Ebola Virus Disease: epidemiology, management, prevention and control

Gasim Abd-Elfarag

Department of Global Health, Academic Medical Center, University of Amsterdam, the Netherlands

Correspondence: Gasim Abd-Elfarag, gasim4u83@gmail.com

INTRODUCTION

Ebola Virus Disease (EVD) is part of the group of illnesses known as viral haemorrhagic fevers, and was previously known as Ebola haemorrhagic fever. Infection with EVD is acute, severe and often fatal in humans. Five species of the Ebolaviruses have been identified: Zaire, Bundibugyo, Sudan, Reston and Tai Forest [1]. The Zaire, Bundibugyo and Sudan ebolaviruses were responsible for the largest outbreaks in Africa [2]. This paper aims to provide an outline of what is known about EVD.

EPIDEMIOLOGY

The EVD occurs in both non-human primates and humans, but the largest outbreak so far was in humans. The first cases of EVD came in 1976 from two simultaneous outbreaks from Zaire (now the Democratic Republic of Congo) and southern Sudan (now South Sudan) [2]. Both, the Zaire ebolavirus and the Sudan ebolavirus were responsible for these outbreaks, which in Zaire, have caused 280 deaths out of 318 cases (88% case fatality rate) [3]. Much later, cases were reported from eastern and western African countries [4]. Between 1976 and 2015 the Ebolavirus has affected over 31,000 and killed around 13,000 people worldwide [2]. The largest outbreak since the discovery of the ebolavirus in 1976 occurred in West Africa between 2014 and 2016 [2]. This outbreak started in Guinea, then spread across land borders to neighboring Sierra Leone and Liberia, and has killed over 11,000 people out of more than 28,000 identified cases [5]. During these outbreaks, EVD also affected other countries such as Italy, Mali, Nigeria, Senegal, Spain, the United Kingdom and the United States [5]. Failure to contain the outbreak in Guinea due to weak surveillance and poor health infrastructure led to the massive spread of the disease across the different borders. Overcrowding in urban areas, increased movement across the borders and poor personal infection prevention practices worsened the situation. A recent outbreak was announced in the North Kivu and Ituri provinces of the Democratic Republic of Congo in August 2018, killing 92 people as of September 2018 [6].

TRANSMISSION

EVD is zoonotic (i.e. it normally exists in animals but can be transmitted to humans), and fruit bats are considered to be the main reservoir [7, 8] - see figure 1. The Ebola virus

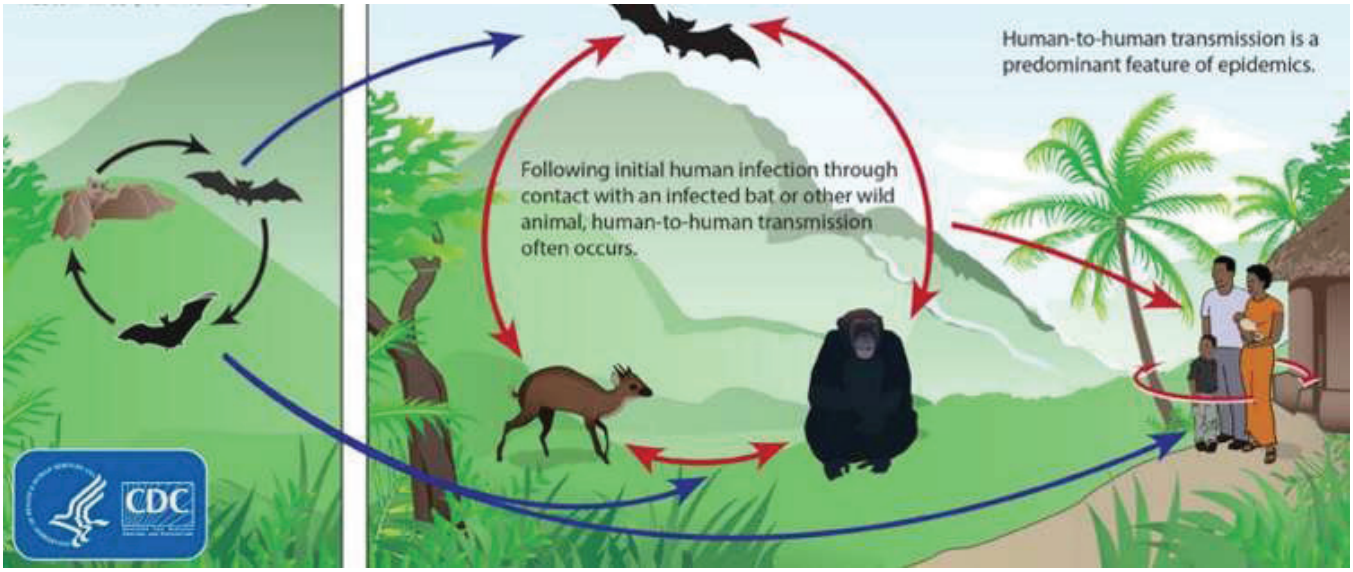

Figure 1. The life cycle of ebolavirus (credit: CDC)

enters the human body when breaks in the mucosa or skin come into contact with the blood, secretions, other bodily fluids and organs of infected animals like fruit bats, monkeys, chimpanzees, gorillas, porcupines and forest antelopes. Once in the human body, the virus can be transmitted from one human to another through direct contact with bodily fluids or organs of infected persons, and also with materials and surfaces soiled with these fluids [2]. Contaminated materials and surfaces can be anything, such as beddings, clothing, etc. EVD can also be transmitted from human-to-human through sexual intercourse up to 6 months after developing the disease [9]. Ebolavirus transmission can also occur during burial ceremonies, when there is direct contact with the dead body of an infected person. Healthcare workers often get infected when treating Ebola infected persons, especially when they do not follow appropriate infection control measures. Ebola infected people continue to infect others as long as they have the virus in their blood.

CLINICAL PRESENTATION

The incubation period is 2-21 days, although in most cases, symptoms occur within two weeks of infection [2, 10, 11]. The initial symptoms of EVD include fever, headache, fatigue, muscle/body pain and sore throat [2]. This can be followed by epigastric and abdominal pain, nausea, vomiting, diarrhoea, rash, hiccups, chest pain, symptoms of impaired liver and kidney functions, and internal and external bleeding such as gum bleeding, blood in stools and blood in vomitus. [2, 12]. Laboratory findings include raised liver enzymes and reduced white blood cells and platelets counts, raised blood urea nitrogen, creatinine and lactate levels, reduced plasma sodium, potassium and calcium levels, and abnormal coagulation profile [2, 10].

DIAGNOSIS

It is very difficult to diagnose EVD based on symptoms because in the early stages of the disease it presents like other diseases, such as malaria, typhoid and meningitis. However, during outbreaks, case definition using specific criteria can be used to help in diagnosis (see Table 1). Laboratory methods used to detect infection with the Ebolavirus include:

1. serologic tests that detects human antibodies produced against the Ebolavirus,
2. antigen tests that detect proteins from the Ebolavirus,
3. molecular tests that detect viral nucleic acid (RNA) sequences, and
4. the traditional gold standard isolation of the Ebolavirus by cell culture [2, 13].

Table 1: Case definition for Ebola Virus Disease [5]

Persons under investigation (PUI)

PUI is any person with both consistent symptoms or signs and risk factors as follows:

1. High body temperature or subjective fever or symptoms including severe headache, fatigue, muscle pain, vomiting, diarrhoea, abdominal pain, or unexplained haemorrhage; AND
2. An epidemiological risk factor within the 21 days before the start of symptoms.

Confirmed case

Laboratory-confirmed diagnostic evidence of Ebolavirus infection.

TREATMENT

There is no available specific treatment for the EVD. Current treatment is supportive with oral rehydration and intravenous fluids including blood transfusion, and treatment of specific symptoms. Currently, other potential treatment options including drug and immune therapies, and blood products are being evaluated [2].

PREVENTION AND CONTROL

Control of EVD outbreak involve implementation of an intervention package that includes case management, surveillance and contact tracing, laboratory diagnosis, safe burials, social mobilization and community involvement [2]. People should be informed of the following [2, 14]:

- **Prevention of transmission from animal-to-human:** avoiding direct contact with sick animals (fruit bats, monkeys, chimpanzees, etc.) and consumption of their raw meat;
- **Prevention of transmission from human-to-human:** avoiding direct/close contact with people having Ebola symptoms. When taking care of the Ebola sick person, gloves and other appropriate personal protective equipment should be worn. Hands should regularly be washed after caring for the Ebola sick patients in hospital or at home;
- **Prevention of sexual transmission:** safe sex and hygiene should be practiced for 12 months from start of Ebola disease symptoms by male survivors of EVD and their sexual partners or using a PCR, testing can be started at 3 months of onset of Ebola symptoms and then monthly until their semen tests negative for the Ebolavirus on 2 separate occasions at least 1 week apart. During this period, healthcare providers should ensure that all EVD survivors and their sexual partners receive counselling on safe sex practices;

- **Measures to contain outbreaks:** this includes identification of people who have been in contact with an EVD patient and monitoring them for 21 days, practicing safe burial of the dead, separation of healthy individuals from the Ebola patients to prevent transmission, and practicing good hygiene while maintaining clean environment.

Healthcare workers should perform thorough standard precautions and protective measures to prevent contact with infected blood and body fluids and contaminated surfaces or materials. This should include basic hygiene, respiratory hygiene, wearing of personal protective equipment (face shield/mask, goggle, clean non-sterile long-sleeve protective gown, gloves and boots), safe injection practices, safe burial practices, and safe handling of infected samples for laboratory tests from humans or animals [2].

A vaccine called rVSV-ZEBOV is currently being used in the DRC outbreak, as it is proven to be highly protective against the Ebolavirus [15, 16]. WHO recommends that as long as there is no licensed candidate vaccine, the rVSV-ZEBOV vaccine should be used during outbreaks with the Zaire Ebolavirus species, but with informed consent and good clinical practice [17].

CONCLUSION

Infection with the Ebolavirus is rare but deadly and has no borders if outbreaks are not contained. However, if appropriate measures are thoroughly and promptly taken, its transmission can be prevented and controlled, especially given the effectiveness of the existing tools, including the new vaccine.

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