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Public Health Implications of ABA River Pollution on Communities in ABA North Abia State Nigeria

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Abstract

Aba river continuously undergoes pollution from effluents from activities around the river and this constitutes a public health hazard. The aim of study is to determine the microbial and chemical pollutants, public health risks and recommend appropriate measures for prevention and control by government. Structured questionnaire was administered to 100 residents, direct plate count, culture and Atomic Absorption Spectrophotometry of the water collected were carried out. (upstream-2B and downstream-1B, all in plain and sterile containers). Results indicated that residents were mainly semi-literate (52%); business and petty traders (80%) with low income. The water from Aba River is used for drinking, washing, cooking and other domestic activities; 54% residents were females and 46% men and the age bracket of 21years to 50years were predominate in the area, hospital visits and bills in last 12 months were high due to typhoid, malaria, diarrhoea, worm infestation and food poisoning, no free medical care by government or surrounding industries; microbial analysis and count from the upstream water prior to discharges showed E.coli count of 7.0 cfu/mLand downstream count showed E.Coli count of 197 cfu/mL indicating heavy microbial pollution; chemical analysis showed an increase in organic analytes of Aluminium 355 mg/L, Arsenic 11 mg/L, Iron 301 mg/L, Lead 8 mg/L, Manganese 13 mg/L, Nickel 11 mg/L, Selenium 280 mg/L, Ammonium 0.35 mg/L, Benzene 1.7 mg/L, Pesticides 0.08 mg/L, Polycyclic Aromatic Hydrocarbon 1 mg/L with a conductivity of 2800 ms/cm which are higher than the standard. Conclusion: Aba River is highly polluted and unfit for drinking or domestic use.

Keywords*: Aba River, pollution, Public Health implication.*

Introduction

Water is an essential part of the human body and its usefulness outside the body cannot be overemphasized. It is essentials that good and standard quality water be utilized both for drinking and other essentials uses. The Aba River popularly known as “water Side” is located in Aba North Local Government Area of Aba city in Abia State. Nigeria. It is a tributary of the Imo state River. The Aba River runs through different communities in Aba North Local Government with its headquarters in Eziama Urrata with an estimated population of about 107,488 (NPC, 2006) with an area of 23km^2. The communities residing nearest to the Aba River (water side) are Ogbor1, Ogbor 11, Emelogor, Ohuru Egbelu, and Umuola okpu’ umuobo communities.

These communities have no potable drinking water, no access roads and utilize the Aba River for drinking, washing, bathing cleaning as evidenced in their responses to administered questionnaire etc. In the absence of good quality water, rivers are the cheapest form of water supply (Amadi *et al*, 2010) the continuous activity of abattoir and industries located around Ogbor hill has aggravated the pollution in Aba River as it forms the effluent discharge.

Heavy metals are pollutants with great health consequences (Jumbe and Nandini, 2009). The Aba River has a history of long-term pollution from surrounding abattoir and dump sites with untreated cow dung, animal’s carcases, burnt tyres for roasting hides, defecation by humans, industrial waste water and chemical, accidental spills and solid waste refuse dumping by residents. Due to poor sanitation habits of the populace and non-compliance to sanitation laws by the people of Aba with lack of enforcement. It is pertinent to now examine the public health implication of the pollution in Aba River.

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Materials and methods

A structured questionnaire was deployed to the five communities and administered to 100 residents, the survey tool covered biodemographics of the study area. Samples of Aba river water was collected (upstream) with less effluents (labelled 2B) downstream where much of the effluents and discharges occur (labelled 1B) in sterile container and transported to the laboratory for analysis. Microbial analysis /count was conducted on samples 1B and 2B using the Direct Plate Count method and chemical analysis was conducted on both sample 1B and 2B using the Atomic Absorption Spectrophotometry method.

Inclusion criteria

The inclusion criterion was based on the communities that live along the river banks and utilize the Aba river water for drinking and other domestic chores.

Informed consent

The consent of the participants and community was got through advocacy visit and explanation of the health hazard to the community chiefs who approved the participation of the people in the survey.

Data collection

The closed and open-ended questionnaire was administered to 100 participants at their residents, some in English language and others in local languages. The water samples were collected in plain and sterile containers and sent to the laboratory for analysis immediately.

Statistical analysis

The data was analysed using SPSS software version 2.1. Results were presented in tables and figures.

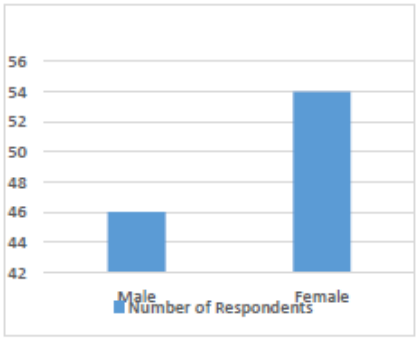
Result

The bio-demographic result indicated; respondent rate of 82%, more female(54%) than male(46%), mostly adult of 21-50 years of age, low academic attainment of 74%, private or petty business dealers(80%) and few government workers and students, 65% earn less than ₦31,000 monthly, all residents of the study area(Ogbor 1, Ogbor 11, Emelogu, Ohuru-Egbelu and Umuola-Egbelu) use water from the Aba River for drinking and other domestic chores, hospital visits and bills in last 12months were high due to typhoid, malaria, diarrhea, worm infestation and food poisoning with absence of free medical care by the government or surrounding industries(See Figures 1-13 and Table 1 below).

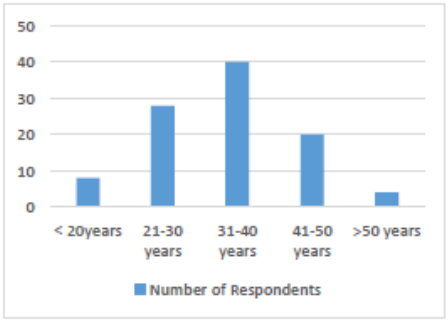
Microbiological analysis result of the both the downstream and upstream of the Aba River indicated growth of *Echerichia coli and* highcoliform count (Table 2 below) while the chemical analysis result indicated inorganic and organic analytes at levels higher than the minimum detectable levels (Table 3 below).

Figures and tables

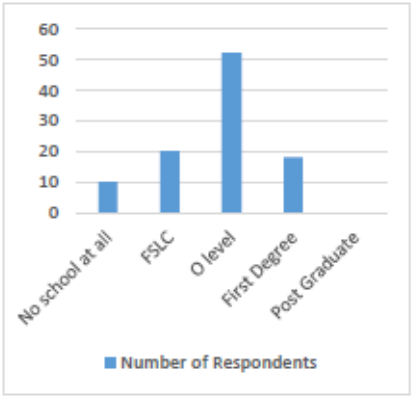
1.Gender of respondent



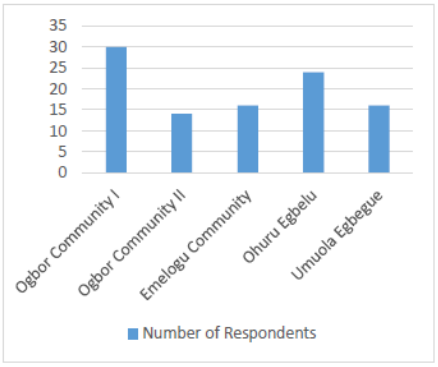
2. Age of respondents



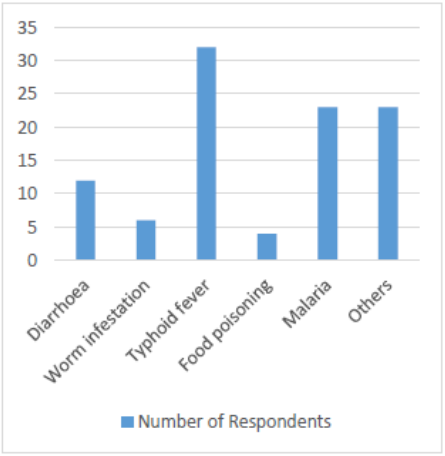
3. Academic attainment



4. Local Government You reside in



5. What was the diagnosis from the hospital V?



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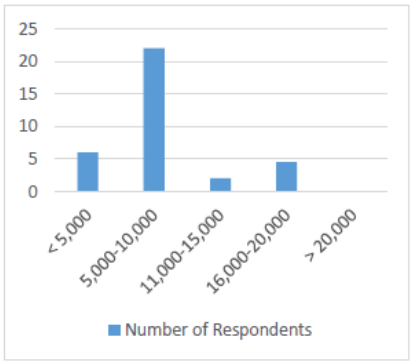
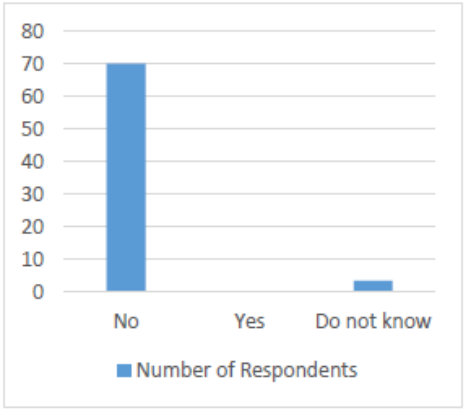
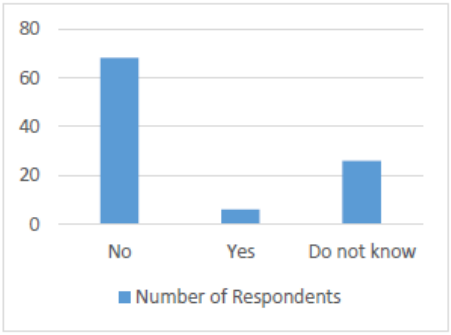
6. How much have you spent on treatment since the last 12 months?



7. Do the industries within the waterside



12. Do Abia state Government provide free provide free medical care to people in the environment medical care to people in your community?



Figures 1-13. Bar Charts of bio-demographic characteristics

Table 1. Respondents bio-demographic characteristics

Bio-demographic Characteristics	Results
Respondent Rate	Respondents (82%), No Response (18%)
Gender	Male (46%), Female (54%)
Age (Years)	Mostly adults (21-50)
Academic Attainment	No School at All (10%). First School Leaving Certificate(20%), O-Level (54%), First Degree(16%)
Communities in Study Area	Ogbor 1(30%), Ogbor 11(14%),

	Emelogu (16%), Ohuru-Egbelu (24%), Umuola-Ebgelu (16%)
Careers	Private Business (80%), Schooling (14%), Government Workers (6%)
Average Monthly Income	<₦31,000(65%), >₦31,000(35%)
Use of Water from Aba River	Domestic Use (60%), Drinking (40%)
Hospital Visits Due to Illness last 12Months	<Twice (40%), >Twice (35%), No Visit At All (25%)
Hospital Diagnosis Last 12Months	Typhoid (32%), Malaria (23%), Diarrheoa (16%), Worm Infestation (6%), Food Poisoning (3%), Others (20%)
Hospital Bills Spent Last 12Months	<₦10,000(30%), >₦10,000(70%)
Presence of Free Medical Care by Government or surrounding Industries	No (70%), Yes (5%), Do Not Know (25%)

Characteristics results are presented percentage (%) and ₦ =Nigeria Naira.

Table 2. Microbial analysis and culture of aba river water

PROPERTIES	SAMPLE 1B	SAMPLE 2B
Appearance	Colourless and clear	Colourles and Clear
pH	6.0 (Acidic)	5.0(Acidic)
Culture after 24hours Incubation at 37^0C	*Echerichia coli*	*Echerichia coli*
Mean Colony Count (cfu/mL)	197	7

Sample1B (Downstream), Sample 2B (Upstream)

Table 3. Chemical analysis of aba river water

PHYSICAL FACTORS	STANDARD	MINIMUM DETECTABLE LEVEL	SAMPLE 1B	SAMPLE 2B
Colour(mg/L,pt/Co)	20	-	22	16
Turbidity (NTU)	4	-	7	5
pH	6.5-9.5	-	6.12	5.05
Conductivity (µs/cm at 20^0C)	2500	-	2800	2550
Total Coliform per 100mL	0	-	7	8
INORGANIC ANALYTES				
Aluminium (µg/L)	200	100	355	215
Arsenic (µg/L)	10	0.5	11	9
Calcium (mg/L)	-	2.0	3.00	3.45
Iron (µg/L)	200	100	301	250
Lead (µg/L)	10	0.5	8	6
Manganese (µg/L)	50	0.4	13	6
Nickel (µg/L)	20	0.2	11	10
Selenium (µg/L)	10	0.5	13	4
Sodium (mg/L)	200	100	280	271
Ammonium (mg/L)	0.5	0.1	0.35	0.55

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Chloride (mg/L)	250	5.0	265	280
Flouride (mg/L)	1.5	0.1	1.0	1.2
Nitrate(mg/L)	50	0.5	65	52
Nitrite(mg/L)	0.5	0.05	0.4	0.5
Sulphate(mg/)	250	5.0	214	200
ORGANIC ANALYTES				
Benzene(µg/L)	1.0	0.5	1.7	1.1
PVCas Vinyl Chloride (µg/L)	0.5	0.1	0.55	0.5
Pesticides (Aldrins, Dieldrins,etc.) (µg/L)	0.03-0.1	0.001	0.08	0.05
Polycyclic Aromatic Hydrocarbon(µg/L)	0.1	0.01	-	1.0

Sample1B (Downstream), Sample 2B (Upstream).

Discussion

Many researchers emphasized the impact of poverty and deprivation on living conditions (Muntaner, Lynch and DaveSmith,2001) while the work of Lynch *et al* (2000), Kawachi (1997) and Wilkingson (1996) focused more on the effects of inequality on a given society. The analysis of this study showed that really, there was deplorable socioeconomic conditions in the study area. In the results as presented in tables 1-3 and figures 1-13, more females, 54% and men, 46% were residents of the communities around the waterside(Aba River) and the age bracket of 21years to 50years were predominate in the area with low academic attainment as the majority of 74% were ordinary level certificate and residents were mainly semi-literate (52%); business and petty traders (80%)with low income and use the water from Aba River for drinking, washing, cooking and other domestic activities; hospital visits and bills in last 12 months were high due to typhoid, malaria, diarrhoea, worm infestation and food poisoning, no free medical care by government or surrounding industries. These buttress the work of Berhardt, Ingram and Makuc *et al* (2000) which emphasised that economic resources, level of income and education, access to health care, and environmental quality could contribute to the health of people and communities.

The microbiological analysis and count in sample 1A downstream showed a colony count of *E. coli* 197cfu/ml while sample 2A upstream had a count of 7.0cfu/ml which is far above the standard and agreed with the work of Ibekwe, Ewelike and Amajuoyi (2006) and Ezeama and Nwankpa (2002) who reported same high Coliform count of *E. coli* when they conducted microbial analysis of the Aba River in their study.

Umunnakwe and Akagha (2013) and Ezeronye and Ubalua (2005) in their work, reported organic and inorganic contamination of the Aba River which supported the result of this study where inorganic and organic analytes were far above the minimum detectable level but disagreed with works of Richards and Shieh (1986) and Hannah *et al* (1986) who reported that priority pollutants and other potentially toxic organic compounds in wastewater were removed in industries treatment plants. The presence of high Coliform count, *E. coli*, inorganic and organic analytes in the Aba River did not agree with WHO (2011) which reported the required standards for drinking water and domestic use and therefore calls for proper waste treatment in order to avert inherent emerged and re-emerging public health threat from the study area.

Considering the health implication of some of these chemical analytes: long term exposure to arsenic in drinking water could cause cancer in the skin, lungs, bladder and kidney (Calvin *et al*, 2014 and Barry and Williams, 2013). The likelihood of effects is related to the level of exposure in areas where drinking water is heavily contaminated (Walker and Walker, 2016), as in this study. Aluminium exposures during neonatal and paediatric parenteral nutrition could impair bone mineralization and delay neurological development (Calvin *et al*, 2014), iron excess is delivered to

generate oxidative stress and shifts the immune-regulatory balance producing severe, deletions physiological effects (Puntarulo, 2005).Also, Iron overload effect include decreased antibody mediated and mitogen stimulated phagocytosis, alteration in T-lymphocyte subsets and modification of lymphocyte distribution in immune system (Walker and Walker, 2016). Just as reported in this study, Lead poisoning causing symptoms of the central nervous system like insomnia, delirium, cognitive deficits, tremor, hallucinations and convulsion were reported by Mgbemena, (2014). According to Barry and Williams (2013),

manganese could damage the nervous system and respiratory tract as well as irreversible parkinsonian-like syndrome. Epidemiological studies and case reports have shown that chronic exposure to selenium compounds is associated with adverse effects on endocrine function particularly synthesis of thyroid harmonies following dietary exposure of around 300micrograms and impairment of natural killer- cells activity.Nail and hair loss. (Marco *et al*, 2001). While eating too much sodium could cause high blood pressure especially later in life osteoporosis, nerve problems (Sally, 2007). Ammonia on its own, had been reported to cause health effects like scratchy throat, chest tightness, cough, dyspnoea, eye irritation and Nickel implicated in skin allergies, lung fibrosis and cancer of the respiratory tract (Mgbemena,2014).

Conclusion

The analysis of the public health implication of Aba River (Waterside) pollutants had yielded empirical evidence that the water which the Aba North communities living by the river banks consume and utilize in domestic chores are highly polluted and not fit for use. It is also evident from the study that both surrounding industries and government had not contributed towards the provision of safe drinking water, clean environment or free medical care and health education. Prevention is safer than cure and thus there is need for urgent intervention to protect surrounding communities in Aba river from epidemics which may be eminent.

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