IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

"TRANSMISSION OF EBOLA VIRUS DISEASE: ITS OUTBREAK"

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ABSTRACT: One of the most severe infectious diseases with high fatality rates is the Ebola virus disease (EVD), a virus that can cause life-threatening hemorrhagic fevers. EVD outbreaks often begin with a single case of possible zoonotic transmission, then spread from person to person by direct contact, contact with contaminated food, or contact with bodily fluids.

The prospect of this virus's global spread necessitates the development of efficient vaccinations and medications. In the early stage, EVD symptoms include an abrupt onset of fever, myalgias, bloody stool, and headache. In the later stage, symptoms may include hemorrhagic rash, life-threatening bleeding, and multi-organ failure.

Methods: Using a variety of studies,

Keywords: Ebola Virus, Treatment, Hemorrhagic Fever, Outbreaks, Symptoms, Overview.

OVERVIEW

Background

The filoviridae family of viruses, which includes the negative stranded RNA virus known as Ebola, are endemic to parts of western and equatorial Africa.(1) Formerly known as Ebola Hemorrhagic Fever (EHF), the disease. The Sudan, Zaire, Tai forest, and Reston ebolaviruses are the four species of the genus Ebola virus. (2)

The Democratic Republic of the Congo was the site of the first EVD outbreak. Little EVD epidemics have since been reported in a few Central African nations, including Sudan and Uganda. (3) and (4), the latter being close to the community where the disease gets its name, Ebola River. (5) Pathogens primarily cause severe and acute systemic disease with high mortality when people come into contact with each other's infected body fluids.

Blood, excrement, and vomit are the bodily fluids that are most contagious, according to the WHO. Urine, semen, saliva, and breasts have all been found to contain infectious viruses (16,17). Although direct skin-to-skin contact with a patient can also transfer the Ebola virus, this method of exposure carries a lesser risk of infection than contact with bodily fluids. (18) From the 3′ leader to the 5′ trailer, the seven genes that make up EBOV code for at least 10 different proteins: Nucleoprotein (NP), viral protein 35 (VP35), VP40, glycoprotein (GP), soluble GP (sGP), -peptide (ssGP), VP30, VP24, and polymerase (L) are the top ten proteins [10, 11].

Many organ systems of the body are affected by the illness known as "viral hemorrhagic fever. “The Ebola virus is thought to live naturally in fruit bats, particularly the species Hypsiganthus monstrosus, Epomops franqueti, and Myonycteris torquata, with humans and other animals acting as unintended hosts. a. antibodies to In the Philippines, Bangladesh, and China, RESTV were discovered in Rousettusspp bats as well as insectivorous and fruit bat species.

Fig : Natural host of Ebola Virus

Since nonhuman primates (NHPs) are regarded to be the natural hosts for filoviruses4, outbreaks are either started by direct transmission from bats to humans or by indirect transmission through an intermediary host like NHPs.

And close physical proximity to patients or bodily fluids that are infectious (13,14). Other animal species, such pigs, are also susceptible to infection, but it is unknown whether they play any part in transmission (15) Recent reports of EBOV and RESTV antibodies in the migratory straw-colored fruit bat, Eidolon helvum, have been made. The Ebola virus disease has an incubation period of two to 21 days and is marked by symptoms such as fever, headache, and digestive problems. There is an urgent need for a vaccine, and the current outbreak provides a chance to assess vaccination, safety, and efficacy. (8)

EBOLA VIRUS'S STRUCTURE

The Ebola virus is typically 970 nm long and 80 nm in diameter.

They have the viral envelope, matrix, and nucleocapsid components and are cylindrical or tubular in shape.

The virus typically takes the form of a long, filamentous structure, but it can also take the "U-shaped," "6-shaped," or even circular forms.

On their lipid bilayer surface, they have spikes that are 7–10 nm long that are made of a glycoprotein (GP) that is virally encoded.

Glycoproteins are proteins that have glycans covalently attached to the side chains of their polypeptides, a process known as glycosylation.(the carefully regulated attachment of a sugar molecule to an organic molecule, notably a protein

The only resident of the Ebola virus is the glycoprotein GP.

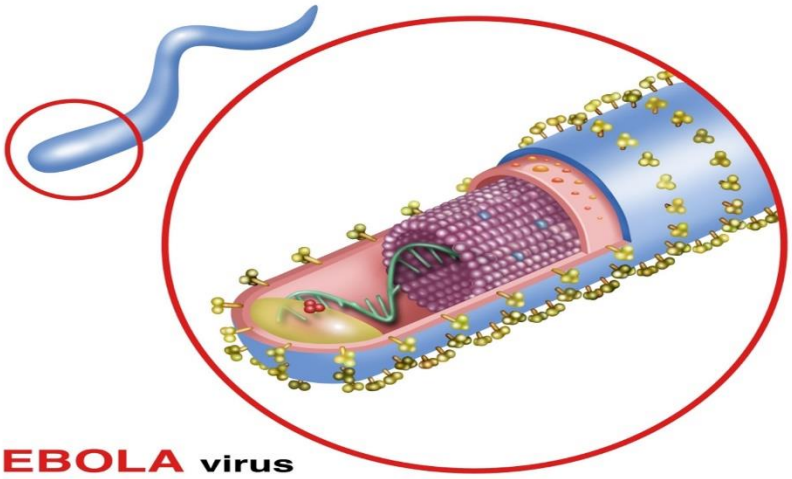


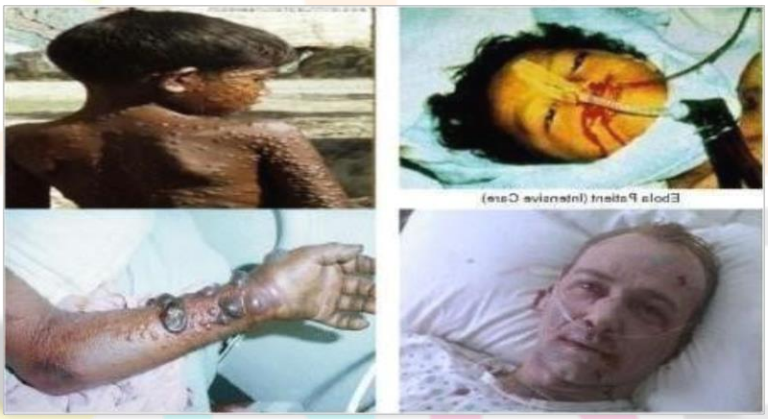
Fig : Structure of Ebola Virus

SYMPTOMS

Ebola virus infections typically manifest 8 days after initial contact, while they can happen as early as 2 days or up to 21 days after exposure [20].

Some signs include:

Headache, Aches in muscles and joints , Weakness , Diarrhoea , Vomiting, Abdominal pain, Having no appetite, On the body, rashes , Mucosal erythema , Fever



Blood loss throughout the body is one of the hallmark signs of the Ebola virus (Fig. 1.5).6

PATHOGENESIS

The incubation period varies depending on the type of exposure, according to the majority of research, despite the fact that the pathophysiology of Ebola is not yet fully known (i.e., six days for percutaneous and ten days for contact exposure). According to the findings of the WHO Ebola response team, the mean incubation period was 11.4 days and did not differ by nation. After viral transmission, symptoms often manifest eight to ten days later (range, 2-21 days).

Nearly all information on the pathogenesis of the Ebola virus disease has been gathered from laboratory trials using mice, guinea pigs, and nonhuman primates because it is challenging to conduct clinical studies during outbreak settings. However in the 2014–2015 West Africa outbreaks, case reports and extensive observational studies of patients are supplying crucial information on the aetiology of the illness in people [22,23]. (Figure2.1)

Pathogenesis stages:

Phase I is defined as the transmission of EBOV from an animal that is infected to a human, frequently through tiny cutaneous lesions. When there are Ebola epidemics, same principles apply to human-to-human transmission.

Phase II can be described as the early symptomatic stage of a viral illness, which typically lasts between days four and ten. During this time, symptoms start to appear and gradually advance to more severe disease manifestations.

Phase III of the Ebola virus infection is characterised by hemorrhagic symptoms, weakened immunity, and end-organ failure.

Cell entry and tissue damage:

The Ebola virus infects a wide variety of cell types after entering the body by mucous membranes, skin breaches, or parental transmission. Probably the first cells to become infected are macrophages and dendritic cells, as filoviruses easily reproduce inside of these pervasive "sentinel" cells, leading to their death and the release of huge numbers of fresh viral particles into extracellular fluids [24,25]. The virus-induced inhibition of type l interferon responses promotes rapid systemic dissemination. Further replication cycles are brought on by dissemination to local lymph nodes, which is then followed by bloodstream dissemination to dendritic cells and fixed and mobile macrophages in the liver, spleen, thymus, and other lymphoid tissues. Many cell types (apart from lymphocytes and neurons) may be infected, according to necropsies performed on afflicted animals, including.

TRANSMISSION MODE:

When a person contracts the Ebola virus by contact with an infected animal's flesh or bodily fluids, an epidemic of the disease typically starts. The virus then spreads to those who come into close touch with the infected person's blood, skin, or other bodily fluids after the patient falls unwell or passes away. Studies on laboratory primates have revealed that the Ebola virus can infect animals when droplets of the virus are accidentally transferred from contaminated hands to the mouth or eyes. This suggests that humans may also become infected in this way. (43,44) Direct contact with the blood, bodily fluids, or skin of persons suffering with the Ebola virus disease, including those who have Ebola Virus.

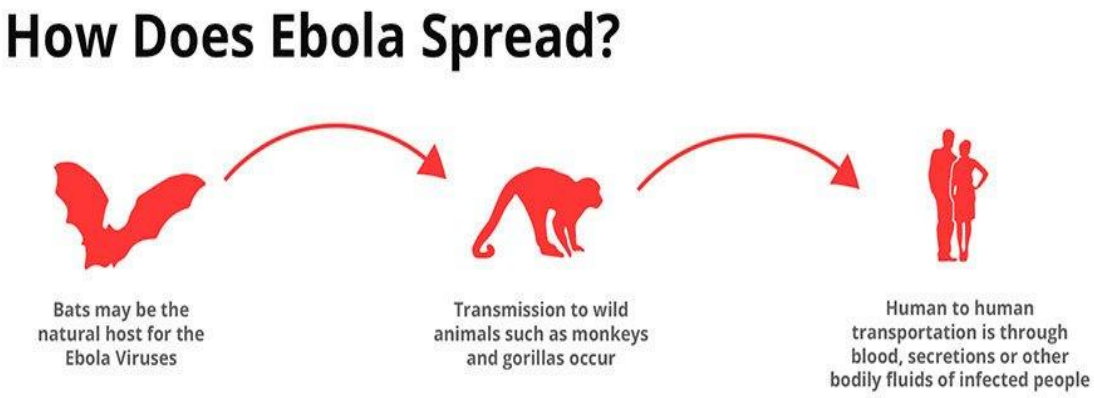


Fig: Transmission of Ebola Virus

Transmission Methods:

From person to person transmission

Fig: Transmission of infection in crowded area

Transmission was found to have happened as a result of contact with primary patients in outbreaks when Ebola spread among people in hospitals, industries, and healthcare settings (27) Direct contact with body fluids and fomites that are contaminated with Ebola causes transmission (28). Yet, there is no proof that mosquitoes or any other insects are involved in the virus's spread. Figure: Infection spread in crowded settings

Inhalational transmission

Fig : Airborne transmission of germs

When the pathogen is in the air alongside respiratory droplets, viral aerosol transmission takes place. Because it is hydrophobic, the virus can survive in dry air and is more stable when there isn't any humidity. (29) However, individuals contracted the disease directly.

Transmission via droplets:

Large droplets that do not evaporate and pass across extended distances are referred to as this sort of transmission. Yet, these droplets can spread over short distances, and up to two metres can separate an infected person from other persons before they get sick. When a person is exposed to the big droplets, which the EV is stable inside, they can contract the virus. Blood, urine, and vomit are examples of human fluids that could contain Ebola droplets

Contact with bodily fluids and spores:

On floors or other surfaces, EV endures. This method of transmission involves coming into contact with contaminated surfaces or objects that have previously been touched by an infected person (32). Long-term survival of the virus is maintained, especially in conditions under control, like a hospital

Identification and DL-HntLDO diagnosis

When an individual has Ebola virus disease, his or her travel and employment history, as well as any exposure to wildlife, are crucial.

Aspects to think about in light of additional diagnostic efforts.

Laboratory tests 1onspHFLF

Low platelet counts, a decrease in white blood cell count followed by an increase, elevated levels of the liver enzymes alanine-aminotransferase (ALT) and aspartate aminotransferase (AST), and abnormalities in blood clotting parameters indicative of disseminated intravascular coagulation (DIC), such as a prolonged prothrombin time, partial thromboplastin time, and bleeding time are all potential laboratory indicators of Ebola virus disease.

Laboratory tests with 6pHFLF

When the virus is isolated and antibodies to the virus are found in a person's blood, the diagnosis of EVD is confirmed. The methods that work best for detecting the virus in early stages of the disease and in human remains are cell culture virus isolation, polymerase chain reaction (PCR) viral RNA detection, and enzyme-linked immunosorbent assay (ELISA) viral protein detection. At advanced stages of the illness and in individuals who

recover, finding antibodies to the virus is most accurate. IgG antibodies can be identified 6 to 18 days after the onset of symptoms, but IgM antibodies can be discovered two days after the onset of symptoms [28].

Fig: Laboratory testing

Fig:Ebola test kit

PREVENTION:

If there is an active outbreak of the disease where you are, your risk of contracting it is increased. Nearly all Ebola outbreaks take place in African nations.

To help from contracting Ebola, abstain from:

Immediate touch with bodily fluids that are contaminated.

Anything that might be contaminated with bodily fluids.

Visiting hospitals or clinics providing Ebola treatment.

Interacting with a victim of the Ebola virus who has passed away.

Care takers must use particular caution to prevent contracting or transmitting Ebola.

Sanitizing the tools.

Making use of disposable tools and materials.

Hand washing.

Donning protective clothing such as gloves, masks, glasses, and other items.

The following actions by a carer can help stop the spread of the Ebola virus:

Cleaning the residences of Ebola patients.

Fig: Disinfecting the home of people who have Ebola

TREATMENT:

Method of therapy

For EVD, there are no approved therapies at this time.

Clinical therapy of sequelae such hypovolemia, electrolyte abnormalities, hematologic abnormalities, refractory shock, hypoxia, hemorrhagic, septic shock, and multiorgan failure should concentrate on supportive care. While the immune system mounts an adaptive response to eradicate the infection, supportive care is the mainstay of treatment for the Ebola virus disease.

Immune Defense Against Ebola

The body's initial line of defence against pathogens is the innate immune system. The innate immune response is activated and regulated in part by the macrophages, monocytes, and dendritic cells. Viral replication is stopped thanks to adaptive immunity. Antigen-presenting cells (APCs) and macrophage infection result in inflammation and an abnormal immune response in deadly8. Antiviral Medication A family of drugs called antiviral drugs is used to treat viral infections. While most antivirals target particular viruses, broad spectrum antivirals work against a variety of viruses. Antiviral medications differ from other antibiotics in that they suppress the growth of their target pathogen rather than eradicating it.

(**Ansuvimab-zykl**) **Ebanga**

A monoclonal antibody drug called ansuvimab is marketed under the trade name Ebanga and used to treat Zaire ebolavirus (Ebolavirus) infection

CHEMISTRY

The monoclonal antibody (mAb) that makes up the medication was first identified from immortalised B-cells taken from a patient who had survived the 1995 Ebola virus disease outbreak in Kikwet, Democratic Republic of the Congo. In research funded by the National Institutes of Health of the United States

MECHANISM OF ACTION

Neutralization

Ansuvimab is a monoclonal antibody therapy that is infused intravenously into patients with Ebola Virus Disease. Ansuvimab is a neutralizing antibody (37) meaning it binds to a protein on the surface of Ebola Virus that is required to infect cells. Specifically, ansuvimab neutralizes infection by binding to a region of the Ebola virus envelope glycoprotein that, in the absence of ansuvimab, would interact with virus's cell receptor protein, Niemann-Pick C1 (40,41,42).This "competition" by ansuvimab prevents Ebola virus from binding to NPC1 and "neutralizes" the virus's ability to infect the targeted cell. (40)

Effector activity

Antibodies have constant fragment (fc) regions and antigen-binding fragment (ABF) regions. When the Fab regions of antibodies bind to virus antigen in a way that prevents infection, virus infection is neutralised.
The "effector activities" of antibodies, such as opsonization, complement-dependent cytotoxicity, antibody-dependent cell-mediated cytotoxicity, and antibody-dependent phagocytosis, can also "kill" virus particles directly and/or infected cells.
The Fc region of antibodies contains these effector activities, but they also rely on the Fab region's ability to attach to the antigen. The utilisation of complement proteins in serum or the FC-receptor on cell membranes is also necessary for effector actions.
Cells can be killed by ansuvimab by an antibody-dependent cell-mediated cytotoxicity (37) Further effective killing

CONCLUSION

The present EVD outbreak necessitates that the healthcare and public health systems respond to infectious disease emergencies, build out the infrastructure for healthcare in poor nations, and raise awareness in nations at risk for EVD imported cases. Human Ebola outbreaks typically start off suddenly and spread quickly from one person to another. E. Viruses are extremely infectious and contagious.
By coming into close touch with sick or deceased animals carrying the virus, EV can spread to both people and other animals. Via direct contact with the blood, bodily fluids, etc. of infected humans, the virus is transferred to other people. People can also contract the sickness by coming into contact with dead bodies during burial rituals. most afflicted individuals contracted the illness in hospitals .

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