International Journal of Epidemiologic Research, 2015; 2(1): 1-3.

ijer.skums.ac.ir

Ebola virus disease: facts and fears

Editorial

Ali Karimi*
Medical Plants Research Center, Shahrekord University of Medical Sciences, Shahrekord, I.R. Iran.
Received: 1/Oct/2014 Accepted: 30/ Nov /2014

Ebola virus (EBOV) is an enveloped virus including a negative single strand genome in its virion with cylindrical/tubular morphology. EBOV is the causative agent of Ebola virus disease (EVD), which is also involved in the outbreak observed in Central Africa since 1976. EVD is a complex zoonotic viral disease which is highly virulent in human. The transmission of Ebola infection is not usually high. In addition, the initial human-to-human transmission of EBV occurs via contact with the fluids of infected patients. Since there is no available established treatment or vaccine for Ebola, symptomatic therapy and strict quarantine seems to be adequate for preventing its transmission. This virus is not airborne, foodborne or waterborne. Due to the fear from EVD and the potential outbreak at any given moment, this article discusses the main epidemiological characteristics of the disease.

The only member of Ebola virus species is EBOV, which is the most dangerous virus among the five known viruses within the genus EBOV.[1,2] EBOV is an enveloped virus which has a negative single strand genome in its virion with cylindrical/tubular morphology. Virological investigations have identified the EBOV (formerly Zaire EBOV) as the causative agent of EVD, which was also involved in the outbreak observed in Central Africa since 1976.[3,4] In fact, EVD is a complex zoonotic viral disease that is highly virulent in human.[5] The disease had previously been referred to as “Ebola hemorrhagic fever” because some Ebola patients did not present hemorrhage.

Human has been fighting against the EVD since its first known outbreak in 1976 in southern Sudan and Yambuku, Democratic Republic of Congo (DRC) near the Ebola River. The first known person infected with Ebola was a 44-year-old man in northern DRC, on 26 August 1976**,** with symptoms beginning with a high fever of 39.2°C and hemorrhage and then he died from severe hemorrhage. In the following months, till late October, there was an outbreak of Ebola, with 280 deaths among 318 patients.[6] According to the data from the World Health Organization, after the first outbreak in 1976 (with 431 deaths), the disease appeared in Sudan three years later and then disappeared for 15 years. Later, a large outbreak appeared in 1995 in DRC with 250 deaths, 2001-2002 in Uganda with 224 deaths, and 2002-2003 and 2007 in Congo with respectively 128 and 187 deaths. In fact, during the past 40 years, the EVD disappeared after an outbreak in one region and then erupted in another with no warning.[4]

The largest recorded outbreak of EVD was striking in West Africa, apart from its previously reported outbreaks since December 2013.[3] The current Ebola epidemic is unique from the first outbreak in West Africa, as it is different from the pattern of outbreaks typically observed in

***Corresponding author:** Dr. Ali Karimi, Medical Plants Research Center, Shahrekord University of Medical Sciences, Shahrekord, IR. Iran. Tel: 00983833346692; E-mail: kakarimi63@yahoo.com

Central Africa. Beginning in Guinea in December 2013, the present outbreak was spread to Sierra Leone, Liberia, and Nigeria, and is now the largest outbreak in its history. The first case in Guinea was a 2-year-old boy who died six days after presenting typical symptoms of Ebola infection.[4] Since then, a great attention has been paid by media to the current Ebola epidemic across the world. As a result, the question is whether the disease, which is generally limited to Africa, may cause an outbreak in other parts around the world at any given moment.

Although there are currently no clear indicators of the source of infection, fruit bats of the Pteropodidae family has been considered as the natural host of the EBOV, which is also thought to be transmitted by monkeys, gorillas, and chimpanzees. During the current outbreak, a rapid accumulation of inter- and intra-host genetic variation was observed in sequencing of EBOV genome from 78 patients with EBOV in Sierra Leone, which allowed us to characterize the patterns of viral transmission within the first weeks of the epidemic. West African variant has been already demonstrated to likely diverge from central African around 2004 and then transmitted from Guinea to Sierra Leone in May 2014, with a sustained human-to-human transmission subsequently, with no additional zoonotic evidence.[7] Thus, in the current outbreak, which has caused high mortality, person-to-person transmission via infected body fluids has been suggested to be the only mode of the spread.[8] Additionally, the data (1976-2014) indicated that EVD is a zoonotic disease with infection in bats and primates and potential transmission to human. Using species distribution models, however, indicated a very low probability of transmission to human.[5]

Furthermore, based on some epidemiological studies, the transmission of Ebola infection was not likely high. For example, in a study on the outbreaks in DRC (1995) and Uganda (2000), the basic reproductive number (i.e., the average number of secondary infections generated by one primary case in an entirely susceptible population or secondary attack rate) of Ebola was estimated 2.7,[9] ranging from 1.34 to 3.65.[10, 11] However, if the necessary interventions are performed, the effective reproduction number may dramatically decrease to 0.3-0.4. This reduction would be possible, because the transmission occurs mainly in hospitals and funerals, where it can be easily controlled.[9] Moreover, if the reproductive number is less than one, then a patient with the disease cannot transmit the disease to another person during the infection period.

In addition, the initial human-to-human transmission of EBV has been demonstrated to occur via contact with the fluids of an infected patients, even though this virus is not airborne, foodborne or waterborne. Furthermore, the EBOV could not infect another individuals during the incubation period (i.e., the period between the initial infection and the onset of symptoms), which can be 2-21 days (generally 8-9 days) for the EBOV. As a result, if a person with history of contact with an Ebola patient, or a patient suspected to have current Ebola fever, then immediate actions such as quarantine, treatment and management by the hospital can affect on the spread of the outbreak. However, even after recovery, the virus may still be found in the body fluids of the patient for an extended period. In another study, the EBOV was detected inside the semen of the patients three months after recovery.[12] Thus, it is important to know if the patient could be released from isolation just after confirming that the EBOV has no longer remained.

By increasing population and international connectivity through airlines since the first detection of EVD in 1976, the dynamics of human-to-human secondary transmission in contemporary outbreaks would be very different compared to those of the past.[5] The pandemics of Ebola could show an obvious independency from any season. Generally, human is susceptible to the EBOV irrespective of gender or age. Finally, it is noteworthy that although there is currently no established treatment or vaccine.[13-15] For EBOV worldwide, symptomatic therapy and strict quarantine are the potential and adequate preventive strategies of its transmission. Proper risk communication and understanding Ebola would be the most important step to avoid the unnecessary anxiety and fear in the community.[8, 12]

REFERENCES

1. Sanchez A, Geisbert TW, Feldmann H. Knipe DM, Howley PM. Filoviridae: Marburg and Ebola viruses. 2007. Fields Virology: Philadelphia: Lippincott Williams & Wilkins; 2007.
2. Semmler IA. Ebola goes pop: the filovirus from literature into film. Lit Med. 1998; 17(1): 149-74.
3. Zhang L, Wang H. Forty years of the war against Ebola. J Zhejiang Univ Sci B. 2014; 15(9): 761-5.
4. Leroy EM, Labouba I, Maganga GD, Berthet N. Ebola in West Africa: the outbreak able to change many things. Clin Microbiol Infect. 2014; 20(10): 597-9.
5. Jamieson DJ, Uyeki TM, Callaghan WM, Meaney-Delman D, Rasmussen SA. What obstetrician-gynecologists should know about Ebola: a perspective from the Centers for Disease Control and Prevention. Obstet Gynecol. 2014; 124(5): 1005-10.
6. World Health Organization. Ebola haemorrhagic fever in Zaire, 1976. Bull World Health Organ. 1978; 56(2): 271-93.
7. Gire SK, Goba A, Andersen KG, Sealfon RS, Park DJ, Kanneh L, et al. Genomic surveillance elucidates Ebola virus origin and transmission during the 2014 outbreak. Science 2014; 345(6202): 1369-72.
8. Okeke IN, Manning RS, Pfeiffer T. Diagnostic schemes for reducing epidemic size of African viral hemorrhagic fever outbreaks. J Infect Dev Ctries. 2014; 8(9): 1148-59.
9. Legrand J, Grais RF, Boelle PY, Valleron AJ, Flahault A. Understanding the dynamics of Ebola epidemics. Epidemiol Infect. 2007; 135(4): 610-21.
10. Chowell G, Hengartner NW, Castillo-Chavez C, Fenimore PW, Hyman JM. The basic reproductive number of Ebola and the effects of public health measures: the cases of Congo and Uganda. J Theor Biol. 2004; 229(1): 119-26.
11. Ferrari MJ, Bjornstad ON, Dobson AP. Estimation and inference of R0 of an infectious pathogen by a removal method. Math Biosci. 2005; 198(1):14-26.
12. Bausch DG, Towner JS, Dowell SF, Kaducu F, Lukwiya M, Sanchez A, et al. Assessment of the risk of Ebola virus transmission from bodily fluids and fomites. J Infect Dis. 2007; 196 (Suppl 2): 142-7.
13. Bethony JM, Cole RN, Guo X, Kamhawi S, Lightowlers MW, Loukas A, et al. Vaccines to combat the neglected tropical diseases. Immunol Rev. 2011; 239(1): 237-70.
14. Dias MB, Reyes-Gonzalez L, Veloso FM, Casman EA. Effects of the USA PATRIOT Act and the 2002 Bioterrorism Preparedness Act on select agent research in the United States. Proc Natl Acad Sci USA. 2010; 107(21): 9556-61.
15. Burki TK. USA focuses on Ebola vaccine but research gaps remain. Lancet. 2011; 378(9789):389.

How to cite the article: Karimi A. Ebola virus disease: facts and fears. Int J Epidemiol Res. 2015; 2 (1): 1-3.