A Review On Ebola Virus

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Abstract: Ebola virus disease caused by Ebola virus is a severe, often fatal illness in humans and non-human primates. The Zaire species of Ebola virus, the causative agent of the 2014-2015 West African epidemics, is one of the most virulent human pathogens. Although, the natural reservoir of EVD is not known, fruit bats are proposed to be the natural host of the Ebola virus. EVD is often characterized by the sudden onset of fever, intense weakness, muscle pain, headache, sore throat, vomiting and diarrhea. People become infected through contact with infected animals, either in the process of slaughtering or through consumption of raw or undercooked meat and person to person transmission occur through direct contact with the blood, secretions or other bodily fluids of infected persons. Rapid diagnostic tests for Ebola virus infection are in use and are principally based upon the detection of specific RNA sequences by reverse-transcription polymerase chain reaction (RT-PCR) in blood or other body fluids. Differential diagnoses should consider diseases such as Lassa fever, Malaria, influenza, Typhoid and Marburg virus disease. Currently, there is no specific treatment for Ebola virus disease and the mainstay of treatment is intensive supportive care. As there is no vaccine for the disease, the prevention and control is mainly based on appropriate precautions to break ways of transmission. The recent Ebola outbreak occurred in Western Africa is the most disastrous and has faced many challenges in its prevention and control. Although, Ethiopia is listed as medium risk country, there is no reported case of EVD until now and the government has established Ebola virus disease preparedness strengthening team. As recommendation, people should take care during contact with wild animals and, health care workers should use proper PPE while treating EVD patients to avoid spread of the disease.
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1. Introduction

Ebola virus disease (EVD) is a zoonotic disease caused by Ebola virus characterized by fever and/or severe headache, weakness, muscle pain, vomiting, diarrhea, abdominal pain, or unexplained hemorrhage (CDC, 2014). Ebola virus is incompletely understood pathogen that causes severe, often fatal, illnesses in humans and non-human primates such as monkeys, gorillas and chimpanzees. As a pathogen of category A, the virus has powerful pathogenicity and potentiality of biological terrorism. It was first recognized in 1976 to be a non-segmented, enveloped negative-stranded RNA virus of the family *Filoviridae* (Elias *et al*, 2014).

Ebola virus is introduced into the human population through close contact with the blood, secretions, organs or other bodily fluids of infected animals. This occurs during the manipulation of animals carrying the virus, alive or deceased; chimpanzees, gorillas, monkeys, fruit bats, forest antelopes and porcupines. The inter human transmission occurs by physical contact with body fluids, secretions, tissues or semen from infected persons (CDC, 2003; WHO, 2003). Suggesting that Ebola viruses can be isolated from saliva, and viral particles have been identified in pulmonary alveoli on human autopsies (infectious aerosols could be emitted from the respiratory tract), Ebola viruses can infect several cell types found in the respiratory tract, including macrophages and epithelial cells, and cough can be a symptom of EVD and coughing is known to generate aerosols, the possibility of aerosol transmission of EVD is hypothesized (WHO, 2014d).

Ebola was first discovered in 1976 near the Ebola River in the Democratic Republic of the Congo from which the disease took its name; outbreaks have since appeared sporadically in Africa. However, the most recent outbreak is the largest and most complex Ebola outbreak and is being observed in both urban and a rural area of West Africa. It occurs primarily in remote areas of West Africa. The outbreak mainly covers countries such as Sierra Leone, Guinea and Liberia. (UNICEF, 2014). This outbreak is the largest Ebola virus outbreak recorded in history, and as of March 8, 2015, the cumulative number of probable, suspected, and laboratory-confirmed cases attributed to Ebola virus is 24, 282, including 9976 deaths (WHO, 2015).

The EVD outbreak is not only a public health emergency of international concern but, in view of its recent evolution, has been considered to be a social crisis, a humanitarian crisis, a political crisis, an economic crisis and a threat to national security is well beyond the outbreak zones (WHO, 2014).

The indirect consequences of the Ebola epidemic and its disruption of public and private services threaten the lives and livelihoods of more than 22 million people in Ebola-affected areas. The economic impact of the Ebola crisis includes loss of gross domestic output, threat to food security, fall in employment and livelihoods, and decline in foreign investment (World Bank, 2014). The deep-rooted poverty in sub-Saharan Africa, poor transportation and communication networks, lack of trained manpower and financial aids, scarcity of diagnostic facilities and the absence of effective vaccines and treatments against EBOV make the prevention and control of this epidemic very difficult (WHO, 2014). Therefore, the objectives of this seminar paper are: To review the current status of Ebola and to highlight its zoonotic potential.

2. Ebola

2.1. Historical Background

Ebola virus disease was first emerged in the form of two near-simultaneous outbreaks in 1976 in Sudan, near the border with DRC, and in DRC, near the border with Sudan. During DRC outbreak, an unknown causative agent was isolated from patients and was named for the river Ebola, which flows past Yambuku, the outbreak epicenter (WHO, 2014).

The current EVD outbreak began in Guinea-Conakry in December 2013. It was first reported in March 2014. The outbreak then spread to Liberia, Sierra Leone, Nigeria, Senegal, and Mali in Africa (Baize *et al*., 2014). The outbreak involved major cities, including Conakry in Guinea, Free-town in Sierra Leone, Monrovia in Liberia, and Lagos in Nigeria. This increases the risk of rapid local dissemination, spread to neighboring countries, and transcontinental spread by air travel, and therefore presenting a major health threat to the entire world (Schieffelin *et al*., 2014).

The first case diagnosed outside Africa was reported from USA on September 30, 2014. In October 2014, three nurses acquired Ebola virus locally in the United States and, Spain which has generated huge media attention and public panic (CDC, 2014a).

Table 1: List of Ebola outbreaks records, the occurrence of EVD throughout the history.

Year	Country	Virus	Cases	Death	CFR
1976	Sudan	SUDV	284	151	53%
1976	Zaire	EBOV	318	280	88%
1979	Sudan	SUDV	34	22	65%
1994	Gabon	EBOV	52	31	66%
1995	Zaire	EBOV	315	254	81%
1996	Gabon	EBOV	37	21	57%
1996-1997	Gabon	EBOV	60	45	75%
2000-2001	Uganda	SUDV	425	22	53%
2001-2002	Gabon and Republic of Congo	EBOV	122	128	79%
2002-2003	Republic of Congo	EBOV	143	128	90%
2003	Republic of Congo	EBOV	35	29	83%
2004	Sudan	SUDV	17	7	41%
2007	DRC	EBOV	264	187	71%
2007-2008	Uganda	BDBV	149	37	25%
2008-2009	DRC	EBOV	32	14	45%
2012	Uganda	SUDV	24	17	71%
2012	DRC	BDBV	77	36	47%
2013-present	Wide spread: Liberia Sierra Leone Guinea Limited and local: Nigeria, Mali, UK, U.S Senegal, Spain	EBOV	26,571	10,995	70-71% (General) 57-59% (Among hospitalized patients)
2014	DRC	EBOV	66	49	74%

Source: (WHO, 2015).

2.2. Etiology

Ebola Virus disease is caused by members of the genera Ebola virus, in the family *Filoviridae*. They are enveloped, single-stranded negative RNA viruses (Leroy*et al*., 2011). The names of these viruses have undergone several taxonomic changes since they were first discovered, including new changes officially accepted in 2013. Currently, the genus Ebola virus contains five recognized viral species: *Zaire ebolavirus, Sudan ebolavirus, Taï Forest ebolavirus, Reston ebolavirus and Bundibugyo ebolavirus* (CDC, 2010). The Ebola virus can be easily eliminated by heat, alcohol-based products, and sodium hypochlorite (bleach) or calcium hypochlorite (bleaching powder) in appropriate concentrations (WHO, 2014).

2.3. Pathogenesis

After entering the body through mucous membranes, breaks in the skin, or parenterally, Ebola virus infects many different cell types. Macrophages and dendritic cells are probably the first to be infected; Ebola virus replicates readily within these ubiquitous "sentinel" cells, causing their necrosis and releasing large numbers of new viral particles into extracellular fluid (Bray and Geisbert, 2005).

Rapid systemic spread is aided by virus-induced suppression of type I interferon responses (Basler, 2005). Dissemination to regional lymph nodes results in further rounds of replication, followed by spread through the bloodstream to dendritic cells and fixed and mobile macrophages in the liver, spleen, thymus, and other lymphoid tissues. Necropsies of infected animals have shown that many cell types (except for lymphocytes and neurons) may be infected, including endothelial cells, fibroblasts, hepatocytes, adrenal cortical cells, and epithelial cells. Fatal infection is characterized by multifocal necrosis in tissues such as the liver and spleen. In addition to causing extensive tissue damage, Ebola virus also induces a systemic inflammatory syndrome by inducing the release of cytokines, chemokines, and other proinflammatory mediators from macrophages and other cells. In other way, the coagulation defects seen in Ebola virus disease appear to be induced indirectly, through the host inflammatory response. Virus-infected macrophages synthesize cell-surface tissue factor, triggering the extrinsic coagulation pathway. This systemic inflammatory response may play a role in inducing gastrointestinal dysfunction, as well as diffuse vascular leak and multiorgan failure that finally leads to death (Geisbert *et al.,* 2003).

2.4. Clinical Signs

Ebola virus disease typically progresses rapidly with multisystem involvements, and in particular coagulopathy leading to severe hemorrhage. During the early stage of illness, the patients usually exhibit an acute onset of non-specific flu-like symptoms, including fever, chills, myalgia, and headache, followed by gastrointestinal symptoms including abdominal pain, nausea, vomiting and diarrhea (Feldmann and Geisbert, 2011). Respiratory symptoms, such as cough and sore throat may also occur. A maculopapular rash typically occurs on day 5-7 after symptom onset, and is associated with erythema and desquamation. Hemorrhagic phenomenon then appears, which can include petechiae or ecchymoses, uncontrolled oozing from venipuncture sites, and mucosal hemorrhages. However, massive hemorrhage occurs in fewer than half of patients and is seldom the cause of death (WHO, 2014). Death usually occurs between days 7 and 16 after symptom onset. Survivors usually improved on day 6-11, when neutralizing antibodies start to develop. In the convalescent phase, myelitis, recurrent hepatitis, psychosis and uveitis may develop (Jamieson *et al*., 2014).

2.5. Diagnosis

Electron microscopy can identify virus particles, which have a distinctive, filamentous pleomor- phic, appearance, in tissues. Viral particles may be seen in the serum under electron microscope, which was used in the confirmation of the first cases in the current outbreak. Serological tests include indirect immune fluorescence (IFA) and ELISAs. Ebola virus disease can be diagnosed by detecting antigens with an antigen-capture ELISA but this test is less sensitive than RT-PCR (Baize *et al*., 2014).

Molecular technique by detecting viral RNA with reverse transcription polymerase chain reaction (RT-PCR) due to high grade viremia occurs in the acute period is the preferred diagnostic test. RT-PCR targeting the nucleoprotein (NP) can be performed on the serum, plasma, whole blood, or oral fluid (Formenty *et al*., 2006). A rapid immune chromatographic assay for the detection of Ebolavirus antigen, which claimed to provide result in 15 minutes, was recently announced by the France's Atomic Energy Commission (UNMEER, 2014).

When evaluating a patient for possible Ebola virus disease, it is important to consider alternative and/or concurrent diagnoses, including infectious and non-infectious disorders. The differential diagnosis depends, in part, upon their symptoms, where the individual has travelled or resides, if they have had close contact with someone who is ill, their sex and their age. Diseases that present with similar findings to Ebola virus disease include, *Malaria, Lassa Fever, Typhoid, Meningococcal disease, Influenza, Measles* and *Marburg virus disease* (CDC, 2015; Takahash *et al*., 2015).

2.6. Treatment

Currently, the cornerstone in the management of patients with EVD is supportive care. The most important aspects of supportive care involve preventing intravascular volume depletion, correcting profound electrolyte abnormalities, and avoiding the complications of shock. It also involves maintaining adequate cardiovascular function while the immune system mobilizes an adaptive response to eliminate the infection (Bah *et al*., 2015). Oral and intravenous nutrition, medications to control fever and gastrointestinal distress, and medications to treat pain, anxiety and agitation are important measures. Antiemetic and ant diarrheal agents may also be beneficial (Chertow *et al.,* 2015). When available, patients will benefit from hemodynamic monitoring and intravenous fluid repletion (Schieffelin *et al*., 2014). However, patients in the early phase of illness, who respond to oral anti-emetic and anti-diarrheal therapy, may be able to take in sufficient fluids by mouth to prevent or correct dehydration. Co-infections should be actively sought and treated appropriately (Kreuels *et al*., 2014).

Despite of extensive research, no specific treatment (licensed antiviral drug) is available for the management of victims of Ebola virus (Fauci, 2014). However, positive outcome have been obtained in laboratory-infected mice for the antiviral drug favipiravir (Oestereich *et al*., 2014) and a number of candidate treatments have shown promise in non-human primate models, although none of these drugs are licensed for treatment of EVD and their availability is currently limited (ECDC, 2014). One of the most promising is nucleotide analog brincidofovir, which is a lipid-conjugated prodrug of cidofovir that is converted intracellularly to cidofovir. Brincidofovir is currently undergoing phase III clinical trials for adenovirus and cytomegalovirus infection. This drug has in vitro activity against Ebola virus and has been used as an experimental treatment in the current outbreak (Florescu and Keck, 2014).

3. Epidemiology

3.1. Geographical Distribution

The known geographic range of Ebola virus infection is in tropical Africa. But, Ebola virus is not limited to Africa. Serological study showed that antibodies against *Zaire* and *Reston Ebola virus* could be detected in fruit bats from Bangladesh, while *Reston Ebola virus* could be detected in fruit bats from the Philippines (Olival *et al.,* 2013).

A study in China showed that up to 3.8% of bats were seropositive for Ebola virus (Yuan *et al*., 2012). The most common bats species with Ebola virus identified in China include *Rousettus leschenaultia, Hipposideros Pomona, Miniopterusschreibersii, Pipistrelluspipistrellus, Myotisricketti*, in which other novel viruses have also been identified (Lau *et al*., 2010). *Reston Ebola virus* have been found in domestic pigs in the Philippines and China (Pan *et al*., 2014]. Antibodies specific against all 5 Ebola virus species have been found in apes of Indonesia (Nidom *et al*., 2012).

3.2. Sources Of Infection

The exact origin, locations and natural reservoir of Ebola virus remained unclear. But, fruit bats have been proposed to be the source of Ebola virus (Chan *et al.,* 2013). The virus was first reported to be found in the fruit bat species *Hypsignathusmonstrosus, Epomopsfranqueti and Myonycteristorquata*, which were captured during the 2001 and 2003 outbreak in Gabon and the DRC (Leroy *et al*., 2005). From fruit bats, the virus can pass to different primate species (gorilla, chimpanzeeand macaques), and from bats or apes the virus reaches humans, who develop EVD after a variable incubation period of 2-21 days. Hunting and butchering of wildlife (great apes and fruit bats) has been identified in previous outbreaks as a potential source of infection. Blood, other bodily fluids and secretions from infected person during the late stage of the disease are also potential source of infection, with high risk to health care workers(WHO, 2014a).

3.3. Mode Of Transmission

Ebola viruses are highly transmissible by direct contact with infected blood, secretions, tissues, organs and other bodily fluids from dead or living infected persons. Ebola virus genome has been detected in semen up to 91 days after onset of disease, and replicative Ebola virus has been detected in semen 41 days after onset of disease and this suggests the possibility of sexual transmission during this period (Bausch *et al*., 2007). Transmission via inanimate objects contaminated with infected bodily fluids is possible (Colebunders and Borchert, 2000). Burial ceremonies and handling of dead bodies play an important role in transmission (WHO, 2014b).

There are no reported cases of Ebola virus being spread from person to person by the respiratory route. However, laboratory experiments have shown that Ebola virus released as a small-particle aerosol is highly infectious for rodents and nonhuman primates. Healthcare workers may therefore be at risk of Ebola virus disease if exposed to aerosols generated during medical procedures (Zumbrun *et al*., 2012).

Ebola virus is shed in a wide variety of bodily fluids during the acute period of illness (Towner *et al*., 2004). The probability of transmission is considered low in the early phase of human disease and the risk is higher with exposure to bodily fluids during the late stages of the disease (Bannister, 2010).

3.4. Host Range

Ebolavirus has been found in humans and several animals, including bats, primates (chimpanzee,

gorilla), rodents (rats, mice, shrews), duikers (Cephalophus species), and pigs (Barrette *et al*., 2009).

Table 2: Levels Of Risk Of Transmission Of Ebola Viruses According To Type Of Contact With An Infected Patient

Level Of Risk	Type Of Contact
Low Risk	▪ Casual contact with a feverish but ambulant and self-caring patient, e.g. sharing a seating area or public transportation; receptionist tasks.
High Risk	▪ Close face-to-face contact without appropriate personal protective equipment (including eye protection) with a probable or confirmed case who is coughing, vomiting, bleeding, or who has diarrhea; or has had unprotected sexual contact with a case up to three months after recovery. ▪ Direct contact with any material soiled by bodily fluids from a probable or confirmed case; ▪ Percutaneous injury (e.g. with needle) or mucosal exposure to bodily fluids, tissues or laboratory specimens of a probable or confirmed case. ▪ Participation in funeral rites with direct exposure to human remains in or from an affected area without appropriate personal protective equipment. ▪ Direct contact with bushmeat or bats, rodents, primates, living or dead in/from affected areas.

Source:(ECDC, 2014).

4. Prevention And Control

In the absence of effective treatment and a human vaccine, raising awareness of the risk factors for Ebola infection and the protective measures individuals can take is the only way to reduce human infection and death. To prevent infection from animals that might be infected but have not yet developed obvious clinical signs, keeping good personal hygiene when handling and preparing meat and the thoroughly cook of meat is very important. Surveillance for deaths and illness in wild animals may provide an early warning to prevent human epidemics (CFSPH, 2014). If contact is unavoidable (occupational exposure), using personal protective equipment and good hygiene are indispensable means of prevention. Human epidemics can be stopped by isolating patients in facilities with barrier nursing procedures and strict infection control measures (Achaand Szyfres, 2003). Burial practices should avoid all contact with the body or fomites (Francesconi*et al*.,2003).

The intervention strategies to control the spread of Ebola include surveillance, placement of suspected cases in quarantine for 3 weeks (the maximum estimated length of the incubation period), education of hospital personnel and community members on the use of strict barrier nursing techniques (protective clothing and equipment, patient management), and the rapid burial or cremation of patients who die from the disease (WHO, 2003).

There is no effective vaccine against Ebola virus and researches are underway. Vaccines against Ebolavirus consisting of virus-vectors such as *adenovirus type 5, human parainfluenza virus type 3, vesicular stomatitis virus*; virus-like particles with VP40, NP and GP, and recombinant ebolavirus have been tested in animal models. The efficacy of these vaccines in humans awaits further studies (Marzi and Feldmann, 2014). The first WHO consultation meeting identified two vaccines in advanced stages of development: a recombinant vesicular stomatitis virus vaccine expressing a Zaire surface glycoprotein (rVSV ZEBOV), which induces a *Zaïre Ebolavirus* specific immune response; and a non-replicative chimpanzee adenovirus type 3 vaccine (cAd3-ZEBOV) also containing the gene for the *Zaïre Ebolavirus* surface glycoprotein (ECDC, 2014).

5. Challanges To Prevention And Control

5.1. Personal/Individual-Level Challenges

At individual level, the prevention and control of Ebola is affected by entrenched poverty and food insecurity that cause individual resource scarcity, overcrowding, and rampant sharing of the basic amenities needed for survival because in sub-Saharan Africa, there is lack of basic necessities, food, water, shelter, and sanitation (World Bank, 2013). Fear and social stigma and limited access to modern health care services in which individuals in some affected areas may not have access to needed supportive care and care that would increase their chance for survival due to lack of transportation and limited ambulance services have increased the public health burden of the disease. Moreover, cultural mores and African traditional belief systems in which the African concepts of disease are heavily influenced by mystical factors, the community, and the universe, beliefs in witchcraft, religion, and ancestral spirits as reasons for being ill are the main challenges in combating Ebola (Chukwuneke *et al*., 2012).

5.2. Structural/Organizational Health System Level Challenges

The control and prevention of Ebola is difficult for countries emerging from civil conflicts with dysfunctional, fragile health systems, halted cultural, economic, educational, and health initiatives, looted and destroyed clinics and hospitals and death of many trained health care workers. On the hand, endemic multimorbidities and competing health priorities, poor public health infrastructure with dearth of medical equipment supplies in the affected countries, and the re-use of equipment serve to increase the risk for medical staff results in the unprecedented high number of cases and deaths from Ebola among health care workers. Limited disease surveillance in place has also initiated the problem (Boozary *et al.,* 2014).

5.3. Community-Level Challenges

Although individual and structural-level factors are essential for the prevention and control of the Ebola epidemic in West Africa, understanding the community-level factors is also essential. There are several factors determined as pivotal community-level challenges to the prevention and control of Ebola. Among these, porous borders and geographic boundaries (an imaginary boundary; movements between countries are fluid and constant) makes conditions ripe for the disease to spread rapidly from one country to another. Mistrust of government and modern health care services and, clash of ethnomedicine with biomedicine in which it is common for family members to seek health care from a traditional healer before finally seeking health care at a clinic or hospital and ethnomedical practices are highly popular are majors among Community-level challenges (Aaron *et al.,* 2014).

6. Public Health Importance

There are some implications of zoonotic potential of Ebola. On the basis of available evidence and the nature of similar viruses, researchers believe that Ebolavirus is zoonotic with four of the five subtypes occurring in an animal host native to Africa (Drotman, 2004). Serological studies have shown that a small percentage of Philippine pig farmers have IgG antibodies against the *Ebola Reston virus* without ever developing severe symptoms, providing the evidence that *Ebola Reston virus* is able to cause mild or asymptomatic infection in humans (Barrette *et al*., 2009).

In Mayibou, Gabon in 1996, a dead chimpanzee found in the forest was butchered and eaten by 19 people, all of whom became severely ill over a short interval. Since that time, several similar episodes have resulted from human contact with infected gorillas or chimpanzees through hunting (CDC, 2014b).

As one study investigated, there is potential involvement of domestic dogs in the occurrence or dissemination of Ebola virus in humans. Serologic survey of dogs in the 2001–2002 Ebola outbreak area in Gabon, founded evidence that dogs can be infected by Ebola virus, a finding that raises important human health issues (Loïs *et al*., 2005). In 1994, an Ebola outbreak occurred among chimpanzees in the Tai national park, Côte d'Ivoire and anethologist was infected with TAFV while conducting a necropsy on a wild chimpanzee that had been found dead; she was wearing "household gloves" but no mask or gown (Formenty *et al.,* 1999).

Investigation of a 2007EBOV outbreak suggested that fruit bats migrating up the Lulua River in the DRC were the source of illness onset, with the index case bought freshly killed bats for food (Leroy *et al*, 2009). During the first outbreak, four U.S. animal workers seroconverted to positivity for RESTV; none developed symptoms. One likely became infected during necropsy on a monkey. For the remaining three, investigators suggested that direct contact with infected monkeys was the most likely route; conjunctival exposure and inhalation were considered possible routes. A WHO report published in 2009 indicated that an additional five monkey handlers in the Philippines tested positive for IgG antibodies to RESTV; none recalled a significant illness (WHO, 2009).

7. Status Of Ebola In Ethiopia

Ethiopia has no Ebola yet, but is listed as medium risk country because most people travelling from West Africa to South Africa travel via this country (Nico, 2014). In addition, the presence of more than 30 species of fruit bats in Ethiopia such as *Rhinolophusblasii, Rousettusaegptiacus, Myonycteristorquata Scotophilusdingani, Miniopterusafricanus, Asselliatridens, Epomophonusgambianus,* etc put the country under risk of Ebola. The living standards and culture of the country may be potential risk factors for the spread of the disease in case the outbreak occurred (Leonid *et al*., 2004). The Government of Ethiopia therefore established a high-level national committee chaired by the Prime Minister's Office and an EVD technical working group under the Ministry of Health, which has initiated various activities, including preparation of a preparedness plan, screening of incoming passengers at international airports and ground crossings, setting up an isolation unit, pre-positioning personal protective equipment (PPE), preparing relevant guidelines and protocols, orienting health workers, raising public awareness and establishing an emergency hot line (WHO, 2014c).

To strengthen EVD outbreak preparedness, the Public Health Institute activated its emergency operations Centre, which had been in place since 2009 and has become instrumental in coordinating the

activities of partners in preparedness activities. The focus of the EVD plan is on prevention of case importation and preparedness for response in the event of an EVD outbreak in the country. It defines the activities to be conducted in the various phases of an outbreak, with two scenarios for prioritization and costing awareness creation, enhancing EVD surveillance, case management, infection prevention and control, capacity-building and insurance (WHO, 2014c).

Conclusion And Recommendations

Ebola virus disease is an emerging zoonotic fatal disease in humans and nonhuman primates caused by Ebola virus. It first appeared in 1976 in two simultaneous outbreaks in Sudan and Democratic Republic of Congo. Fruit bats have been proposed as the natural reservoir of the Ebola virus. The disease has both public health and economic importance. The known geographic range of EVD is in tropical Africa. Person-to-person transmission through direct contact with blood and body fluids of patients with Ebola virus disease is found to be the principal mode of transmission. Patients with Ebola virus disease commonly suffer from severe vomiting and diarrhea. There are some studies that show the zoonotic potential of Ebola. Owing to the absence of effective treatment and vaccine against EVD, prevention and control measures are above all towards avoiding inter-human transmission. The prevention and control of EVD presents many challenges.

In the light of the above conclusive statements, the following recommendations are identified:

- Public awareness should be created about the disease prevention, control and treatment options by concerned bodies.
- Health workers should use appropriate PPE and all patients who have or are suspected of having Ebola virus disease should be promptly isolated in hospitals.
- International travelers should maintain high standards of good hygiene and protection Practices.
- The Ethiopian government should take appropriate proactive measures to the import of animals and movement of people from the EVD outbreak countries to avoid risk of Ebola virus introduction.
- Collaborative research should be conducted to produce effective treatment and vaccine.
- Global response particularly unrelenting support of developed nation is essential to limit the spread the disease.

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