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Implications of Improper Sewage Management on Public Health: A Case Study of Kosofe Local Government Area, Lagos State

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Abstract

Sewage management and its implications on public health remain one of the major challenges of urbanisation faced by developing countries such as Nigeria. As a member of the United Nations (UN), Nigeria is actively involved in ensuring achievement of the Sustainable Development Goals (SDGs), especially those that have direct impact on human health and liveability of dwellings in urban and peri-urban settlements. The sanitary state of an area is largely influenced by the waste handling practices of residents and involves measures for safe waste evacuation and disposal. This study examined sewage management in the low-income settlement of Agboyi-Ketu, Lagos State. In the sampling area, 21 streets were selected using a stratified sampling technique while 105 buildings were chosen via systematic sampling, after which copies of an interview-administered questionnaire were distributed to respondents. It was found that most of the buildings erected close to the nearby water body did not have septic tanks but had either a pit toilet or a non-functional water closet. Some residents openly defecated into the nearby stream and a number of households with septic tanks disposed their sewage in the stream through sewer pipes, thereby polluting the water. Microbiological analyses were carried out on water samples collected from the area (ground water and surface water) to ascertain their level of potability. It was observed that the underground water and surface water samples were highly contaminated with enteric microorganisms such as *E.coli, Klebsiella spp, Pseudomonas* spp and *Saccharomyces spp,* thus making such water unfit for drinking. The study therefore suggests that more efforts should be made to ensure proper sewage disposal in the area to reduce the negative environmental health impacts for which the majority of residents are responsible. If the situation is addressed, then SDG 3 will be attained, i.e., to ensure healthy lives and promote well-being for all at all ages. There will be a reduction in the spread of infectious and communicable waterborne diseases such as tuberculosis, malaria, cholera, hepatitis A, leptospirosis, and typhoid fever. It is also expected that by 2030, SDG 11—making cities inclusive, safe, resilient and

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sustainable—will be achieved, thereby reducing the adverse per capita environmental impact of cities by paying special attention to municipal and other forms of waste management in cities such as Lagos.

Keywords: Sewage, Water, Urbanisation, Sanitation, Environmental health

1. Introduction

Improved sanitation and good hygiene is very important for child survival, socioeconomic development and the well-being of every society (Bartram & Cairncross,2010; Spears, Ghosh & Cumming 2013). Sanitation delivery in the low income urban areas of African countries has been a difficult problem to address, was missed by a wide margin and witnessed almost no improvement under the Millennium Development Goals (MDGs) (Buckley & Kallergis, 2019). Access to improved sanitation especially by the urban poor settlements in Nigeria has declined over time, with Nigeria being ranked among countries with the highest number of people practising open defecation. The country's figures stand at an estimate of over 46 million people without access to improved sanitation (WSP, 2012). This practice has had a negative effect on the health of the populace, especially children, and has contributed to the country's failure to meet the MDG-7 target on sanitation (Baum, Luh, & Bartram 2013). Studies have shown that a large part of the malnutrition burden owes to the unhygienic environment in which children grow up. One of the major reasons for iron-deficiency anaemia among adolescent girls and young mothers is found to be worm infestation that is attributed to open defecation (Abubakar, 2018).

Indeed, the impact of inadequate sanitation on the health of people in general and children in particular is now well known. Diarrhoea, a disease directly attributed to water, sanitation and hygiene, is the second largest killer of children below five years in Nigeria (Pruss-Ustun, Bartram, Clasen, Colford, Cumming & Curtis, 2014). Children weakened by frequent diarrhoeal episodes are more vulnerable to malnutrition and opportunistic infections such as pneumonia. The World Health Organisation (WHO) reports that 88% of diarrhoea cases are attributable to factors essentially originating from poor management of human excreta. According to a World Bank Report, approximately 121,800 Nigerians die each year from diarrhoea, with nearly 90% being children under five years old (World Bank, 2016). Between 1990 and 2015, the WHO-UNICEF Joint Monitoring Program data revealed an 8% decrease in access to sanitation in rural areas and 3% decrease in access to sanitation in low-income urban areas. Declaring access to sanitation as a human right, the United Nations (UN) seeks equitable sanitation and hygiene for all and to end open defecation worldwide by 2030 and in Nigeria by 2025(WHO/UNICEF, 2017).

Sewage is running wastewater that is generated by residential, institutional, commercial and industrial establishments and normally transported in form of small liquid with suspension of small solids in large pipes called sewers. It also includes household waste liquid from toilets, baths, showers, kitchens, sinks, etc., disposed of via sewers. The wastewater may either be directed to a specific place to be recycled or be disposed of far away from people, as it can lead to spread of diseases (Ladan, 2014). Sewage is a complex mixture containing nutrients, suspended solids, pathogens, oxygen-dissolving substances and other contaminants that have different environmental impacts.

Sewage disposal in natural water bodies is a common practice in many developing countries. Inadequate or faulty sewage treatment systems are major causes of pollution in natural waters. Organic matter and nutrients from sewage disposal into aquatic bodies largely contribute to environmental and health problems. It is worthy of note that the exponential growth in

urbanisation through migration of large population from rural and semi-urban areas to cities in search of better livelihood has greatly contributed to the deplorable sewage disposal situations in most major cities of the world, especially in the developing countries. A case study is Lagos where there are insufficient and poorly managed wastewater and sewage treatment plants.

Owing to inadequate sewerage, much of the excreta is disposed of by the drainage of rainwater through open ditches. During the dry season, when the flushing action of rainfall does not exist, drainage channels become blocked with solids and create stagnant ponds of contaminated water. About 94% of the population in Lagos have access to sanitary toilets, 56% of whom use sewage toilets, 33% pit latrines and 4%septic tanks, while the rest of the population use pails, bush, rivers, streams or other kinds of unconventional toilets. In fact most of the sanitary toilets are water closets only by name, as it is quite normal that water does not run in the toilets (UNICEF, 2010).

According to the United Nations Educational, Scientific and Cultural Organisation (UNESCO), owing to rapid population growth and urbanisation, there has been an exponential increase in the wastewater generated globally. An overwhelmingly large percentage of the population in developing countries in Africa and Asia still lack access to sanitation and wastewater treatment facilities. Water bodies are recipients of large volumes of untreated wastewater that is dumped directly into them, thus threatening human health, ecosystems, biodiversity, food security and sustainability of the available water resources (Zandaryaa, 2011). In Nigeria, different cities adopt different methods of sewage disposal (Iloabachie et al., 2012). While some urban settlements such as Abuja, Port Harcourt, and Lagos initially had organised functional sewage treatment plants, such facilities eventually ceased to be adequate following rapid population growth. Many urban slums with no proper residential and housing plans sprung up within the metropolis of such cities, especially Lagos, thus leading to improper disposal of sewage in many parts of the city.

Like any developing nation, Nigeria faces some challenges in its development stride and efforts to improve the quality of life of citizens. Lack of adequate housing and infrastructure has led to the spread of slums and poor sanitation in the major cities. Currently, about 54% of the world's population live in urban areas, this figure is projected to increase to 66% by 2050 with an estimated addition of about 2.5 billion people, close to 90% of whom would be in Asia and Africa. The 2014 revision of the World Urbanization Prospects by UN Department of Economic and Social Affairs (DESA)'s Population Division notes that the largest urban growth will take place in India, China and Nigeria (UN/DESA, 2015). These three countries will account for 37% of the projected growth of the world's urban population between 2014 and 2050. By 2050, Nigeria is projected to add 212 million urban dwellers to the global population. Managing urban areas has thus become one of the most important development challenges of the 21st Century.

The challenges that cities have to face in order to achieve the sustainable development goals include reduction of poverty and pollution, construction of infrastructure and improvement in the services required by current and future residents. SDG 11 is about making cities inclusive, safe, resilient and sustainable. To achieve this goal, the government needs to ensure that by 2030 there must be access for all residents to adequate, safe and affordable housing and basic services, in addition to upgrade of urban slums. Besides, there must be inclusive and sustainable urbanisation and capacity for participatory, integrated and sustainable human settlement planning, just as management must be enhanced.

In the last 10 years, maternal and infant mortality rates have reduced as significant progress was recorded against severe infectious diseases such as tuberculosis, malaria and polio. The spread of HIV has also been checked. However, much effort is still needed to eradicate these communicable diseases arising from poor sanitation. In that regard, SDG 3 is concerned with ensuring healthy lives and promoting well-being for all at all ages. Research and investment are therefore needed to address the possibility of the emergence of new pandemics and neglected tropical diseases. Moreover, it would be necessary to combat hepatitis, waterborne diseases and other communicable diseases caused by improper waste management arising from high population density.

2. Literature Review

Sewage disposal is the return of used water to the environment. Sewage must be disposed of, as it is unwanted water from homes and shops. Disposal points distribute the used water either to aquatic water bodies such as oceans, rivers, lakes, stream, ponds or lagoons or to land by absorption systems, groundwater recharge and irrigation. According to the United Nations Educational, Scientific and Cultural Organisation (UNESCO), global wastewater generation is increasing at an exponential rate owing rapid population growth and urbanisation. An overwhelmingly large proportion of the African and Asian population remains without access to sanitation and wastewater treatment facilities. A large volume of untreated wastewater is dumped directly into water resources, thereby threatening human health, ecosystems, biodiversity, food security and the sustainability of water resources (UNESCO, 2017),

The most common health hazards arising from poor management of domestic wastewater includes diseases caused by viruses, bacteria and protozoa that may get washed into drinking water supplies or other water bodies Microbial pathogens have been identified as critical factors contributing to numerous waterborne disease outbreaks. Many of these pathogens found in domestic wastewater can cause chronic disease with long-term health effects such as stomach ulcer and degenerative heart disease (Idris-Nda, 2013).

According to Toze (1997) and Okoh, Odjadjare, Igbinosa & Osode (2007), viruses are considered to be among the most important and potentially most hazardous pollutants in domestic wastewater. The studies found that viruses are generally more resistant to treatment, more difficult to detect and require smaller doses to cause infections, thus making them the most difficult to treat. Bacteria are also one of the most common microbial pollutants in domestic wastewater. They cause a wide range of infectious diseases such as dysentery, diarrhoea, and skin as well as tissue infections, etc. Bacteria found in wastewater include *E. Coli*, Salmonella, Leptosporosis, etc. These cause mostly dysentery and typhoid fever, which are endemic in developing countries such as Nigeria.

Inappropriate sewage disposal is responsible for degradation of the receiving surface and groundwater, which may lead to eutrophication in receiving water bodies and create environmental conditions that favour proliferation of waterborne pathogens of toxin-producing microorganisms (Akpor & Muchie, 2011). Depending on the location and built area, different methods of sewage disposal have been adopted in the Lagos metropolis. The ideal type is the septic tank, which is a large airtight hole in the ground lined with bricks or concrete with an inlet pipe for incoming sewage and outlet pipe for treated sewage. The tank has a removable concrete cover with air vents for gases to escape. Sewage entering the tank is decomposed anaerobically

by bacteria. This method is more hygienic, as the sewage does not come out to the ground surface and does not occupy the floor area on the roadsides or impair the beauty of the surroundings (Garg, 2004). In the low-income built areas and slums, the methods sometimes adopted for sewage disposal are designed such that the sewage is made to flow into storm water drainages or into open ground which later flows into streams, canals or water ponds. These crude methods are problematic, leading to receiving soils and surface waters becoming saturated with pollutants with adverse effects on man.

As glaring as the effects of wastewater mismanagement could be to the environment and above all to public health, some areas in the Lagos metropolis still take things for granted. In 2011, it was reported that Lagos State alone generated 1.5 million cubic metres of the 35 million cubic metres of wastewater generated per day in Africa (Adegboye, 2011). In a place like Agboyi-Ketu, residential houses are built close to water bodies with the minimum setback of 15 metres not allowed between houses and water bodies. In fact some houses directly connect their sewer to the water body while others defecate directly in the nearby water body.

Although there is no central sewage system in most parts of the city of Lagos, only a very small fraction of the population are served with off-site sewage treatment plants, in many homes, only the wastewaters generated from toilets is connected to septic tanks or soak-away systems constructed in the compounds of such houses. Other domestic liquid wastes from bathrooms and kitchen are discharged directly into the mostly open gutters in front of houses or on the streets which eventually percolate into the ground or washed into the water bodies as runoffs.

Septic tanks or soak-away systems used in the collection of toilet wastewater are potential sources of groundwater pollution, sometimes, they are not properly designed and constructed as they are located too close to sources of domestic water supply such as wells and boreholes which then become contaminated (Olanrewaju, 1990).

Sanitation in low-income areas and urban slums of Lagos is grossly deficient. Most low-income earners living in these places have no access to hygienic toilet facilities and their faecal waste is discharged into the environment without treatment (Babalobi, 2013). This practice has serious implications on the sustainable use of groundwater. Lack of access to drinking water, inadequate sanitation and poor hygiene pose serious global health burdens on people living in such communities. The continuously rising population in Lagos as a mega city has led to urban expansion and slum formation. If not properly developed and managed, the problem may worsen with the rapid sprawling and growth of the population (Akpabio & Udofia,2016). Common sanitation solutions include open defecation, plastic-bag defecation, various types of latrine and in some cases pour-flush toilets discharging into open drains and rarely pour-flush toilets discharging into septic tanks. Indeed, there are no major wastewater treatment facilities for most low-income areas(WHO/UN 2014).

When attempting to empty their septic tanks hygienically, Lagos residents often succeed in polluting the lagoon through excreta waste handlers who dutifully evacuate and discharge faecal effluents into the lagoon without treatment—via the use of itinerant tankers. The raw faecal effluent present in the lagoon is oxygen-demanding; therefore, only aerobic (oxygen-requiring) bacteria can decompose it. The presence of these bacteria in large numbers, perhaps to detoxify excreta waste, degenerates water quality by reducing the quantity of oxygen, thus leading to massive loss of aquatic animals (Kamaldeen &Wahab, 2011).

The aim of this study is to examine sewage management in the low-income area of Agboyi-Ketu in Lagos and how it can be improved. One objective of this study is to examine the existing sewage disposal methods in Agboyi-Ketu using the techniques of collection, storage and disposal of sewage. Another objective is to identify any health hazard and diseases related to improper sewage disposal based on the results obtained from the microbial analyses of groundwater in the sampling area.

The study also addresses how people living in the area dispose of their wastewater, how they treat and manage their sewage, the number of households using septic tanks and pit latrines, the number of households dumping their sewage in water bodies and the types of diseases residents suffer owing to improper sewage disposal practices. The study is equally to determine if the area is linked to any sewage treatment centre.

3. Methods

Agboyi-Ketu is a Local Council Development Area (LDCA) in Lagos State. It has seven wards: Bangbe Elebiju, Arowosegbe Alapere, Agidi Oshogun, Orisigun Erukan, Agboyi I, Agboyi II, and Odogun. Only one of these wards, Agidi Oshogun, was chosen for this study. There are four (4) zones in this ward. The first zone is Agidi, which has 48 streets. The second is Church Zone, which has 22 streets. The third is Oshogun Zone, which has 23 streets. The fourth is Owode Zone, which has 17 streets. In all, there are 110 streets in the ward. For this study, only streets close to water bodies and canals were selected. From the 110 streets only 21 were selected: 7 in Agidi Zone and 14 in Church Zone. The streets have 420 buildings, which constitute the sample frame. From these, 105 buildings (25% of the sample frame) were systematically selected for the questionnaire administration. Figures 1a and 1b are pictures of some of the residential homes where the sampling took place.

Figures 1a and b: Views of some residential buildings where the study took place

Primary data were collected via photographs, questionnaire administration, close observation and personal interviews with residents of the area. The study also examined the microbiological characteristics of the underground and surface water in Agboyi-Ketu in order to test for its potability with respect to sewage management. Water samples from 10 separate points in the area

were randomly collected to test for the presence of microorganisms that might constitute health hazards. Eight samples of underground water (well water for drinking and domestic use) and two samples of surface water from the nearby river and canal were analysed for microbial contamination. Water samples of 100ml were collected in sterile bottles. Finally, the pour plate method was used for bacteriological examination of each sample.

4. Findings and Discussion

It was found that most of the houses in the study area lacked toilet facilities and the common practice in the area was open defecation or pit latrines, as shown in Figures 2a and b. Some other houses had their toilets directly on the nearby water body, with people dropping excreta and other human wastes in the water body (Figure 3). Some others had toilets inside their houses but nevertheless discharged wastes into the water body via pipes connected to the toilets (Figure 4). Quite a number of the houses had abandoned toilets (Figure 5), thus making it obvious that the occupants of such houses practised open defecation (Figure 6) into the nearby water body.

Figures 2a and b: Toilet facilities in some of the houses

Figure 3: Toilet and bathroom built on a river

Figure 4: Toilet with sewage discharged into an open drain

Figure 5: An abandoned toilet

Figure 6: A child excreting in a plastic bag after which the bag would be emptied into the water body

4.1 Responses from the Questionnaire

Twenty-one streets were selected for administration of the questionnaire, for which 105 buildings were covered in the study area. Copies of the questionnaire were randomly distributed to residents, after which the data were analysed with the use of percentages and frequency distribution tables. Forty-one percent (41%) of the respondents were male and 59% were female. Moreover, 47.6% of the respondents had no tertiary education and so were not aware enough about the impacts of improper sewage disposal. The socioeconomic status of residents was also a determinant of housing condition and level of environmental hygiene. Most of the respondents were artisans and low-income earners, with about 38.1% of them earning below the country's minimum wage for workers. The type of apartment reflected the socioeconomic status of respondents, which was found to affect their behaviour towards sewage disposal and environmental hygiene.

In addition, 84.8% of respondents had toilets in their houses while 15.2% did not have toilets in their houses. Clearly, lack of toilet in a house exposes occupants to health risks and such people constitute a serious nuisance to the environment. Some of them dispose their sewage into water bodies and gutters, polluting them and causing health-related issues to the public. Some of the people who had toilets in their houses sometimes had damaged toilets or faulty septic tanks while some lacked water in the toilet for flushing. This situation can also expose people to multiple infectious diseases. Twenty percent (20%) of respondents had water-closet facilities in their houses, 23.8% had pit latrines and 56.2% used sewage buckets. Some of the toilets used can expose individuals to multiple infectious diseases, if they are not properly managed or are not in good condition.

Furthermore, 71.4% of the respondents had septic tanks in their houses while 28.6% did not. Some of the toilets used can also expose individuals to infectious diseases, if they are not properly maintained or if they are not in good condition. The fact that 28.6% of respondents did not have septic tanks indicates that the environment will be in serious threat, as their sewage will be disposed in an exposed and unhealthy manner that can cause serious health and environmental issues. Lack of finances or low education and lack of government support may have resulted in the lack of toilets and septic tanks in the study area. Consequently, sewage is discharged on bare ground, thus polluting the environment and posing a big risk to public health.

On the condition of septic tanks in the home samples, 20% of respondents gave good assessment

of the condition of their septic tanks, 23.8% agreed that the condition of their septic tanks was fair, 27.6 % agreed that their septic tanks were broken, 18.1% believed that their septic tanks were too exposed and 10.5% believed their septic tanks were in very bad conditions. The percentage of respondents whose pit latrines were not in good condition was high. This suggests that their health might be seriously affected owing to the build-up of microorganisms from the exposed sewage. Most of the people whose toilets were very bad resorted to defecating on bare ground, with the high possibility that faecal matter would runoff into nearby surface water bodies. The environment will also be affected by open defecation, which introduces toxins and bacteria into the ecosystem. Moreover, open defecation can contribute to eutrophication or formation of algal blooms that manifest as scum on the surface of waterways, thus disturbing aquatic life and causing the death of aquatic organisms in the affected water bodies.

It was further observed that most of the houses had only one functional toilet irrespective of number of residents. No doubt this situation will lead to overburdening of the toilet facility, forcing some occupants to practise open defecation. In some cases no fewer than eight families shared one toilet and one bathroom, thus exposing themselves to diseases. On the evacuation of filled septic tanks, 43.8% of respondents called the sewage collector, 14.3% dug a new septic tank, 15.2% applied chemicals to reduce the content of their sewage, and 26.7% channelled their sewage to the river or canal (Figure 4). Due to such poor sanitary conditions in the study area, there have been disease outbreaks over the years, such as cholera, diarrhoea, malaria, hepatitis, and typhoid fever.

Although the major source of water in this area is well water, most of the wells were not properly covered after use and some were near septic tanks, thus allowing harmful microbes to be introduced into groundwater. Some homes in the study area had water bodies at very close proximity and most of the respondents reported the presence of dirty, smelly, stagnant and debris-filled water.

4.2 Microbial Analysis of Water Samples

Ten water samples were collected from selected wells, surface water sources and canals in the study area. The samples were analysed for microbiological parameters such as Total Bacterial Count, Total Fungi Count, Total Faecal Coliform Count and Isolates of Bacteria Species.

Table 1: Microbiological Analyses of Water Samples from Agboyi-Ketu Area

S/N	Sample Code	Sample Point (Agboyi – Ketu)	Total Bacterial Counts (cfu/ml)	Total Fungi Counts (cfu/ml)	Total Coliform Counts (cfu/ml)	FaecalIsolates
1	1	Well Water from Street 7	30	0	0	Klebsiella spp
2	2	Well Water from Street 10	10	0	0	-
3	3	Well Water from Street 15	10	0	0	-
4	4	Well Water from Street 19	90	0	60	E.coli, Klebsiella spp
5	5	Well Water from Street 26	23	0	12	E.coli, Klebsiella spp
6	6	Well Water from Street 29	30	0	30	E.coli
7	7	Well Water from Street 36	90	0	60	E.coli, Pseudomonas spp
8	8	Well Water from Street 48	21	0	12	E.coli, Klebsiella spp
9	R	River	100	20	80	E.coli, Klebsiella spp, saccharomyces spp, Pseudomonas spp
10	C	Canal	112	23	90	E.coli, Klebsiella spp, saccharomyces spp, Pseudomonas spp

In developing and underdeveloped countries particularly, the spread of disease through faecal contamination is a common phenomenon. In Lagos State, as well as many other parts of Nigeria, pipe borne water is hardly available. In the Agboyi-Ketu area of Lagos, the supply of treated public water supply is erratic and improper sewage management has affected the potability of the available groundwater. This situation forces some residents to explore boreholes as alternative water sources. However, the low-income earners, who constitute more than 80% of the population, are unable to afford the high cost of borehole drilling; instead they resort to well water for drinking and domestic purposes.

The viable bacterial count, which is a measure of the microbial load of the water samples obtained in this study, ranged from 12–112 cfu/ml and thus exceeded the WHO's recommended limit. This shows that the wells and surface water contain very high levels of microbial contaminates, thus making such water risky to the public health. For all water intended for drinking, *E. Coli* must not be detectable in any 100 ml sample (Ocheli, Otuya, & Umayah, 2020). Ideally, drinking water should not contain any microorganisms known to be pathogenic (i.e., capable of causing diseases) or any bacteria indicative of faecal pollution.

Water samples showing plate counts above the recommended level are mostly associated with faecal pollution resulting from improper sewage disposal. The bacterial loads of water samples collected from the buildings and surface water were high except for water samples 2 and 3. From the results of the questionnaire distributed, 42.9% of the respondents stated that their wells were built 5 metres away from their septic tanks and 33.4% reported their wells were built 10 meters away from their septic tanks. Therefore, there is no doubt that the high contamination of the well water must have been caused by seepage from the septic tanks.

Better environmental conditions as well as reduced pressure of use may reduce the degree of contamination that may be encountered in well water samples and water bodies. Most of the respondents agreed that their water closets were not in good conditions and their pit latrines were also in bad conditions. Some of the respondents had no toilets in their houses while a few respondents used toilet facilities. In some other cases buckets were used to collect faecesfor onward disposal into gutters and open canals. In most cases the waste ran off into rivers, thereby polluting water bodies.

The study found causes of diseases in Agboyi-Ketu and environs to include improper sewage management, stagnant water, smelly water bodies or canals, contaminated drinking water, as well as mosquito and tsetse fly bites. However, the sanitary quality of potable water is determined primarily by the kinds of microorganisms present rather than the microbial count.

The major sources of water were from wells, and the total viable bacterial count obtained from the sample well water and surface water was 12–112 cfu/ml, which exceeded the standard limit set by the WHO. As such, the well water samples had been contaminated by potentially dangerous microorganisms and were thus not fit for drinking. This conclusion was confirmed via characterisation of isolates from well water samples taken from the location under study, as the samples were highly contaminated by one or more bacterial pathogens, such as *Escherichia Coli (E. Coli), Klebsiella spp, Pseudomonas spp* and *Saccharomyces spp* (fungi). Respondents also confirmed the outbreak of diseases and reported prevalence of diseases such as cholera, diarrhoea, malaria, hepatitis, typhoid, dysentery, skin rash and boils. It is worth restating that no water source used for drinking or cleaning purposes is expected to contain any organism of faecal origin.

Presence of enteric coliforms, especially *Escherichia Coli*, therefore makes the water samples unsuitable for human consumption, based on WHO guidelines for evaluation of the bacteriological quality of drinking water (WHO,1997; Ashbolt, Grabow & Snozzi, 2001).

Most of the respondents admitted that their houses were close to the river. The river and the canal also contained high levels of microorganisms as confirmed by the test results of samples R (river) and C (canal). The river and the canal in the neighbourhood may equally harbour mosquitoes that can infest the people living around it with constant malaria.

Apart from lack of environmental hygiene, presence of enteric pathogens in the well water, especially in uncovered wells, may also be attributed to drainage and flooding from contaminated surface water into unprotected wells, as confirmed by the study. Most respondents lived close to dirty, smelly, debris-filled water bodies that overflow during the rainy season. Twenty-four (24) respondents out of 105 admitted discharging their wastewater into the water body. This practice heavily pollutes the water body and leads to eutrophication, which can kill aquatic organisms and distort water transportation. Bioaccumulation may also occur, with devastating implications for human health.

4.3 Implications on Health of the Residents

In this study, it was found that sewage management in Agboyi-Ketu Local Council Development Area was abysmal, as there were no facilities for the management of sewage or wastewater in most houses. Residents were more concerned about shelter than sanitation or treatment of their domestic waste. However, to ensure healthy lives and promote well-being for all at all ages (SDG 3) in this area, proper and adequate attention must be given to issues of sanitation and sewage disposal by residents and there must be enforcement of full compliance with all sanitary requirements as expected in an urban settlement. The situation must be monitored by government and nongovernmental agencies in the state. Public toilets with adequate sanitation can be put in place for the use of residents.

Health issues common in the area due to the inappropriate methods of sewage management are malaria, cholera, typhoid and skin disease such as boils and rash. These health issues are caused by pathogens from the river and the rapidly declining and degrading physical environment. Well water, which is the major source of water for drinking and domestic use in the area, was contaminated with enteric microorganisms and loads of bacteria indicative of faecal pollution. To reduce the risk of the spread of waterborne diseases in the area, there has to be urgent government intervention in providing potable water for the domestic use of residents.

5. Conclusion

Our research results identified effects and implications of improper sewage management on public health in Agboyi-Ketu, including a lack of infrastructure resulting in open and river defecation, poor water quality. This has placed Agboyi-Ketu at the lower end of the scale in the context of SDG targets particularly SDG 6 which bothers on clean water and sanitation. This contributes significant public health risks and economic constraints to the residents in the community.

Proper sanitation services have a fundamental role in improving people's health, economic stability, dignity, and protection of the local environment. Safe and proper sanitation support good health and prevent disease outbreaks among the local community. Proper human excreta

disposal and sewage management significantly lowers the possibility of faecal contamination of water used for drinking and other domestic uses hence public health protection.

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