



Ebola: The Deadly Viral Infection Should Hindustan Be Prepared?

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ABSTRACT

Ebola viruses are one of the most deadliest group of viruses known to mankind. With case fatality rate of more than 90% it's among 30 viruses which causes viral hemorrhagic fever syndrome. Endemic among sub African region, this local terrorist infection plans to become global threat. India being the major player in Afro-Asian economies, there is exchange of human resources which increases the probability of getting infected and spread of infection. Therefore it is essential for us to be prepared, after all forewarned is forearmed. We are writing this article to sensitize the healthcare workers from ward boys to specialist consultants about Ebola virus and to incorporate history of travel in our medical notes very effectively and refer the Ebola suspected patients to specialized units to prevent a catastrophic outcome in India!!!

Keywords -The Ebola outbreak 2014, DIC, multisystem failure

1. INTRODUCTION

Ebola Virus Diseases (EVD) has always been a challenge and a global threat from the time it was discovered first in 1976 by Dr. Peter Piotin in Zaire, Africa (now Democratic Republic of Congo) from the blood of a catholic nun who suspected of having yellow fever. In a recent interview, Dr Piotin said and I quote "The Ebola outbreak 2014 is among the deadliest strain of the virus and 9 out of every 10 patient will die of EVD." The present outbreak is the largest and the longest ever and could soon see it spread across the world, said now the director of the director of the London School of hygiene and Tropical disease, Dr. Peter Piotin. This point of Dr. Piotin holds true. Since the 2014 West Africa Ebola Outbreak which is affecting Guinea, Sierra Leone, Liberia and Nigeria [1,2] [Fig.1]. As of 2014 August, 2127 suspected cases of Ebola 1145 patients have lost their lives [3]. According to the Ministry of health and family welfare, New Delhi, India 9207 passengers have been screened for Ebola by airport health officials at Delhi, Mumbai, Bengaluru, Chennai, Trivandrum and Kochi. So far no confirmed case has been reported. But will this expensive and laborious screening make a difference? Not really, firstly exact mechanism of spread of Ebola is not known. Secondly, if the infected patients are in incubation period (2-21 days) the thermal scanners which are available at airports will not be able to detect since its detection power depends upon fever in arriving passengers. Therefore travel restrictions, closure of borders at point of entry are not recommended.[4] [Fig.2]. EVD can very well thrive in India thanks to the **3P model theory** put forward by experts. [Fig 3]

Background EBOV has a characteristic filamentous form with a uniform diameter of 80 nm and variable length. They may be straight or folded [Fig.4]. There are 30 known viruses which causes viral haemorrhagic fever, EBOV are one among them. They are all RNA viruses with lipid cover. It belongs to the family of filoviridae. Bats are considered to be the reservoir. Ticks and mosquitoes are the vectors. Although EVD spread via bodily secretions it can spread via aerosol rendering EBOV classified as category a **biological weapon**. India being the victim of terrorism, we should be prepared for this biological warfare. EVD have a primary exposure from the people who have come from endemic zone or secondary exposure which could be human to human or primate to human. The clinical findings depend upon the stage of presentation. Two major factors in EVD is the impairment of immune response and vascular dysfunction. Patients who are Ebola virus infected (EBI) do not develop humoral response whereas survivors (<10%) develops neutralizing antibodies. Currently we have no **Ebola specific treatment** and work on vaccine continues.

Etiology & Pathophysiology: EBOLA are non-segmented negative stranded RNA genome containing 7 seven structure and regulatory genes which encodes for 4 Virion structural proteins (VP-30,VP-35, Nucleoproteins and Polymerase protein [L]) and 3 membrane associated proteins (VP-40, GP, VP-24). The surface GP is encoded in two frames ORF-1 and ORF-2 .ORF-1 encodes for soluble secretory GP (sGP) which is present in abundant quantity during early EBI. The

characteristic lymphopenia, delayed neutrophilic activation and poor humoral response all can be attributed to sGP. This is done by binding the neutrophil CD16b receptor. Leroy et al reported 11 of 24 contacts which were exposed to symptomatic Ebola virus infection (EBI), although were infected but remained asymptomatic due to strong immune response with production of IL-1 beta, IL-6 and TNF [7].

According to 2012 virus taxonomy of the International Committee on Taxonomy of Viruses, EBOV classified into 5 separate species. Zaire, Sudan, Bundibugyo, Raston, Tai farel. Most lethal is Zaire strain (79%) followed by Sudan strain (53%) [Fig.5].

Epidemiology: Indian Statistics: Fortunately till today we don't have any single isolated case. None the less we should be prepared. **International statistics:** Although EBOV is endemic to sub-Saharan Africa several human infection with Reston strain have been seen in USA esp. among the animal care workers at primate holding facility. The history of EBOV outbreaks with mortality [Fig 6] shows how susceptible the world has become to EBI.

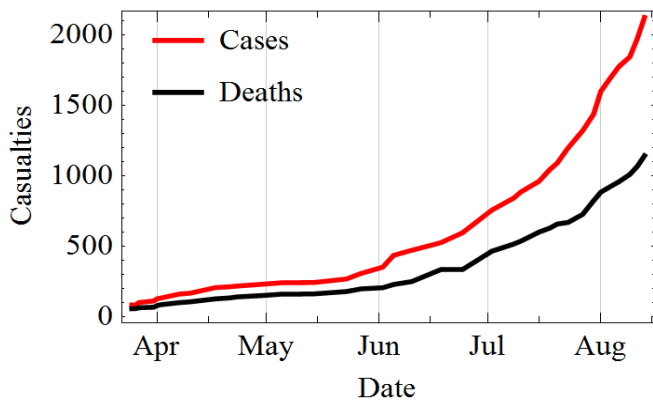


Figure 1 : The 2014 Ebola Outbreak from April to August

Final Destinations of Airline Travelers Departing from Guinea, Liberia, and Sierra Leone
By WHO region during the month of August

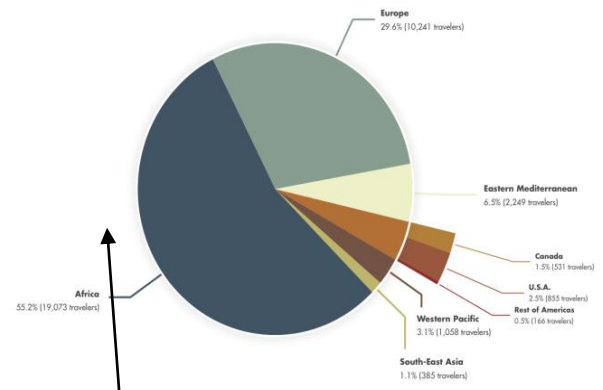


Figure 2. Source: WHO

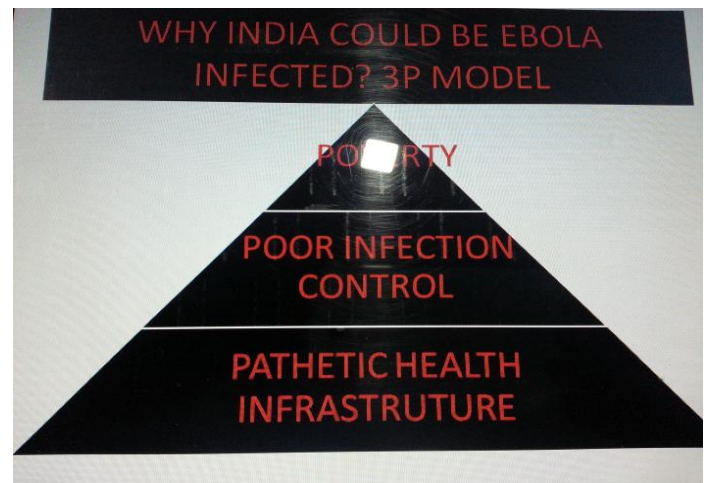


Figure 3. Ebola Virus: 3P Model

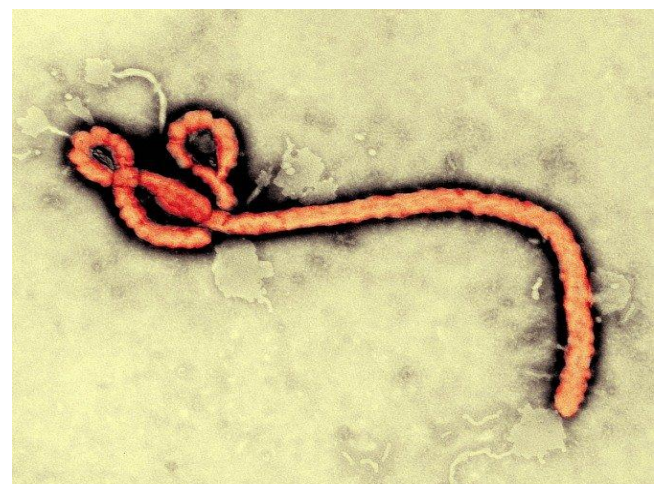


Figure 4. Ebola Virus Structure

diagnosis would be very difficult to rule out, malaria, typhoid, dengue, leptospirosis are the common ones. Others includes, typhus, cholera, plague, Q fever, measles, visceral Leishmaniasis, a fulminant viral hepatitis. Non-infectious diseases can also be confused with EBI which includes Acute promyelocytic leukemia, HUS, snake envenomation, TTP, Kawasaki disease and even warfarin poisoning. [8]

Work Up & Current Status of Treatment: This includes complete blood workup. CBC shows marked lymphopenia in early phases. neutrophilia develops later in the disease secondary to thrombocytopenia, leukopenia. LFT's altered with increase in ALT& AST with bilirubin may rise or be normal. When anuria sets in BUN and creatinine begins to rise the clinical status begins to deteriorate. Definite diagnostic test includes isolation of the EBOV by **RT-PCR** or tissue culture. However EBOV being highly lethal infection WHO recommends that it should be performed in specialized labs. EBOV is a risk group 4 pathogen and requires a Bio safety level 4 containment. [Fig 7]. An Antigen detection ELISA test is available for EBOV antigen. For post mortem diagnosis fixed skin is used. Immune Electron microscopy shows filoviral matrix protein (VP30) and nucleoprotein(NP) as inclusion bodies in Zaire strain EBOV and were closely associated in viral morphogenesis.[9]

Let it be very clear till today there is no EBOLA specific treatment available nor there is any EBOLA vaccine available, however there are several drugs in experimental phase. For EBI treatment is mainly

supportive. Intravenous fluids, fresh frozen plasma, antibiotics, electrolyte balance and quarantine of patient, Pharmacological treatment includes Nucleoside analogue inhibitors of the cell encoded enzyme S-adenosylhomocysteine hydrolase (**SAH**), have been shown to inhibit the Zaire strain of EBOV in lethal mouse model [10]. US FDA has allowed 2 drugs **Z- Mapp** and **TKM Ebola** (an RNA interference drug) to be used in **2014 Ebola Outbreak**[11]. These drugs raised ethical dilemma since it's an experimental drug, but on 11th Aug 2014 WHO reached a consensus and allowed the drugs to be used. Other experimental treatment includes IFN- beta, human recombinant IFN –alfa - 2b in conjunction with hyper immune equine immunoglobulin IgG. **Favipiravir**, estrogen receptor blocker like clomiphene, toremifene inhibits the progression of EBOV in mouse[12,13]. A 2014 study shows amiodarone, dronedarone and verapamil inhibits filovirus cell entry invitro [14]. Si RNA (small interfering RNA) and PMO plus (phosphorodiamidate morpholino oligomers) are other phase 1 clinical trial drugs which are showing promising sign and may be available in future [15,16]

Prevention Pearls: Quarantine, of susceptible patient, is usually effective in decreasing spread. [17][18]. EBOV is highly and lethally infectious, with prevention predominantly involving behaviour changes, proper full-body personal protective equipment, and disinfection. Techniques to avoid infection involve not contacting infected blood or secretions, including from those who are dead and proper burial method.

3. CONCLUSION

Ebola virus is dangerous and highly lethal and infectious. The only way to reduce the incidence and outbreak is to cut the transmission of the disease. Extensive research on vaccination is still required. More definitive screening criteria are essential. Ebola virus is a challenge to human intelligence and we must defeat Ebola before it wipes our race!!!!

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