A Review on Ebola Virus Disease

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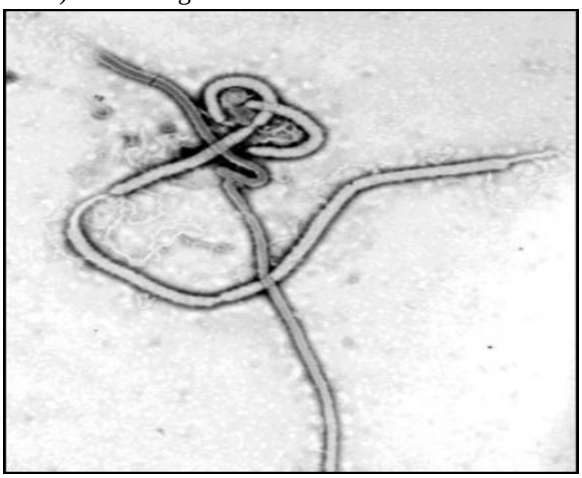
***Abstract*- MkZaire ebolavirus, more commonly known as Ebola virus (EBOV) and Ebola hemorrhagic disease (EHD)is one of six known species within the genus Ebolavirus. This is fatal viral hemorrhagic illness, is due to infection with the Ebola virus of the Filoviridae family. The first outbreak occurred in the Democratic Republic of Congo (formerly Zaire) in a village near the Ebola River, which gave the virus its name. Ebola was firstly described in 1976 and since then occurred sporadically in Central Africa. The 2014 Ebola outbreak in West Africa is the largest in history. As of May 20, 2015 the cumulative number, suspected, diagnosis and laboratory-confirmed cases attributed to Ebola virus was 26, 969, including 11,135 deaths. the difficulty in stopping its spread, and the lack of an effective treatment captured the world's attention. The Ebola virus is transmitted among humans through close and direct physical contact with infected bodily fluids, the most infectious being blood, faeces and vomit. Clinical presentation: symptoms of Ebola virus fever, headach, joint and muscle aches, weakness, diarrhea, vomiting, stomach pain, lack of appetite, Rash, red eye, hiccupscough, redeye, skin rash. treatment:- balancing the patient's fluids and electrolytes, maintaining their oxygen status and blood pressure and treating a patient for any complicating infection.**

***Index terms*- Classification, Structure, Transmission, Symptom, Diagnosis, Prevention, Treatment**

INTRODUCTION

Ebola virus disease is a serious, often fatal condition in humans and nonhuman primates. Ebola is one of several viral hemorrhagic fevers, caused by infection with a virus of the Filoviridae family, genus Ebolavirus. The time interval from infection with Ebola to the onset ofsymptoms ranges from 2-21 days. In 1976, Ebola (named after the Ebola River in Zaire) first emerged in Sudan and Zaire. The first



outbreak of Ebola (Ebola-Sudan) infected over 284 people, with a mortality rate of 53%. EBOZ, with the highest mortality rate of any of the Ebola viruses (88%), infected 318 people. The second outbreak occurred in what is now South Sudan, approximately 500 miles (850 km) away. Scientists later discovered that the two outbreaks were caused by two genetically distinct viruses: Zaire ebolavirus and Sudan ebolavirus. Ebola is a public health nightmare because it can be contacted relatively easily (especially in a hospital setting where proper precautions are not taken) and is almost always fatal. In March 2014, World Health Organization (WHO) reported a major Ebola outbreak in Guinea, Liberia and Sierra Leone, western African nations. On March 23, 2014, with 49 confirmed cases and 29 deaths, the WHO officially declared an outbreak of EVD. The

Ebola virus disease outbreak in West Africa affected impoverished post-conflict countries with weak health systems and no experience with Ebola. Ebola virus has caused the majority of human deaths from EVD, and was the cause of the 2014–2016 epidemics in western Africa which resulted in at least 28,646 suspected cases and 11,323 confirmed deaths. This time, the outbreak has become so large that the three mostaffected countries,namely, Guinea, Liberia and Sierra Leone, face numerous challenges for the implementation of rigorous control measures at the scale needed to prevent transmission and to supply all EVD patients with clinical care.

EBOLA VIRUS OUTBREAK IN WEST AFRICA

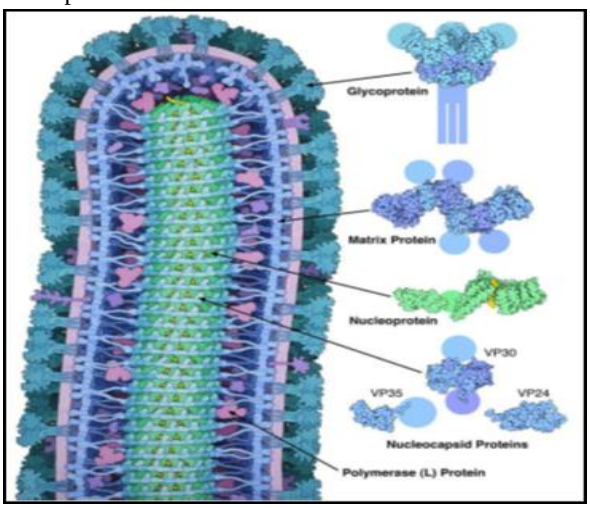
An outbreak of Ebola in nature is described for the first time. During a few weeks in November 1994, 25% of 43 members of a wild chimpanzee community disappeared or were found dead in the Taï National Park, Côte d'Ivoire. This case the virus was spread by human-to-human contact throughout Guinea, Sierra Leone and Liberia. The general population and primary health care workers have been affected by this outbreak, with hundreds of doctors and nurses being infected in the line of duty. Following locations due to outbreaks, laboratory contamination, and accidents:

- Democratic Republic of the Congo (DRC).
- Sudan (South Sudan)
- Senegal
- United Kingdom
- United States (U.S.)
- Philippines
- Italy
- Spain
- Ivory Coast
- South Africa
- Russia
- Uganda
- Guinea
- Liberia
- Sierra Leone

STRUCTURE

Structures of Ebola virus proteins are giving new hope for fighting this deadly virus. The EBOV genome contains seven genes: NP, VP35, VP40, GP, VP30, VP24 and L. Ebola Virus are generally approximately 80 nm in diameter, 970 nm long.

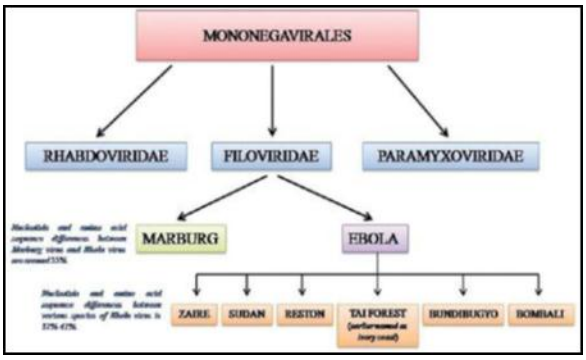
EBOV carries a negative-sense RNA genome in virions that are cylindrical/ tubular, and contain viral envelope, matrix, and nucleocapsid components. The overall cylinders and have a virally encoded in western Africa which resulted in at least 28,646 suspected cases and 11,323 confirmed deaths. This time, the outbreak has become so large that the three mostaffected countries,namely,Guinea,Liberia,and Sierra Leone,face numerous challenges for the implementation of rigorous control measures at the scale needed to prevent transmission and to supply all EVD patients with clinical care.



glycoprotein (GP) projecting as 7–10 nm long spikes from its lipid bilayer surface. The glycoprotein GP is the sole resident of the Ebolavirus surface and is responsible for attaching to and entering new host cells. This virus belongs to the Filovirus family, and structurally it resembles a length of thread. Ebola virus is a pathogenic agent of Ebola haemorrehagic fever, it is a single stranded RNA with negative sense and with a genome length of approximately 18,920 nucleotides. Ebola virus (EBOV) entry requires the surface glycoprotein (GP) to initiate attachment and fusion of viral and host membranes. Crystal structure of EBOV GP in its trimeric, pre-fusion conformation (GP1+ GP2) bound to a neutralizing antibody, KZ52, derived from a human survivor of the 1995 Kikwit outbreak. Individual GP molecules appear with spacings of about 10 nm. The glycocalyx surrounding GP is likely central to immune evasion and may explain why survivors have insignificant neutralizing antibody titres. KZ52 recognizes a protein epitope at

the chalice base where it clamps several regions of the pre-fusion GP2 to the amino terminus of GP1. All known MARV strains consist of one species Lake Victoria marburgvirus, while EBOV strains consist of four different species: Zaire ebolavirus(ZEBOV), Sudan ebolavirus (SEBOV), Côte d'Ivoire ebolavirus (CIEBOV) and Reston ebolavirus(REBOV). The newly discovered Bundibugyo ebolavirus (BEBOV) has been proposed as the fifth species. The characteristic "threadlike" structure is, however, a more general morphologic characteristic of filoviruses (alongside their GP-decorated viral envelope, RNA nucleocapsid, etc.)

CLASSIFICATION



The virus belongs to the Ebola virusgenus, Filoviridae family,and Mononegavirales order. The six known virus species are named for the region where each was originally identified: Bundibugyo ebolavirus, Reston ebolavirus, Sudan ebolavirus, Taï Forest ebolavirus(originally cote d'Ivoire ebolavirus), Zaire ebolavirus, and Bombali ebolavirus. The last is the most recent species to be named and was isolated from Angolan free-tailed batsin Sierra Leone.

TRANSMISSION

Presumably, most index cases become infected through contact with an infected animal. The Ebola virus is transmitted among humans through close and direct physical contact with infected bodily fluids, the most infectious being blood, faeces and vomit (such as through broken skin or mucous membranes in the eyes, nose, or mouth, urine, saliva, sweat, feces, vomit, breast milk, and semen) of a person who is sick with or has died from Ebola virus disease (EVD). Ebola virus is not known to be transmitted through food. In a convalescent male, the virus can persist in semen for at least 70 days; one study suggests persistence for more than 90 days. In studies of saliva, the virus was found most frequently in patients at a severe stage of illness. The whole live virus has never been isolated from sweat.

SYMPTOM

The time interval from infection with Ebola to the onset of symptoms is 2-21 days, although 8-10 days is most common. Symptom of Ebola virus include,

- Fever
- Headache
- Joint and muscle aches
- Weakness
- Diarrhea
- Vomiting
- Stomach pain
- Rash
- Red eyes
- Hiccups
- Cough
- Sore throat
- Chest pain
- Difficulty breathing
- Difficulty swallowing
- Bleeding inside and outside of the body

DIAGNOSIS

The WHO (2014) recommended the sample collection of whole blood or oral swab at suitable centres called Ebola treatment centers. Diagnosing Ebola virus disease (EVD) shortly after infection can be difficult. Early symptoms of EVD such as fever, headache, and weakness are not specific to Ebola virus infection and often are seen in patients with other more common diseases, like malaria and typhoid fever. If a person shows signs of EVD and has had a possible exposure, he or she should be isolated (separated from other people) and public health authorities notified. Polymerase chain reaction (PCR) is one of the most commonly used diagnostic methods because of its ability to detect low levels of Ebola virus. Other methods, based on the detection of antibodies an EVD case produces to an infection, can then be used to confirm a patient's exposure and infection by Ebola virus. Reverse transcriptase

polymerase chain eaction (RT-PCR) and enzyme-linked immunosorbent assay (ELISA) are the most frequently utilized tests for laboratory affirmation of the EVD. A positive laboratory test means that Ebola infection is confirmed. Public health authorities will conduct a public health investigation; including identifying and monitoring all possibly exposed contacts. In the more advanced stages of the disease or after recovery, diagnosis is made using IgM and IgG antibodies. Ebola can be diagnosed retrospectively in deceased patients by other forms of testing.

PREVENTION

There's a vaccine to prevent Ebola, but it is not available in the U.S. The best way to avoid catching the disease is by not traveling to areas where the virus is found. If you are in areas where Ebola is present, avoid contact with bats, monkeys, chimpanzees, and gorillas since these animals spread Ebola to people. You may be able to get the vaccine Wear protective clothing, including face protection like masks and glasses over eyes. From the World Health Organization. Health care workers can prevent infection by wearing masks, gloves, and goggles. Use disposable equipment and supplies when possible and sterilize effectively when it is not possible to dispose of items.

- Notify health officials when contact with a person with EVD is suspected.
- Isolate EVD patients from other patients.
- Use laboratories and staff that are trained and equipped to deal with infectious materials.

TREATMENT

Till date, there is no precise antiviral management or vaccination for EVD. Public health strategies emphasizing on epidemiological surveillance, contact tracing, and quarantine of the patient have been recommended to combat the dissemination of EVD. When used early, basic interventions can significantly improve the chances of survival. These include:

1. Providing fluids and electrolytes (body salts) through infusion into the vein (intravenously).
2. Offering oxygen therapy to maintain oxygen status.
3. Using medication to support blood pressure, reduce vomiting and diarrhea and to manage fever and pain.
4. Treating other infections, if they occur.

A number of investigative clinical trials emphasizing on the development of vaccine, antibody therapies, and antiviral drugs have been conducted for EVD. During the 2018 eastern Democratic Republic of the Congo outbreak, four investigational treatments were initially available to treat patients with confirmed bola. For two of those treatments, called regeneron (REGN-EB3) and mAb114, overall survival was much higher. Various clinical trials in Africa, Europe, and the United States suggest that Ebola vaccines are in various development stages. The mainstay of treatment for Ebola virus disease involves supportive care to maintain adequate cardiovascular function while the immune system mobilizes an adaptive response to eliminate the infection. Clinical management should focus on supportive care of complications, such as hypovolemia, electrolyte abnormalities, hematologic abnormalities, refractory shock, hypoxia, hemorrhage, septic shock, multi-organ failure. Rehydration, adequate nourishment, analgesics, and blood transfusion form a keystone supportive treatment of EVD patient. Ebola virus having the glycosylated surface proteins and preferentially

infecting the immune cells impedes the development of an effective vaccine.

CONCLUSION

EVD is a painful reminder that an outbreak anywhere can be a risk everywhere. The Global Health Security Agenda seeks to enforce public health systems in most affected countries in order to eliminate the spreads before they become emergencies. Although great improvements have been achieved over the past decade, better surveillance, real-time sharing of data and taking rapid action based on the available information remain necessary. Because Ebola virus is primarily transmitted through contact with the body fluids of symptomatic patients, the infection spread can be stopped by an early diagnosis, contact tracing, patient isolation and care, infection control .An unprecedented international response finally enabled the Ebola virus disease epidemic that ravaged countries in West Africa from 2013 to 2016 to be overcome. Recent advancements are being carried out in the form of effective Ebola virus vaccine and anti-Ebola virus drugs. Specific diagnostic test are the possible challenges to combat this dreaded public health menace.

REFERENCE

[1] https://en.m.wikipedia.org/wiki/Zaire_ebolavirus
[2] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6691429/
[3] https://journals.lww.com/anesthesia analgesia/Fulltext/2015/09000/Ebola_Virus_Disease__A_Review_of_Its_Past_and.28.aspx
[4] https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(18)33132-5/fulltext
[5] https://www.sciencedirect.com/science/article/pii/S2221169115303415
[6] https://www.nature.com/articles/s41572-020-0147-3
[7] https://www.omicsonline.org/open-access/review-on-ebola-virus-disease-its-outbreak-and-current-status-2161-1165-1000204.php?aid=65511
[8] https://www.who.int/mediacentre/news/ebola/06-october-2014/en/
[9] https://www.medicalnewstoday.com/articles/280598#causes
[10] https://www.cdc.gov/vhf/ebola/history/summaries.html
[11] https://virus.stanford.edu/filo/history.html
[12] https://scholar.google.co.in/scholar?hl=en&as_sdt=0%2C5&q=ebola+virus+review&btnG=&oq=Ebola+virus#d=gs_qabs&u=%23p%3D1W59VwiPt5IJ
[13] https://scholar.google.co.in/scholar?hl=en&as_sdt=0,5&qsp=2&q=ebola+virus+infection&qst=ib#d=gs_qabs&u=%23p%3DfcFr8Km4oOcJ
[14] https://scholar.google.co.in/scholar?hl=en&as_sdt=0,5&qsp=3&q=ebola+virus+outbreak&qst=ib#d=gs_qabs&u=%23p%3DvwrADaCVLwUJ
[15] https://www.omicsonline.org/vesicular-stomatitis-virus-based-vaccines-for-prophylaxis-and-treatment-of-filovirus-infections-2157-2526.S1-004.php?aid=2263
[16] https://scholar.google.co.in/scholar?hl=en&as_sdt=0%2C5&q=structure+of+ebola+virus&oq=structure+of+ebol#d=gs_qabs&u=%23p%3DtMGtv0SW5MIJ
[17] https://www.dettol.co.in/en/illness-prevention/illnesses/ebola/?gclsrc=aw.ds&&gclid=Cj0KCQjwhZr1BRCLARIsALjRVQOhrp74qzusdtvrdJGogCip8gBhuhAMxk2XXSMmYTGS__k_27_lFHQaAlX6EALw_wcB

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