



doi:10.5281/zenodo.14780860

Cholera in Nigeria: Epidemiology, Risk Factors, and Preparedness Response and Management Strategy

¹Oloruntegbe Dunsin Seyifunmi & ²Prof. Adedamola O Onyeaso

Department Of Health Promotion, Environmental and Safety Education
Faculty of Education

University of Port Harcourt, Port Harcourt, Nigeria

¹oloruntegbedunsin@gmail.com/+2348060213065

²adedamola.onyeaso@gmail.com/+2348031189318

ABSTRACT

Cholera, a waterborne disease caused by *Vibrio cholerae*, remains a significant public health concern in Nigeria, where recurrent outbreaks have led to high morbidity and mortality. This paper explores the epidemiology, risk factors, preparedness, and management strategies for cholera in Nigeria. The disease's endemicity is driven by poor sanitation, limited access to clean water, and environmental factors such as flooding, exacerbated by climate change. Vulnerable populations, including children and residents of urban slums, are disproportionately affected. Epidemiological trends show cyclical outbreaks, with the most severe incidents occurring in northern states due to inadequate infrastructure and weak health systems. Response strategies include emergency oral rehydration therapy, vaccination campaigns, and community-based hygiene education. However, systemic challenges, including funding gaps, insecurity, and population displacement, undermine control efforts. The paper emphasizes the need for a multi-sectoral approach, integrating long-term water, sanitation, and hygiene (WASH) initiatives with enhanced healthcare access and strengthened surveillance systems. These strategies are essential for reducing the burden of cholera and achieving the goal of its elimination in Nigeria by 2030.

Keywords: Cholera, poor sanitation, Safe water

INTRODUCTION

Cholera is a waterborne disease with a higher risk of transmission in area where there is poor sanitation and clean water supply. Millions of people globally are at risk of cholera and other infectious diseases like Covid-19, Ebola and typhoid fever due to inadequate water sanitation and hygiene (WASH) services. Ramamurthy. T (2014)

Cholera is a WASH (water, sanitation and hygiene) related infectious disease that infects the gastrointestinal tract of humans. It is caused by a comma-shaped Gram-negative rod *Vibrio cholerae*. Cholera was first discovered in the Ganges delta in India from where it spread across the world (WHO 2020). Cholera is mainly transmitted by ingestion of food or water contaminated with faecal material containing *Vibrio cholerae*. Cholera has caused significant number of deaths especially amongst children under five and older adults (WHO 2023). Cholera is considered a disease linked to poor WASH conditions and is preventable through wide-spread access to safe drinking water and sanitation. Safe water, sanitation, and hygiene (WASH) are fundamental to human health. Above 884 million people globally have no safe water to drink. Nearly 2.4 billion people lack access to basic sanitation facilities which has resulted in the practice of open defecation that can lead to contamination of water used for drinking and personal use.

Furthermore, Cholera, an acute diarrheal disease caused by *Vibrio cholerae*, remains a pressing public health issue in many low- and middle-income countries, including Nigeria. Characterized by severe dehydration, the disease can lead to death within hours if untreated. Nigeria, as one of the most affected countries globally, faces recurrent cholera outbreaks exacerbated by poor water, sanitation, and hygiene (WASH) conditions. This paper tends to examine the epidemiology, risk factors, impacts, and mitigation strategies for cholera in Nigeria, aiming to underscore the need for robust interventions to prevent future outbreaks.

Cholera is an acute diarrheal disease caused by the bacterium *Vibrio cholerae*. It spreads primarily through ingestion of contaminated food or water. The symptoms include severe watery diarrhea, vomiting, and dehydration, which can lead to rapid health deterioration if untreated. Cholera outbreaks are more common in areas with inadequate sanitation and clean water supply. Treatment involves rehydration therapy, often using oral rehydration solutions, and in severe cases, antibiotics may be prescribed. It is a global public health threat and indicates inequity and lack of social and economic development. Access to safe water, basic sanitation and hygiene is essential to prevent cholera and other waterborne diseases.

Most people with cholera have mild or moderate diarrhea and can be treated with oral rehydration solution (ORS). However, the disease can progress rapidly, so starting treatment quickly is vital to save lives. Patients with severe disease need intravenous fluids, ORS and antibiotics. Countries need strong epidemiological and laboratory surveillance to swiftly detect and monitor outbreaks and guide responses.

Symptoms

Cholera can cause severe acute watery diarrhea, which can be fatal within hours if untreated. Most people infected with *V. cholerae* do not develop symptoms but can spread the bacteria through their faeces for 1–10 days. Symptoms appear 12 hours to 5 days after infection Ilic M (2023). Other symptoms may include Severe Watery Diarrhea, Dehydration, Vomiting: Patients may experience vomiting, which exacerbates fluid loss, Muscle Cramps which can result from electrolyte imbalances due to fluid loss, In severe cases, cholera can lead to hypovolemic shock due to extreme fluid loss and low Blood Pressure: Another consequence of dehydration and shock. Most people with the disease have mild or moderate symptoms. A minority of patients develop severe acute watery diarrhea and life-threatening dehydration.

Causes of cholera

Cholera is caused by the bacterium *Vibrio cholerae* and its spreads through ingestion of contaminated food or water, particularly in areas with poor sanitation. *Vibrio cholerae* bacteria thrive in brackish or alkaline waters and can survive in water and food sources, especially under conditions of poor hygiene and sanitation. Factors such as overcrowding, inadequate sanitation facilities, and lack of clean drinking water contribute significantly to the spread of cholera.

Risk Factors

Cholera in Nigeria is driven by a combination of environmental, socio-economic, and systemic factors:

Over 70 million Nigerians lack access to safe drinking water, and 46 million practice open defecation, creating conditions conducive to cholera transmission (WHO, 2023). Which in turn leads to cholera outbreak with high rate of poverty which restricts access to essential services, while overcrowded living conditions in urban slums amplify disease spread. Also rise in temperatures and increased rainfall variability worsen flooding, which contaminates water supplies poses as risk factors for cholera infection.

Prevention of cholera

In Nigeria, existing prevention and control strategies are multi-sectoral. Epidemic Preparedness and Response (EPR) approaches including registration of cases, case management and public health measures targeting personal hygiene and water treatment as well as emergency responses from both governmental and non-governmental agencies have contributed to the reduction in case fatality rates over the years and should be sustained. Nevertheless, the need to explore more viable approaches cannot be overplayed if the infection has to be wholly curtailed.

Various studies elsewhere have utilized geographic and mathematical information systems to assess spatial distribution of cholera at local levels, demonstrating case clustering and disease risk areas (Tuite AR et al 2010). Modeling techniques using climate data, remote monitoring, and geographic information

systems also provide new techniques that may contribute to the prediction of cholera epidemics (Colwell RR et al cited in Ajoke O et al 2012)

More importantly, it is necessary to introduce intervention measures that address the root problems of poor sanitation and unsafe water supplies in order to prevent future cholera epidemics. In this regards, perhaps, prevention of the disease is the best way to counter subsequent outbreaks. Simple measures as boiling the water for drinking, washing and cooking purposes, treatment of infected facilities, sewages and drainage systems, proper disposal of infected materials such as waste products, clothing, and beddings, treatment of infected faecal waste water produced by cholera victims and sterilization of utensils either by boiling or by using chlorine bleach. Studies have also indicated that use of soap and hand washing promotion can achieve a 26 to 62% decrease in the incidence of diarrhea in developing countries (sited in Ajoke O et al 2012) can aid understanding of epidemic processes and help design effective control strategies. Due to its endemicity in Nigeria, surveillance systems can provide early alerts to outbreaks, therefore leading to coordinated response.

Control of cholera

The long-term solution for cholera control lies in economic development and universal access to safe drinking water, basic sanitation and good hygiene practices. WASH interventions help prevent many waterborne illnesses, including cholera, and contribute to the Sustainable Development Goals. During outbreaks, implementing WASH activities can reduce cholera transmission. These activities include improving WASH in healthcare facilities, conducting water quality monitoring, distributing WASH kits to communities and promoting protective hygiene practices.

Treatment of cholera

Cholera is an easily treatable disease. Most people can be treated successfully with prompt ORS administration. Severely dehydrated patients are at risk of dying from dehydration and need rapid intravenous fluids. They also receive oral rehydration solution and antibiotics. Patients with underlying conditions or comorbidities may require additional care in specific treatment centres. The case fatality rate in treatment centres should remain below 1%.

Community access to ORS is essential during a cholera outbreak. Mass administration of antibiotics to prevent cholera (chemoprophylaxis) is not recommended, as it has no proven effect on the spread of cholera and may contribute to antimicrobial resistance.

Global burden of cholera

Globally, Since 31 August 2024 and as of 23 October 2024, 83 982 new cholera cases, including 900 new deaths, was reported worldwide. Research shows that five countries reporting most cases are Afghanistan (24 151), Sudan (23 590), Pakistan (12 954), Nigeria (4 886) and Myanmar (4 756). The five countries reporting most new deaths are Sudan (598), Nigeria (183), United Republic of Tanzania (34), Ethiopia (33) and Afghanistan (12). New cases have been reported from Afghanistan, Bangladesh, Burundi, Cameroon, Chile, China, Comoros, Democratic Republic of the Congo, Ethiopia, Ghana, Haiti, India, Iraq, Lebanon, Myanmar, Nepal, Niger, Nigeria, Pakistan, Somalia, Sudan, Togo, United Republic of Tanzania and Yemen. New deaths have been reported from Afghanistan, Burundi, Cameroon, Comoros, Democratic Republic of the Congo, Ethiopia, Ghana, Haiti, India, Niger, Nigeria, Somalia, Sudan, Togo, United Republic of Tanzania and Yemen. Since 1st January, 2024 and as of 23rd October 2024, 457 341 cholera cases, including 3 433 deaths, have been reported worldwide. In comparison, since 1st January 2023 and as of 23rd October 2023, 723 171 cholera cases, including 4 319 deaths, were reported worldwide. Countries with most cases Afghanistan, Pakistan, Yemen, Nigeria, and Ethiopia.

Relevance in Nigeria

Cholera, an acute diarrheal infection from ingesting contaminated food or water, remains a significant public health threat in Nigeria, especially in areas lacking safe water and sanitation. Characterized by severe watery diarrhea, cholera can cause dehydration and death if untreated. Historical data shows cholera's endemic nature in Nigeria, with notable outbreaks since 1970, including major ones in 1991, 1999, 2010, 2018, and 2024. According to a descriptive study in Nigeria, the 1991 outbreak reported 59,478 cases and 7,654 deaths, with a Case Fatality Ratio (CFR) of 12.9%. In 2010, there were 41,787 cases and 1,716 deaths, with a CFR of 4.1% across 18 states, mainly affecting impoverished communities

and children. The 2018 outbreak had 43,996 cases and 836 deaths, with a CFR of 2% in 20 states, a 240% increase from 2017. By mid-2024, there were 1,579 suspected cases and 54 deaths (CFR 3.4%) in 32 states. This paper evaluates cholera trends in Nigeria and proposes effective preventive and treatment strategies. Policy suggestions highlight the need for improved WASH infrastructure, enhanced surveillance, and rapid response mechanisms. Innovative approaches like case-area targeted interventions (CATI) and increased public health education are crucial for mitigating future outbreaks and achieving the goal of reducing cholera deaths by 90% by 2030. Despite the established knowledge of transmission pathways and preventative measures over the past 150 years, cholera continues to pose a significant public health challenge in many regions, particularly in Africa, Asia, and Central and South America (Turankar et al., 2023). In the early twenty-first century, cholera continues to be a global concern, leading to large outbreaks in countries such as Haiti, Yemen.

According to Emizet et al(2009). Nigeria, the Democratic Republic of Congo, the Dominican Republic, Egypt, Somalia, Bangladesh, Pakistan, the Philippines, China, Ghana, and Cameroon, as well as remaining endemic in numerous other nations. Approximately 2.9 million cholera cases occur annually, leading to around 95,000 fatalities globally, with most of these cases and deaths concentrated in low- and middle-income countries.

Notably, cholera serves as an indicator of inequality, disproportionately impacting the world's most impoverished populations. It predominantly affects individuals already rendered vulnerable by conditions of poverty and conflict ((Turankar et al., 2023). In 2021, cholera outbreaks were reported in 23 countries, predominantly in the WHO regions of Africa and the Eastern Mediterranean. This trend persisted into 2022, with cholera cases or outbreaks emerging in 30 countries spanning five of the six WHO regions. Nigeria, one of the countries in the WHO African region, continues to face persistent annual incidences of cholera. As of July 21, 2024, Nigeria had recorded over 4,809 suspected cases, resulting in 156 deaths with a case fatality ratio (CFR) of 3.2% across 35 states in Nigeria (192 local government areas) This increasing trend necessitates a proactive measure to tackle the country's rising cholera infection cases. Hence, this paper aims to evaluate the trends of cholera incidences in the country while proposing effective, innovative approaches to preventing and treating infection.

On this global and local prevalence of cholera, this paper tends to examine the epidemiology, risk factors, and management strategies for cholera in Nigeria.”

Trends and epidemiology of cholera outbreaks in Nigeria

According to the research done by Leckebusch et al. 2018). Cholera is endemic in Nigeria with recurrent outbreaks annually some of which are sporadic and seasonal mostly during the wet season. Several outbreaks have been recorded since 1970 with various outcomes of morbidity and mortality. Outbreaks are not limited to specific regions of the country, however some states have been identified as hotspots of the disease (Adagbada et al. 2012, NCDC, 2019). The northern part of Nigeria has recorded more and severe outbreaks than other regions of the country overtime. Cholera cases reported between 2004 and 2014 in Nigeria had five states (Bauchi, Borno, Katsina, Gombe and Kano) contributing 66% of the entire cases (UNICEF, 2015). Already known underlying factors such as absolute poverty, illiteracy, poor sanitation and hygiene that drives cholera in any endemic location is largely at play in this region. However, these factors have been amplified as a result of the protracted unrest initiated by the terror group Boko Haram, banditry, farmers and herders crisis causing residents of affected communities to flee to overcrowded internally displaced person (IDP) camps which becomes epicenters of outbreaks

Another research recorded Cholera outbreaks in Nigeria since the 1970s, with the disease becoming endemic in several regions. Between 2010 and 2021, over 1.7 million suspected cases and 53,000 deaths were reported, indicating a fatality rate exceeding the global average of 1-2% (WHO, 2022). The 2021 outbreak, one of the worst in decades, resulted in over 111,000 suspected cases and nearly 4,000 deaths, affecting 31 of the country's 36 states (NCDC, 2022).

The north of Nigeria bears the brunt of these outbreaks due to its arid conditions, limited access to clean water, and high population density in urban slums. Cholera is seasonal, peaking during the rainy season when flooding contaminates water sources, facilitating the spread of the disease (UNICEF, 2023). Since

1970, Nigeria has been endemic to cholera, experiencing significant outbreaks over the years. Notably, in 1991, a major outbreak resulted in 59,478 cases and 7,654 deaths, with a case-fatality ratio (CFR) of 12.9%. Another significant outbreak occurred in March 1999 in Kano State, subsequently spreading to Adamawa and Edo states by May, resulting in 26,358 cases and 2,085 deaths. Findings revealed that the 2010 cholera outbreak in Nigeria resulted in 41,787 cases and 1,716 deaths with a case-fatality ratio (CFR) of 4.1% across 18 states, highlighting the vulnerability of poor communities, particularly children, to the infection. In 2014, there were 4,996 reported cases of cholera, with a CFR of 2%. In 2018, epidemiological surveillance reported 43,996 cases and 836 deaths across 20 states between January 1st and November 19th, with a CFR of 2% , representing a 240% increase in cases compared to 2017. As of July 21, 2024, Nigeria had recorded over 4,809 suspected cases, resulting in 156 deaths with a case fatality ratio (CFR), of 3.2% across 35 states in Nigeria (192 local government areas). Of the suspected cases since the beginning of the year, the majority have occurred in children under the age of 5, followed by those in the 5–14 age group. Moreover, of all suspected cases, 50% are males and 50% are females.

Brief history of cholera in Nigeria

Cholera has been a persistent public health challenge in Nigeria since its first recorded outbreak in 1970. The disease is caused by the bacterium *Vibrio cholerae*, typically spread through contaminated water and food, and it remains endemic in various regions of the country, particularly during the rainy season when sanitation conditions deteriorate.

In Nigeria, the first Cholera outbreak was in 1970, the most severe outbreaks were reported in 1991, 1996, and 1999 and from 2009 to 2011 (Federal Ministry of Health, 2013). The outbreak affects the Northern states the most, with significant mortality of two thirds (66%) of the cases reported between 2004 and 2014. Faecal contamination of the environment is the root cause of an annual average of 5,400 cases of cholera affecting Nigeria. The cost of the necessary WASH response is estimated to be US\$3.5 million each year (WSP, 2012). In May 2017, suspected cholera cases were reported from five local government areas; Asa (18), Ilorin East (450), Ilorin south (215), Ilorin west (780) and Moro (50) in Kwara State (WHO, 2017). In addition to human suffering caused by cholera, cholera outbreak cause panic, disrupt the social and economic structure and can impede development in the affected communities. Unjustified panic-induced reactions by other countries include curtailing or restricting travel from countries where a cholera outbreak is occurring, or import restrictions on certain foods. For example, the cholera outbreak in Peru in 1991 cost the country US\$770 million due to food trade embargoes and adverse effects on tourism (WHO, 2015). However, the economic implications of cholera outbreak go beyond the immediate health system response, there are also costs related to productivity loss and premature death, diverting expenditures from other essential items and losses in trade and tourism revenue. Farmers' health has significant effects on agricultural productivity. Farmers are usually exposed to harsh weather, difficult working posture and lengthy hours of work due to the use of local farm tools since majority of them are small scale subsistence farmers, and this could lead to illness. A number of demographic and socioeconomic factors including age, gender, and nutritional status, social and economic status are also known to play crucial role in susceptibility to cholera. Sanitation and nutrition are particularly important factors and it has become clear that good sanitation and hygienic practices largely prevent the disease (Adagbada et al., 2012).

Risk Factors and Health implication of cholera in Nigeria

A risk factor is any characteristic, condition, or behavior that increases the likelihood of developing a disease or health problem. Risk factors can be intrinsic (related to individual traits like genetics or age) or extrinsic (environmental or lifestyle-related). Understanding risk factors is crucial for identifying at-risk populations and implementing preventive measures (CDC, 2023; WHO, 2022). For example, smoking is a risk factor for lung cancer, while poor sanitation and lack of clean water are risk factors for cholera. Some risk factors are modifiable (e.g., unhealthy diets), while others, such as genetic predispositions, are not.

Transmission of cholera in Nigeria is through the faecal-oral route, where food and water are contaminated with faeces containing *V. cholerae*. In a cholera episode that resulted in 5,600 cases and 340 deaths in Kano between December 1995 and May 1996, consumption of contaminated street vended water and eating without prior washing of the hands were identified factors that exacerbated the outbreak (Hutin et al. 2003). In a 2010 study that evaluated the risk factors associated with cholera outbreak in a cholera naïve rural community in northern Nigeria, contact with persons with the infection, unwashed hands after using the toilet and before meals were significant risk factors for infection (Sheed et al. 2018). An investigation of cholera outbreak in an urban north central community of Akwanga local government area (LGA) Nasarawa state reported open defecation, post defecation bath and car washing as sources of the contamination of Rafin Kumin Tagwaye river that resulted in September 2013 cholera outbreak in the area. Similarly, indiscriminate defecation from polluted water source and the environment resulted in the 2014 cholera outbreak in Gomani, Kwali LGA of the Federal Capital Territory (Akyala et al. 2014, Dan-Nwafor et al. 2019). In Nigeria open defecation was not restricted to the northern parts of the country as other parts of the country with an estimated 34 million Nigerians, defecate outside mostly in urban and peri-urban slums (Gregor and Auwal, 2015). In a study from three states in Northwest Nigeria, the attributed risk of cholera outbreaks was due to contamination of drinking water sources by sewage seepage caused by heavy downpour while during the dry season, stagnant waters and wells of shallow depth were the main sources of contamination by the bacterium (Leckebusch and Abdussalam 2015).

Deaths due to cholera can be almost entirely avoided by early detection of cases, rapid access to adequate treatment and by preventing cholera transmission in the first place. The Global Task Force on Cholera Control (GTFCC) End Cholera 2030 roadmap has as one of its two main objectives the reduction of cholera attributed mortality by 90% globally by 2030 . While the availability of oral rehydration solution (ORS) and medical workers able to give intravenous (IV) fluid replacement has reduced cholera case fatality rate (CFR), the standard CFR of 50-60 years old) or those with one or more comorbidities (hypertension, diabetes, kidney disease) in all ages. Adequate case management, provided for a patient on presentation to a health facility or for a case within the community is a crucial intervention to reduce mortality. To better adapt current case management practices to address excess mortality in otherwise treatable cases will require better knowledge of the demographics and comorbidities which can make severe dehydration (and even its usual therapy) harder to tolerate physiologically. With both physiological and community aspects in mind, a scoping review was undertaken to explore the literature and summarise the existing evidence on cholera mortality and reported risk factors.

According to research conducted by Despina P (2022) the following risk factors were itemized and the researcher stated that these factors were not restricted to quantitative information provided in the studies; many of them were extracted from comments and interpretations provided by the authors in the discussion. The thematic analysis resulted in creating six categories and sub-categories i.e. Patient (Biological, Health conditions), Clinical (Symptoms and presentation, Complications), Healthcare (Health seeking behaviour, Access to care, Case management, Facilities), Public Health (Surveillance and preparedness, Outbreak response), Social (Individual, Household, Behavioural, Political and cultural) and Environmental

Cholera has severe health implications and impacts that can result in significant morbidity and mortality if not promptly addressed.

Impact and burden of cholera in Nigeria

Cholera significantly contributes to Nigeria's high under-five mortality rate. Children are particularly vulnerable due to weaker immune systems and limited access to rehydration therapy which also strain Nigeria's healthcare resources, disrupt economic productivity, and increase household financial burdens due to medical expenses and lost income thereby leading to social disruption.

Health implication

Cholera causes acute watery diarrhea, leading to rapid loss of fluids and electrolytes. This severe dehydration can progress within hours and result in hypovolemic shock, which is life-threatening if

untreated (WHO, 2022). Furthermore, the disease often causes imbalances in critical electrolytes such as sodium, potassium, and bicarbonates. This can lead to:

- **Hypokalemia:** Low potassium levels can cause muscle weakness, arrhythmias, and cardiac arrest.
- **Metabolic Acidosis:** Loss of bicarbonates may lead to acidification of the blood, impairing normal cellular functions.

Without treatment, cholera has a case fatality rate of up to 50%, especially in vulnerable populations such as children, pregnant women, and the elderly. With prompt intervention like oral rehydration therapy (ORT), the fatality rate drops below 1% (CDC, 2023). In children, cholera exacerbates malnutrition by impairing nutrient absorption due to severe diarrhea. This creates a vicious cycle, as malnourished children are more susceptible to infections and slower to recover (UNICEF, 2023). Dehydration and poor immune response in cholera patients increase the risk of secondary infections, such as urinary tract infections (UTIs) or sepsis, particularly in settings with inadequate healthcare. Pregnant women with cholera are at higher risk of preterm labor, stillbirth, and maternal mortality. Dehydration can reduce amniotic fluid levels, directly affecting fetal health. Frequent outbreaks strain healthcare systems, reduce healthcare access for other conditions, and disrupt public health services. Additionally, cholera often acts as an indicator of broader systemic issues, such as insufficient sanitation infrastructure and inadequate health services.

Preparedness, Response and Management of Cholera Outbreaks in Nigeria

The basic aim of cholera outbreak response is to contain the spread of the disease and lower mortality (WHO, 2004). To achieve this the Nigeria Center for Disease Control (NCDC) emphasized three core strategies, which include surveillance, infection prevention and control, care and treatment (NCDC, 2017). Suboptimal surveillance and response contributes to the continuous outbreaks with recorded high numbers of morbidity and mortality. Several drawbacks have been attributed to ineffective response and management of cholera outbreaks in Nigeria. Inadequate number of healthcare workers (HCW) with limited training in emergency response and limited supply of emergency response kits constitutes such drawbacks (Oladele et al. 2012). Ujah et al. (2015) identified wrong perception and myth as factors that hinder acceptance and accessibility to launch effective response during cholera outbreaks.. UNICEF, (2018) reported WASH as a cornerstone for conquering the 2017 cholera outbreak in Borno state northeast Nigeria. The strategy entailed operation and maintenance of water facilities in cholera hotspots and high-risk camps, sustained provision of emergency WASH supplies, hygiene promotion and immediate access to safe water through emergency water trucking in unserved and underserved locations, intensified focus on chlorination including batch chlorination in host communities and blanket chlorination in urban areas and environmental sanitation. Deployment of science and technology in combating infectious diseases has yielded great gains in the recent past. The application of technology in surveillance of cholera outbreaks has been demonstrated. In the rapid epidemiological mapping of cholera outbreak in parts of Abeokuta metropolis using Geographical Information Science (GIS) by Oyedepo et al. (2015), proved effective in tracking the cause of the outbreak. Similarly,

Olajumoke and Kayode (2017) used geospatial technology in investigating the spatial relationship between cholera incidences and environmental risk factors. Mathematical modeling has also been deployed in investigating the influence of meteorological and socioeconomic factors on the spatio-temporal variability of cholera morbidity and mortality in Nigeria (Leckebusch and Abdussalam, 2015). Oral cholera vaccine (OCV) is important in control and prevention of cholera. OCV was used the first time in Nigeria to control a 2017 cholera outbreak in Borno state (Hassan et al. 2018) which proved effective. Hence, stock piles of OCV is advocated in cholera hotspots within the country.

CONCLUSION

Cholera remains a persistent threat in Nigeria, with significant health, economic, and social implications. Addressing this issue requires a multi-sectoral approach that combines emergency response with long-term investments in WASH infrastructure, healthcare systems, and community education. The Nigerian

government, supported by international agencies, must prioritize cholera prevention and control to safeguard public health and achieve sustainable development goals. Cholera remains a preventable yet recurring public health crisis in Nigeria. The persistence of outbreaks highlights gaps in water, sanitation, and hygiene (WASH) infrastructure, as well as in preparedness and response strategies. Although government and non-governmental organizations have made progress in improving surveillance and response, sustainable solutions are needed to break the cycle of cholera outbreaks. Strengthening public health interventions, fostering community engagement, and addressing systemic inequities are critical to achieving long-term control and prevention.

SUMMARY

Cholera is a major public health issue in Nigeria, characterized by periodic outbreaks that result in significant morbidity and mortality. The disease is caused by ingesting water or food contaminated with *Vibrio cholerae*. The epidemiology of cholera in Nigeria reveals that outbreaks are often linked to inadequate access to clean water, poor sanitation, and hygiene practices. Key risk factors include densely populated urban areas, floods, open defecation, and poor waste management. Despite efforts to combat cholera, challenges such as limited healthcare infrastructure, insufficient awareness, and delayed response mechanisms persist.

RECOMMENDATIONS

Despite all these cases of cholera reported research has shown that behavioral change is still the main factor responsible for the persistent recurrence of cholera over the years.

In view of this, this research work will be recommending the following that aims and objectives with the sole purpose of affecting behavioral change.

1. Including health education in the curriculum starting from crèche to university level. According to the comprehension level of the pupils and students.
2. Pre-school children can be taught the basic of handwashing and simple hygienic practices
3. Primary school children also taught how to wash your hands, cover their food and little bit of higher environmental hygiene
4. Secondary school level should be taught body hygiene, environmental hygiene and
5. University level health education on hygiene should be not be overlooked.
6. Community involvement in environmental sanitation should be strengthened, make compulsory and set at standard as a public health concern.
7. Expansion of access to clean drinking water and functional sanitation facilities in urban and rural areas.
8. Promotion of community-led total sanitation (CLTS) programs to eliminate open defecation. (environmental sanitation).
9. Conduction of health education campaigns emphasizing hygiene practices such as handwashing and proper food handling.
10. Raising of community awareness about cholera prevention and the importance of seeking immediate medical care

REFERENCES

- Adagbada, A.O., Adesida, S.A., Nwaokorie, F.O., Niemogha, M. and Coker, A.O. (2012). Cholera Epidemiology in Nigeria: an overview. *Pan African Medical Journal*. 12:59 . (n.d.).
- Ajoke Olutola Adagbada, Solayide Abosedo Adesida, Nwaokorie, F. O., Mary-Theresa Niemogha, & Coker, A. O. (2012). Cholera Epidemiology in Nigeria: an overview. *The Pan African Medical Journal*, 12, 59. <https://pmc.ncbi.nlm.nih.gov/articles/PMC3428179/>
- Akyala IA, Bright ES, Ajumobi O, Olayinka A, & Nguku P (2014). Investigation of cholera outbreak in an urban north central Nigeria community-The Akwanga experience. *Public Health Research*4(1):7-12. (n.d.).
- Ali, M., Nelson, A. R., Lopez, A. L., & Sack, D. A. (2015). Updated Global Burden of Cholera in

- Endemic Countries. *PLOS Neglected Tropical Diseases*, 9(6), e0003832. <https://doi.org/10.1371/journal.pntd.0003832>
- Azman, A. S., Rudolph, K. E., Cummings, D. A. T., & Lessler, J. (2013). The incubation period of cholera: a systematic review. *The Journal of Infection*, 66(5), 432–438. <https://doi.org/10.1016/j.jinf.2012.11.013>
- Black, R. E., Laxminarayan, R., Temmerman, M., & Walker, N. (2015). *Disease Control Priorities, Third Edition (Volume 2) : Reproductive, Maternal, Newborn, and Child Health*. World Bank Publications.
- Brunette, G. W. (2017). *CDC health information for international travel 2018 the yellow book*. Oxford University Press.
- Charnley, G. E. C., Jean, K., Kelman, I., Gaythorpe, K. A. M., & Murray, K. A. (2022). Association between Conflict and Cholera in Nigeria and the Democratic Republic of the Congo. *Emerging Infectious Diseases*, 28(12), 2472–2481. <https://doi.org/10.3201/eid2812.212398>
- Chirisa, I., Mutambisi, T., Chivenge, M., Mabaso, E., Matamanda, A. R., & Ncube, R. (2020). The urban penalty of COVID-19 lockdowns across the globe: manifestations and lessons for Anglophone sub-Saharan Africa. *GeoJournal*. <https://doi.org/10.1007/s10708-020-10281-6>
- Dan-Nwafor, C. C., Ogbonna, U., Onyiah, P., Gidado, S., Adebobola, B., Nguku, P., & Nsubuga, P. (2019). A cholera outbreak in a rural north central Nigerian community: an unmatched case-control study. *BMC Public Health*, 19(1). <https://doi.org/10.1186/s12889-018-6299-3>
- Emizet Francois Kisangani, & Bobb, S. F. (2009). *Historical Dictionary of the Democratic Republic of the Congo*. Scarecrow Press.
- Eneh, S., Onukansi, F., Collins Anokwuru, Ogechi Ikhuoria, Edeh, G., Sochima Obiekwe, Zakariya'u Dauda, Awoyemi Praise-God, & Okpara, C. (2024a). Cholera outbreak trends in Nigeria: policy recommendations and innovative approaches to prevention and treatment. *Frontiers in Public Health*, 12. <https://doi.org/10.3389/fpubh.2024.1464361>
- Eneh, S., Onukansi, F., Collins Anokwuru, Ogechi Ikhuoria, Edeh, G., Sochima Obiekwe, Zakariya'u Dauda, Awoyemi Praise-God, & Okpara, C. (2024b). Cholera outbreak trends in Nigeria: policy recommendations and innovative approaches to prevention and treatment. *Frontiers in Public Health*, 12. <https://doi.org/10.3389/fpubh.2024.1464361>
- Espoir Bwenge Malembaka, Patrick Musole Bugeme, Hutchins, C., Xu, H., Juan Dent Hulse, Demby, M. N., Gallandat, K., Jaime Mufitini Saidi, Baron Bashige Rumedeka, Moïse Itongwa, Esperance Tshiwedi-Tsilabia, Faïda Kitoga, Tavia Bodisa-Matamu, Kavunga-Membo, H., Bengheya, J., Jean-Claude Kulondwa, Debes, A. K., Nagède Taty, Lee, E. C., & Octavie Lunguya. (2024). Effectiveness of one dose of killed oral cholera vaccine in an endemic community in the Democratic Republic of the Congo: a matched case-control study. *The Lancet Infectious Diseases*. [https://doi.org/10.1016/s1473-3099\(23\)00742-9](https://doi.org/10.1016/s1473-3099(23)00742-9)
- Gomathi, Ms. S., Theresa, Ms. P. L., & Debora, S. J. (2017). WASH Water, Sanitation and Hygiene : A Review. *International Journal of Trend in Scientific Research and Development*, Volume-2(Issue-1), 575–579. <https://doi.org/10.31142/ijtsrd7012>
- Gregor CL & Awual FA (2015). Climate and socioeconomic influences on inter-annual variability of cholera in Nigeria. *Health and Place*34:107-117. (n.d.).
- Grönwall, J., & Danert, K. (2020). Regarding Groundwater and Drinking Water Access through A Human Rights Lens: Self-Supply as A Norm. *Water*, 12(2), 419. <https://doi.org/10.3390/w12020419>
- Gulumbe, B. H., Aminu, U., Yusuf, Z. M., Liman, U. U., Faggo, A. A., Abubakar, J., Abdulrahim, A., & Usman, N. I. (2023). Cholera Outbreaks in Conflict-Hit Regions of Northern Nigeria: An Overview. *Afro-Egyptian Journal of Infectious and Endemic Diseases*, 13(2), 134–142. <https://doi.org/10.21608/aeji.2023.205724.1286>
- HealthThink. (n.d.). *Cholera in Nigeria: Get your facts right – Health Think Analytics*. Retrieved November 17, 2022, from <https://healththink.org/cholera-in-nigeria-get-your-facts-right/>
- Hospodsky, D., Yamamoto, N., Nazaroff, W. W., Miller, D., Gorthala, S., & Peccia, J. (2014).

- Characterizing airborne fungal and bacterial concentrations and emission rates in six occupied children's classrooms. *Indoor Air*, 25(6), 641–652. <https://doi.org/10.1111/ina.12172>
- Ilic, I., & Ilic, M. (2023). Global Patterns of Trends in Cholera Mortality. *Tropical Medicine and Infectious Disease*, 8(3), 169. <https://doi.org/10.3390/tropicalmed8030169>
- Kumar, P., Jain, M., Goel, A. K., Bhadauria, S., Sharma, S. K., Kamboj, D. V., Singh, L., Ramamurthy, T., & Nair, G. B. (2009). A large cholera outbreak due to a new cholera toxin variant of the *Vibrio cholerae* O1 El Tor biotype in Orissa, Eastern India. *Journal of Medical Microbiology*, 58(2), 234–238. <https://doi.org/10.1099/jmm.0.002089-0>
- Leckebusch GC & Abdussalam AF (2015). Climate and socioeconomic influences on interannual variability of cholera in Nigeria. *Health & Place* 34:107–117.ks in Nigeria are associated with multidrug resistant atypical El Tor and Non-O1/Non-O139 *Vibrio cholerae*. *PLoS Neglected Tropical Diseases*7(2):e2049. (n.d.).
- Nigeria's cholera outbreaks: why they happen and are so hard to control.* (2024). Gavi.org. <https://www.gavi.org/vaccineswork/nigerias-cholera-outbreaks-why-they-happen-and-are-so-hard-control>
- Oladele DA, Oyedeji KS, Niemogha MT, Nwaokorie F, Bamidele M, Musa AZ et al. (2012). An assessment of the emergency response among health workers involved in the 2010 cholera outbreak in northern Nigeria. *Journal of Infection and Public Health*5:346-353. (n.d.).
- Olajumoke EO & Kayode AA (2017). Geospatial assessment of cholera in a rapidly urbanizing environment. *Journal of Environment and Public Health*2017:8. (n.d.).
- Organització Mundial De La Salut. Global Influenza Programme. (2009). *Pandemic influenza preparedness and response : a WHO guidance document.* World Health Organization.
- Turankar, R. P., Mallika Lavania, Singh, I., & Umesh Datta Gupta. (2023). *Modern molecular era of the mycobacterial world: Insights into diagnosis and transmission of mycobacteria and associated diseases.* Frontiers Media SA.
- Ujah IAO, Nwaokorie F, Adeneye A, Oladele D, Bamidele T, Musa S et al. (2015) A review of perception and myth on causes of cholera infection in endemic areas of Nigeria. *African Journal of Microbiology Research* 9(9):557-564. (n.d.).
- Wardlaw, T. M., Johansson, E. W., Hodge, M., World Health Organization, & United Nations Children's Fund (UNICEF. (2010). Pneumonia : the forgotten killer of children. *Who.int.* <https://doi.org/9789280640489>
- World Health Organization. (2013). *Pocket book of hospital care for children : Guidelines for the management of common illnesses* (2nd ed.). World Health Organization.
- World Health Organization. (2021). *WORLD HEALTH STATISTICS 2020 : monitoring health for the sdgs, sustainable development goals.* World Health Organization.
- World Health Organization. (2023, February 11). *Cholera – Global situation.* *Www.who.int.* <https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON437>