

A Short Overview of Ebola Outbreak

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Abstract:

Ebola virus disease (formerly known as Ebola haemorrhagic fever) is a severe, often fatal illness, with a death rate of up to 90%. The illness affects humans and nonhuman primates (monkeys, gorillas, and chimpanzees). Ebola first appeared in 1976 in two simultaneous outbreaks, one in a village near the Ebola River in the Democratic Republic of Congo, and the other in a remote area of Sudan.

The origin of the virus is unknown but fruit bats (Pteropodidae) are considered the likely host of the Ebola virus, based on available evidence. In the current outbreak in West Africa, the majority of cases in humans have occurred as a result of human-to-human transmission. Infection occurs from direct contact through broken skin or mucous membranes with the blood, or other bodily fluids or secretions (stool, urine, saliva, semen) of infected people.

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Introduction

In December 2013, a new round of Ebola virus disease (EVD) first occurred in a remote countryside of Guinea and then spread in Guinea, Liberia, Sierra Leone, and Nigeria of West Africa (Figure.1). EVD, caused by Ebola virus and previously known as Ebola hemorrhagic fever, is an acute infectious disease with fatality rates up to 90%. As of September 23, 2014, the number of suspected and confirmed cases was 6553, causing 3083 deaths. On August 8, 2014, World Health Organization (WHO) announced the current outbreak in West Africa as an international public health emergency. The global epidemic tendency remains ambiguous to date (Table.1-3). We conduct this literature review of epidemiology, treatment and prevention to provide evidence for controlling the risk and carrying out effective interventions.



Fig. 1: 2014 Ebola Outbreak in West Africa - Outbreak Distribution Map

Epidemiology

EVD remains a plague in Africa, with an increase in the number of outbreaks and cases since 2000. As a classic zoonosis, Ebolavirus is believed to persist in a reservoir species in endemic areas. Apes, man, and perhaps other mammalian species

are regarded as end hosts of Ebola virus . Bats are currently thought as potential reservoir species. After direct contact with virus in dead or infected wildlife and the subsequent person-to- person transmission, Ebola virus enters the body through mucosal surfaces or skin abrasions. EVD symptoms usually appear after an 2-to-21-day incubation period. Patients initially show nonspecific flu-like symptoms, such as fever, chills, malaise, muscle pain, and headache. A macropapular rash associated with varying severity of erythema often appears around day 5 and serves as a characteristic feature. Extensive viral replication causes systemic, vascular, and neurologic manifestations, and necrosis occurs in the liver, spleen, kidneys, and gonads. In fatal cases, death occurs usually between 6 and 16 days after infection, and multiple organ failure and severe syndrome might resemble the fatal septic shock (Figure.2).

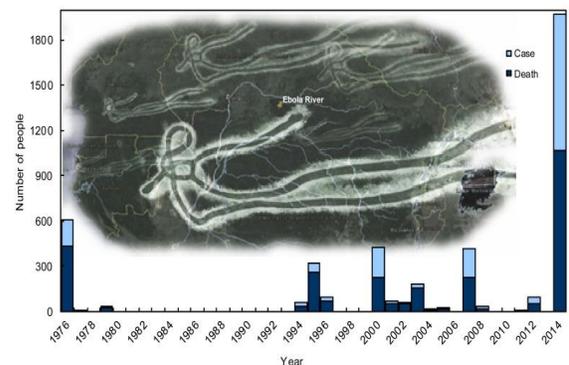


Fig.2: Outbreck of Ebola, 1976 - 2014

Table 1: Total cases as of September 25, 2014

September 25, 2014	Cases
Total Case Count	6263
Total Deaths	2917
Laboratory Confirmed Cases	3487

Table 2: Total cases As of September 25, 2014 by country

Guinea	Total Case Count	1022
	Total Deaths	635
	Laboratory Confirmed Cases	832
Liberia	Total Case Count	3280
	Total Deaths	1677
	Laboratory Confirmed Cases	890
Nigeria	Total Case Count	20
	Total Deaths	8
	Laboratory Confirmed Cases	19
Senegal	Total Case Count	1
	Total Deaths	0
	Laboratory Confirmed Cases	1
Sierra Leone	Total Case Count	1940
	Total Deaths	597
	Laboratory Confirmed Cases	1745

Table 3: Cases of Ebola virus disease in Africa, 1976 - 2014

Country	Town	Cases	Deaths	Species	Year
Congo	Yambuku	318	280	Zaire ebolavirus	1976
South Sudan	Nzara	284	151	ebolavirus	1976
Congo	Tandala	1	1	Zaire ebolavirus	1977
South Sudan	Nzara	34	22	Sudan ebolavirus	1979
Gabon	Mekouka	52	31	Zaire ebolavirus	1994
Ivory Coast	Tai Forest	1	0	Tai Forest ebolavirus	1994
Congo	Kikwit	315	250	Zaire ebolavirus	1995
Gabon	Mayibout	37	21	Zaire ebolavirus	1996
Gabon	Booue	60	45	Zaire ebolavirus	1996
South Africa	Johannesburg	2	1	Zaire ebolavirus	1996
Uganda	Gulu	425	224	Zaire ebolavirus	2000
Gabon	Libreville	65	53	Zaire ebolavirus	2001
Congo	Not specified	57	43	Zaire ebolavirus	2001
Congo	Mbomo	143	128	Zaire ebolavirus	2002
Congo	Mbomo	35	29	Zaire ebolavirus	2003
South Sudan	Yambio	17	7	Zaire ebolavirus	2004
Congo	Luebo	264	187	Zaire ebolavirus	2007
Uganda	Bundibugyo	149	37	Bundibugyo ebolavirus	2007
Congo	Luebo	32	15	Zaire ebolavirus	2008
Uganda	Luwero District	1	1	Sudan ebolavirus	2011
Uganda	Kibaale District	11*	4*	Sudan ebolavirus	2012
Congo	Isiro Health Zone	36*	13*	Bundibugyo ebolavirus	2012
Uganda	Luwero District	6*	3*	Sudan ebolavirus	2012
Multiple countries	multiple	3487*	1698*	Zaire ebolavirus	2014

*Numbers reflect laboratory confirmed cases only.

Key facts

- Ebola virus disease (EVD), formerly known as Ebola haemorrhagic fever, is a severe, often fatal illness in humans (Figure.3).
- The virus is transmitted to people from wild animals and spreads in the human population through human-to-human transmission.
- The average EVD case fatality rate is around 50%. Case fatality rates have varied from 25% to 90% in past outbreaks.

- The first EVD outbreaks occurred in remote villages in Central Africa, near tropical rainforests, but the most recent outbreak in west Africa has involved major urban as well as rural areas .
- Community engagement is key to successfully controlling outbreaks. Good outbreak control relies on applying a package of interventions, namely case management, surveillance and contact tracing, a good laboratory service, safe burials and social mobilisation.
- Early supportive care with rehydration, symptomatic treatment improves survival. There is as yet no licensed treatment proven to neutralise the virus but a range of blood, immunological and drug therapies are under development.
- There are currently no licensed Ebola vaccines but 2 potential candidates are undergoing evaluation.



Figur.3: Ebola is a severe, often fatal illness in humans

Transmission

- Because the natural reservoir host of Ebola viruses has not yet been identified, the manner in which the virus first appears in a human at the start of an outbreak is unknown. However, researchers believe that the first patient becomes infected through contact with an infected animal.
- When an infection does occur in humans, the virus can be spread in several ways to others. Ebola is spread through

direct contact (through broken skin or mucous membranes) with

- blood or body fluids (including but not limited to urine, saliva, feces, vomit, and semen) of a person who is sick with Ebola
- objects (like needles and syringes) that have been contaminated with the virus
- infected animals
- Ebola is not spread through the air or by water, or in general, food. However, in Africa, Ebola may be spread as a result of handling bushmeat (wild animals hunted for food) and contact with infected bats.
- Healthcare providers caring for Ebola patients and the family and friends in close contact with Ebola patients are at the highest risk of getting sick because they may come in contact with infected blood or body fluids of sick patients.
- During outbreaks of Ebola, the disease can spread quickly within healthcare settings (such as a clinic or hospital). Exposure to Ebola can occur in healthcare settings where hospital staff are not wearing appropriate protective equipment, including masks, gowns, and gloves and eye protection.
- Dedicated medical equipment (preferable disposable, when possible) should be used by healthcare personnel providing patient care. Proper cleaning and disposal of instruments, such as needles and syringes, is also important. If instruments are not disposable, they must be sterilized before being used again. Without adequate sterilization of the instruments, virus transmission can continue and amplify an outbreak.
- Once someone recovers from Ebola, they can no longer spread the virus. However, Ebola virus has been found in semen for up to 3 months. People who recover from Ebola are advised to abstain from sex or use condoms for 3 months.

Symptoms of Ebola include

- Fever (greater than 38.6°C or 101.5°F)
- Severe headache
- Muscle pain
- Weakness
- Diarrhea
- Vomiting
- Abdominal (stomach) pain
- Unexplained hemorrhage (bleeding or bruising).

Symptoms may appear anywhere from 2 to 21 days after exposure to Ebola, but the average is 8 to 10 days. Recovery from Ebola depends on the patient's immune response. People who recover from Ebola infection develop antibodies that last for at least 10 years.

Diagnosis

Diagnosing Ebola in an person who has been infected for only a few days is difficult, because the early symptoms, such as fever, are nonspecific to Ebola infection and are seen often in patients with more commonly occurring diseases, such as malaria and typhoid fever.

However, if a person has the early symptoms of Ebola and has had contact with the blood or body fluids of a person sick with Ebola, contact with objects that have been contaminated with the blood or body fluids of a person sick with Ebola, or contact with infected animals, they should be isolated and public health professionals notified. Samples from the patient can then be collected and tested to confirm infection. Laboratory tests used in diagnosis include (Table.4).

Table 4: Laboratory tests used in diagnosis of Ebola

Timeline of Infection	Diagnostic tests available
Within a few days after symptoms begin	<ul style="list-style-type: none"> • Antigen-capture enzyme-linked immunosorbent assay (ELISA) testing • IgM ELISA • Polymerase chain reaction (PCR) • Virus isolation
Later in disease course or after recovery	<ul style="list-style-type: none"> • IgM and IgG antibodies
Retrospectively in deceased patients	<ul style="list-style-type: none"> • Immunohistochemistry testing • PCR • Virus isolation

Treatment and vaccines

Supportive care-rehydration with oral or intravenous fluids - and treatment of specific symptoms, improves survival. There is as yet no proven treatment available for EVD. However, a range of potential treatments including blood products, immune therapies and drug therapies are currently being evaluated. No licensed vaccines are available yet, but 2 potential vaccines are undergoing human safety testing.

Prevention and control

Good outbreak control relies on applying a package of interventions, namely case management, surveillance and contact tracing, a good laboratory service, safe burials and social mobilisation. Community engagement is key to successfully controlling outbreaks. Raising awareness of risk factors for Ebola infection and protective measures that individuals can take is an effective way to

reduce human transmission. Risk reduction messaging should focus on several factors:

- **Reducing the risk of wildlife-to-human transmission** from contact with infected fruit bats or monkeys/apes and the consumption of their raw meat. Animals should be handled with gloves and other appropriate protective clothing. Animal products (blood and meat) should be thoroughly cooked before consumption.
- **Reducing the risk of human-to-human transmission** from direct or close contact with people with Ebola symptoms, particularly with their bodily fluids. Gloves and appropriate personal protective equipment should be worn when taking care of ill patients at home. Regular hand washing is required after visiting patients in hospital, as well as after taking care of patients at home.
- **Outbreak containment measures** including prompt and safe burial of the dead, identifying people who may have been in contact with someone infected with Ebola, monitoring the health of contacts for 21 days, the importance of separating the healthy from the sick to prevent further spread, the importance of good hygiene and maintaining a clean environment (Figure.4).



Fig. 4: Prevention and control of Ebola

If you travel to or are in an area affected by an Ebola outbreak, make sure to do the following:

- Practice careful hygiene. Avoid contact with blood and body fluids.
- Do not handle items that may have come in contact with an infected person's blood or body fluids.
- Avoid funeral or burial rituals that require handling the body of someone who has died from Ebola.
- Avoid contact with bats and nonhuman primates or blood, fluids, and raw meat prepared from these animals.
- Avoid hospitals where Ebola patients are being treated. The U.S. embassy or consulate is often able to provide advice on facilities.
- After you return, monitor your health for 21 days and seek medical care immediately if you develop symptoms of Ebola(<http://www.cdc.gov/vhf/ebola/symptoms/index.html>). Healthcare workers who may be exposed to people with Ebola should follow these steps:
 - Wear protective clothing, including masks, gloves, gowns, and eye protection.
 - Practice proper infection control and sterilization measures. For more information, see "Infection Control for Viral Hemorrhagic Fevers in the African Health Care Setting".
 - Isolate patients with Ebola from other patients.
 - Avoid direct contact with the bodies of people who have died from Ebola.
 - Notify health officials if you have had direct contact with the blood or body fluids, such as but not limited to, feces, saliva, urine, vomit, and semen of a person who is sick with Ebola. The virus can enter

the body through broken skin or unprotected mucous membranes in, for example, the eyes, nose, or mouth.

Controlling infection in health-care settings

- Health-care workers should always take standard precautions when caring for patients, regardless of their presumed diagnosis. These include basic hand hygiene, respiratory hygiene, use of personal protective equipment (to block splashes or other contact with infected materials), safe injection practices and safe burial practices.
- Health-care workers caring for patients with suspected or confirmed Ebola virus should apply extra infection control measures to prevent contact with the patient's blood and body fluids and contaminated surfaces or materials such as clothing and bedding. When in close contact (within 1 metre) of patients with EBV, health-care workers should wear face protection (a face shield or a medical mask and goggles), a clean, non-sterile long-sleeved gown, and gloves (sterile gloves for some procedures).
- Laboratory workers are also at risk. Samples taken from humans and animals for investigation of Ebola infection should be handled by trained staff and processed in suitably equipped laboratories (1-15) (Figure.6).



Fig.6: Guidline of controlling infection in health-care settings

Conclusion

Ebola virus disease currently has no vaccines or medicines approved by national regulatory authorities for use in humans save for the purpose of compassionate care. To date, the virus has infected 6242 people and killed 2909 of them. These figures, which are far greater than those from all previous Ebola outbreaks combined, are known by WHO to vastly underestimate the true scale of the epidemic. The Ebola epidemic ravaging parts of West Africa is the most severe acute public health emergency seen in modern times. Never before in recorded history has a biosafety level four pathogen infected so many people so quickly, over such a broad geographical area, for so long. These data indicate that without drastic improvements in control measures, the numbers of cases of and deaths from EVD are expected to continue increasing from hundreds to thousands per week in the coming months.

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