

DETERMINATION OF THE QUALITY STATUS OF OTAMIRI RIVER IN OWERRI, IMO STATE FOR DOMESTIC AND AGRICULTURAL USES

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ABSTRACT

This paper evaluated the quality status of the Otamiri river in Owerri, Imo State, for agricultural and domestic uses. The biological, chemical and physical tests of the water samples were carried out to determine the level of impurity and the type of the treatment units required. The results show that the chemical qualities (mg, ca, fe, cu etc) and physical qualities (odour, turbidity, temperature, appearance etc) met the World Health Organization (WHO) standard while the Biological quality tests (BOD) failed to meet the required standard hence there is the need to carry out biological treatments of the water from the river before they are used for agricultural and domestic purposes. This is to prevent the spread of water communicable diseases.

Key words: Quality status, physical, chemical and biological characteristics, treatments units.

INTRODUCTION

Water is the most important requirement for the survival of all forms of life on the earth (Okoro; 2001); Edgar; 2001). Plants and animals tissues are said to require water to function effectively (Chijioke; 2001). Surface and ground water contain micro organisms, chemicals suspended solids and toxics materials which are harmful to man, animal and plant (Omoare et al, 2000). The presence of there foreign materials in the water bodies increases the level of turbidity, sediment concentrations, iron contents, solid suspensions, excess carbon dioxide and deficient oxygen (Chijioke, 2001). It also increases the organic biomass, total concentration of sodium, calcium and magnesium salts (Iwuamadi et al, 2000). The presence of the foreign materials do change the colour, taste, odour and proportions of Sodium ions with respect to other cations (Sodium Absorption Ratio) in the water sample. The level of these impurities makes water unfit for both agricultural and domestic purposes. Agunwamba (2000) stated that the analysis of water and waste water is aimed at determining the level of

impurity and the types of treatment units required for effective purification before intended uses.

The extent of treatment required depends on the characteristics of the water collected and the quality of water desired. Water of low quality status causes pollution and the spread of communicable diseases since the water is usually contaminated (Elendu, 2002). Plants have limits for tolerance to low quality water, therefore, such water is hazardous to man, animals and plants. Otamiri river in Owerri, Imo State, therefore provide sufficient surface water that can be used for agricultural, domestic and industrial purposes (Iwuamadi et al, 2000). The river is susceptible to pollution due to inflow of runoff/water during the rainy seasons. It also receives industrial discharges, agricultural waste materials and inputs such as fertilizers, insecticides and pesticides. The large volumes of runoffs and overland flows generated during the rainfall days carry pollutants and other sediments that can change the quality of the otamiri river.

MATERIALS AND METHODS

Six (6) water samples were collected at different points along the water courses for laboratory analysis. Three (3) samples were collected in the month of June (samples A, B and C) and three (3) other (samples D, E and F) collected in the month of July, 2008. These two months were selected due to the fact that they have the higher-rainfall days in Owerri (Meteorological services Report 2008) and hence generate higher runoffs that may transport the pollutants which are latter deposited at the river courses thereby, affecting the quality of the water.

The tests include physical (colour, odour, taste, temperature, turbidity, sediment concentrations); chemical (conductivity, hardness, iron, pH total dissolved solids and biological tests (caliform bacteria tests). These analysis were carried out to ascertain the level of impurity, suitability and the type of treatment units required for otamiri river/water samples. The results obtained were compared with the World Health Organization (WHO) standard as presented on Table 4.

Table 1

International standards for drinking water by World Health Organization (WHO)

S/No	Elements	Standard Range mg/l
1.	Magnesium	0 – 150 mg/l
2.	Calcium	0 – 200 mg/l
3.	Iron	0 – 50 mg/l
4.	Manganese	0 – 5 mg/l
5.	Copper	0 – 2 mg/l
6.	Zinc	0 – 3 mg/l
7.	Fluoride	0 – 1.5 mg/l
8.	Chloride	0 – 250 mg/l
9.	Nitrate	0 – 50 mg/l
10.	Nitrite	0 – 50 mg/l
11.	Sulphate	0 – 200 mg/l
12.	Carbonate	0. 120 mg/l
13.	Sodium	0 – 200 mg/l
14.	Total soluble solids	0 – 500 mg/l
15.	pH range	6.5 – 9. 2 mg/l
16.	Microorganism (BOD)	0.2 – 0.5 mg/l

Source: World Health Organization guidelines for drinking water quality. 3rd Edition vol. 1 Recommendations (2004).

Table 2

Results of the Physical tests on Otamiri River

Sample characteristics	Samples					
	A	B	C	D	E	F
Appearance	Mildly coloured	Mildly coloured	Mildly coloured	Mildly coloured	Mildly coloured	Mildly coloured
Odour	Mild	Mild	Mild	Mild	Mild	Mild
Turbidity	Slight	Slight	Slight	Slight	Slight	Slight
Temperature °c	32.6	32.4	32.6	31.9	31.8	32.1
pH	6.4	6.4	6.3	6.2	6.1	6.2
Sedimentation	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

Table 3

Result of the biological and chemical analysis on Otamiri River.

Samples mg/l

S/No	Tests	A	B	C	D	E	F	AV
1.	Bicarbonate	22.2	22.1	22.2	22.3	22.4	22.1	22.2
2.	Calcium	5.0	4.9	4.9	5.0	5.0	4.8	4.9
3.	Carbonate	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.	Carbondioxide	14.7	14.6	14.5	14.6	14.7	14.7	14.6
5.	Chloride	2.3	2.3	2.4	2.3	2.2	2.3	14.3
6.	Conductivity	20.3	20.1	20.2	20.3	20.3	20.4	20.3
7.	Copper	0.1	0.1	0.1	0.2	0.1	0.1	0.1
8.	Iron	0.2	0.2	0.2	0.2	0.2	0.2	0.2
9.	Magnesium	1.5	1.5	1.4	1.6	1.5	1.6	1.6

10	Nitrates	0.47	0.41	0.42	0.44	0.41	0.41	0.43
11	TDS	15.6	15.6	15.6	15.7	15.6	15.5	15.6
12	Hardness	15.1	15.0	14.9	14.9	14.8	14.6	14.6
13	Microorganism (BOD)	3.4	3.2	2.6	2.9	2.9	3.1	4.4

RESULTS

The result of the physical analysis show that all the six (6) samples A-F met the World Health Organization standard in terms of appearance, odour, turbidity etc. The samples were said to be acidic with pH level less than seven (7) while the temperature of the water samples remained high. The rise in temperature shows reduced dissolved oxygen (DO) in the water. Table 3 shows that the level of the total dissolved solids (TDS); hardness and calcium levels were slightly higher as a result of the deposition of foreign materials generated from domestic, commercial and industrial activities in and around Owerri Metropolis.

Similarly, the level of bacteria concentrations was quite higher despite the low level of dissolved oxygen (DO) in the water. Consequently, the river has higher concentration of bacteria and other microbial organisms that can cause bacterial infection and other related diseases when the water is used for both domestic and commercial activities the BOD result is about eight times higher than the biological dissolved oxygen (BOD) as prescribed by the World Health Organization and would require some treatments before uses.

Table 4

Comparison of Otamiri River quality with World Health Organization standard indices

WHO water quality standard (mg/l)	Ca 200	Co ₃ 120	Cl 250	Cu 2	Fe 50	Mn 5	NO ₃ 50	TDS 500	BOD 0.5
Nworie River water quality (mg/l)	4.9	0	2.3	0.2	0.2	1.6	0.4	15.6	4.0

CONCLUSION

The otamir river water samples can be used adequately for agricultural and domestic uses – if some biological treatments are carried out. This will reduce the bacterial and the microbial loads in the water and prevent the spread of communicable diseases when used for the above purposes.

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