

ORIGINAL ARTICLE

# Timely Response and Containment of 2016 Cholera Outbreak in Northern Zambia

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## ABSTRACT

**Background:** The Northern Province of Zambia has recorded outbreaks of Cholera in Nsumbu area over the years including the year 2008 and 2012. Recently, an outbreak of cholera was reported in Northern Province between March and April 2016. This study aims to document the appropriateness of the response to the cholera outbreak to guide outbreak preparedness and timely response in the future.

**Method:** A prospective study where a team was put in place to investigate an outbreak of diarrhoeal disease of undetermined cause. The team comprising of surveillance, medical, environmental and laboratory staff was formed to investigate this outbreak within the context of cholera an on-going cholera epidemic Lusaka and other parts of Zambia.

Stool samples and water samples were taken for laboratory investigations. Various interventions including contact tracing and community sensitisation were employed to contain the outbreak. A descriptive analysis of the data and review of literature was used to determine the quality of detection, investigation and response to this cholera outbreak.

**Results:** Sixty six people were clinically affected 8 of who were laboratory confirmed for strain 01 Ogawa. The case fatality rate (CFR) was 4.5%(3/66). The outbreak

was detected and contained within 24 days.

**Discussion:** The CFR was high compared to the WHO standards of a similar scenario in the 2012 outbreak in the same area. Of the 3 deaths, one was brought in dead and a week into the outbreak while the other two died at the health facility. The two fell sick in Congo DR and brought to Kapisha health post for treatment. Although the high CFR indicates inadequate response or poor case management the general response and management of the cases seemed adequate with detection and response within 48 hours of the notification. The interventions employed played a pivotal role in containing the outbreak.

**Conclusion:** Based on the CFR, the response to the outbreak was inadequate. However, the outbreak was generally well managed. The interventions implored as a response to the outbreak and active and rapid response contributed to the containment of the cholera in Nsama district within a short period.

## INTRODUCTION

Early detection of outbreaks with an efficient surveillance system is pivotal in epidemic control.<sup>1</sup> Various steps are critical in timely and effectively responding to a cholera outbreak. The first step is to immediately confirm the outbreak followed with setting up a coordination committee, making an inventory of available supplies, setting up a case management centre, community sensitization and implementing standard interventions.<sup>2</sup>

**Key words:** Cholera, Northern province, Zambia, response, containment

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Zambia is endemic to cholera and outbreaks have occurred in various parts of the country. The first documented outbreak of cholera in Zambia was reported between 1977 and 1978 affecting up to 1380 cases with 122 deaths giving a case fatality ratio of 8.8 and from then on till the 1990s, it experienced outbreaks every 3 – 5 years.<sup>3</sup> In 1990 Zambia was hit with a very large outbreak lasting till 1993. Thereafter cases were reported every year except in 1994 and 1995. Between 1999 and 2010, outbreaks have been reported every year except in 2002 when Zambia had experienced a drought.<sup>4</sup>

Cholera is not peculiar to Zambia but has caused epidemics and is endemic in many countries globally. The extent of epidemics varies across countries. In 2015 by 21<sup>st</sup> October, more than 10,000 cases had been reported in five countries in the WHO Eastern Mediterranean and African Regions. The WHO expressed concern with the management of the outbreaks in three of the countries, Democratic Republic of Congo, Tanzania and Iraq. The Tanzania outbreak which started in August 2015 is still on going. WHO reported a cumulative number of cases of 20,961 with 339 deaths as at 20<sup>th</sup> April 2016 (CFR 1.6%).<sup>5</sup> On December 15<sup>th</sup> 2015, WHO reported a cumulative number of 19,705 cases in Democratic Republic of Congo that started early in the year. The report in October 21<sup>st</sup> reported a case fatality of 2.4%.<sup>6</sup> The approach to contain outbreaks in all areas were standard interventions including improving water sanitation through chlorination, active surveillance, community sensitization, health education and case management. WHO is working closely with national authorities and partners to manage the cases and has provided access to safe water, adequate sanitation and basic hygiene needs.

Zambia in 2015 reported outbreaks within Lusaka, Copperbelt and Northern provinces with almost 1200 cases and about 20 deaths (CFR 1.9%) according to UNICEF situational reports.<sup>7</sup> Standard interventions were implemented according to WHO guidelines.<sup>8</sup> We document in this paper the appropriateness of the response to the cholera outbreak to guide outbreak preparedness and timely response in the future.

## METHODOLOGY

According to the 2010 Census of Population, Nsama district has a projected population of 66,009 and is serviced by 7 health facilities.<sup>9</sup> Kapisha Rural Health Post is about 108 KM from Nsama district Medical Office, Northern Province (figure 1). It is located on the lake shores of Lake Tanganyika in Nsumbu area a fishing camp site. Kapisha RHP catchment area projected population is 5,455.<sup>9</sup>

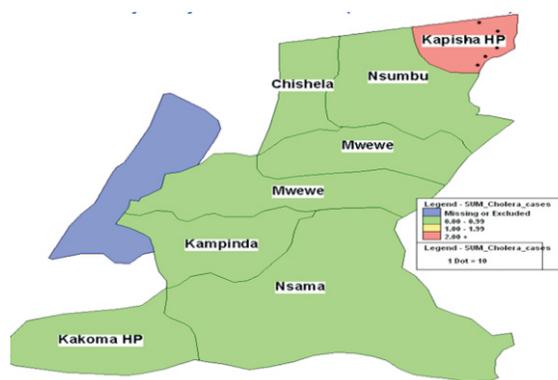


Figure 1: Nsama district health facility map

## Response to the outbreak

An investigation team comprising of surveillance, medical, environmental and laboratory staff from district to provincial level was assembled to investigate and manage the outbreak. The district rapid response team was prepared to conduct an Epidemiological investigation of the sudden increase of diarrheal cases and logistics were put aside for the first 20 patients. Case detection was done at both facility and community level using the case definitions below:

- 1. Suspected case:** Any resident of Kapisha catchment area who presents with acute diarrhoea with or without any of the following signs and symptoms vomiting, dehydration and muscles clamps.
- 2. Confirmed case:** any suspected case with isolation of the *Vibrio cholerae* in the stool or vomitus or with cholera rapid test positive.
- 3. Probable case:** Any suspected case with a link to a confirmed case or history of travel to an area with an outbreak

## Public Health Response

The government put in place public health measures that included active case and contact finding and physical checks on source of water and sanitation in residential areas where patients came from. Community sensitization was performed. Other interventions included contact tracing and prophylaxis treatment was provided to about 232 contacts; distribution of 1,483 bottles of chlorine to household heads and some group of marketers through the Neighbourhood Health Committees; disinfection of 484 latrines and 94 homes where the patients and their close contacts came from; and distribution of IEC materials on prevention of diarrheal diseases was also provided to residents of Mushi, Kalomo A, Kalomo B, Katete and Chibengu villages. Patients were treated with ciprofloxacin, and preventive measures/interventions were put in place.

## Laboratory investigations

Samples from suspected cholera patients hospitalised at Kapisha rural health post were collected: 08 rectal swab specimens were sent to Mporokoso district hospital for laboratory analysis.

Due to limited reagent resources, only 5 of the samples were subjected to culture using TCB media while another 3 cases were confirmed using Cholera Rapid Diagnostic Test (RDT). Water from the water sources of the affected communities was tested using hydrogen sulphide

A descriptive analysis of the outbreak and review of literature was used to determine the quality of detection, investigation and response to the cholera outbreak in Nsama district.

## RESULTS

66 people were affected with 3 deaths. The total case fatality (CFR) was 4.5% (3/66) of which 2 patients died in the facility and 1 patient died before reaching the facility, therefore the facility CFR was 3.1% (2/65). Eight cases were laboratory investigated and all tested positive to Strain 01 Ogawa.

## Epidemic curve

The outbreak lasted between 10<sup>th</sup> March and 3<sup>rd</sup> April 2016 (figure 2 below).

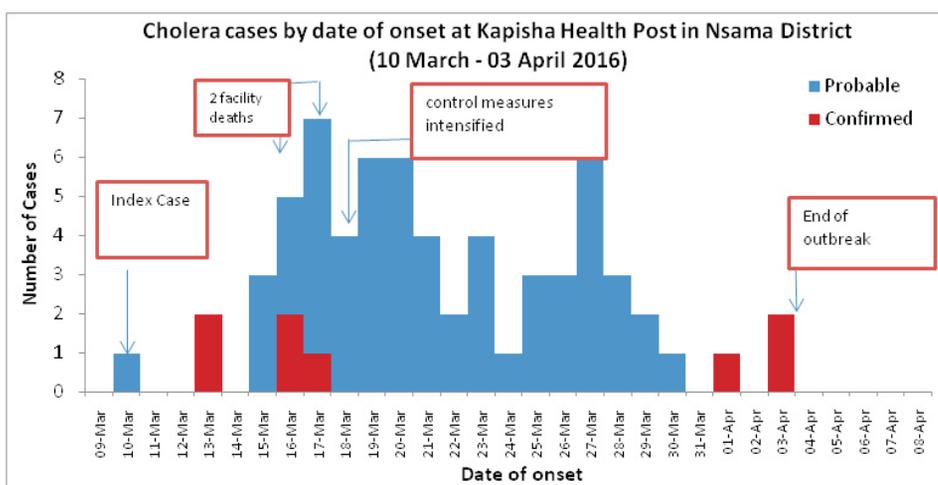


Figure 2: Cholera in Nsama district epidemic curve

## Laboratory results

Laboratory investigations for stool culture with TCB media revealed growth of *Vibrio Cholerae* (Ogawa) on all the 5 samples (3 cases from Kalomo A village and 2 cases from Munshi village) confirming cholera. The sensitivity test results also revealed that the species organism was sensitive to ciprofloxacin, intermediate to erythromycin and resistant to Nalidixic Acid.

The 3 samples tested using RDT were also positive.

## Environmental findings

Environmental findings showed the outbreak appeared to have been precipitated by the flooding of Kapisha dam leading to submerging of pit latrines. It was found that Kalomo A, Kalomo B, Munshi and Chibengu villages had

inadequate sanitary facilities and most households drew water from the lake and the unprotected shallow scoop wells. Laboratory tests of the water revealed faecal contamination.

The land where houses in all the affected villages were built is referred to as a floating land formed by smooth round stones washed away from the lake. The floating land is between the lake on the eastern side and Kapisha dam on the Western side.

### Timeliness and quality of outbreak investigation, detection and response

The response and detection of the outbreak was timely because the field investigations were done within 48 hours of the notification. However, the health facility delayed in notifying the District Health Office (Tables 1-4)

**Table 1: Outbreak detection**

Description	Dates	Duration
Interval between onset of the index case (Date 1) to arrival of the first outbreak case at the health facility (Date 2) -Target: <3days	Date 1 to Date 2 11/3/16 11/3/16	12 hours
Interval between initial outbreak case seen at health facility (Date 1) and reporting to the district health team (Date 2) -Target: within 24 hours	Date 1 to Date 2 11/3/16 15/3/16	4 days
Cumulative interval between onset of the index case (Date 1) to notification of the district (Date 2) -Target: < 7days	Date 1 to Date 2 11/3/16 15/3/16	4 days

**Table 2: Outbreak investigation**

Description	Dates	Duration
Case forms/line listed completed?	Yes	
Laboratory specimens taken (if required)?	Yes	
Interval between notification of the District (Date 1) and District field investigation conducted (Date 2) -Target: within 48 hours	Date 1 to Date 2 15/3/16 16/3/16	24 hours
Interval between sending specimen to the Laboratory (Date 1) and receipt results by the district (Date 2) -Target: 3-7 days	Date 1 to Date 2 17/3/16 to 18/3/16	1 day

**Table 3: Outbreak response**

Description	Dates	Duration
Interval between notification of the outbreak to the district (Date 1) and concrete response by the district (Date 2) -Target: within 48hrs of Notification	Date 1 to Date 2 15/3/16 16/3/16	24 hours

**Table 4: Evaluation and feedback**

Description	Dates	Duration
Interval between end of the outbreak (Date 1) and the finalization of the outbreak report with line list sent to the national level (Date 2) -Target: 2 weeks	Date 1 to Date 2 03/4/16 18/4/16 Interval: 2 weeks	15 days
Outbreak management committee met?	Yes	
Feedback given to health facility and community?	Yes ( method of feedback; community meetings as well as health facility meeting)	

## DISCUSSION

Although the facility CFR was at 3.1%, the outbreak was contained timely. The 2012 outbreak in the same area had a CFR of 6.3% (2/32). The delay in notifying the District Medical Office for expert intervention could have contributed to the fatalities. Kapisha Rural Health Post is in a remote area and, it is limited in diagnostic and patient management capacity. WHO indicates CFRs up to 20% in rural areas are encountered due to their limited capacities. It is also possible that the denominator (cases investigated) is lower than the actual number of cases. Generally the detection and response to the outbreak was timely because the field investigations were done within 48 hours of the notification. The district was able to respond to the outbreak on notification within 24 hours. The active case and contact finding, community sensitisation, environmental sanitisation, chlorination of water and case management played a pivotal role in containing the outbreak.

The outbreak in Nsumbu area is not the first, with previous documented outbreaks in 2008 and 2012. According to Olu *et al.* cholera is known to be endemic in Zambia and the timing and geographic distributions are

predictable according.<sup>4</sup> Other risk factors including contaminated water, poor sanitation, rain patterns are known and have been documented. The results from the environmental assessment indicate inadequate access to safe water and sanitation as probable risk factors. The water tested was found to contain faecal matter. Inadequate access to safe water and sanitation has been cited in many studies on cholera as a significant factor associated with the diseases. Olu *et al* cite the flooding of the poorly sank pit latrines causing contamination of shallow wells and other unsafe drinking water sources as risk for cholera outbreaks.<sup>4</sup> Sasaki *et al* demonstrate the association between low latrine coverage and poor drainage systems with high incidence of Cholera.<sup>10</sup> DuBois *et al*, in a case control study, identified raw vegetables, left over nshima (a local staple food) and sharing latrines as the strongest link for cholera transmission.<sup>11</sup> WHO also notes that outbreaks occur commonly in areas where water supplies, sanitation, food safety and hygiene are inadequate, siting as greater risks overcrowded areas with poor sanitation and unsafe drinking water.<sup>12</sup>

The containment of a cholera epidemic is dependent on the response and interventions employed. This study reveals the immediate response by the DMO on being notified of the cases at Kapisha Rural Health Post. Had there been immediate notification by the district, the CFR may have been less. However the mitigations put in place including forming an epidemics control committee, quick case detection case and contact tracing, enhanced case management with antibiotic use, disinfection of pit latrines, chlorination of drinking water and community sensitisation helped contain the outbreak timely. A similar approach was used in the Dominican Republic where diagnostic capacity was enhanced within 48 hrs of confirmation of the Haiti outbreak.<sup>13</sup> Continuous monitoring of chlorination levels in drinking water, sanitation improvements and public education were put in place in the Dominican Republic and the outbreak was contained within two months. Haiti on the other hand had a bigger outbreak and lack of preparedness is quoted as a cause to the widespread of the cholera outbreak in from 2014 to 2015. Though the correct interventions were put in place it has spread rapidly in Haiti.<sup>13</sup> The importance of

preparedness in endemic Cholera areas has proved to contribute to successful containment of out breaks as seen in the case of the Afghanistan 2005 outbreak.<sup>14</sup>

## CONCLUSION

The initial response to the outbreak was delayed. This outbreak in Kapikisha was linked to poor sanitation and unsafe drinking water was contained timely due to the quick response and interventions put in place by the provincial and district medical offices. Preparedness and timely response are critical in mitigating a cholera outbreak.

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