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ANALYSIS OF CHOLERA OCCURRENCE IN SUB-SAHARAN AFRICA

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Abstract

Cholera is identified to be among the widespread public health disease in Sub-Saharan Africa. Regarding the control of cholera, the special task force of the World Health Organization are battling the disease. The public health effects of cholera epidemics in West Africa in 2021 to 2025 were discussed in this research. This was a descriptive cross-sectional study. A non-probability technique was employed, as well as a detailed selection of all West African states affected by cholera outbreaks betwween 2021 and 2025. There was data gathering through reports from meetings and workshops, situation reports, and line-lists. It was revealed that from 2021 to 2025, a total of 108,859 cases and 3,711 fatalities were reported in seven African countries. On 12th December, 2020,the disease first became epidemic in Delta State, Nigeria and followed by Burkina Faso, Benin, Mali, Cameroon, Togo, and Niger Repulblic. The disease outbreak in Nigeria was reprted to be 527 out of 1,000,000 people. The major risk factors were poor sanitation, lack of access to safe water, and unchecked cross-border migrations. In all of the afflicted nations, the epidemics were verified in laboratories. 617 (56.8 percent) of the 1,086 stool samples obtained confirmed positive. Vibrio cholerae serogroup was found in all seven nations. Serotype Ogawa was found in Burkina Faso, Niger, and Togo, whereas serotype Inaba was found in Cameroon. It was decided that African countries are still on course to miss the 2030 cholera eradication target. The study recommends that West African countries should strengthen their execution of the global roadmap and Water, Sanitation, and Hygiene (Wash) framework for cholera eradication without delay.

Keywords: Cholera; Epidemiolgy; Outbreak; West Africa

1. Introduction

T Cholera is a severe diarrheal infection caused by consuming food or water infected with the bacteria Vibrio cholerae serogroups O1 and O139 (Kaper, Morris & Levine, 1995). The world is now suffering the seventh pandemic, which began in

JIRRS
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Vol: 01.07
DOI: 10.66104/spzwa977
Pages: 1-13

1961 in Indonesia and spread to Africa in 1970 (Griffith, Kelly-Hope & Miller, 2006). Recurrent outbreaks of cholera have been noticed and understudied in many African subregions since then (Akinoye, 2024a; Ajayi & Smith, 2019). From 1970 to 2011, the illness have killed many persons, with 3,221,207 cases and 202,456 fatalities documented (Mengel, Delrieu & Heyerdahl, 2014). The disease's understanding is steadily improving, and the primary risk factors are becoming clear.

The cholera-prone Member States of the African area have created the control and prevention strategies of cholera, and are coordinating the execution of critical measures for disease control. Despite this, the disease's prevalence and consequences are greatest in the sub-Saharan region (Akinoye, 2024b). Since decades, at least eleven Member States of the World Health Organization (WHO) Region for Africa have been afflicted by cholera epidemics (WHO, 2019). Every year, cholera epidemics strike West African countries. In certain areas, the disease is becoming endemic, while in others, it is becoming epidemic (Akinloye, 2024c). The incidence is directly related to impoverished and low-income areas.

The most susceptible groups are those who live in congested places with insufficient opportunity to safe drinkable water and sanitation, as a result of uncontrolled mass urbanization. Displacement due to conflict, natural catastrophes, and dramatic weather changes are also ideal circumstances for cholera epidemics in many places across the world (Regional Committee for Africa 68, 2018). The Worldwide Task Force on Cholera Control (GTFCC) approved the Ending Cholera: A Global Roadmap to 2030 in 2017, with the goal of lowering global cholera mortality by 90% and eliminating the illness in 20 countries by 2030 (Global task force on cholera control, 2030).

WHO hosts the GTFCC secretariat and is strongly dedicated to cholera eradication. The World Health Assembly's 71st session in 2018 endorsed the global strategy for control and prevention of Cholera (World Health Assembly 71, 2018). In accordance with this decision, the WHO African Region Member States approved the Regional Framework for Implementation of the global strategy for control and prevention of Cholera 2018-2030 in 2018 (Regional Committee for Africa 68, 2018). This framework establishes specific goals, objectives, milestones, and strategies for cholera prevention and control in the WHO African Region (Akinloye, 2025).

West African nations are executing planned interventions for cholera preparedness and response in accordance with the eradication framework. Multi-sectoral collaboration is being enhanced, as is monitoring and cross-border cooperation. Despite these measures, fresh cholera outbreaks in the sub-region have been recorded since December, 2020. The epidemiology of these epidemics is described in this report, as are the public health implications for cholera eradication in the WHO African Region.

2. Study Areas

JIRRS
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Vol: 01.07
DOI: 10.66104/spzwa977
Pages: 1-13

The study focused on West African nations. This sub-region is made up of 16 nations with a combined population of 397 million people in 2025. The sub-region is distinguished by strong population mobility along main roads, with daily reports of intensive population migrations. These routes include the Abidjan-Lagos corridor (Nigeria, Benin, Togo, Ghana, and Côte d'Ivoire), the Niamey-Dakar corridor (Nigeria, Burkina Faso, Mali, and Senegal), and the Lake Chad basin routes (Nigeria, Niger, Cameroon and Chad).

Moreover, although Cameroon and Chad are not geographically located in West Africa, they were included in the analysis because to their frequent and consistent ties with cholera outbreaks in West Africa, particularly in Nigeria. Many nations in the sub-region are experiencing humanitarian crises, notably the northern section of Nigeria, the south-eastern part of Nigeria (Bakasi peninsula), Niger, and Burkina Faso (Raleigh, Nsaibia & Dowd, 2021). Malnutrition is prevalent in several areas, particularly the Sahel (Heirman, Rosenzweig & Jenkins, 2020).

3. Methods

Descriptive cross-sectional method was adopted in this study. The populations targeted were West African nations where cholera epidemics had been detected, as well as Lake Chad basin countries. The sample approach was non-probability, and all impacted nations were considered (exhaustive choice). Data on cases and fatalities were gathered using standardized procedures designed specifically for the outbreak. Each health institution, Cholera Treatment Unit (CTU), or Cholera Treatment Center (CTC) was required to complete the tool on Excel and share it with national levels. Each country compiled its own line-list, and the database was periodically updated.

The information submitted into each line list was also acquired through active community case search or a community-based monitoring system. Information on sample collection and laboratory findings was not routinely updated in the line lists. Document review was also employed to gather data on risk factors, notably water and sanitation. The data was collected between 2021 and 2025. Stool samples are obtained on all suspected patients before to the outbreak for laboratory confirmation. In certain cases, a local rapid diagnostic test (RDT) on stool samples was performed. If the test results are negative, the case is closed. If the RDT test showed a positive result, the sample was sent to a laboratory for culture or Polymerase Chain Reaction (PCR).

In other circumstances, samples are sent to a laboratory right away for confirmation. Once an epidemic in a specific geographic region was verified, additional suspected cases were not sampled systematically, but a minimum number of samples were collected on a regular basis in compliance with WHO criteria for laboratory confirmation during cholera epidemics. Document exploitation was the major way of data collection. The sources of information were line-lists supplied by national governments, situational reports published by national governments, information

JIRRS
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Vol: 01.07
DOI: 10.66104/spzwa977
Pages: 1-13

from other sources, including the internet, and meeting reports available at the time of the research.

The internet, conference reports, and nation presentations were used to acquire data on predisposing factors. The following variables were included in the line list: general information (reporting date, epidemiological week), patient information (patient's name, sex, age), location information (name of health district, health facility or UTC or CTC name, residence place's name), clinical information (date of diarrhea onset, symptoms), laboratory information (date of lab test, test performed, Lab results), and final epidemiological classification (suspection) (alive, dead, unknown).

Case definition was used to identify the case. The GTFCC field manual - responding to cholera was used to define cases and outbreaks (GTFCC, 2019). Before each country's epidemic was established, every person aged 2 years or older who presented with acute watery diarrhea and severe dehydration, or died from acute watery diarrhea, was deemed a suspected cholera case. Following the outbreak's confirmation, every individual experiencing or dying from acute watery diarrhea was designated a suspected cholera case. A confirmed case was referred to as one that has Vibrio cholerae O1 or O139 verified by culture or PCR (2025/ 0087). The cholera epidemic was defined by the presence of at least one confirmed case of cholera as well as evidence of local transmission.

4. Result and Discussions

Record on Epidemiology

The Table 1 shows key data for cholera outbreaks by affected countries from 2021 to 2025. From 2021 to 2025, seven (7) nations reported a total of 3,711 fatalities and 108,859 cases. In Mali, the total Case Fatality Ratio (CFR) was 3.4 percent, with a range of 38.5 percent. Burkina Faso was not affected by the cholera epidemic, according to the outbreak case definition, because the two recorded cases were imported cases with no confirmation of local transmission. In Nigeria, the national attack rate (AR) was 527 per 1,000,000 people.

On 12th December 2020, Nigeria was identified to be the first nation to announce the outbreak in Delta State. The index patient in Niger, had just traveled to and lived in Sokoto States, Nigeria, where a cholera outbreak was happening. There are two cases reported in Burkina-Faso where two drivers who spent several days in Niamey, where there was a cholera outbreak. The first cholera-related fatality was recorded in Gao, Mali, in a household that had received guests from Ayorou, Niger, where a cholera outbreak was happening, two days before the death. The first cases in Cameroon's South West region were reported by Nigerian fisherman in the Bakasi area, where there is heavy migration across borders. There was no indication of a link between the epidemics in Benin and Togo and the other three rounds of cholera outbreaks recorded in Cameroon and Benin.

JIRRS
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Pages: 1-13

Table 1: Cases, death, case fatality ratio and attack rate of cholera outbreaks in West Africa, from 2021 to 2025

Country	Population	Cases	Deaths	CFR	AR (per 1,000,000)	Proportion of affected regions/state	Proportion of affected LGA/ districts
Nigeria	194,766,361	102,684	3,519	3.4%	527.2	89.2%	51.6%
Niger-Republic	22,944,730	5,542	163	2.9%	242	87.5%	44.4%
Benin	12,535,961	454	9	2%	36.2	66.7%	25.7%
Cameroon	26,153,961	119	11	9.2%	4.5	40%	2.5%
Burkina-Faso	21,478,529	2	0	0%	0.1	7.7%	2.9%
Mali	20,153,290	13	5	38.5%	0.6	11.1%	1.5%
Togo	7,972,962	35	4	11.4%	4.4	16.7%	2.6%
Total	306,005,763	108,859	3,711				

Source: Authors' compilation

Lab Confirmation

The epidemic was laboratory verified in each country's afflicted second administrative level. A total of 1,086 stool samples were collected and cultured at reference laboratories. This figure represents 1.0 percent of all instances recorded. Six hundred of the samples obtained proved positive, yielding a positivity percentage of 56.8 percent. Vibrio cholerae serogroup O1 was found in all seven nations (Benin, Burkina Faso, Cameroon, Mali, Niger, Nigeria, Togo). Serotype Ogawa was found in Burkina Faso, Niger, and Togo, whereas serotype Inaba was found in Cameroon.

Trend Analysis Regarding Time, Place, and Persons

In terms of affected regions/states/districts/local government areas (LGAs), Niger and Nigeria had the highest proportion of affected regions/states/districts/LGAs (Table 1). In Nigeria, 33 states out of 37 were affected (89 percent); in Niger, seven regions out of eight (88 percent); in Benin, eight departments out of 12 (58 percent); and in Mali and Togo, one region was affected. The table also displays the rate of assault in Nigeria by state, as well as in other countries by region or department. With a total of 9,694 cases reported, the pandemic reached its global peak in week 33 (2025). Over the same week, the high was recorded in Nigeria and Niger.

In epidemiological week 45, outbreaks in Benin, Cameroon, and Togo were continuously spreading, with no maxima yet reached. In terms of fatalities, the

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Pages: 1-13

overall high was observed in epidemiological week 30 (week ending August 2025), with 399 deaths. This was mostly due to the fact that Nigeria recorded 395 deaths this week. Niger's mortality rate peaked in week 33 (2025) with 46 fatalities. The subregion's worldwide sex ratio was 1.01. In Niger, the ratio was 1.24, in Benin and Cameroon it was 0.72, and in Togo it was 1.00. Males are somewhat more impacted than females globally. However, when it came to fatalities, the sex ratio Female / Male was 0.82. Male fatalities were recorded in greater numbers than female deaths. People over the age of 15 were the most impacted (59 percent). This pattern was observed in all of the afflicted nations. Under-fives accounted for 26% of all cases.

Influencing Factors

According to a study of important documentation on the outbreaks, insufficient access to Water, Sanitation, and Hygiene (WaSH) was identified as the primary predisposing factor in all afflicted countries (Table 2). This includes a shortage of potable water in rural regions and urban slums across all impacted nations, as well as limited access to sufficient sanitation and inadequate hygiene standards. The closure of potable water supplies, as well as the pollution of water sources as a result of floods in Niger and Nigeria, robbed Lac district in Togo of access to safe water. Poor communal behavior was also reported. Low compliance with hygiene measures, purposeful discharge of stool waste in run-off, aversion to using latrines, and large-scale open defecation behaviors were among them (Niger, Nigeria, Togo).

The continuing rainy seasons in Niger, Nigeria, and Cameroon with severe rains and floods, as well as humanitarian and security difficulties in Cameroon, Mali, Niger, and Nigeria, were cited as risk factors. Overcrowded camps were also mentioned. Cross-border mobility and continuing epidemics in neighboring countries aided the outbreak's spread.

Table 2: The status of important WaSH metrics in West African nations

Country	Proportion of population using improved drinkable water (%)			Proportion of population using improved sanitation (%)			Proportion of population on open defication (%)			Proportion of population with hand-washing (%)			Proportion of health care facilities with hand- washing (%)		
	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Urban	Rural	Total			
Benin	65	73	58	17	27	8	52	31	70	12	17	8	90	97	87
Burkina-Faso	47	80	33	22	40	13	40	6	55	9	17	5	91	91	95
Cameroon	66	82	44	45	61	23	6	1	12	36	47	22	71	-	-
Mali	83	96	72	45	56	37	5	1	9	17	27	9	-	-	-

JIRRS
Journal International Review of Research Studies

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Vol: 01.07
DOI: 10.66104/spzwa977
Pages: 1-13

Niger	47	86	39	15	52	7	68	11	79	23	39	20	68	80	58
Nigeria	78	92	62	43	52	33	19	8	32	33	25	41	63	80	56
Togo	69	91	52	19	30	8	45	12	70	17	27	10	91	95	-

Sources: WHO-UNICEF Joint monitoring programme on hygiene and sanitation, 2025

Discussions

In the WHO African Region, cholera is considered a serious public health emergency, and high burden cholera outbreaks have been documented in the past (Bartels, Greenough, Tamar & VanRooyen, 2010; Dalhat, Isa & Nguku, 2014; Noora, Issah & Kenu, 2017). However, the cholera outbreak in Niger and Nigeria in 2021 is unprecedented in terms of the number of cases recorded and the geographic spread in terms of the number of states and regions impacted (Elimian, Musah & Mezue, 2019; WHO, 2018). This is West Africa's largest reported cholera outbreak in history. The number of cases recorded is nearly equal to the entire number of cholera cases documented in all West African nations between 1995 and 2005 throughout 124 outbreaks (Griffith, Kelly-Hope & Miller, 2006).

The magnitude of the outbreak was mostly determined by Nigerian data, which account for almost 95 percent of cases and deaths. From 1970 to 2011, the cases recorded in Nigeria accounted for over half of the total cumulative number of cholera cases reported in the nation (Mengel, Delrieu & Heyerdahl, 2014). The amount of deaths in the 2021 pandemic is likewise exceptional. So date, the epidemic has killed over 3,700 lives and has resulted in high CFR in all affected nations. This number of deaths has never been recorded in any cholera epidemic in West Africa, particularly in Nigeria and Niger, since 1991 (Elimian, Musah & Mezue, 2019; WHO, 2018; Denue, Akawu & Kwayabura, 2018).

Many reasons can explain the severity of the pandemic. The ongoing Covid-19 pandemic strained already-weak health systems in impacted nations; the novelty and burden of Covid-19 aroused political leaders and resources sooner in the response to these cholera outbreaks. Other epidemics and emergencies were also occurring in the impacted nations. Yellow fever in Nigeria, circulating vaccine-derived poliovirus epidemics in both nations, and humanitarian catastrophes are among them. All of these public health crises were to be managed by the same health system workers, with insufficient extra help supplied. Countries, on the other hand, were not fully prepared to detect and respond to cholera epidemics in a timely and effective manner. A preparedness assessment was carried out in seven nations (Burkina Faso, Cameroon, Côte d'Ivoire, Democratic Republic of the Congo, Ghana, Kenya, and Togo) in October 2021 displays an overall preparedness percentage of 54%.

Only laboratory confirmation capabilities reached 80%, while risk communication, surveillance, WASH, and case management rates fell below 50%. The magnitude and spread of the outbreak can also be explained by afflicted communities'

JIRRS
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Pages: 1-13

heightened susceptibility to cholera in both countries. While cholera is widespread in some areas of Nigeria and Niger, the outbreak's spread to non-endemic areas exposed cholera susceptible communities. This vulnerability might explain for the high attack rates observed in diverse settings (Onyango, Karambu & Abade, 2013). Inadequate vaccination coverage in high-risk areas might have contributed to this susceptibility. Indeed, if oral cholera vaccine (OCV) programs were launched in particular and geographically limited areas in response to West African outbreaks (Msyamboza, M'bang'ombe & Hausi, 2016; Amani, Tatang & Bayiha, 2021; Ngwa, Alemu & Okudo, 2020), Because of the restricted availability of OCV in the stockpile, as well as the delay in completing hotspot analyses and vaccine requests to GTFCC, preventative immunization in significant hotspots was not possible prior to the epidemic. Despite GTFCC's enhanced efforts to make vaccinations available, the many cholera outbreaks reported throughout the world are frequently harming the stock.

Furthermore, OCV has been shown to be more successful when programs are implemented in the context of early epidemic detection and rapid response. In these cases, prompt deployment of an OCV campaign is important for limiting disease transmission and attaining quick control in a very narrow geographical area. There were severe delays in diagnosing the outbreak and, in particular, in requesting immunizations from the International coordination group, or GTFCC, during the 2021 occurrence in West Africa. Established risk factors, such as restricted access to WASH services (Ajayi & Smith, 2019; Elimian, Mezue, & Musah, 2020; Visa, Emmanuel, & Mbodi, 2020), exacerbated the community's susceptibility (Elimian, Mezue & Musah, 2020; Gallandat, Jeandron & Ross, 2021) and ineffective community behaviors that contributed to the spread of Vibrio cholerae.

The overall CFR was abnormally high during the pandemic. A CFR of less than 1% is the goal of the regional framework for executing the global strategy for control and prevention of Cholera 2018-2030. (African Regional Committee 68, 2018) The reported high CFR has previously been identified during prior cholera epidemics, including one in Nigeria Dalhat, Isa, and Nguku, 2014. Late care seeking (Elimian, Musah, & Ochu, 2020) and a high proportion of malnutrition in some contexts (Heirman, Rosenzweig, & Jenkins, 2020) were highlighted as key explanations in many articles. This delayed seeking of care was linked to a misunderstanding of the condition in numerous cases. In some areas, for example, some patients prefer to wait until the evening before seeking medical attention.

In the meanwhile, their condition frequently deteriorated and killed them. Because of the vast magnitude of the outbreak, certain health institutions had to address severe cases. However, health personnel were overloaded by competing emergencies (Covid-19, Yellow fever, and circulating vaccine-derived poliovirus outbreaks), which might have contributed to inadequacies in case management and effective follow-up of severe cases. The lack of a community component in case management systems may possibly account for the high CFR. In reality, the creation of community oral rehydration points was exceedingly rare in all afflicted nations (Tappero & Tauxe,

JIRRS
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Vol: 01.07
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Pages: 1-13

2011). Regardless of these possible explanations, the number of reported deaths is alarming and warrants additional examination.

During these epidemics, no cholera fatalities case definition was utilized. The number of reported deaths might perhaps have included deaths from other illnesses connected with cholera. While the covid-19 epidemic was active, the outbreak was handled. However, there was no technique in place to determine whether covid-19 was associated with cholera. On the other hand, while girls were the most afflicted, deaths were mostly reported among males. Elimian et al. discovered that male gender was positively related with cholera death during the 2018 cholera epidemic in Nigeria (Elimian, Musah & Ochu, 2020). Other characteristics discovered by this author include older age, residing in peri-urban locations or in flooded states, and infection during the rainy season (Elimian, Musah, & Ochu, 2020).

All of these variables were present during the current outbreak, which may explain the high CFR observed. The 2021 cholera outbreak in West Africa emphasizes the relevance of cross-border mobility in outbreak transmission (Ajayi, and Smith, 2019; Glass, Blake, and Waldman, 1991), as well as the involvement of specific demographics such as travelers, migrants, truck drivers, and fisherman in spreading the illness. The location of index case exposure in four of the seven nations gives evidence of cross-border dissemination. When a cholera epidemic occurs in Nigeria, it is always reported in Niger Republic. The serogroup detected in all impacted nations was Vibrio cholerae O1. Laboratory isolates of serotype Ogawa were found in six of the seven nations, whereas serotype Inaba was found in Cameroon.

Regardless of these findings, the lack of vibrio sequencing prevents the official establishing of linkages when impacted on nations. Efforts are being undertaken, however, to standardize vibrio sequencing throughout future epidemics. On the other hand, a regional approach to reacting to any cholera epidemic should be formed as soon as possible; this involves improved cross-border coordination as well as swift development of preparation in at-risk nations. The present outbreak is a major impediment to achieving the intended outcomes of the regional framework for implementing the global roadmap for cholera prevention and control in the WHO African Region (Regional Committee for Africa 68, 2018).

While one of the global plan aims was to minimize cholera-related mortality by 90%, figures revealed throughout the pandemic are compromising the achievement of this goal. This also applies to the high CFR reported by affected countries. Countries have failed to fully commit to adopting the framework for cholera eradication. Prior to the pandemic, none of the affected countries had a long-term cholera eradication plan in place, as suggested by the global cholera control task force. It is therefore imperative that WHO, Member States, and partners intensify their commitment to the global roadmap and the African region's cholera eradication plan.

This is required to avoid further high-burden cholera outbreaks with devastating social and economic consequences, as well as to put the area on pace to eliminate cholera by 2030. The current investigation yielded the anticipated outcomes. The epidemics' epidemiology was described. The possible constraints (underreporting,

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Vol: 01.07
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Pages: 1-13

reporting delay, poor laboratory confirmation rate) have no bearing on the outcome. Data are clearly under-estimated, and more efforts are required to improve completeness and promptness of reporting during cholera epidemics. However, the high-level commitment of all parties involved in epidemic control must be increased. Political leaders and technical teams in all countries took the outbreaks seriously, and effective interventions were deployed, resulting in the epidemics being quickly controlled in Burkina Faso, Mali, and Togo. At the time of the research, the trajectory of the epidemic had dramatically slowed in Niger and Nigeria, indicating likely containment in the next weeks.

5. Conclusion

The magnitude of the 2021 cholera pandemic reveals that West Africa and other WHO African region Member States are still on track to fall short of the 2030 cholera elimination objective. Countries should accelerate their implementation of the global roadmap and African region framework for cholera eradication by 2030. To strengthen country preparedness and readiness, as well as to allow early detection and response to cholera outbreaks, strong and effective measures are essential. The lack of access to Water, Sanitation, and Hygiene services is a result of the sector's years of crippling underinvestment; if any successful intersectoral interventions to control or eliminate cholera in the region are to be undertaken, improving WASH conditions must be addressed efficiently at all levels.

Finally, early in the course of any specific epidemic, cross-border collaboration should be actively enhanced, and subregional response structures should be developed to enable efficient coordination of response and preparation efforts. To avoid deteriorating, cholera epidemics require better and more rapid intervention by the government and partners at an earlier stage, especially when they occur concurrently with other calamities.

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Conflicts of Interest

The authors declare no conflict of interest.

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JIRRS
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Author Responsibility Statement

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