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Reemergence of Ebola in 2021

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Abstract

Ebola also known as Ebola Virus Disease (EVD) is a serious disease that is caused by viruses that belong to the genus Ebola virus (EBOV). The purpose of this review is to discuss the most recent Ebola outbreak in Africa. A latest report on Ebola indicated that the disease recently resurged in Democratic Republic of Congo in February 2021. The Democratic Republic of Congo contains heavy forested areas that have been suggested as the primary factor for the repeated outbreaks of Ebola in the Democratic Republic of Congo. In addition to this, consumption of bushmeat and deforestation has been reported as additional factors that have contributed for the repeated Ebola outbreaks in the Democratic Republic of Congo. The most recent Ebola outbreak that was documented in Democratic Republic of Congo in 2021 might be due to transmission of the EBOV from Ebola survivor. Therefore, the community in Ebola endemic areas has to be educated as contact with fruit bat, deforestation, consumption of bushmeat and contact with body fluids of Ebola patients are the key ways of transmission of Ebola virus. Moreover, immunization of those at high-risk of being infected by the virus can be taken as an additional measures so as to prevent future outbreaks of Ebola. Furthermore, active surveillance and follow up of survivors of Ebola is needed.

Keywords: EVD; EBOV; Resurgence; Democratic republic of Congo

Background

Ebola is a deadly disease with case fatality rate of 50%. It is caused by viruses that belong to the genus Ebola Virus (EBOV) [1]. Since the disease was discovered in 1976, there have been several Ebola outbreaks that have been documented in different parts of the world [1]. The most recent outbreak of Ebola occurred in February 2021 in the Democratic Republic of Congo (DRC) [2,3]. The purpose of this review is to discuss the re-emergence of Ebola in 2021 in DRC.

Epidemiology of Ebola

Ebola is a viral disease that is caused by six species of viruses that belongs to the genus EBOV. The following are the six species of EBOV that causes Ebola: Zaire EBOV also known as Ebola virus, Reston EBOV, Bombali EBOV, Ivory coast EBOV which is also called Tai forest EBOV, Bindbuguyo EBOV, and Sudan EBOV [1]. With the exception of Reston EBOV, the other five aforementioned viruses cause Ebola in human beings. Ebola is a serious disease with fatality rate up to 90% [4].

The disease is most commonly seen in humans, fruit bats, forest antelope and non-human primates, which includes monkeys, gorillas, and chimpanzees [5,6]. The primary reservoir hosts of the viruses that cause Ebola are Fruit bats that live in forested areas [1,7]. Pigs and dogs can also be infected with EBOV [8].

Transmission of EBOV usually occurs by direct contact with body fluids (blood, semen, breast milk, saliva, sweat, tear, mucus, and vomit) [1,9,10]. Eyes, breasts and testicles are immunologically privileged sited in which the virus can live for a long time [11-13]. Studies showed that breast milk and semen of a person that recovered from Ebola may carry the EBOV for more than a year [14,15].

Thus, there is an increased risk of vertical transmission of the virus from Ebola survivor mother to a new born baby through breast milk for over twelve months. In addition, there is risk of sexual transmission of the virus from semen of Ebola Virus Disease (EVD) survivors that carry EBOV for over a year [15,16]. Therefore, survivors of EVD are advised to use condoms for more than one year or until they be tested negative for EBOV [17].

Ebola was first discovered in 1976 when two simultaneous Ebola outbreaks were occurred in the today's' South Sudan (Nzara) and the DRC (near to the Ebola River) [1]. Since then, several Ebola outbreaks have been documented in different parts of the world, especially in Africa [1]. The DRC had the most Ebola outbreaks.

Since 1976, the DRC has had the most Ebola outbreaks. However, other African countries and countries outside Africa have also experienced Ebola outbreak, including the United States of America, United Kingdom, Guinea, Sierra Leone, Italy, Ivory Coast, Gabon, Russia, Liberia, Mali, Nigeria, Senegal, Uganda, Spain, Philippines and South Sudan [18].

Since 1976 EVD caused thousands of deaths in the world [19]. The largest Ebola outbreak to date is the Ebola outbreak that occurred between 2014-2016 (the West Africa Ebola outbreak). This outbreak

caused higher number of deaths in Liberia, Sierra Leone and Guinea [2,20]. There were 28,000 Ebola cases and 11,000 deaths due to Ebola during the West Africa Ebola outbreak.

The most recent outbreak of EVD was documented in February 2021 [2,3] in the DRC, after three months of the 2020 Ebola outbreak, which ended in November 2020 in DRC [20]. Then, the disease reached to Guinea within a week [21]. The Democratic Republic of Congo contains heavy forested areas, which has been suggested as the primary factor for the repeated outbreaks of Ebola in the DRC. The other important factors that have contributed for multiple Ebola outbreaks in Africa in general and DRC in particular are consumption of bushmeat (which is not properly cooked at high temperature) and deforestation. This is due to the fact that index cases of EVD have often been close to recently deforested areas, which favored the occurrence of an EVD outbreak up to two years after deforestation [22,23]. The 2014 West Africa EVD outbreak was originated from bushmeat consumption and exhibited sustained human-to-human transmission [24-26]. The index case for the most recent EVD outbreak was a woman, who was wife of an Ebola survivor [3], suggesting that the outbreak might be connected with transmission of the EBOV to the index case from her husband.

Virology

EBOV is member of the family Filoviridae. EBOV has single stranded, negative sense RNA genome that is about 19 kb in size [27]. The 19 kb genome of EVOB is consisted of only seven genes. The seven genes encode for seven main proteins: Viral proteins (VP24, VP30, VP35, and VP40), nucleoprotein, Glycoprotein (GP), and L-polymerase proteins [28,29].

L-polymerase protein is a polymerase enzyme that catalyzes biosynthesis and replication of genome of the virus [30]. The viral proteins VP24 and VP35 involve in evasion of host immune response. The nucleoprotein encapsulates the genome into the nucleocapsid [31]. The VP40 drives viral assembly and budding. The role of VP30 is initiating EBOV transcription [31]. The protein GP (GP1 and GP2) is essential for entry of the virus to target cells [32].

Pathogenesis and Clinical Features of EVD

Entry of EBOV to our body takes place through the mucosa and injuries and cuts in skin [30,32]. The entry of EBOV is mediated by the viral spike GP [33]. The virus enters the target cells by using receptor-mediated endocytosis and macropinocytosis [34,35]. GP2 mediates the fusion of the viral and cellular membrane [36]. Following the release of nucleocapsid, the biosynthesis and replication occurs in the cytoplasm of host cell. Finally, after completion of assembly, the viral particle leaves the host cell by budding [36].

Pathogenesis of EBOV infection involves both direct cytopathic effects of the virus and indirect effect that arise from impaired host immune response [33]. Dendritic cells and macrophages are the cells that are early infected by the EBOV [37-39]. The macrophages and dendritic cells play important roles in the dissemination of the EBOV throughout the host body [40]. Although, the macrophages and dendritic cells are the cells that are early targets of the virus, there are also other cell types with the exception of lymphocytes that are infected by EBOV at later stages of infection [4].

Usually death from Ebola occurs within 9 days after the onset of symptoms, and mainly arises from break down the vascular epithelium, cytokine storm and multiple organ failure [2,30,41]. The signs and symptoms usually take place between two days and three weeks after contracting the virus [9]. The signs and symptoms of EVD include: headaches, vomiting, fever, sore throat, muscular pain, diarrhea, and rash [8]. In some people, bleeding occurs both internally and externally [9]. Bleeding usually occurs from five to seven days after the first symptoms [42]. Patients of Ebola show decreased blood clotting [43] that results in coughing and vomiting of blood [44]. Blood loss usually causes death [45]. Ebola survivors experience decreased hearing, muscular pain, continued weakness, joint pain, and inflammation of liver, difficulty returning to pre-ill weight and decreased appetite [46].

Interventions against Ebola

The World Health Organization (WHO) recommends nucleic acid tests for routine diagnosis of Ebola. Monoclonal antibodies are the only antiviral drugs that have been recommended for treatment of Ebola. Recently (in 2020), the United States food and drug administration (FDA) approved two monoclonal antibodies (which are called Inmazed and Ebanga) for the treatment of Ebola that is caused by Zaire Ebola virus [1]. Supportive care significantly improves survival from the disease. Recently (in December 2020), the FDA has also approved a vaccine against Ebola virus that is known as Ervebo vaccine. The Ervebo vaccine was demonstrated to be well tolerated and effective in the treatment of Ebola [1].

Conclusions

The main factor that has contributed for the multiple outbreaks of Ebola in Africa, particularly in the DRC, is the heavy forested area in which Fruit Bats live. Bushmeat consummation and deforestation are other important factors that have contributed for the multiple Ebola outbreaks in the DRC. The most recent Ebola outbreak that was documented in Democratic Republic of Congo in 2021 might be due to transmission of the EBOV to the index case from her husband. Hence, the community in Ebola endemic areas has to be educated as contact with body fluids of Ebola patients, deforestation, contact with fruit bat and consumption of bushmeat are the key ways of transmission of EBOV. Moreover, immunization of those at high risk of being infected by the virus can be taken as an additional method of preventing possible future Ebola outbreak. Furthermore, active surveillance and follow up of survivors of Ebola is needed.

Conflict of Interest

The authors declare that he has no competing interest.

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