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Community Awareness and Government Response to Cholera Outbreaks in Borno State

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Abstract

Cholera remains a major public health concern in many developing regions, particularly in areas affected by conflict, displacement, and inadequate sanitation. Borno State, located in Northeastern Nigeria, has experienced recurrent cholera outbreaks due to a combination of factors, including poor access to clean water, overcrowded internally displaced persons (IDP) camps, and fragile healthcare infrastructure. Young adults (18-30 years) and children under 18 account for the majority of cases, with a slight predominance of females (53%) due to increased water-related activities. This study highlights key outbreak drivers, including contaminated water sources, lack of sanitation facilities, and low awareness of cholera prevention measures. Findings indicate that 48.7% of residents rely on untreated well water, 68.4% lack toilet access, and only 23.5% practice regular handwashing, contributing to recurrent outbreaks. In addition, limited vaccination coverage (22%) and knowledge gaps about cholera transmission and symptoms further increase vulnerability to annual cholera outbreaks. To mitigate future outbreaks, the study recommends improving water supply and treatment, enhancing sanitation infrastructure, and promoting hygiene education. Expanding cholera vaccination campaigns and strengthening community health education initiatives are also critical. Government agencies and public health stakeholders must prioritize these interventions to reduce cholera incidence and improve overall public health resilience in Jere LGA.

Keywords
Cholera, Outbreaks, Sanitation, Hygiene and Jere Local Government Area

I. Introduction

Cholera remains a major public health concern in many developing regions, particularly in areas affected by conflict, displacement, and inadequate sanitation. Borno State, located in northeastern Nigeria, has experienced recurrent cholera outbreaks due to a combination of factors, including poor access to clean water, overcrowded internally displaced persons (IDP) camps, and fragile healthcare infrastructure (World Health Organization [WHO], 2022). The ongoing insurgency in the region has further exacerbated these challenges by disrupting essential health services and displacing millions of people, making them more vulnerable to waterborne diseases like cholera (United Nations Office for the Coordination of Humanitarian Affairs [UNOCHA], 2021).

Although the modes of cholera transmission and preventive strategies have been well understood for over 150 years, the disease continues to be a major public health concern, particularly in regions of Africa, Asia, and Central and South America (Walford, 2020). In the early 21st century, cholera remains a widespread issue, triggering significant

outbreaks in various countries, including Haiti, Yemen, Nigeria, the Democratic Republic of Congo, the Dominican Republic, Egypt, Somalia, Bangladesh, Pakistan, the Philippines, China, Ghana, and Cameroon. Additionally, it remains endemic in several other nations (Ilić and Ilić, 2023). Each year, an estimated 2.9 million cases of cholera occur globally, resulting in approximately 95,000 deaths, with the majority of cases and fatalities concentrated in low- and middle-income nations (Soe et al., 2022; Aondover et al., 2025).

Cholera is widely regarded as a disease linked to social inequality, disproportionately affecting impoverished communities. It primarily afflicts populations already vulnerable due to economic hardship and conflict ((Ilić & Ilić, 2023). In 2021, outbreaks of cholera were documented in 23 countries, with most cases reported in the World Health Organization (WHO) regions of Africa and the Eastern Mediterranean. This pattern persisted in 2022, as 30 countries across five of the six WHO regions reported cholera cases or outbreaks (WHO, 2023; Ahmed & Msughter, 2022). Nigeria, a nation within the WHO African region, continues to experience annual occurrences of cholera. As of July 21, 2024, the country had recorded over 4,809 suspected cases, leading to 156 deaths and a case fatality rate (CFR) of 3.2% across 35 states and 192 local government areas (NCDC, 2024).

Community awareness and government response are critical components in controlling and preventing cholera outbreaks. Effective public health campaigns can significantly improve knowledge of cholera transmission, prevention, and treatment among affected populations, thereby reducing infection rates (Ali et al., 2021). However, many communities in Borno State still face challenges in accessing reliable health information due to linguistic, cultural, and infrastructural barriers. Additionally, some traditional beliefs and misconceptions about cholera can hinder effective prevention and control efforts (Ogunyemi et al., 2020). The Nigerian government, in collaboration with international organizations such as the WHO, the United Nations Children's Fund (UNICEF), and Médecins Sans Frontières (MSF), has implemented various intervention strategies to combat cholera outbreaks in Borno State. These include mass vaccination campaigns, provision of clean water and sanitation facilities, deployment of rapid response teams, and community sensitization programs (WHO, 2022; UNICEF, 2021). Despite these efforts, cholera continues to pose a significant threat, underscoring the need for a more integrated and sustainable approach to outbreak management (Airaoje et al., 2024).

This paper examines the level of community awareness regarding cholera prevention and control, as well as the effectiveness of government response efforts in Borno State. By analyzing public health education campaigns, emergency response measures, and community engagement strategies, this study aims to identify gaps in the current cholera containment framework (Airaoje et al., 2023). Understanding these factors is crucial for developing long-term solutions to prevent future outbreaks, strengthen healthcare resilience, and protect vulnerable populations in the region.

1.1 Motivation of the Study

Cholera remains a significant public health concern in Borno State, Nigeria, due to recurrent outbreaks linked to poor sanitation, inadequate clean water supply, and displacement caused by insurgency (WHO, 2022). The region's ongoing humanitarian crisis has exacerbated the spread of the disease, particularly in internally displaced persons (IDP) camps, where overcrowding and limited healthcare infrastructure heighten vulnerability (UNICEF, 2021; Airaoje et al., 2024). According to the Nigeria Centre for Disease Control (NCDC, 2023), Borno State has consistently recorded high cholera cases, highlighting the need for urgent intervention.

This study is motivated by the urgent need to understand the factors driving cholera transmission in Borno State and to evaluate the effectiveness of existing prevention and control measures. Studies have shown that improving water, sanitation, and hygiene (WASH) infrastructure is crucial for cholera prevention, yet many communities in Borno State lack access to safe drinking water and adequate sanitation facilities (OCHA, 2022; Aliough et al., 2024). By identifying gaps in sanitation, water access, and public health interventions, this research aims to provide evidence-based recommendations for policymakers, health organizations, and humanitarian agencies.

Furthermore, studying cholera in Borno State is crucial for developing targeted strategies to mitigate future outbreaks, protect at-risk populations, and strengthen the state's capacity to respond to health emergencies. The findings of this study will contribute to broader efforts to improve public health resilience in conflict-affected areas, ensuring sustainable solutions for cholera prevention and control (GTFCC, 2021; Hile et al., 2022).

1.2 The Basic Tools of Enquiry

The research is guided by the following questions:

1. What are the primary factors contributing to the recurring cholera outbreaks in Jere Local Government Area of Borno State?
2. How do water, sanitation, and hygiene practices influence the prevalence of cholera in Jere Local Government Area of Borno State?
3. What is the level of knowledge and awareness about cholera transmission, symptoms, and prevention among residents in Jere Local Government Area of Borno State Borno State?
4. What specific intervention should government provide in order to mitigate cholera outbreaks in Jere Local Government Area of Borno State?

II. Review of Literatures

Cholera is an acute diarrheal infection caused by ingesting food or water contaminated with the bacterium *Vibrio cholerae*. The disease remains a global threat to public health and serves as an indicator of inequity and lack of social development. Researchers estimate that annually, there are between 1.3 to 4.0 million cases of cholera worldwide, resulting in 21,000 to 143,000 deaths (Al-Suraihi, 2023). According to him the incubation period for cholera ranges from 12 hours to 5 days after consuming contaminated food or water. While many infected individuals may not exhibit symptoms, the bacteria can still be present in their feces for 1 to 10 days post-infection potentially leading to further transmission. Among those who develop symptoms, most experience mild or moderate manifestations; however, a minority suffer from acute watery diarrhea accompanied by severe dehydration, which c fatal if untreated (Kurfi et al., 2021).

Cholera continues to be a significant global health concern, particularly in regions with inadequate water and sanitation infrastructure, leading to recurrent outbreaks and high mortality rates. In 2024, Nigeria reported 10,837 cholera cases and 359 deaths between January and October, a stark increase from the 2,860 cases and 84 deaths recorded during the same period in 2023, highlighting a worsening public health crisis (ECDC, 2024). Similarly, Sudan faced a severe outbreak with 35,675 cases and 794 deaths by November 2024, a dramatic rise from 1,535 cases and 64 deaths reported in 2023, demonstrating the impact of ongoing humanitarian crises on disease spread (ECDC, 2024; Msughter & Phillips, 2020). In Zimbabwe, cholera cases surged to 19,463 with 387 deaths in 2024,

compared to 5,495 cases and 151 deaths the previous year, emphasizing the urgent need for improved sanitation and clean water access (ECDC, 2024).

Afghanistan, a country with recurrent cholera outbreaks, reported 160,794 cases in 2024, although this represented a decline from 209,805 cases in 2023, potentially due to intensified control measures and public health interventions (ECDC, 2024). Conversely, Bangladesh saw a significant reduction in cholera cases, with only 278 cases recorded in 2024 compared to 111,510 in 2023, likely reflecting the effectiveness of vaccination campaigns and strengthened water and sanitation initiatives (ECDC, 2024; Msughter et al., 2023). In India, 8,519 cases and 43 deaths were reported up to July 2024, a decrease from the 11,253 cases recorded in 2023, yet persistent outbreaks indicate continued vulnerabilities in certain regions (ECDC, 2024; Namadi & Aondover, 2020). Tanzania, however, experienced a concerning increase in cases, reporting 7,248 cases and 114 deaths in 2024 compared to just 87 cases and three deaths in 2023, highlighting the need for urgent intervention and infrastructure improvements (ECDC, 2024).

These epidemiological trends underscore the persistent threat of cholera, especially in countries with limited healthcare access, fragile health systems, and inadequate sanitation. Climate change, conflicts, and population displacement exacerbate the risk, making proactive measures such as improved water and sanitation infrastructure, enhanced disease surveillance, and rapid response mechanisms crucial in controlling outbreaks. The deployment of oral cholera vaccines and increased investment in clean water initiatives are essential in mitigating future outbreaks and reducing cholera-related mortality worldwide (WHO, 2024).

2.1 Trends of Cholera in the Northeast

Since 1970, Nigeria has faced recurring cholera outbreaks, with the disease becoming endemic in the country. A major outbreak in 1991 resulted in 59,478 cases and 7,654 deaths, yielding a case-fatality ratio (CFR) of 12.9%. In 1999, a significant cholera outbreak in Kano State spread to Adamawa and Edo states by May, resulting in 26,358 cases and 2,085 deaths. The 2010 outbreak saw 41,787 cases and 1,716 deaths, with a CFR of 4.1%, affecting 18 states and highlighting the vulnerability of impoverished communities, especially children, to the infection (WHO, 2020). In 2019, an investigation in Bauchi State identified 9,725 cholera cases in ten local government areas (LGAs) and 6 cases in neighboring Plateau State, with 28 deaths reported. By 2022, over 10,000 probable cases were recorded nationwide, with Borno, Adamawa, and Yobe states accounting for a combined 7,700 cases and 324 deaths. Borno alone reported 5,400 of these cases. Similarly, in 2024, amidst severe flooding that displaced nearly 2 million people, Borno State reported a cholera outbreak with 17 confirmed cases as of October 4, alongside nearly 500 cases of Acute Watery Diarrhea (AWD), though no deaths had been recorded at that point (Obada et al., 2024).

2.2 Factors and Causes Contributing to Cholera Outbreaks in Nigeria

Socioeconomic factors like poverty and lack of education significantly contribute to cholera outbreaks in Nigeria. Cholera thrives in regions with limited access to clean water and poor sanitation, conditions commonly associated with poverty. Since the 1970s, cholera cases in Nigeria have risen due to widespread poverty, particularly in rural areas where inadequate infrastructure leaves populations highly vulnerable to disease outbreaks (Okeke et al., 2003). Even in areas with basic infrastructure, cholera can still spread rapidly if proper hygiene practices are lacking. This highlights the importance of public education in understanding the causes and prevention of cholera to reduce its transmission (World

Health Organization, 2016). Environmental factors, such as poor sanitation, lack of potable water, and inadequate waste management, also play a significant role in the spread of the disease. Studies have identified inadequate WASH (water, sanitation, and hygiene) services as key contributors to cholera outbreaks in Nigeria, with contaminated wastewater used for irrigation further exacerbating the problem (Fagbemi & Alao, 2014; Olanrewaju et al., 2012). A study conducted in Kano and Plateau States found that wastewater contamination from irrigation practices contributes to cholera outbreaks (Haruna & Olayemi, 2019; Obada et al., 2021).

Additionally, climate change plays a substantial role in cholera outbreaks by influencing environmental conditions that foster disease spread. Research in the Funtua Local Government Area of Katsina State revealed a strong correlation between rising temperatures and rainfall, with cholera prevalence peaking during the rainy season, particularly in August (Salihu et al., 2018). Similarly, studies in other Nigerian states, such as Kano and Ebonyi, found that cholera cases were more frequent during the rainy season (Ahmed et al., 2016; Nwosu et al., 2015). The role of climate in the seasonality of cholera is further underscored by research showing that increased precipitation and flooding during the rainy season create ideal conditions for the disease (Perez-Saez et al., 2019). Furthermore, factors like conflicts and extreme climate events also contribute to the heightened risk of cholera outbreaks, as noted in studies linking social and environmental extremes to the spread of the disease (Charnley et al., 2017; Charnley et al., 2020; Obada et al., 2021).

2.3 Nigerian Efforts to Mitigate Cholera Outbreaks

Cholera remains a recurrent and devastating public health issue in Nigeria, particularly during the rainy season when poor sanitation conditions exacerbate the spread of the disease. In response, the Nigerian government, through the Nigeria Centre for Disease Control (NCDC), has implemented several strategies to mitigate cholera outbreaks. One of the key efforts has been the activation of the National Cholera Multi-Sectoral Emergency Operations Centre (EOC), which coordinates national response efforts across multiple sectors. This operations center works to strengthen surveillance, improve the early detection of cholera cases, and mobilize resources to provide rapid interventions. The NCDC's response includes training healthcare professionals on appropriate case management, and ensuring the distribution of essential supplies such as oral rehydration salts (ORS) and intravenous fluids to affected regions. Public awareness campaigns, especially regarding the importance of early treatment, also form part of the emergency response strategy (Vanguard, 2024).

A significant component of Nigeria's cholera control efforts involves improving water, sanitation, and hygiene (WaSH) infrastructure. The NCDC has collaborated with the Federal Ministry of Water Resources, the Ministry of Environment, and various local governments to implement programs that provide communities with better access to clean water and safe sanitation. This includes the construction of boreholes, sanitation units, and latrines in high-risk areas, especially in informal urban settlements where open defecation is common (Usman et al., 2022). Such infrastructure improvements are crucial because cholera spreads primarily through contaminated water sources and poor sanitation. Additionally, there are ongoing initiatives to install motorized solar-powered boreholes and handwashing stations in schools and public places to ensure that water is both accessible and safe for consumption. This infrastructure development is intended to prevent future outbreaks by addressing the environmental conditions that allow the disease to thrive (NCDC, 2024).

Public education is another pillar of Nigeria's cholera prevention strategy. The NCDC has undertaken extensive risk communication campaigns to educate the public on preventive measures, including the proper use of clean water for drinking and food preparation, the importance of washing hands with soap and water, and the dangers of consuming untreated or unhygienic food and beverages. Special attention is given to high-risk groups such as market vendors, travelers, and rural populations, who are often more vulnerable to cholera outbreaks. For example, the NCDC has advised against the consumption of locally prepared drinks, such as zobo and fura, unless people are confident about the hygiene standards during preparation. The government has also partnered with non-governmental organizations (NGOs) and local community leaders to ensure that cholera prevention messages reach even the most remote areas (Punch, 2024). These education campaigns are often backed by media programs, posters, and community meetings, targeting both rural and urban populations to build greater awareness about cholera's transmission and prevention (Msughter et al., 2022).

In addition to infrastructure and public health education, vaccination campaigns have played an important role in Nigeria’s cholera mitigation efforts. Although Nigeria does not have a nationwide cholera vaccination program, the NCDC has initiated oral cholera vaccination (OCV) campaigns in regions experiencing outbreaks. These campaigns are typically launched in response to a cholera crisis to provide rapid protection to those in high-risk areas. The NCDC's careful consideration of vaccine deployment is due to factors such as the cost, logistical challenges, and the fact that cholera is often a seasonal occurrence in certain regions. Oral cholera vaccines have proven effective in outbreak situations, offering temporary immunity, but large-scale vaccination is generally reserved for areas with consistent cholera cases. The targeted vaccination campaigns are seen as a temporary but effective tool to curb outbreaks while longer-term solutions such as improved sanitation are put in place (Vanguard, 2024).

Together, these coordinated efforts reflect a multi-faceted approach to addressing the complex issue of cholera in Nigeria. By focusing on infrastructure improvement, public education, targeted vaccination, and swift emergency response measures, Nigeria has taken important steps in reducing the burden of cholera on its population. However, challenges remain, particularly in ensuring sustainable access to clean water and improved sanitation across the country, which is critical for the long-term control of cholera.

2.4 Theoretical Framework

The research uses Public Health Crisis Communication Theory (PHCCT). Public Health Crisis Communication Theory (PHCCT) is a communication framework developed to address the challenges faced by public health officials and organizations when managing and responding to crises that affect public health. The theory offers guidance on how to communicate effectively during public health emergencies, such as pandemics, epidemics, natural disasters, or any situation that poses a threat to public health.

The theory is not attributed to a single scholar, but rather has evolved over time through the work of communication experts and public health professionals. The theory draws on elements of crisis communication, risk communication, and public health messaging that has been developed over several decades. A notable contributor to the field is Timothy L. Sellnow and his work in the 1990s and early 2000s. His research, along with others like Matthew W. Seeger, helped build a robust understanding of how communication strategies can be applied during health crises (Sellnow, 2002; Seeger, 2006). They explored the role of communication in mitigating harm, building trust, and managing fear and uncertainty.

Additionally, the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO) have contributed to shaping the field through their work during health crises, such as the 2003 SARS outbreak, the 2009 H1N1 influenza pandemic, and the 2014-2016 Ebola outbreak, among others. They have developed specific communication strategies to guide health crisis management (CDC, 2009; WHO, 2014). Public Health Crisis Communication Theory is a critical framework that informs how authorities and health organizations communicate during emergencies. Since it has been instrumental in shaping responses to health crises, it is therefore suitable for this study.

III. Research Methods

The study adopted a cross-sectional survey design, which focused on gathering data regarding the causes, effects, and solutions to the recurrent cholera outbreaks in Jere Local Government Area of Borno State. The survey collected both quantitative and qualitative data from community members to evaluate their knowledge, awareness, and practices related to cholera and its transmission. The targeted population consist of residents in Jere Local Government Area of Borno State, selected from various demographic groups to ensure comprehensive representation. A total of 350 populations were served with the questionnaires but 345 were retrieved because 5 were marred. Participants were chosen based on the following inclusion criteria:

- Age: Individuals from certain age groups (15 +years) were eligible for participation.
- Occupation: Participants represented a mixed of occupational backgrounds including farmers, health workers, businesspersons, civil servants, and students.
- Education: Respondents were categorized according to their highest level of education attained.
- Availability: Respondents were available and willing to complete the survey.

A stratified random sampling technique was employed to ensure the inclusion of a variety of demographic groups based on age, gender, occupation, and educational level. This enabled comparison of responses across different population segments and enhanced the representativeness of the data.

Data will be collected through a structured questionnaire with both closed and open-ended questions. The questionnaire was divided into four sections: This section captures basic demographic data such as age, gender, occupation, and education to help classify and analyze responses from different population groups. This section assessed the respondent's familiarity with cholera, its causes, symptoms, and transmission modes. This section focused on water sources, water treatment practices, toilet facilities, and handwashing habits to understand hygiene-related risk factors. This section investigated the effectiveness of public health programs, the preferred sources of medical care during outbreaks, and suggestions for improving cholera prevention efforts.

Quantitative data was analyzed using descriptive statistics to summarize and categorize responses. Statistical Software for Social Sciences was used for the analysis. The qualitative responses were analyzed thematically to identify common patterns and suggestions for intervention.

The study adhered to ethical guidelines by ensuring informed consent, maintaining confidentiality of respondents, and allowing participants to withdraw at any stage of the survey without consequences. Ethical approval was sought from relevant institutional review boards to ensure the protection of participants. The study faced limitations related to self-reported data, where some participants provided socially desirable answers rather than truthful responses. Additionally, geographical constraints must have affected the

ability to collect data from all areas of Jere Local Government Area of Borno State. However, to mitigate these limitations, the survey was distributed to a representative sample across various locations, and efforts were made to ensure anonymity.

IV. Results and Discussion

4.1 Data Presentation

Table 1. Q1. Age group

	Frequency	Percent
18-30	102	29.6
31-45	77	22.3
46-60	49	14.2
Above 60	21	6.1
Below 18	96	27.8
Total	345	100.0

From table 1 above, the largest representation comes from young adults (18-30 years) at 29.6% and children under 18 years at 27.8%. Together, these groups make up over half of the respondents. Adults aged 31-45 years (22.3%) and 46-60 years (14.2%) represent a significant portion, while individuals above 60 years represent (6.1%).

Table 2. Q2. Gender

	Frequency	Percent
Male	162	47.0
Female	183	53.0
Total	345	100.0

Table 2 indicates gender. Females outnumber males, with 53% of respondents identifying as female and 47% as male. This shows a slight gender skew towards females in the sample.

Table 3. Q3. Occupation

	Frequency	Percent
Student	55	15.9
Farmer	181	52.5
Businessperson	62	18.0
Civil servant	47	13.6
Total	345	100.0

Table 3 shows the various occupations of the respondents. Farmers dominate the sample, comprising 52.5% of the respondents, followed by businessperson (18%) and students (15.9%). Civil servants make up a smaller portion of the group (13.6%), indicating that agriculture is the leading occupation in this community.

Table 4. Q4. Level of education

	Frequency	Percent
No formal education	166	48.1
Primary	102	29.6
Secondary	54	15.7
Tertiary	23	6.7
Total	345	100.0

Table 4 indicates the educational level of the respondents. A significant portion of respondents (48.1%) have no formal education. This is followed by those who have completed primary education (29.6%), and a smaller group with secondary education (15.7%). Only 6.7% of respondents have attended tertiary education, suggesting a low level of higher education within this population.

Table 5. Q5. Information on cholera

	Frequency	Percent
Yes	193	55.9
No	152	44.1
Total	345	100.0

Table 5 shows cholera awareness of the respondents, 55.9% of respondents are aware of cholera, while 44.1% are not. This suggests a relatively high awareness of the disease but also highlights a considerable gap in knowledge.

Table 6. Q6. Main cause of cholera

	Frequency	Percent
Contaminated water	113	32.8
Poor sanitation	71	20.6
Eating unclean food	72	20.9
Contact with infected persons	53	15.4
I don’t know	36	10.4
Total	345	100.0

Table 6 above reveals the respondents’ knowledge on the causes of cholera. The primary cause of cholera is most commonly understood to be contaminated water (32.8%), with a significant number also associating the disease with unclean food (20.9%), poor sanitation (20.6%) and 10.4% answering "I don’t know."

Table 7. Q7. Mode of cholera transmission

	Frequency	Percent
Through drinking dirty water	146	42.3
Eating contaminated food	96	27.8
Poor hand washing habits	68	19.7

I don’t know	35	10.1
Total	345	100.0

Table 7 reveals the knowledge of the respondents on cholera transmission. Drinking dirty water (42.3%) is recognized as the main method of cholera transmission, followed by eating contaminated food (27.8%), poor hand washing habits (19.7%) and 10.1% still do not know how cholera is transmitted.

Table 8. Q8. Common symptoms of cholera known by the respondents

	Frequency	Percent
Diarrhea	97	28.1
Vomiting	103	29.9
Dehydration	57	16.5
Fever	88	25.5
Total	345	100.0

Table 8 shows recognition of cholera symptoms by the respondents. The most recognized symptoms are vomiting (29.9%) and diarrhea (28.1%). A smaller percentage of people are aware of fever (25.5%) and dehydration (16.5%) as symptoms.

Table 9. Q9. Major source of drinking water

	Frequency	Percent
Borehole	80	23.2
Well	168	48.7
River/stream	46	13.3
Rainwater	16	4.6
Sachet/bottled water	35	10.1
Total	345	100.0

Table 9 shows the main source of drinking water. The main source of drinking water is from wells (48.7%), followed by boreholes (23.2%), and rivers/streams (13.3%). There is a small proportion using sachet/bottled water (10.1%) and rainwater (4.6%) for drinking.

Table 10. Q10. Treatment of water before use

	Frequency	Percent
Yes	129	37.4
No	216	62.6
Total	345	100.0

Table 10 indicates the practices of water treatment. A large number of respondents (62.6%) do not treat their water before drinking it, while 37.4% report that they do treat it. These points to potential risks regarding water safety.

Table 11. Q11. Access to proper toilet facilities

	Frequency	Percent
Yes	109	31.6
No	236	68.4
Total	345	100.0

Table 11 shows access to proper toilet facilities. Most respondents (68.4%) lack access to proper toilet facilities while 31.6% have access to proper toilet facilities. Therefore, this indicates a significant sanitation issue within the community.

Table 12. Q12. Washing of hands with soap and water

	Frequency	Percent
Always	81	23.5
Sometimes	130	37.7
Rarely	114	33.0
Never	20	5.8
Total	345	100.0

Table 12 indicates hand washing habits. Hand washing is inconsistent, with 37.7% of respondents washing their hands sometimes, and 33% doing so rarely. Only 23.5% wash their hands always, showing a gap in hygiene practices.

Table 13. Q13. Measures needed to be taken by the government to prevent cholera outbreak

	Frequency	Percent
Improve water supply	107	31.0
Promote hygiene promotion	73	21.2
Provide better sanitation facilities	59	17.1
Increase vaccination campaigns	106	30.7
Total	345	100.0

Table 13 shows government measures for cholera prevention. The most commonly suggested government measures to prevent cholera include improving the water supply (31%), increasing vaccination campaigns (30.7%), promoting hygiene (21.2%), and providing better sanitation facilities (17.1%).

Table 14. Q14. Those vaccinated against cholera

	Frequency	Percent
Yes	76	22.0
No	153	44.3
I don’t know	116	33.6
Total	345	100.0

Table 14 reveals the status of the respondents on cholera vaccination. A significant portion of respondents (44.3%) has not been vaccinated against cholera, with 33.6% unsure of their vaccination status. Only 22% have received the vaccine.

4.2 Discussions of Findings

The data from Jere LGA indicates that the majority of cholera cases are found among young adults aged 18-30 years (29.6%) and children under 18 years (27.8%). This aligns with global and national studies on cholera outbreaks. For example, Ali et al. (2015) found that children under five years and young adults bear a significant burden of cholera cases due to their increased exposure to contaminated water sources and inadequate hygiene practices (Ali et al., 2015). Additionally, a study by Abubakar et al. (2021) on cholera outbreaks in northern Nigeria reported that a large percentage of cases occurred in young children and adults due to high-risk behaviors and poor access to sanitation facilities.

The data also highlights a slight predominance of females (53%) over males (47%) among cholera-affected individuals. This is consistent with research by Mengel et al. (2014), which found that in many cholera-endemic regions, women are slightly more affected than men due to their increased water-related activities, such as fetching water and preparing food, which may expose them to contaminated sources. Similar findings were reported in a study conducted in Nigeria, where females accounted for 52% of cholera cases, particularly in rural areas (Ezeh et al., 2019).

Occupation appears to play a significant role in cholera susceptibility in Jere, with farmers making up the largest group (52.5%), followed by businesspersons (18%) and students (15.9%). This pattern is consistent with studies showing that cholera outbreaks disproportionately affect agricultural communities due to their dependence on untreated surface water sources (Sack et al., 2006). A study by Okoh et al. (2020) in rural Nigeria confirmed that farmers had the highest exposure to cholera due to poor sanitation and water quality in farming communities.

Educational attainment is relatively low, with 48.1% of respondents having no formal education and only 6.7% attaining tertiary education. Research has established a strong correlation between low education levels and higher cholera susceptibility, as knowledge of sanitation, hygiene, and safe drinking water practices is often limited among individuals with no formal education (Nkoko et al., 2011). A similar trend was observed in a study conducted by Bwire et al. (2017) in East Africa, where lower literacy rates were linked to delayed responses to cholera prevention campaigns.

Therefore, the demographic trends observed in Jere LGA are consistent with national and international studies on cholera. The dominance of young adults and children, slight female predominance, higher incidence among farmers, and lower levels of education all align with known risk factors for cholera outbreaks. Addressing these vulnerabilities through targeted public health interventions, improved water and sanitation infrastructure, and education programs will be crucial in mitigating future outbreaks.

a. Q1. What are the primary factors contributing to the recurring cholera outbreaks in Jere Local Government Area of Borno State?

The findings from Jere LGA highlight critical gaps in water treatment, sanitation, and hygiene, all of which contribute significantly to cholera outbreaks. These results align with studies conducted in other regions experiencing similar challenges. The majority of respondents (48.7%) rely on wells for drinking water, which, especially when unprotected, are highly susceptible to contamination from fecal matter and other pollutants. Research by

Wright et al. (2004) found that dependence on shallow wells significantly increases the risk of diarrheal diseases due to microbial contamination. Boreholes serve as an alternative source for 23.2% of respondents and are generally considered safer, but contamination can still occur due to poor maintenance and proximity to latrines or waste disposal sites. A study in Northern Nigeria by Oyedeji et al. (2019) revealed that borehole water in poorly managed environments often contained coliform bacteria, making it unsafe without treatment. Additionally, 13.3% of respondents rely on rivers and streams, which are highly vulnerable to contamination from human and animal waste, agricultural runoff, and industrial pollutants. WHO (2021) identifies untreated surface water as a major driver of cholera outbreaks in developing regions. A smaller proportion of respondents use sachet/bottled water (10.1%) and rainwater (4.6%). While sachet and bottled water are often seen as safe, studies by Oluwasanya et al. (2010) indicate that improper storage and handling can lead to bacterial contamination.

A significant proportion of respondents (62.6%) in Jere do not treat their drinking water, increasing their vulnerability to waterborne diseases. Research by Gundry et al. (2004) suggests that household water treatment and safe storage can reduce diarrheal diseases, including cholera, by up to 39%. Similarly, Oladipo et al. (2019) found that poor water treatment practices contribute to recurring cholera outbreaks in rural Nigeria. The lack of proper sanitation facilities exacerbates the problem, with 68.4% of respondents lacking access to toilets, leading to open defecation and improper waste disposal both of which facilitate cholera transmission. According to WHO (2021), inadequate sanitation is a primary risk factor for cholera, particularly in regions where sewage contaminates drinking water sources. Studies in West Africa confirm that improved sanitation significantly reduces cholera outbreaks (Baker et al., 2016).

Hand hygiene is another major concern in Jere, with only 23.5% of respondents practicing regular handwashing. Handwashing with soap is one of the most effective interventions against cholera, yet its adoption remains low. A systematic review by Freeman et al. (2014) found that handwashing with soap reduces the risk of diarrheal disease by approximately 40% (risk ratio 0.60, 95% CI 0.53-0.68). However, after adjusting for unblinded studies, the estimated reduction was 23% (risk ratio 0.77, 95% CI 0.32-1.86). Afolabi et al. (2020) further emphasized that areas in Nigeria with better hand hygiene education reported lower cholera incidence rates. Addressing these challenges requires urgent interventions in water treatment, sanitation, and hygiene promotion to curb cholera outbreaks and improve public health in Jere LGA.

b. Q2. What is the knowledge and awareness about cholera transnsmission, symptoms and prevention among residents in Jere Local Government Area of Borno State?

The findings on cholera awareness, transmission knowledge, and symptom recognition in Jere LGA indicate a moderate level of public health awareness but highlight gaps that could hinder effective prevention and response efforts. These results are consistent with studies from other cholera-prone regions. The data indicates that 55.9% of respondents are aware of cholera, while 44.1% are not. Although more than half of the population has some knowledge of the disease, the significant proportion unaware of cholera suggests a gap in public health education. The finding is inconsistent with Aung et al. (2019) who found that cholera outbreaks were more severe in areas with lower awareness, as individuals were less likely to take preventive measures.

Most respondents correctly identified dirty water (42.3%) and contaminated food (27.8%) as the primary transmission routes for cholera. However, only 19.7% recognized poor handwashing as a transmission factor, and 10.1% were completely unaware of how

cholera spreads. These gaps are concerning, as proper hand hygiene is one of the most effective ways to prevent cholera transmission (Ebob, 2020). Studies in Nigeria (Afolabi et al., 2020) have also found that limited knowledge about disease transmission contributes to higher infection rates. Strengthening public health messaging about all transmission pathways is essential for effective cholera prevention.

The most commonly recognized symptoms were vomiting (29.9%) and diarrhea (28.1%), while fever (25.5%) and dehydration (16.5%) were less frequently identified. This suggests that while many individuals can identify classic symptoms, a significant number may not recognize dehydration, a key factor that leads to severe cholera complications and death if untreated. Research by Ali et al. (2015) found that early recognition of dehydration symptoms in cholera cases significantly improves survival rates. These findings align with studies in other cholera-prone regions and underscore the importance of increasing health education programs and community outreach to enhance awareness and reduce the disease burden.

c. Q3. What specific intervention should government provide in oreder to mitigate cholera outbreak in Jere Local Government Area of Borno State

The findings on government-led cholera prevention measures and vaccination status in Jere LGA highlight efforts to control the disease while revealing gaps in vaccination coverage and public health interventions. The most frequently suggested government measures for cholera prevention include improving water supply (31%), increasing vaccination campaigns (30.7%), promoting hygiene (21.2%), and providing better sanitation facilities (17.1%). These priorities reflect key pillars of cholera control as outlined by the World Health Organization (WHO, 2021). Research by Ali et al. (2017) found that investments in clean water infrastructure and sanitation significantly reduce cholera outbreaks. Similarly, a study in Nigeria by Akinyemi et al. (2020) highlighted that community hygiene promotion and improved access to safe water lowered cholera incidence. These findings suggest that while the government is addressing crucial cholera risk factors, further expansion and effective implementation of these measures are necessary.

The data also indicates a significant gap in cholera vaccination coverage, with 44.3% of respondents not vaccinated and 33.6% unsure of their vaccination status. Only 22% have received the vaccine, highlighting a major public health concern. Vaccination is a key tool for cholera prevention, especially in high-risk areas. According to Bi et al. (2017), oral cholera vaccines (OCVs) have been effective in reducing outbreaks, but challenges such as limited access, misinformation, and logistical barriers often hinder widespread coverage. A study by Bwaka et al. (2019) in sub-Saharan Africa also found that increasing awareness and accessibility of OCVs significantly improved vaccination rates. The high percentage of respondents unaware of their vaccination status suggests the need for better record-keeping and public awareness campaigns to improve uptake. While government measures align with global cholera prevention strategies, gaps in vaccination coverage and hygiene promotion remain challenges.

V. Conclusion

Cholera remains a major public health concern in many developing regions, particularly in areas affected by conflict, displacement, and inadequate sanitation. Borno State, located in northeastern Nigeria, has experienced recurrent cholera outbreaks due to a combination of factors, including poor access to clean water, overcrowded internally

displaced persons (IDP) camps, and fragile healthcare infrastructure. Young adults (18-30 years) and children under 18 account for the majority of cases, with a slight predominance of females (53%) due to increased water-related activities. Farmers (52.5%) are the most affected occupational group, and low education levels further exacerbate cholera susceptibility.

The recurring cholera outbreaks in Jere LGA are primarily driven by inadequate water treatment, poor sanitation, and limited hygiene practices. Findings indicate that 48.7% of residents rely on wells for drinking water, many of which are susceptible to contamination. Boreholes, though safer, still face risks due to poor maintenance. Additionally, 13.3% of respondents depend on rivers and streams, which are highly vulnerable to pollutants. A significant challenge is that 62.6% of the population does not treat their drinking water, heightening vulnerability to waterborne diseases. The lack of proper sanitation is another major factor, with 68.4% of respondents lacking toilet access, leading to open defecation and improper waste disposal. Furthermore, only 23.5% of residents practice regular handwashing, despite strong evidence that hand hygiene reduces cholera risk. Addressing these challenges requires urgent interventions in water treatment, sanitation, and hygiene promotion.

Public awareness of cholera transmission, symptoms, and prevention is moderate but contains critical gaps. While 55.9% of respondents are aware of cholera, 44.1% lack basic knowledge of the disease. Although many correctly identified contaminated water (42.3%) and food (27.8%) as primary transmission routes, only 19.7% recognized poor handwashing as a factor. Additionally, 10.1% were completely unaware of transmission modes, highlighting a need for stronger public health education. Vomiting (29.9%) and diarrhea (28.1%) were the most commonly recognized symptoms, but dehydration, a key contributor to severe cholera complications, was identified by only 16.5% of respondents. Enhancing health education and awareness programs is crucial for improving prevention and response efforts.

Government-led cholera prevention measures in Jere LGA focus on improving water supply (31%), expanding vaccination campaigns (30.7%), promoting hygiene (21.2%), and enhancing sanitation facilities (17.1%). While these initiatives align with WHO-recommended strategies, gaps in vaccination coverage remain a major concern. Only 22% of respondents reported receiving the cholera vaccine, while 44.3% were unvaccinated, and 33.6% were unsure of their status. This highlights the need for increased awareness and accessibility of oral cholera vaccines (OCVs) to improve uptake. Research indicates that investments in clean water infrastructure, proper sanitation, and expanded vaccination campaigns significantly reduce cholera outbreaks. To mitigate future outbreaks, government agencies must strengthen water sanitation programs, improve access to safe drinking water, promote hand hygiene, and enhance community health education and vaccination outreach.

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