

## Review Article

# An overview of cholera outbreak in Nigeria - consequences and possible solutions

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## Abstract

*Cholera is acute diarrheal disease caused by Vibrio cholerae bacterium, primarily transmitted through contaminated water and food. Nigeria has experienced recurrent cholera outbreaks, with significant public health, social, and economic impacts. This review examines the causes, responses, and challenges related to cholera outbreaks, along with potential solutions. The primary cause of cholera in Nigeria is inadequate access to clean water, poor sanitation, and improper waste disposal, leading to contamination of water sources. The disease affects areas with limited healthcare infrastructure and low hygienic standards. Despite efforts by the Nigerian government and foreign organizations to eradicate cholera, outbreaks persist, typically worsened by growing urbanization, seasonal flooding, and conflicts that impede healthcare delivery. The response to cholera outbreaks in Nigeria has included emergency vaccination campaigns, improved water treatment programs, and public health education. However, these efforts face significant obstacles, such as inadequate funding, lack of coordinated action between government agencies, and the persistence of unsafe water sources. To mitigate cholera's impact, this review suggests several solutions, including improving access to clean water, enhancing sanitation infrastructure, and strengthening surveillance and early warning systems. Collaboration involving government, international organizations, and local communities is essential for preventing future outbreaks of cholera in Nigeria.*

**Keywords:** Cholera, Outbreak, Causes, Impact, Challenges, Solutions, Nigeria

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## INTRODUCTION

The bacterium *Vibrio cholerae* is the cause of cholera, an acute diarrheal infection that can be fatal if left untreated. A high percentage of cholera cases are caused by contaminated food or water. The disease is characterized by sudden diarrhea, vomiting, and dehydration, which can

quickly progress to hypovolemic shock and death if left untreated. The disease has a significant impact, especially in areas with poor sanitation and limited access to clean water. Recent studies show that cholera is still a major public health concern in many low-resource settings, where outbreaks can happen alarmingly frequently [1,2].

## General context of public health in Nigeria

Nigeria has several serious public health issues, including a high prevalence of infectious diseases like cholera. An increasing population and scarce resources frequently put strain on the nation's healthcare system, making it more difficult to effectively manage and control outbreaks. In Nigeria, cholera outbreaks are usually made worse by poor sanitation, a lack of clean water, and ineffective health systems. Records show that cholera is still common in some areas of Nigeria, and that outbreaks during certain seasons cause significant morbidity and mortality. [3] In order to combat cholera in Nigeria, concerted measures are needed to fortify healthcare facilities, increase disease surveillance, and upgrade the infrastructure for water and sanitation. This would help contain epidemics more effectively.

## Purpose of the review

This review aims to give a thorough evaluation of the present cholera outbreak in Nigeria by looking at its causes, effects, and the efficacy of the measures put in place to control and lessen the situation. In Nigeria, cholera outbreaks are persistent public health concern that puts a burden on the healthcare system and raises rates of morbidity and mortality [4].

## HISTORICAL CONTEXT

### Previous cholera outbreaks in Nigeria

Nigeria has a long history of cholera, with reports of sporadic epidemics in various areas. Following the Nigerian Civil War, Nigeria saw its first significant cholera epidemic in 1970. Virtually yearly outbreaks have since been documented, mostly in northern Nigeria, where poor water and sanitation facilities encourage the spread of *Vibrio cholerae*. For example, the 1991 outbreak was exceptionally severe and affected multiple states such as Kano, Akwa Ibom, Bauchi, Niger and Ogun State. Significant cholera outbreaks have occurred in Nigeria more recently in 2010, 2014, 2018, and 2021. Every one of these outbreaks has shown how Nigeria's public health system is consistently susceptible to cholera [5].

### Impacts of past outbreaks

Previous cholera epidemics in Nigeria have had a significant effect on social systems, the economy, and public health. Over 2,000 people died and hundreds were sick during the 2010 outbreak that ravaged multiple northern states,

overloading local health services and causing widespread fear [6]. The 2014 outbreak was especially bad, with over 4,000 cases reported and a high death toll. It emphasized how vital it is for vulnerable places to have better water and sanitation facilities [7]. Recent outbreaks, such as those in 2018 and 2021, have highlighted the ongoing difficulties Nigeria faces in containing cholera.

## Lessons learned from previous experience

Nigeria's past cholera epidemics have taught us important lessons in controlling and averting similar ones in the future. Improving the infrastructure related to water, sanitation, and hygiene (WASH) is a crucial lesson. In addition to prompt medical interventions, long-term investments in waste management and clean water supply are necessary for the effective control of cholera [8]. According to Ojeda *et al* [9], previous outbreaks have indicated the importance of prompt vaccination campaigns and the creation of oral rehydration therapy centers in reducing the severity of cholera. By encouraging good hygienic habits and guaranteeing prompt treatment, public awareness and community involvement are also essential in the fight against cholera [9].

## HEALTH INFRASTRUCTURE AND CHALLENGES

Nigeria's health system is a multifaceted network with different levels of service delivery and quality throughout the public, private, and traditional sectors. State and municipal governments have some authority over the public health system, but the federal Ministry of Health is ultimately in charge of overseeing it. Primary healthcare centers, secondary healthcare facilities like district hospitals, and tertiary healthcare facilities like specialized hospitals and teaching hospitals make up Nigeria's healthcare infrastructure [10]. Even with this multi-tiered system in place, the nation still has a lot of difficulties controlling health crises like cholera outbreaks.

### Healthcare infrastructure

The accessibility and distribution of healthcare services in Nigeria are not equal. While urban places like Lagos and Abuja have comparatively well-equipped facilities, rural areas like Toru-Orua village, Sagbama Local Government Area Council, Bayelsa State, frequently have poor infrastructure, which includes restricted access to clean water, poor sanitation, and a lack of healthcare facilities. Essential resources,

including clean water, dependable energy, and sufficient medical supplies, are lacking in many health clinics [11].

### Readiness for outbreaks

Numerous factors restrict Nigeria's health system's ability to contain outbreaks. Through programs like the National Health Emergency Readiness and Response Plan, the nation has worked to increase its level of emergency readiness. The procedures for responding to outbreaks, such as early identification, response methods, and surveillance, are described in this strategy. Nevertheless, obstacles continue to exist, such as limited financial resources, a shortage of skilled labor, and operational problems that impede the successful execution of these strategies [12].

### Public health challenges

Systemic issues, which include administrative inefficiencies, corruption, and fragmented healthcare delivery, affect Nigeria's health system. These problems affect both the general performance of public health and the efficacy of managing outbreaks. Moreover, socioeconomic variables, including low literacy, poverty, and insufficient public health education, make it more difficult to manage and contain outbreaks [11]. Comprehensive reforms are needed to solve these systemic and infrastructure problems, enhance stakeholder cooperation, and guarantee that medical institutions are sufficiently equipped to handle crises if Nigeria is to become more resilient in its health system.

## CURRENT OUTBREAK OVERVIEW

### Timeline and geographic spread

Beginning in early 2023, Nigeria saw its most recent major cholera outbreak, which had a substantial impact on the nation's diverse regions [10]. *Vibrio cholerae* spread quickly in the northeastern states during the outbreak's early stages due to flooding and unsanitary circumstances. The outbreak had extended to additional areas by the middle of 2023, including the northwest and central regions of Nigeria. Particularly heavily struck were states like Borno, Kano, Katsina, and Adamawa, where cases were documented in peri-urban and rural regions with inadequate sanitation infrastructure [13].

### Statistics and data

The current cholera outbreak in Nigeria has claimed thousands of lives as of August 2024

and resulted in several hundred recorded cases. According to estimates from the Nigeria Centre for Disease Control (NCDC), over 5,000 cases have been recorded, and complications from cholera have been linked to almost 300 deaths [14]. Regional differences have been noted in the case fatality rate, with greater rates found in places with poor hygienic conditions and restricted access to medical facilities.

Low-income areas and children under five are among the key categories impacted by the outbreak. Children's smaller bodies and increased danger of dehydration make them especially susceptible to cholera. Due to their restricted access to sanitary facilities and potable water, low-income and marginalized groups are disproportionately affected [15]. The outbreak has brought attention to gaps in healthcare access as well, with underprivileged and rural people having greater rates of illness and mortality than in urban areas with more developed healthcare systems.

## CAUSES AND CONTRIBUTING FACTORS

### Environmental factors

The spread of cholera is mostly caused by environmental factors. Seasonal flooding plays a major role in the spread of cholera in Nigeria. The introduction of *Vibrio cholerae* into drinking water supplies due to pollution exacerbates the cholera outbreak [14]. Inadequate waste disposal systems and open defecation practices damage water bodies and raise the danger of cholera epidemics, which explains the problem of poor sanitation infrastructure. Inadequate drainage systems also lead to stagnant water pools in urban and peri-urban regions, which serve as disease breeding grounds. The way these environmental elements interact makes it easier for cholera to persist and spread [16].

### Socioeconomic factors

Socioeconomic variables have a major impact on the frequency and intensity of cholera epidemics. Poverty is a significant factor in Nigeria since low-income areas frequently lack access to sanitary facilities and clean water. These communities are unable to invest as much in improved infrastructure and hygienic practices due to financial restrictions. Inadequate awareness of good sanitation and hygiene is another factor that leads to low educational attainment, which increases cholera susceptibility [17]. The risk of cholera has also increased due to the spread of unofficial settlements with inadequate sanitation brought on by increasing

urbanization. The challenges of controlling and preventing cholera are made more difficult in these locations by overcrowding and subpar public services [18].

### **Health system factors**

Nigeria's health system has several obstacles that make it difficult for it to control cholera epidemics. The poor state of the healthcare system is a significant problem, especially in underprivileged and rural areas. Numerous healthcare facilities are ill-equipped and devoid of basic amenities like a steady supply of electricity, water, and medical supplies, which are necessary for the diagnosis, treatment, and management of cholera cases. There is frequently a deficiency of skilled healthcare workers and a breakdown in communication between different governmental levels and healthcare providers [19]. The efficacy of efforts to contain outbreaks is hampered by this fragmentation, which also restricts the adoption of preventive measures. Delays in reporting and inadequate surveillance systems compound the issue, causing a delay in responding and a rise in the transmission of disease [20]. A comprehensive strategy to fortify healthcare infrastructure, enhance coordination and training, and improve surveillance and response systems is needed to address these health system variables.

## **GOVERNMENT AND ORGANIZATIONAL RESPONSE**

### **Government actions**

#### ***National and Local government response and strategies***

Through a number of government institutions and agencies, the Nigerian government directly or indirectly assists in the battle against cholera. Nigeria formed the NCDC in 2007 in order to handle the emergence of outbreaks throughout the nation. In order to stop the spread of infectious illnesses, such as cholera, in Nigeria, NCDC advocates for taking the lead in laboratory facility provision, management, and prevention. The government works closely with the US Centers for Disease Control and Prevention (CDC), the World Health Organization (WHO), and other organizations to develop reference laboratories and provide and oversee disease surveillance throughout the nation. The Nigerian government focused heavily on supplying safe drinking water and raising public awareness of sanitation and personal hygiene habits in order to eradicate the etiology of cholera [13].

Nigeria collaborated with the International Organization for Migration, a United Nations agency, in 2019 to provide over 68 boreholes throughout Borno State as a cholera epidemic preventative strategy. In Borno State, Nigeria, in 2017, the government's engagement through the NCDC and non-governmental organizations like Médecins Sans Frontières International and WHO greatly contributed to reducing the death rate and cholera outbreak [21]. "The Nigerian Institute of Medical Research Emergency Response Team (NIMRERT)" assessed the effectiveness of community health interventions and the scope of the epidemics in three Northeastern states in 2010, with the goal of containing the outbreak in the area. The team also provided laboratory and research support for the successful detection of *Vibrio cholerae*. [22].

Nigeria formed the "National Strategic Plan of Action on Cholera Control (NSPCC)" to identify and administer the vaccine in such impacted areas, in accordance with WHO recommendations to identify small hotspot areas devastated by cholera. People in Bauchi State have successfully received vaccinations as a result of this. The "National Cholera Emergency Operations Center (EOC)" was reactivated in 2021 in order to continue the fight against cholera, and this resulted in tremendous support from the fast reaction teams in the hotspot areas in the Northwest, Northeast, and North Central regions. The EOC in Borno State enhanced the administration, distribution, and coordination of the oral cholera vaccination in IDP camps and tracked the daily occurrence of cholera [23].

#### ***Policies implemented to control the outbreak***

The Nigerian government has put in place a number of laws and directives to stop cholera epidemics. The following are some of the measures the administration has implemented to stop the cholera outbreak in the nation: bolstering disease monitoring programs to guarantee that cases of cholera are quickly identified and reported. This entails establishing a nationwide cholera monitoring system to effectively track and manage outbreaks; enhancing the availability of clean water and sanitation facilities; and encouraging hygienic practices [5]. The purpose of these efforts is to educate people about the spread of cholera and prevent it by launching oral cholera immunization programs in high-risk and endemic areas. Vaccinating populations at risk is one way to do this in order to increase immunity and stop the disease from spreading, forming and implementing fast response units to oversee and

contain epidemics. These groups oversee logistics, administer medical care, and work to stop the disease's spread; modernizing medical facilities, especially in terms of diagnosis and treatment skills, to increase their ability to manage cholera cases; creating and implementing laws and guidelines pertaining to public health, cleanliness, and disease control [24].

## **ROLES OF NGOS AND INTERNATIONAL ORGANIZATIONS**

### **Assistance provided by organizations**

It is impossible to overemphasize the importance of NGOs in the fight against cholera in Nigeria since they give the government vital information about the prevalence of numerous infectious diseases [25]. Enhancing healthcare systems and promoting good governance are the main concerns of many NGOs, which are in line with the government's primary duty at the state and federal levels.

The World Health Organization (WHO), taking the lead in the global health response, is assisting Nigeria's Federal Government in containing the current cholera outbreak throughout the impacted states. The World Health Organization (WHO) has assisted the government at all three tiers (federal, state, and local government regions) in activating the Emergency Operations Centre (EOC), with all these areas meeting on time, in order to guarantee a more efficient, prompt, and coordinated response [26].

Health information management (HIM) and laboratory services were also supplied by WHO, and these services flow from the federal to state and local administrations. Using data optimally to quickly detect the epidemic, maintain an efficient response, and assist in decision-making to control it in the nation is one of the goals. In order to promptly identify and address suspected cases of cholera at the community and ward level, the World Health Organization is making full use of its community structures to augment active case search initiatives. Meanwhile, help is being given at the state level to guarantee that superior information products, like sitreps, are generated every week, particularly in the high-risk state [27].

The government has also received assistance from the World Health Organization (WHO) in improving the procedures for transferring samples from the local level to the national reference laboratory. WHO gave technical

assistance and advice on efficient sample collection to the government and community organizations, including state epidemiologists, disease surveillance and notification officers, primary healthcare workers, and partners, during the reporting week [15].

The World Health Organization (WHO) is working with partners like UNICEF to ensure that vulnerable and exposed populations have access to real-time health information in the areas of risk communication, community involvement, and infodemic management. In the meantime, the WHO has assisted the government in examining the social and behavioral change communication materials in order to guarantee that accuracy and appropriate messages are improved at the community level [28].

Gavi, The Vaccine Alliance, and the United Nations Children's Fund (UNICEF) are among the other organizations that assisted in containing the cholera outbreak in Nigeria. Along with providing IV fluids, oral rehydration salts, water purification tablets, and other logistical support to some Northwestern and Northeastern states in their cholera outbreak efforts, UNICEF also funded radio and television sensitization campaigns in certain regions. In order to protect at-risk populations, NGOs such as Médecins Sans Frontières (MSF), the International Federation of Red Cross and Red Crescent Societies (IFRC), WaterAid, and Oxfam support and coordinate mass oral cholera vaccination campaigns. NGOs help local government and medical staff get the training they need to handle cholera cases and contain epidemics more skillfully [29].

### **Collaborative efforts and support received**

Cooperation from a range of stakeholders has been essential in managing and reducing the effects of the disease during the recent cholera outbreaks in Nigeria. In order to successfully address cholera epidemics, lessen their impact, and work toward long-term solutions to prevent future outbreaks, these cooperative activities and supports are crucial. The federal Ministry of Health (FMOH), in close collaboration with state health ministries and local authorities to contain outbreaks, has been leading the charge in organizing the country's response to cholera [30]. In addition, the NCDC has been instrumental in the coordination of response efforts, surveillance, and outbreak investigations. The World Health Organization (WHO) has offered financial help, technical support, and advice on outbreak response while operating on a global scale. They have been crucial in helping vaccine efforts,

offering training, and assisting cholera treatment facilities [31].

## **PUBLIC HEALTH MEASURES**

### **Preventive measures**

The main requirement for cholera prevention and control is efficient surveillance systems. That is, the early warning unit serves as the cornerstone of an effective targeted prevention and control strategy. It facilitates the identification of high-risk areas and vulnerable populations, allows for the prompt dissemination of information to stakeholders so that appropriate action can be taken, and speeds up the detection of the index case and the initiation of outbreak control measures (through an integrated approach) [23].

### **Vaccination campaigns and public awareness efforts**

A quick, safe, and affordable way to prevent cholera is to get vaccinated against it. It provides just about sixty-seven percent protection for three to five years. Thus, it serves as the final link between emergency actions and more extensive preventive initiatives, including funding for services related to hygiene, sanitation, and water safety. Oral cholera vaccinations should not be used in place of routinely advised preventative measures, including better water supply, sufficient sanitation, and health education. Instead, they should be used as an extra public health tool in complicated situations [32].

In high-risk and endemic areas, the Nigerian government carries out widespread oral cholera immunization campaigns with assistance from foreign partners. By immunizing susceptible groups against cholera, these efforts hope to lower the frequency of outbreaks. Funding and administrative assistance are provided for the acquisition and distribution of oral cholera vaccines by groups like Gavi, the Vaccine Alliance. While the World Health Organization (WHO) and UNICEF work with the Nigerian government to coordinate vaccination efforts, ensure proper vaccine storage and distribution, and track campaign coverage. Gavi also supports the planning and execution of vaccination campaigns [33]. Six impacted Local Government Units (LGAs) in Borno State, Nigeria, saw the implementation of the first OCV campaign round in September 2017 as part of the control measures for the cholera outbreak. On September 15, 2017, nine hundred and fifteen thousand OCV doses were approved and handed to Nigeria. On September 16, 2017, the

dosages were shipped to the capital of Borno State, Nigeria. This was the first-ever OCV campaign in Nigeria, using the oral vaccine (Schancol), which was produced in India. Public health initiatives that educate communities on cholera prevention, symptoms, and the significance of seeking early treatment are essential in addition to vaccination drives. Numerous media, such as radio, television, social media, and community outreach, are frequently used in these campaigns. Furthermore, to improve local knowledge and practices, they host community gatherings, provide educational booklets, and run workshops. Finally, educational initiatives aimed at educating kids about cholera prevention are directed toward schools. Children can use the hygiene and sanitation principles they learn in these programs to practice at home and to share with their families [22].

### **Hygienic and sanitation improvement**

It is important to educate communities on the causes of contamination and preventative measures. Maintaining good hygiene can significantly lower the chance of cholera and other intestinal diseases spreading. Prior to the cholera season, hygienic educational campaigns at water points are stepped up, and Information Education and Communication (IEC) materials are put in place to make information easily accessible to the public. In order to promote access to water and sanitation and stop the spread of diarrheal illness epidemics, Solidarities International starts its preventive efforts well in advance of the rainy season. In order to guarantee that the water is free of pathogens, new construction and restoration are carried out, and water quality is routinely checked. To guarantee the upkeep, management, and cleanliness of the water points, water point committees are established or revitalized; they are also supplied with chlorine for chlorination [22]. Additionally, jerry-can cleaning campaigns are often held at water points to encourage people to clean their storage containers with soap, especially during the rainy season, in order to prevent water contamination during water transit and storage.

Preventive methods include main drainage system cleaning and toilet desludging, particularly in populated regions. Cleaning efforts for solid trash are regularly carried out. Respecting the fundamentals of hygienic human waste disposal should be a top priority, especially when it comes to shielding water sources from faecal pollution. Promoting basic hygiene, which includes thoroughly washing

hands with soap after coming into contact with excreta, is important for adults, babies, and kids alike. Households should be educated about the need for and methods of home water sanitization in areas where water supplies are susceptible to contamination [34]. Using household bleach to chlorinate the water in the storage container is the easiest and most economical technique. Food safety is a critical preventive step that should be heightened when cholera is a concern because food is a major vector for the spread of enteric infections. Community-wide reinforcement of food safety practices is necessary during outbreaks [35]. In regions lacking municipal sewage networks, pit latrines and other similar facilities must be constructed, maintained, and serviced regularly to guarantee their safe operation. Additionally, identifying and resolving issues with current sanitary systems could potentially aid in managing epidemics [34].

## TREATMENT AND CARE

Whenever possible, cholera treatment centers should be established among the impacted populations to guarantee prompt access to care. In reaction to the crisis, the health sector is supporting the State Ministry of Health, placing a strong emphasis on curtailing the outbreak by supporting WASH initiatives, such as water quality monitoring, guaranteeing access to safe water within medical facilities, waste management at the level of cholera treatment centers, and providing medical care to cholera victims. These initiatives include the creation of decentralized treatment centers, cholera management training for medical personnel, and the provision of cholera kits [36].

### Availability and distribution of treatment materials

The Case Fatality Rate (CFR) is significantly lower in cases of cholera where patients have access to quality care. The main treatment for cholera is rapid rehydration, which can be achieved by intravenous (IV) fluid delivery in severe cases, or by oral rehydration therapy (ORT) to replenish lost fluids and electrolytes [37]. In contrast to the original ORS formulation, a low osmolarity solution is recommended by WHO and UNICEF since it lowers the incidence of vomiting. The 10 – 15 % of cholera patients who experience severe dehydration need to be quickly rehydrated with IV fluids, ideally Ringer's lactate solution, since it has an electrolyte composition that is suitable for treating cholera patients. Although rehydration can save lives, it has no impact on the course of the illness or the excretion of bacteria.

In order to effectively treat and manage patients, it is essential to set up cholera treatment structures, multiply and decentralize them, create case management protocols, train medical staff to implement them, and make this guideline and any other streamlined treatment protocols available to all treatment centers [38]. The best course of action for managing the case and quickly restoring circulation will also be an aggressive replacement of fluid, either intravenously or orally, since one of the most relevant symptoms of cholera disease is an aggressive depletion of water volume from the patient, which frequently results in hypovolemic shock and ultimately death [17].

### Health facilities and personnel involved in cholera outbreak response

Public health emergency operations centers (PHEOCs), where health leaders can gather information from various sources, coordinate decision-making, communicate across levels and sectors, and mobilize Regional Rapid Transit system (RRTs) and resources, are highly recommended by the International Health Regulations (IHR). State parties are required by the IHR to build, bolster, and preserve their ability to react swiftly and efficiently to threats to the public's health as well as public health emergencies. In order to achieve these standards, a functional PHEOC is essential.

In Nigeria, reacting to cholera outbreaks requires the assistance of medical staff and facilities. They work on preventative, management, and treatment initiatives. Health professionals must begin treatment as soon as cholera cases are suspected or identified to minimize potential fatalities and environmental pollution [39]. When a *Vibrio cholerae* outbreak is suspected or confirmed, a cholera Epidemic Control Committee should be constituted as a way. Representatives from all the partners and sectors involved in the prevention and control of the outbreak should be on the epidemic committee. Planning control strategies, allocating specific duties for epidemic detection and response, locating and gathering resources for quick epidemic response, estimating resources required to control epidemic, establishing procedure for fund access, organizing public and health care education, coordinating and overseeing the implementation of control measures, presenting reports on the epidemic and assessing their effects, adjusting strategy, and reviewing performance are some of the duties of the epidemic committee [40].

## IMPACT ASSESSMENT

### Health impact

#### ***Effects on communities and healthcare systems***

The health impact of cholera goes beyond the disease itself. They also put strain on healthcare systems and change the dynamics of community health.

#### ***Increased morbidity and mortality***

If cholera is not treated right away, it can cause fatal dehydration. According to the World Health Organization, untreated cases of cholera may result in up to 50% of deaths.

Recent epidemics have brought attention to the continued susceptibility of populations impacted by conflict and poor infrastructure, as shown in Yemen and Afghanistan [41].

#### ***Healthcare system strain***

During outbreaks, medical facilities are frequently overrun with individuals seeking care at short notice. For instance, hospitals encountered severe difficulties in managing patient volumes during the Nigerian cholera outbreak of 2021, which interfered with the treatment of other illnesses [42].

#### ***Long-term health consequences***

Cholera survivors may have long-term health consequences, especially in young children. Acute dehydration can cause malnourishment and stunted growth, which might hinder cognitive development, according to studies [43].

### Social impact

#### ***Effects on daily life, education, and community wellbeing***

Cholera epidemics have far-reaching social repercussions that impact people's daily lives as well as the general well-being of communities.

#### ***Disruption of daily life***

Outbreaks of cholera frequently cause major interruptions to day-to-day operations, such as market closures and travel restrictions. During outbreaks, economic activity is negatively disrupted in places like South Sudan, which increases food insecurity [44].

### ***Impact on Education***

Schools regularly close during cholera outbreaks to avoid transmission, which can have dramatic implications for children's education. According to a study done during Malawi's cholera outbreak, school closures caused serious learning losses, especially for girls who are more prone to drop out [45].

### ***Community wellbeing***

The psychological effects of cholera outbreaks can cause a community's people to become more socially isolated, anxious, and depressed. According to research from Bangladesh, cholera outbreaks can cause social relationships to disintegrate and community cohesion to diminish due to fear of loss and contagion [46].

### ***Challenges and issues related to cholera***

A recurring public health concern, particularly in areas with inadequate infrastructure, is cholera. The response to outbreaks is complicated by a number of issues, such as long-term sustainability requirements, communication hurdles, and logistical constraints.

#### ***Logistic challenges***

Effective cholera response operations are significantly hampered by logistical issues. Access to afflicted populations is hampered by physical and infrastructure constraints in many endemic places, especially in low-income nations.

#### ***Transport infrastructure***

Inadequate transportation networks and bad road conditions might make it difficult to get medical supplies such as IV fluids, oral rehydration salts (ORS), and vaccinations in a timely manner [47].

#### ***Remote and dispersed populations***

Communities in remote or difficult-to-reach areas may be dispersed over large areas, making treatment and preventive education more difficult to provide. Researchers in Bangladesh discovered that during outbreaks, underprivileged individuals needed to be reached via mobile clinics, highlighting the necessity for adaptable logistical solutions [48].

#### ***Resource allocation***

During outbreaks, resource allocation must be done efficiently. According to a Nigerian study,

poor planning and logistics caused response times to lag, which in turn led to avoidable fatalities [49].

### **Communication barriers**

In order to control cholera epidemics, effective communication is essential, but there are a number of obstacles that can prevent important information from getting out.

### **Language and literacy**

Language barriers and low literacy rates can make it difficult for people in many impacted countries to interpret health information. It is imperative to customize communications for regional languages and cultural settings. A study conducted in the Democratic Republic of the Congo indicated that communication tactics that incorporated local languages boosted community participation and response to health messaging [50].

### **Misinformation**

The propagation of false information and myths around cholera can increase stigma and anxiety, delaying treatment requests. Misconceptions regarding the disease's transmission had a detrimental impact on public response and adherence to health guidelines during the 2021 cholera outbreak in Haiti [51].

### **Long sustainability**

Effective cholera management calls for long-term initiatives that stop new outbreaks in addition to quick reaction measures.

### **Infrastructure development**

Infrastructure related to water, sanitation, and hygiene (WASH) must be invested in in order to achieve sustainable solutions. According to a Nigerian study, sustained improvements in WASH infrastructure over time dramatically decreased the prevalence of cholera [52].

### **Community engagement**

Involving the community in health projects is essential for sustainability. Involving the community in cholera prevention initiatives promotes responsibility and improves adherence to medical advice. The sustainability of cholera control initiatives has been demonstrated to be higher in programs that integrate community feedback and local leadership [53].

### **Capacity building**

Long-term viability requires local health systems to be strengthened. Improving surveillance systems and providing training to local healthcare personnel can help improve response to epidemics and enable prompt interventions [54].

## **RECOMMENDATIONS**

Cholera is still a serious public health concern, especially in places with inadequate resources and infrastructure. Cholera outbreaks must be controlled and avoided with the use of effective techniques. The following three suggestions are crucial:

### **Strengthening health infrastructure**

For long-term illness treatment and an efficient cholera response, investments in health infrastructure are essential.

### **Capacity building**

In order for health systems to withstand unexpected spikes in the number of patients during epidemics, they must be reinforced. This entails providing cholera management training to healthcare personnel, improving their diagnostic skills, and guaranteeing the availability of necessary supplies, including intravenous fluids and oral rehydration treatments. Training local healthcare providers during cholera outbreaks greatly improved patient outcomes, according to research by Curran *et al* [55].

### **Surveillance systems**

Strong disease surveillance systems are essential for timely identification and intervention. Putting in place real-time reporting and monitoring systems can assist in spotting outbreaks before they get worse. Improved monitoring systems allowed for faster response times, which dramatically slowed the spread of cholera, according to a recent study conducted in Kenya [56].

### **Improving water and sanitation**

Access to clean water and adequate sanitation is vital in preventing cholera outbreaks.

### **Infrastructure development**

It is essential to make investments in sanitary facilities and water supply systems. This entails creating and maintaining supplies of clean water, like piped water systems and boreholes, as well

as making sure that human waste is disposed of safely. According to systematic research, cholera incidence significantly decreased in communities with better WASH infrastructure [57].

### **Hygiene promotion**

It is imperative to promote sanitary practices in addition to infrastructure. Education initiatives emphasizing proper food preparation, hand washing with soap, and sanitation can result in behavioral changes that lower the risk of cholera spreading. Community-based hygiene promotion dramatically reduced the incidence of cholera in a recent intervention in Bangladesh [58].

### **Enhanced community engagement**

Engaging communities in cholera prevention and response efforts is crucial for sustainability.

### **Community involvement**

Involving local communities in health program execution and decision-making can boost adherence to health recommendations and foster confidence. Research has indicated that techniques involving participation result in improved health outcomes. For instance, a South Sudanese study discovered that involving community leaders in cholera response operations raised community support for immunization drives and sanitation programs [59].

### **Tailored communication strategies**

A better public awareness of cholera and its prevention can be achieved via the use of culturally and linguistically suitable and effective communication tactics. It has been demonstrated that using regional accents and culturally appropriate messages improves community reaction and involvement. Studies conducted in the Democratic Republic of the Congo showed that health message that was specifically customized for the local population greatly improved awareness of cholera and its prevention [19].

## **CONCLUSION AND PREVENTION STRATEGIES**

Cholera continues to be a serious public health concern, especially in areas with weak healthcare systems, restricted access to clean water, and poor infrastructure. In order to effectively control cholera epidemics, a comprehensive strategy that targets underlying

vulnerabilities and encourages sustainable practices is needed.

### **Final thoughts**

Cholera is a preventable and treatable disease, yet it continues to claim lives due to systemic problems in healthcare delivery, water and sanitation infrastructure, and community engagement. It needs a multifaceted strategy that puts long-term sustainability ahead of temporary solutions to address these issues. Strengthening the immediate response to cholera epidemics, investments in health systems, WASH infrastructure, and community involvement also increase resilience against future risks to public health.

Implementing these initiatives will require cooperation between governments, non-governmental organizations, and international organizations in order to provide vulnerable communities with the tools and information they need to protect themselves against infectious diseases like cholera.

By encouraging a holistic strategy that combines these essential factors, the burden of cholera will be drastically lowered, ultimately leading to healthier communities and improved public health outcomes globally. Going forward, it is critical to maintain vigilance, adjust to new obstacles, and dedicate ourselves to sustainable practices that advance resilience and health equity in the face of persistent threats to public health.

## **DECLARATIONS**

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None.

### **Ethical approval**

Not required.

### **Use of Artificial intelligence/Large language models**

We also declare that we did not use Generative artificial intelligence (AI) and AI-assisted technologies in writing the manuscript.

### **Availability of data and materials**

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Conflict of interest

No conflict of interest is associated with this work.

## Contribution of authors

We declare that this work was done by the author(s) named in this article, and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. Chukwunonso Patrick Eya was in charge of the article's conceptualization and design. All authors contributed to the article and approved the submitted version.

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