Cholera Outbreak in Homa Bay County, Kenya, 2015

Jane Njoki Githuku, Waqo Gufu Boru, Casey Daniel Hall, Zeinab Gura, Elvis Oyugi, Rogath Saika Kishimba Innocent Semali, Ghada Nadim Farhat, and Meeyoung Mattie Park

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Authors: Jane Njoki Githuku[1], Waqo Gufu Boru[1], Casey Daniel Hall[2], Zeinab Gura[1], Elvis Oyugi[1], Rogath Saika Kishimba[3,4], Innocent Semali[5], Ghada Nadim Farhat[2], and Meeyoung Mattie Park[2]

[1]Kenya Field Epidemiology and Laboratory Training Program, Ministry of Health Kenya; [2]Rollins School of Public Health, Emory University; [3]Tanzania Ministry of Health and Social Welfare; [4]Tanzania Field Epidemiology and Laboratory Training Program; [5]Muhimbili University of Health and Allied Sciences

Corresponding author: Jane Njoki Githuku

Email: jgithuku@feltp.or.ke

Abstract

Cholera is among the re-emerging diseases in Kenya. Beginning in December 2014, a persistent outbreak occurred involving 29 out of the 47 counties. Homa Bay County in Western Kenya was among the first counties to report cholera cases from January to April 2015. This case study is based on an outbreak investigation conducted by FELTP residents in Homa Bay County in February 2015. It simulates an outbreak investigation including laboratory confirmation, active case finding, descriptive epidemiology and implementation of control measures. This case study is designed for the training of basic level field epidemiology trainees or any other health care workers working in public health-related fields. It can be administered in 2-3 hours. Used as adjunct training material, the case study provides the trainees with competencies in investigating an outbreak in preparation for the actual real-life experience of such outbreaks.

How to Use the Case Study

General instructions: This case study should be used as adjunct training material for novice epidemiology trainees to reinforce the concepts taught in prior lectures. The case study is ideally taught by a facilitator in groups of about 20 participants. Participants are to take turns reading the case study, usually a paragraph per student. The facilitator guides the discussion on possible responses to questions. The facilitator may make use of flip charts to illustrate certain points. Additional instructor's notes for facilitation are coupled with each question in the instructor's guide to aid facilitation.

Audience: This case study was developed for novice field epidemiology students. These participants are commonly health care workers working in the county departments of health whose background may be as medical doctors, nurses, environmental health officers or laboratory scientists who work in public health-related fields. Most have a health science or biology background.

Prerequisites: Before using this case study, participants should have received lectures on disease surveillance and outbreak investigation.

Materials needed: Flash drive, flip charts, markers, computers with MS Excel

Level of training and associated public health activity: Novice – Outbreak investigation

Time required: 2-3 hours

Language: English

Participant's Guide

Goal of Case Study: To review and simulate the steps of an outbreak investigation based on an outbreak of cholera in Homa Bay County, Kenya in 2015.

Learning Objectives – At the conclusion of the session, participants will be able to:

1. Discuss the use of data generated from a surveillance system in outbreak detection
2. Describe the role of the laboratory in disease surveillance and outbreak investigation for cholera
3. Explain the preparations made before conducting a field investigation
4. Develop a case definition and discuss how to use it to conduct active case searches
5. Use MS-Excel to calculate measures of disease frequency
6. Draw an epidemic curve using MS-Excel and interpret the results
7. Describe different measures of disease control during a cholera outbreak
8. Identify various channels of communicating findings from a field investigation

Introduction

Homa Bay is a county in Western Kenya that borders Migori County to the south, Kisii and Nyamira to the east, Kericho and Kisumu counties to the northeast, and Lake Victoria to the northwest (Figure 1). The climate is semi-arid with April to November being the coldest months of the year and January to March being the hottest and driest months. There are two rainy seasons; long rains occur between March and May, while a period of short rains lasts from September to November. Fishing and agriculture are the main economic activities. Major bodies of water include the Kibuon, Kuja, Maugo, and Riana Rivers. HIV/AIDS,

Figure 1. Map showing Homa Bay County, Kenya

tuberculosis, malaria, diarrhoeal diseases, and respiratory infections are the leading causes of morbidity [1].

Health services in Homa Bay are organized into county referral hospitals, sub-county referral hospitals, and lower-level health centres and dispensaries. There are a total of 145 health facilities, including 4 county referral hospitals, 7 sub-county hospitals, 38 health centres, 88 dispensaries, 7 HIV testing centres, and 1 large- volume private hospital [2].
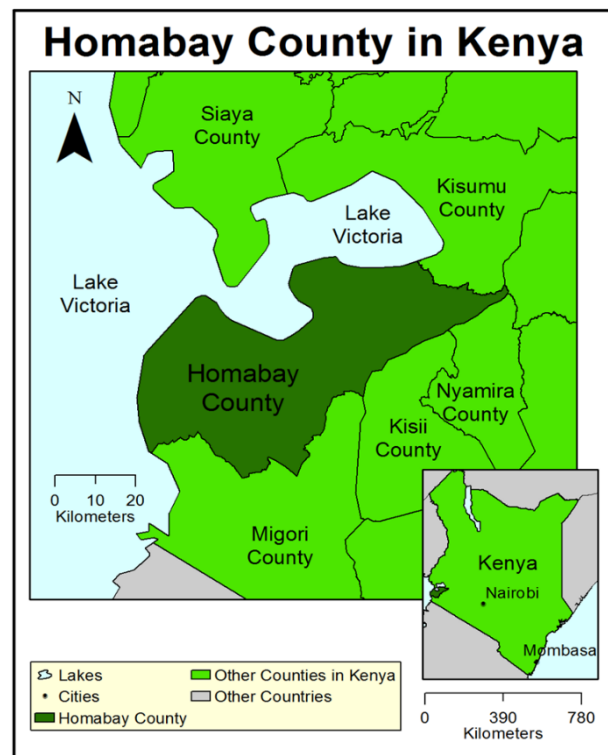
Part 1

On 9th February 2015, the county disease surveillance coordinator in Homa Bay County received a call from the Medical Officer of Health in Ndhiwa Sub-county informing him that they had noted an increase in the number of cases with acute watery diarrhoea reported through the integrated disease surveillance system. A total of 17 cases had been admitted at Hospital A in the last 48 hours. Although the patients were severely dehydrated, none had died so far. In addition to profuse watery diarrhoea, the patients presented with severe dehydration, vomiting, muscular cramps, and unconsciousness. Samples had been submitted for testing but the results were still pending.

Question 1. What is public health surveillance?

Question 2. Should the county disease surveillance coordinator report this occurrence? Justify your answer.

Part 2

Diarrhoeal diseases are endemic in Kenya and particularly in Homa Bay County, where it is among the leading causes of morbidity [1]. A cholera outbreak was persisting in Nairobi County, the capital city of Kenya, since 26th December 2014. As per the weekly epidemiological bulletin for the week ending on 1st February 2015, there were 46 cases and 2 deaths reported, of which there were 8 confirmed cases of *Vibrio cholerae* serotype 01 Ogawa and Inaba [3].

In view of this, there was a need for laboratory testing to identify the aetiology of the outbreak in Homa Bay County. Eight samples were submitted for testing at a regional reference laboratory according to the Kenya IDSR guidelines, which recommend collecting and testing samples of 5-10 of the first suspected cholera cases [4].

Question 3a. What samples should be collected for testing? What etiologic agent should the lab test for?

Question 3b. What are your recommendations for sample collection, transportation, and testing?

Question 4. What role do you think the laboratory plays in this scenario?

On 10th February 2015, five of the eight samples submitted for testing were confirmed to be positive for *V. cholerae* serogroup 01, Ogawa. The County Director of Health (CDH) reported the cases to the Ministry of Health and requested support to investigate and respond to the outbreak. On receiving reports of confirmed cholera cases, the head of Disease Surveillance and Response Unit (DSRU) at the national level constituted a team to investigate the outbreak. The team composed of FELTP residents and DSRU officers began preparations for the field investigation.

Question 5a. What is the definition of an outbreak?

Question 5b. How many confirmed cholera cases are required for the County Director of Health (CDH) to declare the existence of a cholera outbreak?

Question 6. What kind of preparations do you think the investigation team should undertake before heading out to the field? Provide answer in terms of scientific and administrative activities.

Question 7. Summarize the steps of an outbreak investigation.

The team arrived in the field on 16th February, 2015. After meeting with the county and sub-county health management teams to obtain an overview of the situation, the team started the field investigation. The investigating team started by updating the existing line list of cases. In order to do this, they developed a case definition and used it to find additional cases.

Question 8. What is a case definition?

Question 9a. What is the difference between active surveillance and passive surveillance?

Question 9b. What type of surveillance would be most appropriate for use during the cholera outbreak? Why?

Question 9c. Suggest suspected, probable, and confirmed case definitions for a cholera case for use in this investigation.

Using the above definitions, the team searched for additional cases that may have not have been reported through the routine Integrated Disease Surveillance and Response (IDSR) reporting system.

Question 10. Where would you suggest that the team look for additional cases?

Part 3

The investigating team visited all the health facilities in Homa Bay County, identified additional cases, and updated the line list. After the field investigation, the disease surveillance coordinators continued listing cases as they occurred. By 1st April, 2015, a total of 355 cases had been identified, with 5 deaths.

Question 11a. Use the line list provided by the instructor (MS-Excel spreadsheet) to fill in the table below. Calculate the proportion of the total female cases for this outbreak.

Table: Distribution of cholera cases by age and sex, Homa Bay County, Kenya, February= April 2015

Age Group	Male Frequency (%)	Female Frequency (%)	Unknown Frequency (%)	Total
<5				
5 – 14				
15 – 24				
25 – 49				
≥50				
Missing Age				
Total				

Question 11b. Can you tell who was more affected, males or females? Why?

Question 12. Use the line list to calculate the case fatality rate (CFR).

Question 13. Use MS-Excel to draw an epidemic curve from the beginning of the outbreak to 24th February 2015 based on data in the line list. Interpret the epidemic curve.

After summarizing their findings using descriptive epidemiology, the investigating team observed that most of the cases were clustered in villages situated around River Riana. The river was a major source of water for the people residing in these villages. They postulated that the river could be the source of the outbreak. On further investigation, they discovered that a factory in Kisii County had discharged effluent into the river through a burst sewer line. Public health officers also informed the team that latrine coverage in the county was approximately 60% and that open defecation was a common practice in this community. Furthermore, *V. cholerae* serogroup 01, Ogawa had been isolated from a sample of water collected from this river.

Question 14. Based on the preliminary findings above, what control and prevention measures do you think the investigating team should recommend?

Question 15. What actions would you take to engage the community while implementing prevention and control measures?

Question 16. As a member of the team, what forum/channels would you used to share findings with all the relevant partners, including the county health management team, health

care providers, and organizations such as Médecins Sans Frontières (MSF; Doctors Without Borders) and the World Health Organization (WHO)?

Conclusion

The number of new cases of cholera decreased to two new cases per day by 1st April 2015. Control interventions were put into place to control the outbreak. In addition to the descriptive study, the FELTP residents conducted a case control study to identify factors associated with the outbreak, including lack of household latrines, communal handwashing basins, and food vending occupations.

A second wave of the cholera outbreak occurred from 12th May 2015. A joint team of FELTP residents conducted a survey to assess the knowledge, attitude, and practices of the community in Homa Bay County. Among the key findings of this survey were that half of the study participants did not have access to improved water sources and a quarter had no latrines in the homesteads.

Overall, it appears that poor sanitation and lack of access to clean drinking water were factors that contributed to perpetuation of the outbreak. In order to control the outbreak and prevent future ones, all relevant authorities have to work together to improve sanitation and access to clean drinking water.

Background Reading

CDC. Differential Diagnosis: Outbreaks of Acute Watery Diarrhea. In *Global Disease Detection (GDD) Manual "Rapid Diagnostic Tests for Epidemic Diseases" 2011 (draft)*, 2011. Atlanta, GA. CDC. http://www.cdc.gov/cholera/pdf/gdd_manual_cholera_chapters_2012_1_11-508c.pdf

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