*Arşiv Kaynak Tarama Dergisi*
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# Ebola Virus

## Ebola Virüsü

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**ABSTRACT**

The disease Ebola takes its name from the Ebola River situated near a village in the Democratic Republic of Congo, where the disease first appeared in 1976. It is caused by a virus from the *Filoviridae* family. The present outbreak of Ebola Virus Disease concerns four countries in West Africa, namely Guinea, Liberia, Sierra Leone and Nigeria till date. Further to widespread transmission of the disease, it has been declared as a Public Health Emergency of International Concern by the World Health Organisation on 8 August 2014. 2,127 cases with 1,145 deaths in these 4 affected countries are reported till 13 august 2014. This review paper enlightens about the awareness of Ebola virus and its preventive measures.

**Key words:** Ebola virus, filovirus, West Africa.

**ÖZET**

Bu hastalık ismini 1976'da ilk kez görüldüğü Kongo Demokratik Cumhuriyetindeki bir köye yakın olarak konumlanmış Ebola Nehrinden alır. Bu hastalığa *Filoviridae* ailesine mensup bir virüsten sebep olmaktadır. Ebola salgını başladığı günden bu yana temelde Batı Afrika'da yerleşim gösteren dört ülkeyi; Gine, Liberya, Sierra Leone ve Nijerya'yı ilgilendiriyordu. Fakat hastalığın yayılması nedeniyle, 8 Ağustos 2014 tarihinde Dünya Sağlık Örgütü tarafından Uluslararası Halk Sağlığı Acil Durumu olarak ilan edildi.13 Ağustos 2014 tarihine kadar bildirilen bu 4 ülkedeki 2,127 hastadan 1,145ínin yaşamlarının sonlandığı rapor edildi.Bu derleme Ebola virüsü için farkındalığın artmasına ve önleyici tedbirlerin geliştirilmesine katkı sağlayacaktır.

**Anahtar Kelimeler:** Ebola virüsü, filovirüs, Batı Afrika.

## Introduction

Filoviruses, like Ebolavirus, pose significant threats to public health and species conservation by causing hemorrhagic fever outbreaks with high mortality rates. Ebola haemorrhagic fever (EHF) is a zoonosis affecting both human and non-human primates (NHP). Outbreaks in Africa occur mainly in the Congo and Nile basins. The first outbreaks of EHF occurred nearly simultaneously in 1976 in the Democratic Republic of the Congo (DRC, former Zaire) and Sudan with very high case fatality rates of 88% and 53%, respectively. It was given the name 'Ebola' after the small river near the catholic mission of Yambuku, the epicenter of the 1976 EHF outbreak[1].

In most outbreaks, Ebola virus is introduced into human populations via the handling of infected animal carcasses**.** Animal-to-human transmission occurs when people come into contact with tissues and bodily fluids of infected animals, especially with infected nonhuman primates[2]. The onset of the disease is abrupt after an incubation period of two to 21 days. Sudden onset of fever, intense weakness, muscle pain, headache and sore throat are typical signs and symptoms. This is followed by vomiting, diarrhoea, rash, impaired kidney and liver function, followed by both internal and external bleeding[1]. There is no known specific therapy for these viruses, such as convalescent plasma, antiviral drugs, or interferon as used in other viral hemorrhagic fevers[3].

The aim of this review article is to create awareness about the deadliest ebola virus which has taken thousands of lives. We have also discussed and highlighted about the present concern, the documented outbreaks of this disease all around the world, etiology and pathogenesis with various clinical manifestations, its diagnosis and very importantly, the preventive measures to avoid the spread of the disease.

## Documented Outbreaks of Ebola in Africa

The first documented outbreaks were generally regarded as causing a mysterious disease. In most of the cases, the disease has appeared suddenly out of the elusive natural environment and dissipated slowly during the outbreak. The first outbreaks of EHF occurred almost simultaneously in 1976 in southern Sudan (June) and northwestern Zaire (now Democratic Republic of the Congo, DRC) (September). The first case in Sudan was a cotton factory worker

who transmitted the infection in Maridi hospital. 53% of morality rate was noticed in 284 affected patients[4].

Whereas in Congo, it was 44-year-old male instructor at Yambuku Catholic mission school was diseases after extensive travels to Northern Equateur Province. In total 318 cases were recorded, with a case fatality rate of 88%. Close contact with an acute Ebola case and receiving an injection with a reused, unsterilized syringe at the hospital were the major risk factors for virus transmission in humans5. The other reported cases are represented below in the Graph 1[6-19].

## Present Concern

The present outbreak of Ebola Virus Disease (EVD) concerns four countries in West Africa, namely Guinea, Liberia, Sierra Leone and Nigeria. Further to widespread transmission of the disease, it has been declared as a Public Health Emergency of International Concern by the World Health Organisation (WHO) on 8 August 2014.

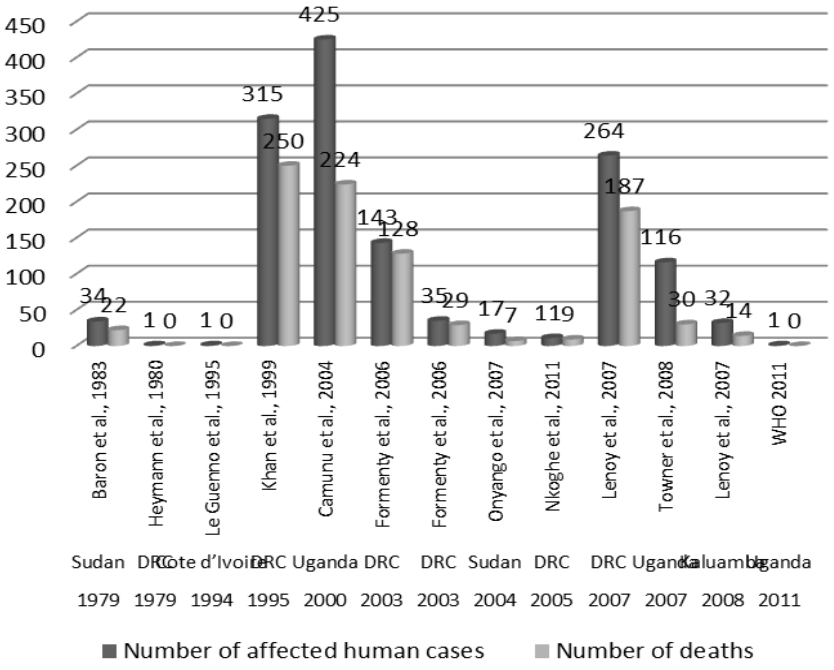
Some species of the Ebola virus have been associated with large EVD outbreaks in Africa. The present outbreak of EVD was notified to WHO on 21 March 2014 by the Ministry of Health of Guinea. The cases of EVD were initially reported from Gueckedou, Macenta, and Kissidougou in the forest region, an area forming the border with Sierra Leone and Liberia, and which later spread to Conakry, the capital city. On 30 March 2014, neighboring Liberia reported its first cases of EVD followed by Sierra Leone. The Ministry of Health of Nigeria reported its first case of EVD on 27 July 2014 in an incoming passenger from Liberia; following which several other cases have been detected in the country. National authorities in all the four above mentioned countries are working closely with WHO and its partners to ensure that this outbreak is contained. The scale of the present outbreak is unprecedented, with reports of more than 2, 127 cases and 1, 145 deaths (as of 13 August 2014) in the four affected countries since March 2014[20].

## Etiology and Pathogenesis of EVD

Ebola virus belongs to the family *Filoviridae*, in the order Mononegavirales which includes *Rhabdoviridae* and *Paramyxoviridae*. The virion is pleomorphic, producing 'U'- shaped, '6'-shaped, or circular forms but the predominant forms of the virion most frequently seen by electron microscope are long tubular structures. It contains one molecule of linear, single-

stranded, negative-sense RNA of $4.2x10^6$ Da[1]. Ebola haemorrhagic fever (EHF) is caused by any of five genetically distinct members of the *Filoviridae* family: *Zaire ebolavirus* (ZEBOV), *Sudan ebolavirus* (SEBOV), *Côte d'Ivoire ebolavirus* (CEBOV), *Bundibugyo ebolavirus* (BEBOV) and *Reston ebolavirus* (REBOV)[1,21].

The pathogenesis involves infection of macrophages and endothelial cells throughout the body with multiple organ involvement. The presence of viral antigen and viral particles correlates with the actual lesions. Severe lymphoid lesions are present and may be partially responsible for the absence of an effective immune response. The pathogenesis is similar in man and monkeys[21,22].




**Graph 1: Documented outbreaks of EVD in Africa**

**Table 1. Clinical Features and Phases of Ebola Virus Disease**

| Phases | Days | Signs and Symptoms |
|---|---|---|
| Phase A | Influenza–like syndrome | The onset is abrupt with non-specific symptoms or signs such as high fever, headache, arthralgia, myalgia, sore throat, and malaise with nausea |
| Phase B | Acute (Day 1–6) | Persistent fever not responding to antimalaria drugs or to antibiotics, headache, intense fatigue, followed by diarrhea and abdominal pain, anorexia and vomiting. |
| Phase C | Pseudo-remission (Day 7–8): | During this phase the patient feels better and seeks food. The health situation presents with some improvement. Some patients may recover during this phase and survive from the disease |
| Phase D | Aggravation (Day 9) | In many if not most cases, the health status gets worse. |

## Transmission

Ebola is introduced into the human population through close contact with the blood, secretions, organs or other bodily fluids of infected animals. Such infections have primarily occurred through the handling of infected chimpanzees, gorillas, fruit bats, monkeys, forest antelope and porcupines found ill or dead specially in the rainforests.

Human-to-human transmission occurs as a result of direct contact with the blood, secretions, organs or other bodily fluids of infected people, or through indirect contact with environments contaminated with such fluids[24]. Burial ceremonies have also contributed to the transmission process whenever mourners have had direct contact with the body of the deceased person.

As a matter of fact, once a person comes into contact with an animal that has Ebola, it can spread within the community from human to human. Infection occurs from direct contact (through broken skin or mucous membranes) with the blood, or other body fluids or secretions (stool, urine, saliva, semen) of infected people. Infection can also occur if broken skin or mucous membranes of a healthy person come into contact with environments that have become contaminated with an Ebola patient's infectious fluids such as soiled clothing, bed linen, or used needles[23,25]. Sexual transmission has been suggested in humans since filoviruses can be found in semen[26].

## Clinical Signs and Symptoms

The onset of the disease is abrupt after an incubation period of two to 21 days. The clinical features can be divided into four main phases as given in Table 2[1]. The following symptoms may be observed[1]:

- Respiratory disorders: dyspnea, throat and chest pain, cough, hiccups
- Symptoms of haemorrhagic diathesis: bloody diarrhoea, haematemesis, conjunctival injection, gingival bleeding, nosebleeds and bleeding at the site of injection consistent with disseminated intravascular coagulation
- Skin manifestations: petaechiae (not so obvious on black skin), purpura (morbiliform skin rash)
- Neuro-psychiatric manifestations: prostration, delirium, confusion, coma
- Cardio-vascular distress and hypovolaemic shock (death).

From these clinical manifestations it is obvious that EHF may mimic many other tropical diseases like malaria, typhoid fever or yellow fever at the start of the disease. In most outbreaks, recognition of the disease is delayed because physicians are not accustomed to this new illness and the symptoms are generally non-specific. Outside the epidemic context, it appears quite impossible to recognize the first Ebola case in an outbreak on clinical grounds only. Suspicion of EHF is only possible later during the aggravation phase[1,25].

## Diagnosis

Early laboratory confirmation of suspected clinical haemorrhagic fever cases is essential to implement appropriate control measures. Laboratory findings include low white blood cell and platelet counts, and elevated liver enzymes[25]. Definitive diagnosis of suspected cases of EHF is usually made by Polymerase Chain Reaction (PCR) detection and virus isolation on Vero cells. As a class-4 pathogen, Ebola virus culture requires a maximum containment facility. Additional laboratory diagnostic tests include Enzyme Linked Immune Sorbent Assays (ELISA) for the detection of Ebola IgG- and IgM-specific antibodies and virus antigens; more specialized molecular testing is also available but is not readily available in the usual clinical setting[1].

## Management

Severely ill patients require intensive supportive care. They are frequently dehydrated and need intravenous fluids or oral rehydration with solutions that contain electrolytes. There is currently no specific treatment to cure the disease. Some patients will recover with the appropriate medical care. To help control further spread of the virus, people that are suspected or confirmed to have the disease should be isolated from other patients and treated by health workers using strict infection control precautions[25].

### Ways to Prevent Infection and Transmission as Recommended by WHO

While initial cases of Ebola virus disease are contracted by handling infected animals or carcasses, secondary cases occur by direct contact with the bodily fluids of an ill person, either through unsafe case management or unsafe burial practices. During this outbreak, most of the disease has spread through human-to-human transmission. Several steps can be taken to help in preventing infection and limiting or stopping transmission[25].

- Understand the nature of the disease, how it is transmitted, and how to prevent it from spreading further.
- Listen to and follow directives issued by your country's respective Ministry of Health.
- If you suspect someone close to you or in your community of having Ebola virus disease, encourage and support them in seeking appropriate medical treatment in a care facility.
- If you choose to care for an ill person in your home, notify public health officials of your intentions so they can train you and provide appropriate gloves and personal protective equipment (PPE), as well as instructions as a reminder on how to properly care for the patient, protect yourself and your family, and properly dispose of the PPE after use.
- When visiting patients in the hospital or caring for someone at home, hand washing with soap and water is recommended after touching a patient, being in contact with their bodily fluids, or touching his/her surroundings.
- People who have died from Ebola should only be handled using appropriate protective equipment and should be buried immediately.

Additionally, individuals should reduce contact with high-risk infected animals (i.e. fruit bats, monkeys, or apes) in the affected rainforest areas. If you suspect an animal is infected, do not handle it. Animal products (blood and meat) should be thoroughly cooked before eating[25].

## Conclusion

Since Ebola virus is generally considered as a potential biological weapon, it is urgent to develop effective antiviral drugs and vaccines. The ideal is to develop a candidate vaccine able to confer interspecies cross-protection against all Ebola virus species. Raising awareness of the risk factors and measures people can take to protect themselves are the only ways to reduce illness and deaths.

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