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Outbreak of Cholera Due to Cyclone Idai in Central Mozambique (2019)

Edson Mongo, Edgar Cambaza, Robina Nhambire, Jacinto Singo and Edsone Machava

Abstract

Idai was a strong tropical cyclone in Central Mozambique, causing over 1000 deaths, destroying schools, hospitals, roads, and more than 239,731 houses, displacing thousands of people to 136 accommodation sites, and leaving people in need for assistance. The resulting precarious hygienic conditions caused outbreaks of diseases such as malaria and cholera. This communication summarizes the onset of cholera outbreak in Sofala province and its response. It was declared on 27 March, and the number of cases raised up to 6766 and 8 confirmed deaths, with the highest incidence in the city of Beira. The government and partners made integrated efforts to control the disease, establishing treatment centers and units and improving sanitation and hygiene and surveillance. Furthermore, 800,000 people were immunized, and the results seemed satisfactory considering the response. Although cyclones are rare, Mozambique has a very limited capacity to handle their impact, and this urges the country to keep a contingency fund for future disasters.

Keywords: cholera, Cyclone Idai, Sofala, Center of Mozambique, outbreak

1. Introduction

In mid-March 2019, Tropical Cyclone Idai from category 4 hit Mozambique, devastating the port city of Beira and surrounding areas, following torrential rains and strong winds, causing massive flooding and leaving entire communities submerged [1–3]. It has damaged supplies, cut off clean water and sanitary facilities, and destroyed different infrastructures including schools, hospitals, houses (239,731), roads, rails, disrupting regional trade, and supplies of fuel, wheat, medicines, and other goods, even from neighbor countries such as Zimbabwe and Malawi [3–5].

Thousands of displaced people were sheltering in 136 accommodation sites, including schools, across Sofala, Manica, Zambezia, and Tete, as reported by the National Institute of Disaster Management (INGC) [4, 6, 7].

Idai caused a range of public health consequences, including mortality (598 confirmed deaths until 02 April 2019), injury, and infections [8, 9] due to water-borne and vector-borne diseases including cholera, malaria, and measles, and more than half of affected people are children [2, 10, 11]. Two weeks after Cyclone Idai's landfall, the index of cholera was confirmed in Mozambique with the death of five

people. After the Ministry of Health declared a cholera outbreak on 27 March, 4979 cases and six deaths were confirmed [1, 3, 5, 8, 12].

Cholera is an acute, secretory diarrhea caused by strains of the Gram-negative bacterium *Vibrio cholerae* that occurs in both endemic and epidemic patterns, presenting symptoms like watery diarrhea, rice-water stools, fishy odor to stools, vomiting, rapid heart rate, loss of skin elasticity, dry mucous membranes, and low blood pressure. This bacterium is usually found in food or water contaminated by stools from a person with the infection, and, if untreated, the fatality rate can be as high as 30–50%, but with rehydration and electrolyte replacement, the death rate decrease to 1% [8, 13].

Environmental factors play an important role in the epidemiology of cholera. The flooding and displacement of people has increased the risk of cholera because many of them spent days without accessing safe water supplies, resorting to drink the floodwaters. There are some videos of children playing with the same water that unfortunately were strewn bodies of humans and animals. Beyond that, menstruated women are also susceptible to waterborne diseases due to the use of unsafe water to wash their clothes, during the bath or while collecting water to prepare food [1, 8, 14–16].

Idai survivors received supplies to purify their drinking water, food supplies, and items such as soap, nappies, towels, and blankets, to stop spreading cholera. The Mozambican Ministry of Health (MISAU), World Health Organization (WHO), Cooperative for Assistance and Relief Everywhere (CARE), and other NGOs worked in setting up treatment centers and clinics, as well as helping to run a massive campaign, where 800,000 doses of oral cholera vaccines were distributed and dispensed [2, 4, 10]. This paper aims to summarize the status of the outbreak of cholera in Mozambique due to the deadliest storm Cyclone Idai.

2. Sources and documentary analysis

This short communication was based on simple reviews of the most relevant literature related to the cholera outbreak as a result of Cyclone Idai. The documentary analysis was performed through ATLAS.ti (ATLAS.ti GmbH, Berlin, Germany) and partly in Microsoft Excel™ (Microsoft, Redmond, Washington, USA) and mainly based on flash updates by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), WHO, UNICEF, OXFAM, Health Cluster of Mozambique, and other agencies.

3. Overview of Cyclone Idai

Due to the damages caused by Cyclone Idai, it is important to know that different humanitarian helps were given, coming from national and international entities, both to the outbreak of cholera and to other diseases, in order to reduce the impact caused to the cyclone victims.

The central region of Mozambique was affected by heavy rains since 6 March 2019. It was a system formed in the Mozambican channel, which evolved from tropical depression to moderate tropical storm called Idai that took more than 800 lives and displaced thousands of individuals [17].

The house's destruction, roads, hospitals, clean water, and sanitary facilities also puts the traveler's health at risk, so they should always take the basic prevention, such as drinking and using safe water, washing hands often with soap, avoiding bug bites and direct contact with contaminated floodwater, or avoiding travels to dangerous areas [18, 19].

Idai was one of the worst tropical cyclones on record to affect Africa and the southern hemisphere and caused catastrophic flooding, landslides, and large numbers of casualties in Mozambique, Zimbabwe, and Malawi, affecting more than 3 million people, but the most affected area was Beira, Mozambique's second largest port city, where the cyclone's landfall was on 14 March [17]. The heavy rains, strong winds, and severe flooding caused problems with water and food supplies, sanitation, electricity, transportation, shelter, communication, security, medical care, and mosquito control, creating opportunities for outbreak diseases, such as cholera. Due to the disasters caused by Idai, 6766 cholera and 43,556 malaria cases were registered [1, 19–21].

Idai affected 1,85M people (more than half were children), displacing 90,000 to 136 accommodation sites, mostly schools and churches. The sheltered people were sleeping in open spaces, increasing the risks of gender-based violence [11].

Tropical Cyclone Idai was outside the range expectations for a typical tropical cyclone that has happened in Mozambique and its neighboring countries. More than 14 countries provided supplies to help the affected areas. The United Nation's Central Emergency Response Fund (CERF) launched an emergency appeal for US \$282 million to respond to cyclone, which affected Mozambique, Malawi, and Zimbabwe. Furthermore, goods and military or rescue planes, helicopters, ships, and boats were provided to aid the huge search and rescue effort needed. Only 17% of the total amount required had been funded [3, 10, 22].

3.1 Area of impact

The most impacted area includes the city of Beira, in the center of Mozambique, province of Sofala (**Figure 1**). Sofala is a vast province composed of 12 districts located in central-eastern Mozambique with a total area of 68,018 square kilometers and population of 28,861,863 individuals (2017 census). It is bordered to the

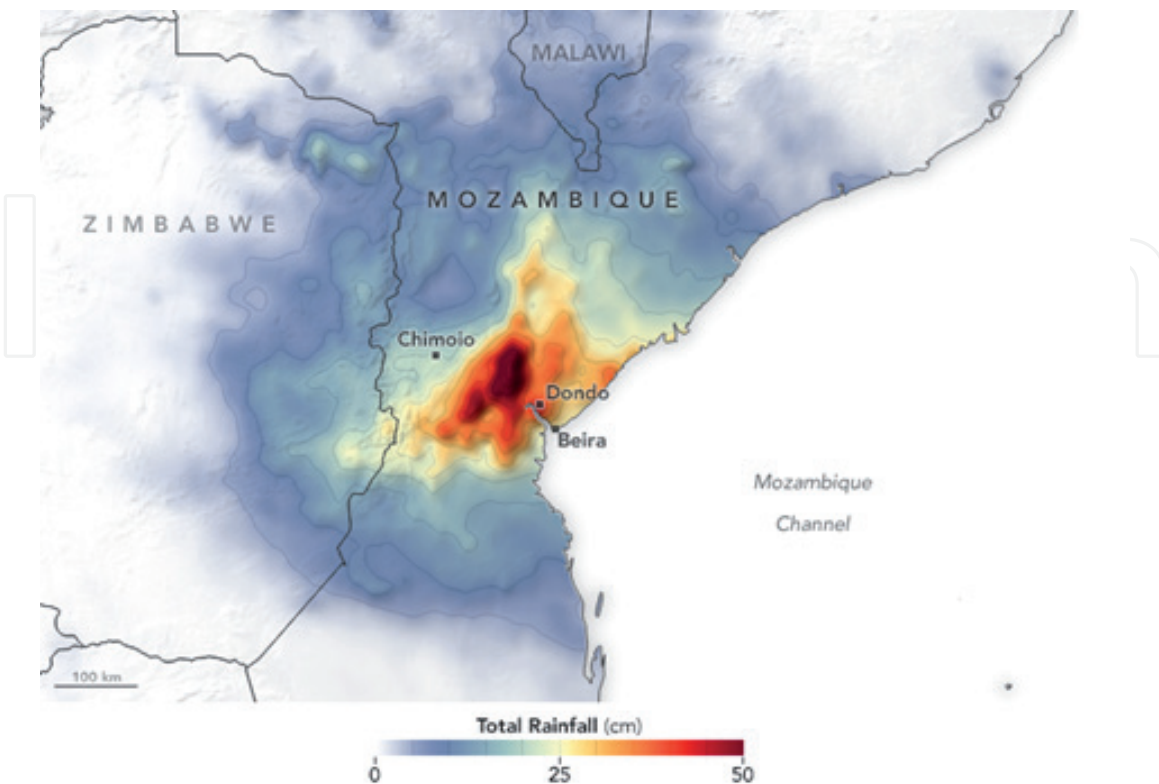


Figure 1.
Draft of Mozambican map showing the affected areas by Cyclone Idai in Sofala province. Source: Dauphin and Stevens [23], under public domain.

north by Tete province, to the northeast by Zambezia province, to the south by Inhambane province, and to the west by Manica province.

4. The outbreak of cholera

A high number of cases of cholera were reported in April 2019, after the catastrophic disasters caused by Cyclone Idai in the center of Mozambique. About 4979 cases of cholera and six deaths were confirmed in emergency clinics created by the government of Mozambique aided by NGOs and other institutions [12], but until May the number of cumulative cases increased to 6766 and 8 deaths, according to the Health Cluster of Mozambique. Flooding and house destruction forced 68,974 displaced people living in accommodation places, making some places overcrowded, and increasing the risk of spreading cholera among the people there [1, 21].

The symptoms of cholera vary depending on the period of the infection. Between 18 h and 5 days, it is characterized by incubation period, followed by profuse watery diarrhea, rice-water stools, fishy odor to stools, vomiting, rapid heart rate, loss of skin elasticity, dry mucous membranes, and low blood pressure [24]. Most people are asymptomatic, but they remain carriers of the disease, excreting the bacteria in their feces, usually for 2 weeks but occasionally for several years. Approximately 2.8 million cases and 91,000 related deaths are reported annually, and the spreading of this disease included insufficient access to clean water, reduction of immunity, and taking of antacids [25].

Without the access of clean water and sanitary facilities, thousands of families were at risk of cholera mainly children because they used to play in dirty water which were strewn bodies of humans and animals, and women, during the menstruation period, sometimes needed to clean their bodies and only untreated water were available [8, 16]. In the beginning, the destruction of road and infrastructure corridor that connected Sofala to other parts, it was very difficult to help those people with water, food medical, and relief supplies, forcing the use of helicopters, rescue planes, boats, and ships [1, 3].

According to the Oxford Committee for Famine Relief (OXFAM), the Mozambican government worked quickly to set up cholera treatment centers in the city of Beira [22]. Supported by the WHO and funded by the GAVI (the Vaccine Alliance), more than 800,000 doses of oral cholera vaccines had been distributed in just 6 days, from 3 to 9 April 2019, since a vaccination campaign has launched. Fixed points were created to administrate vaccines to children and adults on schools and health center and on districts of Beira, Dondo, Nhamatanda, and Buzi [26]. It resulted in a decrease of the daily reporting number of cholera cases [1, 3, 14], with a cost of US\$1.85 per dose [27]. They also provided supplies to purify their drinking water and stop to spread the cholera [4], but the sanitization of drinking water can be achieved through boiling, and all food must be well cooked and consumed immediately [8]. After the humanitarian response plan had been created to respond the outbreaks across the globe, millions of doses of oral cholera vaccine have already been shipped in many countries [26].

5. Epidemiological accounts

According to the Health Cluster of Mozambique, there were a total of 6735 cumulative cholera cases, as of 6 May 2019. Until 31 May 2019, the number

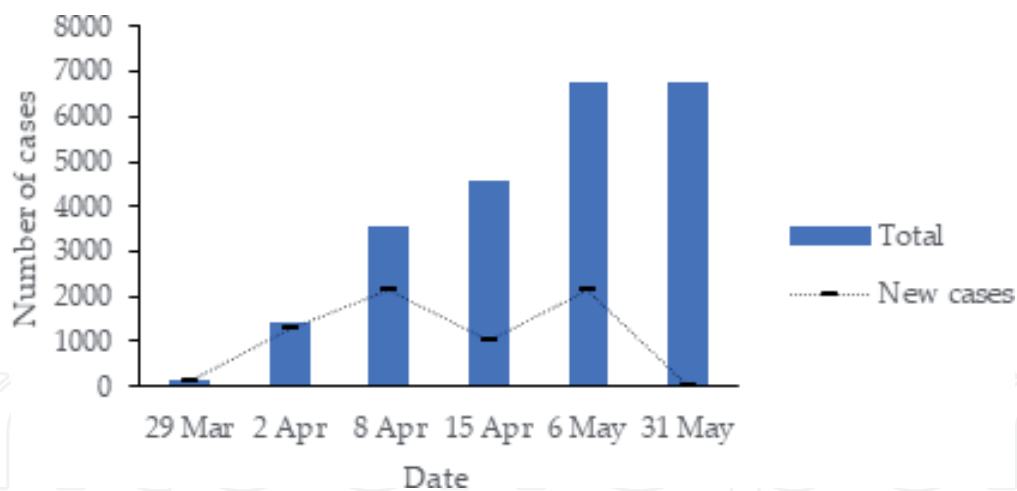


Figure 2.
Epidemiological curve of cholera outbreak attributed to Cyclone Idai, March–May 2019.

increased to 6766 cases, identified in emergency clinics, according to the National Situation Report [21].

The **Figure 2** shows that the number of cases of the present outbreak is lower than 7073 cholera cases observed in 2015, even though Cyclone Idai caused a much higher destruction of infrastructure [3, 28]. The Ministry of Health of Mozambique declared a cholera outbreak on 27 March after the epidemiological conclusions made in areas affected by Idai, and more than 4000 cases were recorded in the city of Beira [1, 29]. **Figure 2** shows how the number of confirmed cases of cholera increased from the day it was announced as an outbreak, up to 31 May.

As the capital of Sofala and because it is the most populous city in the province, Beira registered 4745 cases, followed by Dondo with 1094 cases, Nhamatanda with 793 cases, and Buzi with 134 cases of cholera [20, 21, 29–31].

The Mozambican government, with the help of international entities, reacted to this happening with the supply of vaccines and water purification supplies, and, according to some reports, the daily reporting number of cholera cases reduced [1], but they do not show the numbers or percentages.

Cholera is just a part of the disasters; there were other concerns such as malaria, measles, respiratory infections, mental disorders, and the material damages. Restoration of the damages is still ongoing, and there are more people waiting for help; in some areas, people are already living in chronic poverty and now face huge challenges to survive.

6. Conclusions

Cyclone Idai hit the center of Mozambique in mid-March 2019 causing thousands of deaths. The destruction of infrastructures contributed to the epidemiology of cholera, and the Ministry of Health declared a cholera outbreak on 27 March, after identifying more than 4000 cases, number that increased to 6766 until 31 May; eight deaths in emergency clinics created to reduce the impact of diseases in that area. Flooding and overcrowding in accommodation places increased the risk of spreading cholera; however, considering the magnitude of the disasters caused by Idai, the outbreak of cholera was well managed with the efforts of the Mozambican government and partners, such as the WHO and CARE. Mozambique has already faced other outbreaks, which helped the country to create ways to confront the recent outbreak, due to Cyclone Idai.

Many infrastructures were destroyed, including roads, hospitals, schools, and houses, and only 17% of the money required had been provided. However, food, water, and medicine supplies arrived to the affected areas through planes, helicopters, and boats. The outbreak was controlled certainly due to the setting up of treatment centers and clinics, where more than 800,000 people were immunized with doses of oral cholera vaccines. They also provided supplies to purify the drinking water and campaigns to spread the information about treatment of water and food, resulting in a decrease of the daily reporting number of cholera cases. It is important to know that even with all of this help, there are people who still need help.

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