Water Pollution and its Effect on Water Consumption in Akure

Imoukhuede O.B[1*], Afuye, G.G.[2]

Department of Agricultural and Bio-Environmental Engineering Technology, Rufus Giwa Polytechnic, Owo, Ondo State, Nigeria.

Abstract— *This research focuses primarily on the causes, consequences and ways of mitigating the ongoing fresh water pollution problems among Akure communities. Surface water quality of River Ala, which cut across the town of Akure was assessed and three locations (3) were chosen spatially to reflect a consideration of all possible human activities capable of changing the quality of river water. Water samples were analyzed for physio-chemical parameters and it was observed that variations exists in the quality of the sampled waters and impaired to different degrees using WHO drinking water standards for the selected parameters. Leo road (Ala 3) has the highest dissolved solids, which shows that the dumping of waste to the water bodies might have caused the higher occurrence; the* P^H *was low in Ala 3 and high in Ala 1 (Oke-Ijebu) with 6.9 and 7.4 respectively. The water is coloured, total alkalinity total hardness, iron and turbidity were found to be above the WHO standard, therefore not suitable for domestic use.*

Keywords— River Ala, Water Pollution, Waste, Water Quality, Domestic Purposes.

I. INTRODUCTION

Human and industrial activities result in the discharge of various pollutants into the aquatic environment (water) threatening the health of the population and damaging the quality of the environment by rendering water bodies unsuitable. Water pollution is a major problem in the global context (Yang *et al*, 2004). It has been suggested that is the leading worldwide cause of death and diseases, and that its accident for the death and diseases and accounts for death and more than 14,000 people daily (World Bank, 1990). Surface water pollution could threaten human, animal and ecosystem (Adamu Mustapha and Balabe Usman (2014).

In addition to the acute problems of water pollution in developing countries, industrialized countries continue to struggle with pollution problems as well (Sachez-choliz and Daurtz, 2005). Water is typically referred to as polluted when it is impaired by anthropogenic contaminants and either does not support a human use like serving as drinking water and or undergoes a market shift in its ability to support its constituent biotic communities such as fish, natural phenomena such as volcanoes, algae blooms, storms and earthquakes also causes major changes in water quality and the ecological status of water (Farid, 2002).

The new research concerning lead levels in drinking indicates that lead levels in our drinking water continue to be too high and may be more harmful than previously thought (FEPA, 1991). Drinking water quality criteria should be based on documented health effects research consumer acceptance, demonstrated treatment techniques and effective utility management. The minimum criteria should be as defined by federal, state and provincial regulations that take into account appropriate health and cost considerations (Everpure, 1997). Water pollution or contamination also places other resources at risk, fisheries and land resources for example, has already been affected significantly. Contribution to water pollution include substance drawn from the air, silt from soil erosion, chemical fertilizers and pesticides, run-off from septic tanks, outflow from livestock feed lot, chemical waste (some toxic) from industries, and sewage and other urban wastes, from cities and towns (Fewtrell and Clofford, 2004).

Contaminated storm water washed of parking lots, roads and highways, called urban runoff, is sometimes included under the category of non point source pollution. (Hung and Shaw, 2004, Khan, 1997) example of point sources pollution (pipe or ditch) include discharges from a sewage treatment plant, a factory or a city storm drain (Harrington *et al*, 1989; Hertz-Picciotto *et al*, 2000). Oils and anti-freeze leaked from vehicles also pollute water. Children and new born babies are mostly affected by the consequences of water pollution which can be seen from the high infant mortality rate in the country (Ilegbodu *et al*, 2007). On the other hand, Jimoh *et al*, 2007 declared that health deteriorations have seriously been raised due to persistence human and animal productivity declination. Some industrial facilities, generates ordinary domestic sewage which can install a pre-treatment system to remove the toxic components and then send the partially treated wastewater to the municipal system or industries generating large volumes on site treatment systems (Esrey *et al*, 1991). Waste management has become increasingly complex due to the increase in human population, industrial and technological revolution (Akinbile and Yussoff (2011).

II. MATERIALS AND METHODS

Akure, the capital city of Ondo State, Nigeria is the study area which falls between longitude 5^0 06^1E and 5^0 38^1E and latitude 7^0 7^1N and 7^0 37^1N. River Ala with total length of about 57km has a length of 14.8km within AKure Township; it took its source from Northwestern part of Akure and flow towards southeastern part of the town. The water samples was collected along river Ala, in three (3) different locations during the rainy season between October and November 2012 and analyzed. The locations area named Ala, Ala 2 and Ala 3.

The equipments used include simple (In Situ) and basic to more complex parameter (laboratory), total solid (TS) and Ph were determined in-situ measured with a potable in-situ pH meter. The water samples was collected into clean plastic bottles and labeled; it was collected at about 20-30cm below the water surface at the midstream.

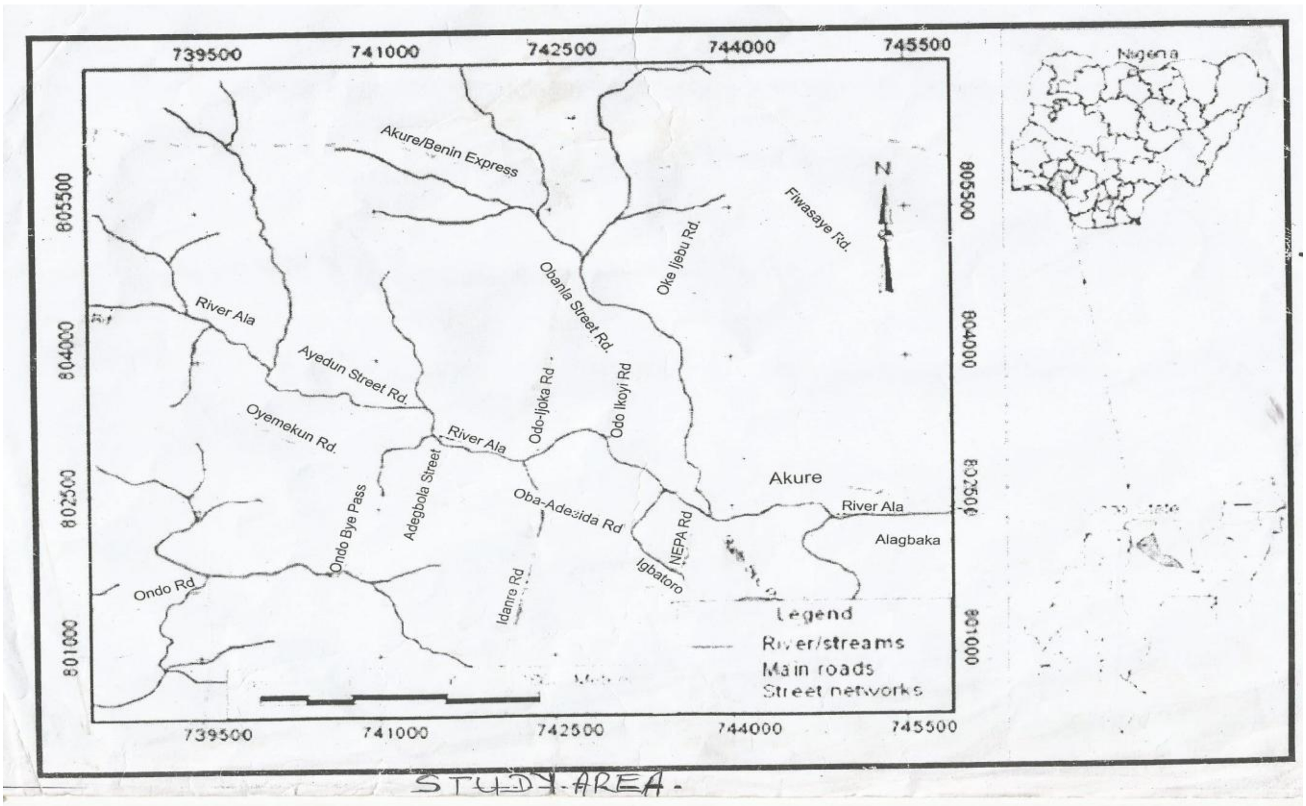

FIGURE 1. BELOW SHOWS THE MAP OF AKURE, INDICATING THE SAMPLING POINTS

III. RESULT AND DISCUSSIONS

Table 1 shows the results of the analysis of the Ala River locations compared with WHO standard. The water quality samples for the three locations appears slightly brownish and coloured which does not conform with the WHO limits of colourless and clear appearance; this might be caused by erosion, the washing away of debris into the river. The turbidity values are of the same range above the WHO limit that is 5.0 for any water sample; this may result from different pollutions from neighbouring area or industries, which have gained entrance into the river. Ala 3 (Leo-road) have the least pH value while (Oke-Ijebu) have the highest with values 6.9 and 7.4 respectively. The reason was that as the water flows from upstream (Leo-road) to down stream (Oke-Ijebu), the water is more polluted because of much debris or run off, that make way into the river (Ala). The pH falls within the WHO limits (6.5-8.5) for any water sample.

From table 1, Leo road (Ala 3) recorded the highest concentration of dissolved solids (DS) of 136 while Oke-Ijebu (Ala 1) has the highest total alkalinity of 162 and Araromi (Ala 2) has the highest total hardness (TH) of 145. The stated values which was discovered above from table 1 shows that the total alkalinity and total hardness fall above the WHO limits which means river Ala is highly polluted. Also, Ala 2 (Araromi) has the highest concentration of calcium and Ala (Oke-Ijebu) the least concentration with values of 120 and 118 respectively. Ala 3 (Leo road) has the highest magnesium concentration while

Ala 1(Oke-Ijebu) has the highest concentration of chloride and iron with 76 and 0.35 respectively, the three locations have uniform concentration of manganese with values of 0.1. Comparing these values with the WHO standard, it was observed that Ala river is highly polluted and not suitable for domestic use.

TABLE 1
TOTAL RESULTS OF WATER QUALITY OF RIVER ALA WATER SAMPLE POINTS

S/N	TEST	Ala 1 Oke-Ijebu	Ala 2 Araromi	Ala 3 Leo Road	Mean Value	Standard Deviation	Coefficient of Variation	WHO Rec. Limits
1.	Appearance	Slightly	Slightly	Slightly	-	-	-	Clear
2.	Colour	Brownish coloured	Brownish coloured	Brownish coloured	-	-	-	Blankess
3.	Turbidity (NTU)	12.6	12.4	12.0	12.33	0.24	1.94	5
4.	Conductivity	$0.18x10^3$	$0.17x10^3$	$1.9x10^3$	$0.75x10^3$	$0.8x10^3$	1.08	$1.0x10^3$
5.	P^H	7.4	7.2	6.9	7.16	0.20	2.79	65-8.5
6.	Dissolved solid ppm $Caco_3$	135	133	136	134.6	1.24	0.92	1000
7.	Total Alkalinity ppm, $Caco_3$	162	160	159	160.33	1.25	0.77	100
8.	Total hardness ppm $Caco_3$	140	145	142	142.33	2.054	1.44	100
9.	Calcium Hardness ppm $Caco_3$	118	120	115	117.66	2.054	1.74	75
10.	Magnessium ppm $Caco_3$	22	20	25	22.33	2.054	9.19	30
11.	Chloride ppm	76	75	71	74	2.16	2.91	250
12.	Total iron ppm Fe	0.35	0.30	0.33	0.32	0.02	6.25	0.3
13.	Manganese	0.1	0.1	01	0.1	0	0	0.1

Figures 2 and 3 shows the comparism of these sampling points with WHO standard.

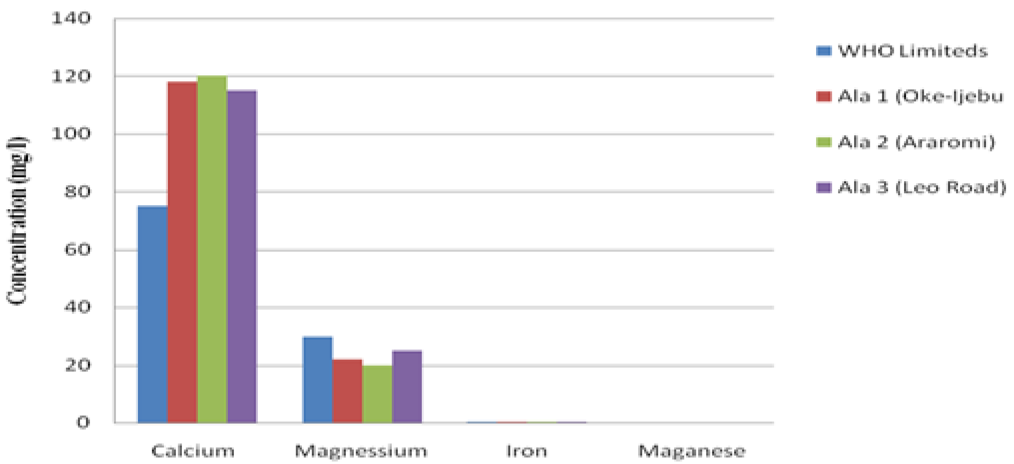

FIGURE 2: CATIONS FOR THE SAMPLING POINTS COMPARED WITH WHO LIMTS

Figure 2 describes the comparism between the sampling points and WHO standard for the cations; for manganese, they all have the same concentration and for total iron, there is little or no variation. Magnesium has variations that are close together but the WHO standard is above it likewise calcium hardness, the three locations have little variations but the WHO limit is below their concentration. Therefore, the water is not suitable for consumption.

Water samples compared to the WHO Standard

Figure 3 show comparism between the sampling points and WHO standard of some physio-chemical parameters and the variations.

Table 1 also shows the standard deviation and the coefficient of variation of the rivers compared to the WHO standard which shows that River Ala is not suitable for drinking and other domestic uses or consumption.

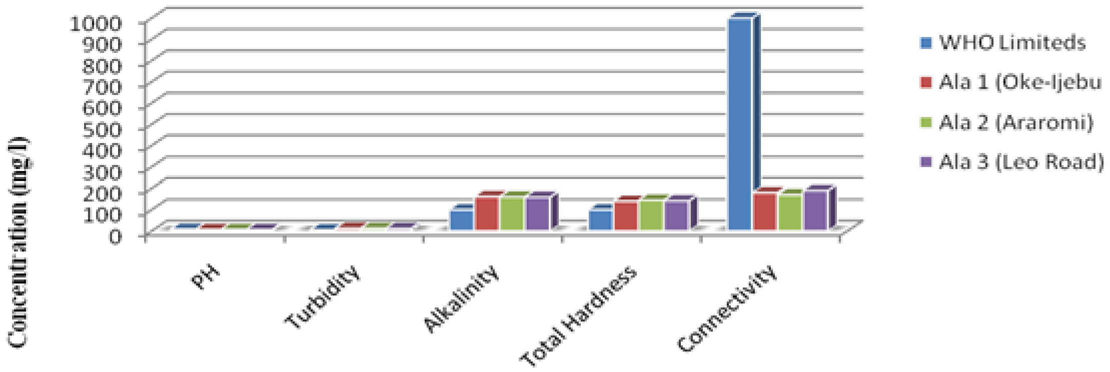

FIGURE 3: PHYSCIO-CHEMICAL ANALYSIS OF WATER SAMPLES COMPARE TO THE WHO STANDARD

IV. CONCLUSION

Based on the analysis of the water parameter using various analytical techniques; it was concluded that, river Ala upstream water quality has degraded beyond reasonable doubt. This may have resulted from domestic and possible industrial wastes that are disposed directly to the river at various locations without treatment due to poor implementation of environmental regulations or improper waste disposal management.

REFERENCES

[1] Adamu Mustapha and Balabe Usman Getso, 2014. Sources and Pathway of Environmental Pollutants into surface water resources: A review. Journal of Environments, Assian online Journal Publishing group. ISSN: 2313-660 X, Vol. 1, No.2, Pg.54-59.

[2] Akinbile, C.O and Yussoff M.S; 2011: International Journal of Environmental Science and Development, Vol. 2, No. 1, ISSN: 2010-0264.

[3] Esrey, S.A, J.B. Potash, I. Roberts and C. Shiff, 1991: Effects of Improved Water Supply and Sanitation on Ascariasis, Diarrhea, Dracuncihasis, hookworm infection, sechistosomiasus and trachoma: Bull, WHO, 69(5): pg 609-621.

[4] Everpure, 1997: Evaluation of Groundwater quality characteristics in Lagos City. Journal of Applied Science, 7(13). Pg. 1780-1784.

[5] Farid, S., 2002: Water Pollution and Its Effects on Human Health in Rural Areas of Faisalabad Pak, Journal of Applied Sciences, Volume 2, No. 8. Pg.822-825.

[6] FEPA, 1991: Guidelines and Standards for Environmental Pollution Control in Nigeria. Federal Environmental Protection Agency, Lagos.

[7] Fewtrell, L and J.M. Colford, 2004: Water, Sanitation and Hygiene: Interventions and Diarrhea. A systematic Review and Meta-Analysis, Water Supply and Sanitation Board. The World Bank Retrieved from:

http/www/worldbank.org/htp/pubsdiscussion/fewtrell&colfordjuly.

[8] Harrington, W.A. Krupnick and W.Spofford, 1989: The economic losses of a water borne disease outbreak. Journal of urban economics, No.25, Pg.116-137.

[9] Hertz-Piccioto I.H.M. Arrighi, and S.W. HU, 2000: Does Arsemic Exposure Increase the Risk of Circulatory Disease? American Journal of Epidemial, 151:174-181.

[10] Hung, M.F. and Shaw, 2004: A Trading-Raton System for Trading Water Pollution Discharge Permits. Journal of Environmental Economy and Management. No. 49, Vol.1: Pg.83-102.

[11] Ilegbodu, V.A, Christatensen, B.L, Wise R.A., Ilegbodu A.E, Kale O.O, 1987: Sources of Drinking Water Supply and Transmission of Guinea-worm Disease in Nigeria, Ann Trop Med. Parasitology, 81(6):Pg.713-718.

[12] Jimoh, H.I and I.P Ifabiyi, 2007: Ilorin, Nigeria Hay Tee Press and Publishing Co.Ltd.

[13] Khan A.W, 1997: Arsenic Contamination in Groundwater and its effect on human health with particular references to Bangladesh. Journal of Preventive Soe. Med. 16(1): 65-73.

[14] Sanchez-Choliz J and R. Duarte, 2005; Water Pollution in the Spanish Economy: Analyst of Sensitivity to Production and Environment Constraints. Ecol; 53(3): 325-338.

[15] World Bank, 1990: Towards the Development of an Environmental Action Plan for Nigeria. Report Number 9002-UNI World Bank, Washington, DC.

[16] Yang, G;C. Gangcai and C. Youngguan, 2004: The Econometric Assessment of Losses by water Pollution in Chongqing, South West China, Chinese Journal of Geoch, 23(1). Pg. 94-100.