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Water Quality Assesment and Health Risk Implications on Residents of Diobu, Port Harcourt Metropolis

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Abstract: The study interest was to ascertain the quality of water in the area and its influence of disease incidence. To achieve this, water quality analysis was also done for three water samples which were collected from public water boreholes. The parameters of interest to the study are pH, Total Dissolved Solids, E.coli, Total Heterotrophic Bacteria, Total Coliform Count, Chromium, Nickel, Cadmium and Lead, all these parameters were tested using standard operating procedure in line with World Health Organization (WHO) standards. The study showed that the quality of the water in the area is poor and polluted and hence possess great danger to life especially children and the aged. The study recommended that water regulatory authorities if not in place should be set up primarily to ensure water facility provision and maintenance in the area. Residents as well should be encouraged to boil their water before consumption as a measure to curtail the spread of water borne disease which is evident in the area.

Keywords: Assessment, Water, Water Quality, Health, Risk, residents

Introduction

Poor water quality is a global problem placing individuals (humans) with the risk of chemical elements intoxication due to poor environmental practices in our economic activities such as mineral resources mining and agricultural practice and processes (Hughes and Koplan, 2005). Therefore availability and accessibility to safe drinking water plays an important role in human life in relation to health. Recently, the United Nations (UN) stated

that safe and clean drinking water is a human right. Therefore, the UN declared "Water for life" program in the period from 2005-2015 and made one of the targets of the millennium development goals that shall be achieved by 2015 was halving the number of people without proper access to safe water and basic sanitation (Bloomfield, 2012; WHO, 2011).

Even though this target was already achieved in 2010 (88% of the global population had access to improved drinking water source), still about 748 million people lack access to improved sources of drinking water. Of these people, about 173 million get water from untreated surface water and more than 90% live in rural areas. So one of the big problems now is to overcome the gap of proper drinking water supply between urban and rural area (WHO, 2014).

Although drinking water coverage has increased worldwide, access to reliable water quality is still a challenge. Poor water quality bears the risk to transport and spread diseases related to water. The problem may not be limited to untreated surface water, but may also arise from improved water sources with poor water quality. WHO (2014) stated that there was no assurance that people who get water from an improved source will get it free of contamination. One of the studies also showed that about 1.8 billion people get water from a source that is already faecally contaminated, which can cause cholera, enteric fever, and many other acute and chronic diseases (Szabo and Minamyer, 2014). It is an obvious fact that health is wealth; this implies that the health condition of a person or group of people depends greatly the quality of water that there consume and thus contributes greatly to the determination of the health status of the people.

Study Area

Diobu is located in Port Harcourt City Local Government Area (PHALGA) of Rivers State in Nigeria. It is a densely populated neighborhood consisting of mile 1, mile 2 and mile 3 with streets scattered in it. It houses two major markets in Port Harcourt; the Mile one and Mile 3 markets as well as the famous Ikokwu spare parts market and the mile 3 timber market. It is the hub of commercial activities in Port Harcourt.

Diobu is bordered by New G.R.A to the East, D/Line to the North-East, Rivers State University to the North-West, Old G.R.A to the East, Kidney Island to the South East and Eagle

Island to the South-West. Diobu is located on Latitudes between Latitudes between 4^0 47' 24" N and 4^0 49' 00" N; and longitudes between 6^0 59' 00" E and 7^0 01' 00"; with an elevation of 468m.

The area has the same weather condition like Port Harcourt as a region the climatic condition is the tropical climate (Osuiwu and Ologunorisa, 1999). Diobu features a humid tropical climate with rainfall starting from the month of February through the month of November, while only the months of December and January truly qualifies as dry season months in the city. Rainfall is seasonal, variable, and heavy in Diobu. The mean annual temperature for Diobu is 26°C just as the case of Port Harcourt. The hottest months in Rumuagholu community are February to May. Relative humidity is high in the area throughout the year and decreases slightly in the dry season (Salau, 1993) as cited in Chukwu-Okeah, (2012).

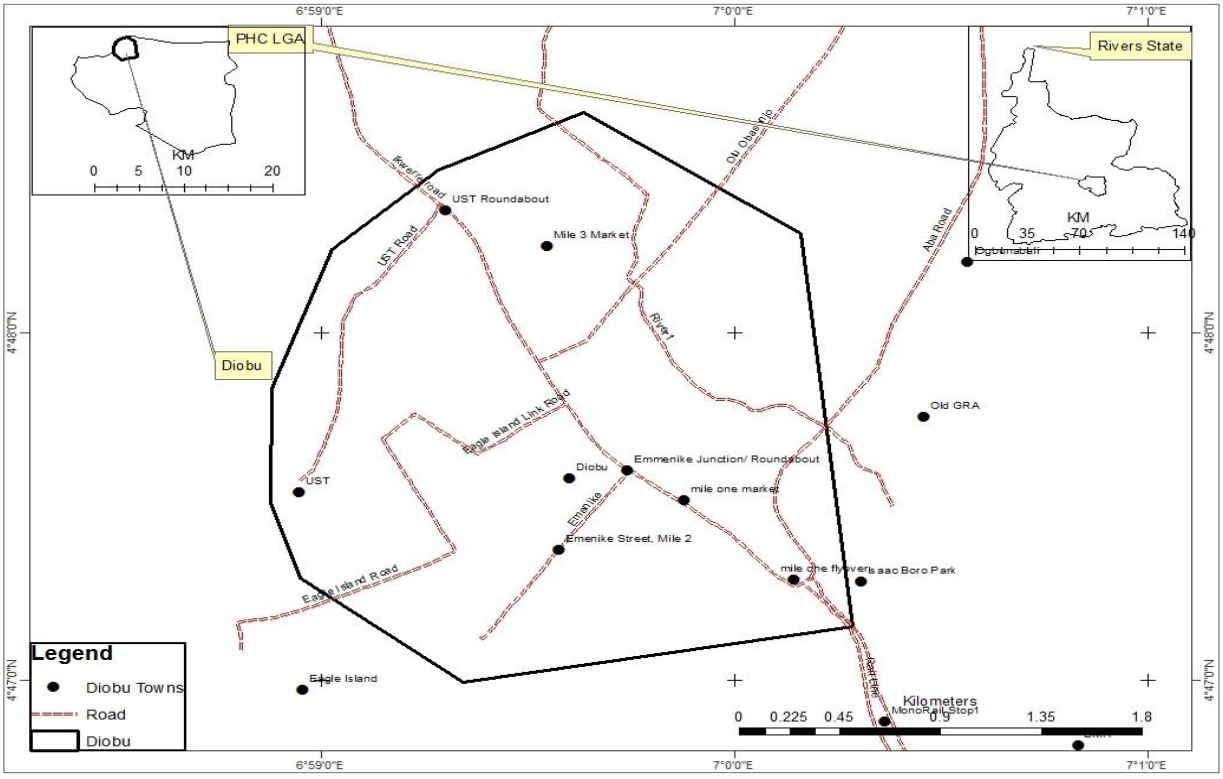

Fig 1.1: Port Harcourt City L.G.A Showing Diobu

The area lies on the recent coastal plain of the eastern Niger Delta. Its surface geology consists of fluvial sediments. It is topographically unique and it is located within the coastal plains which by its structure are of the sedimentary rocks of the Agbada formation of the Niger Delta. Diobu was originally occupied by rainforest but this has been drastically modified by human activities. In terms of general surface features, the area is very unique, the area falls within the coastal belt dominated by low lying coastal plain which belongs to the structural sedimentary formation of the recent Niger Delta.

Materials and Methods

This study adopted the use of the quasi- experimental research design. Since the study area comprised of three major locations which are mile 1, 2 and 3 areas of Diobu, in order to understand the status of ground water in the study area. Three water samples were collected from three public boreholes where water was sold to the public in the area. The first was at Afikpo Street, next at Gambia and the last at Wobo Street.

This was done with the aid of clean plastic bottles of 500ml and 100ml capacity for physicochemical analyses. These bottles were first washed with distilled water and then with the sample water then filled with the same water. The collected samples were subjected to water quality analysis as a determinant to quality health in the area. The parameters of interest are pH, TDS, E.coli, Total Heterotrophic Bacteria, Total Coliform Count, Chromium, Nickel, Cadmium and Lead; all the parameters were tested using standard operating procedure in line with World Health Organization standards.

Results and Discussion

The results of the water quality analysis of collected water samples in Diobu area of Port Harcourt City Local Government Area is shown in table 1.

Table 1: Water Quality Result for Diobu Public Borehole

Location / Parameters	Mile 1	Mile 2	Mile 3
THB (cfu/ml)	8100	576	9801
TCC(cfu/ml)	Nil	3025	8281
E.coli (per 100ml)	Nil	121	484
pH	4.5	4.3	5.2
TDS (Mg/l)	30.00	40.00	20.00
Cr (Mg/l)	ND	ND	ND
Pb (Mg/l)	ND	ND	ND
Ni (Mg/l)	ND	ND	ND
Cd (Mg/l)	ND	ND	ND

Table 1 above shows the result of the water quality from the sampled public bore holes in the area. Nine parameters on the whole were analyzed and the report showed that mile one public borehole had a THB value of 8100 (cfu/ml), 576 (cfu/ml), in Mile 2 public borehole and 9801(cfu/ml), in mile 3 public borehole.

Total coliform count (TCC) as shown had no value from the Mile 1 public borehole, in mile 2 public borehole it had 3025 (cfu/ml) and 8281 (cfu/ml), in the Mile 3 public borehole. E.coli as shown had no value from the Mile 1 public borehole, in mile 2 public borehole it had 121 (cfu/ml) and 484 (cfu/ml), in the Mile 3 public borehole. pH value of the water samples analyzed in the study showed that all the water samples tested were in the range 4.5, 4.3 and 5.2 for mile 1, 2 and 3 sample locations respectively.

Total dissolved solids in the water samples showed that in mile one public borehole, it had a value of 30.00mg/l, in mile two public borehole it had 40.00mg/l and in the mile three public borehole it had 20.00mg/l. Analysis also revealed that Chromiun, Nickel, Cadmium and Lead showed non detectable, the water samples which implies their absence in the public boreholes.

Table 2: Result of Water Quality of Public Boreholes in Diobu and WHO Standard

Location / Parameters	Mile 1	Mile 2	Mile 3	WHO
THB (cfu/ml)	8100	576	9801	100
TCC(cfu/ml)	Nil	3025	8281	10
E.coli (per 100ml)	Nil	121	484	0
pH	4.5	4.3	5.2	6.5-8.5
TDS (Mg/l)	30.00	40.00	20.00	500
Cr (Mg/l)	ND	ND	ND	0.05
Pb (Mg/l)	ND	ND	ND	0.05
Ni (Mg/l)	ND	ND	ND	0.05
Cd (Mg/l)	ND	ND	ND	0.01

Table 2 above presents the water quality analysis report and the World Health Organization standard for water quality. From the table it is observed that total heterotrophic bacteria in all the sampled water are higher than the WHO permissible limit of 100cfu/ml with the water sample from mile 1 account for THB value of 8100 cfu/ml, mile 2 accounting for 576 cfu/ml and mile 3 accounting for 9801 cfu/ml. This indicates the presence of pollutants in the water samples of the various public boreholes.

Total Coliform count as observed in table 2 shows that the water samples from Mile 2 and Mile 3 public bores holes contains values of TCC higher than the WHO acceptable limits. The water sample from mile 2 public borehole had a value of 3025 cfu/ml and the water sample from Mile 3 a value of 8281 cfu/ml which are both higher than the WHO permissible limit for water quality.

E.coli as observed is within the WHO permissible limit for water quality. The pH of the water samples from the three sample location indicates that there are all not within the WHO permissible limit for water quality. Water sample in mile 1 had a pH value of 4.5, mile 2 had a pH value of 4.3 and Mile 3 had a pH value of 5.2. The water samples tested indicates that the water from the three sampled public boreholes is acidic.

Total Dissolved Solids as shown on table 2 shows that the TDS value of the water samples from the three public boreholes are within the WHO permissible limit for water quality. The water sample from the mile 1 public borehole had a TDS value of 30mg/l, mile 2 a TDS value of 40mg/l and Mile 3 a TDS value of 20mg/l. The case of the heavy metals tested

showed that all were found to be non detectable in the water samples from the different public boreholes in Diobu Port Harcourt.

Discussion of Findings

The water quality result revealed that total heterotrophic bacteria in all the sampled water are higher than the WHO permissible limit of 100cfu/ml with the water sample from Mile 1 account for THB value of 8100 cfu/ml, Mile 2 accounting for 576 cfu/ml and Mile 3 accounting for 9801 cfu/ml. This indicates the presence of pollutants in the water samples of the various public boreholes. The implication is they may be health implication on the residents especially children. The America research based learning network (2010), in Ojukwu (2013) opined that the presence of heterotrophic bacteria in drinking water is not an indication that the water presents a health risk, rather high concentration of THB may be an indicator of poor general biological quality of drinking water (USEPA, 2003) in Ojukwu (2013).

Total Coliform count as observed shows that the water samples from Mile 2 and Mile 3 public bores holes contains values of TCC higher than the WHO acceptable limits. The water sample from Mile 2 public borehole had a value of 3025 cfu/ml and the water sample from Mile 3 a value of 8281 cfu/ml which are both higher than the WHO permissible limit for water quality.

This agrees with the work of Ojukwu, (2013) where the America Research Based Learning Network (2010), states that the nearness of fecal coliform microscopic organisms in drinking water is a solid sign of ongoing sewage or creature squander sullying, which ought to be translated as a sign that there is a more serious hazard that pathogens are available. Microorganisms in these waters may cause momentary impacts, for example, looseness of the bowels, spasms, sickness, cerebral pains or different side effects, just as possibly present long haul wellbeing impacts. They may represent an extraordinary wellbeing hazard for newborn children, youthful youngsters, a portion of the old and individuals.

E.coli as observed is within the WHO permissible limit for water quality. The pH of the water samples from the three sample location indicates that there are all not within the WHO permissible limit for water quality. Water sample in mile 1 had a pH value of 4.5, mile 2 had a pH value of 4.3 and Mile 3 had a pH value of 5.2. The water samples tested indicates that the water from the three sampled public boreholes is acidic and, in some instances, pose as a threat to human health and wellbeing.

Total Dissolved Solids as shown on table 2 shows that the TDS value of the water samples from the three public boreholes are within the WHO permissible limit for water

quality. The water sample from the mile 1 public borehole had a TDS value of 30mg/l, mile 2 a TDS value of 40mg/l and Mile 3 a TDS value of 20mg/l.

Conclusion

It is concluded from this study that the quality of the water in the area is poor and polluted and hence possess great danger to life especially children and the aged. This however explains that there are possible health risk implications from the consumption of the water available to the residents which could further lead to the outbreak of waterborne diseases outbreak. It was also discovered that within the study area, water facilities available to the residents of Diobu are also in a dilapidated state, hence not able to meet international set standards for quality water provision.

Recommendations

Water regulatory authorities if not in place should be set up primarily, to ensure water facility provision and maintenance in the area.

Personal hygiene should be encourage and maintained by residents to forestall the outbreak of diseases.

Residents should be encouraged to boil their water before consumption as a measure to curtail the spread of water borne disease which is evident in the area.

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