I	Sample II	Sample III	Sample IV	Sample V	Sample VI
37.92	22.82	23.70	31.62	32.58	33.62

CONCLUSION

Drinking water is found to be potable except hardness and phosphate which is found to be on slight higher side. Even though Water quality ratings, and Water Quality Index is found to be less than 50. Thus water is found to be safe for drinking purposes.

References

- Osci Y New School Chemistry for Senior Secondary Schools. African First Publisher Ltd, Onitsha. 3rded., p: 292. (2005)
- Obi C N, Okocha C O, Microbiological and Physico – Chemical Analysis of selected Boreholes Waters, *Journals of Engineering Applied Science*; 257; (2007)

3. B. K. Sinha, Dr.R.K.Sahoo;" Studies on the potable water quality of Cuttack city, Orissa", Das, Jyotiramaya - Dept. of environmental science, Sambalpur uni. University news; 10, (2004)
4. Chanda, Jagdish; Prof Sayad Hasnain;" Hydrochemistry of Dhauliganga River Basin: Atributary of river Kali in Kumaun Himalaya, India" School of environmental science, Jawaharlal Nehru Uni. New India. University News April 26 (2004).
5. M.P."Jain, Shalil, Dr. U. K. Chauhan;" Physico-chemical study of enteropathogenic bacteia isolated from potable water of Rewa, Dept. of environmental sciences University of Reva.
6. Pawale, R.G.; Dr. G. A. Kadam; " Characterisation of Fluoride and Iodide from major drinking water reservoirs in Nanded District and its significance; Dept. of environmental Science S.R.T. Marathwada University Nanded.
7. Birendra Kumar, Dr. B.N. Prasad, Dept. of Chemistry, Physico- Chemical and analytical studies on polluted water of certain water reservoirs in katihar,; Bhundra Narayan Mandal University Madipura University News Aug. 09, (2004).
8. Hydrobiological studies of some water bodies of Amravati District-Ingole, Sangita Pradip (Dr.J.L.Tarar) Dept of Environmental Science Nagpur University Nagpur) University news (Nov 01-07-2004)
9. <http://www.walrus.com>
10. [http://www.green oritoria.Org/strategy/water.html](http://www.green.oritoria.Org/strategy/water.html).
11. WHO In Water, Sanitation and Health; World Health Organisation, (2006).
12. Joshi D.M; Alok Kumar, Agarwal Namita; *Rasayan Journal of Chemistry*, 2; 195 (2009).
13. Sharma R.N, Baruah A.K, Bora C.G; *Pollu. Res.*; 15, 19 (1996).
14. Agrawal A, Pandey R.S, Sharma Bechan, *Journal of Water Resource and Protection* 2, 432; (2010).
15. Bergin Michelle S, West J Jason, Keating Terry J., Armistead G. *Annual Review of Environment and Resources*; 30, 5938; (2005).

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