Ebola Virus Disease (EVD)
Epidemic
August 2014,

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Haile Resort, Hawassa
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The virus in brief

- The filoviruses, **Ebola and Marburg**, are among the most virulent pathogens of humans, causing severe hemorrhagic fever.
- Like all filoviruses, ebolavirions are filamentous particles that may appear in the shape of a shepherd's crook or in the shape of a "U" or a "6", and they may be coiled, toroid, or branched.
The virus in brief

- Ebola and Marburg viruses are non-segmented, negative-sense, single-stranded RNA viruses that resemble rhabdoviruses and paramyxoviruses in their genome organization and replication mechanisms.
- Zoonotic
The virus in brief

Ebola virus under electron microscope
The virus in brief

- Following the infection coagulation defects, a capillary leak syndrome, and shock.
- Other types of viral hemorrhagic fever include Rift Valley fever, Crimean-Congo hemorrhagic fever, Lassa fever, yellow fever, and dengue hemorrhagic fever.
EVD is caused by four of five viruses classified in the genus Ebolavirus, family Filoviridae, order Mononegavirales.

The genus Ebola virus is divided into five different species:
- E. Zaire,
- E. Sudan,
- E. Ivory Coast,
- E. Bundibugyo, and
- E. Reston (Only reported in animals like pigs and other primates)
Historical background of the Epidemic

- The filoviruses were first recognized in 1967, when the inadvertent importation of infected monkeys from Uganda into Germany and Yugoslavia resulted in explosive outbreaks of severe illness among vaccine plant workers who came into direct contact with the animals by killing them, removing their kidneys, or preparing primary cell cultures for polio vaccine production.


- Since Ebola discovery in 1976 until December 2013:
  - 23 outbreaks
  - 2388 human cases including 1590 deaths
Historical background of the Epidemic

● Since 1976, the Zaire species has caused multiple large outbreaks with mortality rates of 55-88 %

The Sudan virus has been associated with about 50 % case-fatality rate in four known epidemics: two in Sudan in the 1970s, one in Uganda in 2000, and another in Sudan in 2004

The Ivory Coast virus has only been identified as the causative agent in one person, who survived

● The Bundibugyo virus emerged in Uganda in 2007, with a lower case-fatality rate of about 30% and is less fatal than E. Zaire and E. Sudan viruses.

Sequencing has shown that the agent is most closely related to the E. Ivory Coast agent
Geographic distribution of Ebola virus disease outbreaks in humans and animals

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: Health Statistics and Information Systems (HSI)
World Health Organization
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Geographical distribution of the Ebola spp.
Epidemiology of the existing Epidemic

- The 2014 current Ebola outbreak began in Guinea in December 2013 and now involves transmission in Guinea, Liberia, Nigeria, and Sierra Leone
- Since August 11, 2014 the epidemic has also been reported in DRC
- Most severe outbreak of Ebola in terms of the number of cases and fatalities since the discovery of the virus in 1976
- 40% of cases occurred in the last three weeks
Trends of Cases and Deaths

- As of 27 August 2014, the four countries Guinea, Sierra Leone, Liberia and Nigeria reported countries have reported 3069 cases and 1552 deaths.
How did the Epidemic start?

- First human cases start with infection by an animal
  - Chimpanzes, gorillas, monkeys, forest antelopes, fruit bats, porcupine...
  - How 2014 outbreak in West Africa started is unknown

- Infection from person-to-person creates an outbreak
  - Direct or indirect physical contact with body fluids of infected person (blood, saliva, vomitus, urine, stool, semen)

- Well known locations where transmission occurs
  - Hospital: health care workers, other patients, unsafe injections
  - Communities: Family, friends, contacts caring for ill, through funeral practices
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Ethiopian Situation

- There is no report of Ebola Virus Disease in Ethiopia so far.
- Screening for cases and high risks has been established at Bole International Airport for the travelers from West Africa particularly affected by the Epidemic.
- The screening is expanding to the major land ports these days.
Distribution of cases and deaths by countries

- The first case was from Guinea on December 6/2013. The total number of cases and deaths from the four African countries (Guinea, Liberia, Sierra Leone and Nigeria) by August 29/2014 was 3069 and 1552 respectively.
- On August 11, there was a report of Ebola Virus Disease from DRC. And by August 27 the number of cases and deaths increased to 25 and 12 respectively.
- On August 30, one case was reported in Senegal.
Mode of Transmission

- Person to person (through direct contact with virus-containing body fluids (eg, blood, vomitus, urine, feces, and probably sweat) from a person who has developed signs and symptoms of illness. This mode of transmission may lead to outbreaks)
- Ritual washing of Ebola victims at funerals
- Others including ingestion, inhalation, or passage through breaks in the skin.
Mode of Transmission

- Exposure to bats — Exposure to bat secretions or excretions
- Nosocomial transmission
- Other routes — Other potential routes of transmission include the following:
  - Accidental infection of workers in any Biosafety-Level-4 (BSL-4) facility where these viruses are being studied.
  - Use of filoviruses as biological weapons
Ebola infection landscapes
Fruit bats (*Rousettus aegyptiacus*)
Ebola Virus Disease

- Incubation 2-21 days
- Case Fatality Ratio 24-89%
Signs and Symptoms

- **Nonspecific flu-like symptoms** — abrupt onset of fever, chills, and general malaise. Other signs and symptoms include weakness, anorexia, severe headache, and pain in the muscles of the trunk and lower back, relative bradycardia, a nonproductive cough and pharyngitis, with the sensation of a lump or "ball" in the throat.

- **Rash** — Some patients develop a diffuse erythematous, nonpruritic maculopapular rash by day five to seven of illness. The rash usually involves the face, neck, trunk, and arms, and can desquamate.

- **Gastrointestinal** — Gastrointestinal signs and symptoms usually develop five days after the initial presentation. These include watery diarrhea, nausea, vomiting, and abdominal pain.

- **Hemorrhage** — Bleeding is not universally present but can manifest later in the course of disease as petechiae, ecchymosis/bruising, oozing from venipuncture sites, and/or mucosal hemorrhage. Frank hemorrhage is less common.

- **Other findings** — hiccups, chest pain, shortness of breath, headache, confusion, seizures, and/or cerebral edema. Conjunctival injection and dark red discoloration of the soft palate are common physical findings. Pregnant women may experience spontaneous miscarriages.
Signs and symptoms
Ebola Virus Disease

- Treatment is supportive but effective in reducing mortality - Rehydration, intensive care

- Several new treatment options are under development,
  - Very limited availability
    - Limited information on safety & efficacy
      - ZMap: a cocktail of three monoclonal antibodies produced in plants
      - Hyperimmune globulins made in horses or cattle
      - BCX4430: a chemical which blocks viral replication
Ethical Consideration for use unregistered intervention for EVD

12 August 2014 -- A panel of experts was convened by WHO to assess the ethical implications for clinical decision-making of the potential use of unregistered interventions.

Consensus was reached, in the circumstances of this outbreak, it is ethical to offer unproven interventions with as of yet unknown efficacy and adverse effects, as potential treatment or prevention
Ebola Virus Disease

- Vaccines in development
  - Two vaccines have been shown to protect non-human primates against Ebola Virus infection.
  - Development is being fast-tracked, with first-in-man Phase 1 clinical likely to start in September 2014 in USA

- None of the above products are currently registered for use in EVD.
Prevention and Control

- Infection control (PPE and Disinfection)
- Standard precaution
- Hand washing
- Behaviour Change Education
- Quarantine
- Vaccination?
- Lab-Biosafety level 4
Response to the Epidemic

- Affected countries activated their national emergency committees, prepared Ebola virus disease response plans, and carried out needs assessments.
- Declared the EBV outbreak to be of a national Emergency
- On 3 July 2014, the West African states announced collaboration on a new strategy, and the creation of a World Health Organization sub-regional centre in Guinea "to co-ordinate technical support"; the centre was inaugurated in Conakry on 24 July.
Response to the Epidemic

- On 31 July, WHO and West Africa nations announced $100 million in aid to help contain the disease

  ◦ stop transmission of Ebola virus disease in the affected countries through scaling up effective, evidence-based outbreak control measures; and

  ◦ prevent the spread of Ebola virus disease to the neighbouring at-risk countries through strengthening epidemic preparedness and response measures.
Response to the Epidemic

- On 8 August 2014 - WHO declared the outbreak an international public health emergency, after a two-day teleconference of experts.
  - The third declaration – H1N1 and Polio emergency

- Donation (finance, drugs, supplies) and Technical team deployment continues
  - ECOWAS, Nigerian, EU, USA/CDC, Canada, Japan, UNICEF, WHO (200 experts) MSF (700 experts), Samaritan's Purse, PHEF, ECHO, Italy, South Korea, USAID, Estonia, Canada, Rio Tinto Guinea, CERF, Germany, VIVO Energy, Japan, OAS Brazil, Société des mines de fer de guinée (SMFG), Société Anglogold Ashanti de Guinée (SAG), United Kingdom-Department For International Development (DFID), Vale International Holdings GmbH, United States, and the African Development Bank.
Legal measures

- **Cordon sanitaire**, a disease fighting practice, by isolating affected regions, was established in August, covering the area where 70% of the cases were reported.

- Guinea - In early August 2014, closed its borders with both Sierra Leone and Liberia to help contain the spreading of the disease.

- Liberia – Banning of **Football** events, closure of all schools nationwide, including the **University of Liberia**, and a few communities were to be quarantined.
Legal Measures

- **Sierra Leone** - quarantine the hot spots of the epidemic.

- **Nigeria** - issues a statement supporting the use of non-validated treatments without prior review as approved by a health research ethics committee.

- **Screening** – Exit and entry of passengers at PoE
Air travel is low-risk for Ebola transmission

On August 14 - WHO provided advice:

- to put no ban on international travel or trade;
- that countries be prepared to detect, investigate, and manage Ebola cases; including access to a qualified diagnostic laboratory for Ebola virus and, where appropriate, the capacity to identify and care for travellers originating from known Ebola-infected areas who arrive at international airports or major land crossing points with unexplained fever and other symptoms.
- To provide their citizens traveling to Ebola-affected countries with accurate and relevant information on the Ebola outbreak and measures to reduce the risk of exposure.
Challenges in containing the Epidemic

- The outbreak's multiple locations across country borders,
- Inadequate equipment given to medical personnel,
- Funeral practices such as washing a body, and reluctance among country people to follow preventive practices
- Rumours and denial
- Language barriers
To contain the Epidemic

- National leadership and risk communication
- Outbreak control measures to stop transmission:
  - Clinical Management and IPC
  - Epidemiological investigation, surveillance and laboratories
  - Behavioral and social interventions
  - Logistics
Priority actions to quickly inform and empower populations

1. The President should address the nation declaring Ebola a national health emergency – be widely distributed through TV and radio channels

2. Senior government and UN leadership should travel to affected areas to demonstrate their leadership and support for these communities

3. A coordinating task team for community engagement should be established with appropriate membership from all ministries, UN partners, International and National NGO Groups, Community Groups
Priority actions to quickly inform and empower populations

4. Dialogue with local community leaders to assist mobilization and engagement of local communities

5. Messages crafted and endorsed by this group that address the key behavioral practices relating to home based care, safe burial and early reporting of cases to treatment centres

6. Rumors should be tracked closely with efforts established to correct and inform with appropriate information
Ports of Entry (PoE) – International Travel and Trade

States with EVD transmission:

- Develop standard operational procedures and conduct exit screening of all persons at international airports, seaports and major land crossings:
  - The exit screening should consist of, at a minimum, a questionnaire, a temperature measurement and, if there is a fever, an assessment of the risk that the fever is caused by EVD.
PoE - ITT

For all points of entry:

- Allocate space at PoE for health assessments in the event of suspected ill travellers is detected.

- Establish standard operation procedures when ill travellers need to be referred to designated hospitals including identification of adequate ambulance service.

- Ensure sufficient trained staff with appropriate and sufficient Personal Protective Equipment (PPE) and disinfectants.
PoE - ITT

- Raise awareness among conveyance operators for the need of immediate notification to PoE health authorities prior to arrival of any suspected case(s).

- In regard to air travel:
  - coordinate health sector and civil aviation authorities, airport operators and airlines to facilitate contact tracing and event management,
  - ensuring passenger locator form is on board and at airport and
  - airport ground staff and crew trained for managing EVD and environmental contaminants in flight and at airport.
  - Ensure timely communication between PoE and national health surveillance system
National Preparedness

- Government commitment
- Task force established
- Resource Mobilization
- Workshops
- Identification of treatment center
- Deployment of human resource
- Screening started at the Airport
- Development and distribution of pamphlets
- Strengthening surveillance communication channels
Role of EPHA

- Awareness creation to its members and wider public through different media
- Generation of evidences
- Demonstrate collaboration with the FMoH and other partners outside Ethiopia to contain the Epidemic
- Resource mobilization
- Etc
References

- Press release of the Ethiopian Broadcasting Corporate, August 2014