International Journal of Infectious Diseases 53 (2016) 23–29

Contents lists available at ScienceDirect

International Journal of Infectious Diseases

journal homepage: www.elsevier.com/locate/ijid

Clinical profile and containment of the Ebola virus disease outbreak in two large West African cities, Nigeria, July–September 2014

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ARTICLE INFO

Article history:
Received 15 April 2016
Received in revised form 16 August 2016
Accepted 18 August 2016

Corresponding Editor: Eskild Petersen, Aarhus, Denmark.

Keywords:
Ebola virus disease
Outbreak containment
Clinical profile
Hemorrhagic fever
Gastroenteritis
Nigeria

SUMMARY

Introduction: The Ebola virus disease (EVD) outbreak in Nigeria began when an infected diplomat from Liberia arrived in Lagos, the most populous city in Africa, with subsequent transmission to another large city.

Methods: First-, second-, and third-generation contacts were traced, monitored, and classified. Symptomatic contacts were managed at Ebola treatment centers as suspected, probable, and confirmed EVD cases using standard operating procedures adapted from the World Health Organization EVD guidelines. Reverse transcription PCR tests confirmed EVD. Socio-demographic, clinical, hospitalization, and outcome data of the July–September 2014 Nigeria EVD cohort were analyzed.

Results: The median age of the 20 EVD cases was 33 years (interquartile range 26–62 years). More females (55%), health workers (65%), and persons <40 years old (60%) were infected than males, non-health workers, and persons aged ≥40 years. No EVD case management worker contracted the disease. Presenting symptoms were fever (85%), fatigue (70%), and diarrhea (65%). Clinical syndromes were gastroenteritis (45%), hemorrhage (30%), and encephalopathy (15%). The case-fatality rate was 40% and there was one mental health complication. The average duration from symptom onset to presentation was 3 ± 2 days among survivors and 5 ± 2 days for non-survivors. The mean duration from symptom onset to discharge was 15 ± 5 days for survivors and 11 ± 2 days for non-survivors. Mortality was higher in the older age group, males, and those presenting late.

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http://dx.doi.org/10.1016/j.ijid.2016.08.011

Conclusion: The EVD outbreak in Nigeria was characterized by the severe febrile gastroenteritis syndrome typical of the West African outbreak, better outcomes, rapid containment, and no infection among EVD care-providers. Early case detection, an effective incident management system, and prompt case management with on-site mobilization and training of local professionals were key to the outcome.

1. Introduction

Ebola virus disease (EVD) is a zoonotic hemorrhagic fever illness caused by a filovirus. Since its discovery in Zaire in 1976, human EVD infections have been rare but repeated among people living in forest communities of endemic central and east African countries. The endemic countries are the Democratic Republic of Congo, Uganda, Sudan, and Gabon. Between 1976 and 2013, only two countries outside the endemic region recorded Ebola cases. In 1994, an ethnologist was infected by a novel Ebola subtype from a wild chimpanzee in Côte d'Ivoire.[1] In 1996, the predominant Zaire subtype was implicated in a South African case.[2]

Although Nigeria and other West African countries have experienced cases of Lassa and dengue fever, the 2014 Ebola virus outbreak was the largest viral hemorrhagic fever (VHF) outbreak in these countries. The Nigeria outbreak began on July 20, 2014 when an infected Liberian-American diplomatic traveler (the index case) from neighboring Liberia arrived in Lagos, the commercial capital of Nigeria and Africa's most populous city. His entry into Lagos and subsequent spread of the disease to another large city – Port Harcourt – marked the first recorded spread of Ebola virus in an international mega-city or large urban setting. This heightened the international community's concern for an exponential increase in the magnitude of the already devastating West African EVD outbreak.

The clinical profile of patients affected by EVD has been documented in previous outbreaks. The incubation period is between 2 and 21 days, and this is followed by an abrupt presentation of non-specific symptoms. Initial symptoms may include fever, headache, abdominal pain, diarrhea, vomiting, macular rash, etc. Late in the clinical course, there may be hemorrhagic signs and weight loss. Macular rashes were used in previous outbreaks to aid the differential diagnosis because patients who presented with such rashes within 5–7 days of infection often showed signs of desquamation.[3] However, recent events have highlighted the unpredictability of Ebola virus in human hosts. For example, the 1996 case in Côte d'Ivoire presented with a variety of symptoms including prostration, but recovered after a prolonged illness. This contrasts with a case in a 12-year-old in Uganda who presented simply with fever and yet quickly progressed to hemorrhage and death within 3 days of presentation to a health care facility.[4]

Much of what is known of Ebola signs and symptoms has come from outbreaks in which data collection was limited. Other factors that have contributed to the limited understanding of EVD include the quick progression of clinical manifestations, as well as the level of infection prevention and control (IPC) measures needed to manage or study this disease.

The core case identification process, critical clinical presentations, morbidity patterns, primary clinical management, and outcomes of a confirmed EVD case cohort in Nigeria, seen during the successful containment effort during the period July 20–September 30, 2014, are described herein. This review contributes to the small but growing EVD presentation and management information from West Africa, which is of value to clinicians and public health practitioners.

2. Methods

2.1. Outbreak setting and population

The outbreak occurred in two large West African and Nigeria-state capital cities, namely Lagos and Port Harcourt. Lagos, the most populous city in Africa, is located in the South West geo-political region of the country, and Port Harcourt in the South South geo-political region, with land areas of approximately 3345 and 11 077 km^2, respectively. Lagos and Port Harcourt are complex urban megacities with a combined population of over 23 million people. The two cities host international airports and seaports, and have witnessed large influxes of people not only from within Nigeria, but also from neighboring countries, as they serve as major business, employment, and cultural centers.

Like many metropolises in developing countries, Lagos and Port Harcourt are crowded cities with many slums. More than 60% of the population in Lagos live in urban slums, which could pose a challenge to the containment and control of an infectious disease outbreak. However, compared to other cities in Nigeria, Lagos and Port Harcourt are among the State capitals with relatively better developed public and private health care infrastructure, including emergency response resources.

One of the main ports of entry into Nigeria is Murtala Muhammed International Airport in Lagos, which is a major hub for the West African travel route and other international flights. This airport is one of the busiest in Africa and was the point of entry for the Nigeria index EVD case.

2.2. Identification of suspected and confirmed EVD case patients and their management

All persons who were exposed to the index case were traced and monitored by the contact tracing team. If they subsequently became ill, their contacts were also traced, placed under surveillance, and monitored daily for clinical features of EVD, especially body temperature (using a self-administered axillary thermometer). As soon as they reported or were observed to have a body temperature of $\geq$38 °C or had other symptoms meeting the suspected case definition, such as abdominal pain, diarrhea, or vomiting, sudden bleeding or bloody diarrhea or blood in the urine, they were referred to the case management team for evaluation and subsequent evacuation to the Ebola treatment centre (ETC), in accordance with the adapted EVD screening and case management standard operating procedure (SOP). They were then reviewed by a medical officer and admitted to the suspected case isolation ward if they met the EVD suspected case definition. Third-generation contacts were also traced and managed based on the SOP, with significant outcomes especially in the second city – Port Harcourt. Two of the three tertiary contacts here had been in direct contact with a secondary contact, while one had shared only an emergency care centre facility (room) with the same secondary contact, implicating a nosocomial transmission (Figure 1 shows the EVD chain of transmission in Nigeria).

Blood samples were collected from suspected case patients and these were tested by reverse transcription PCR (RT-PCR) for