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Ebola Virus Disease in the year 2014-2015: Retrospective Study of Suspected Cases of Ebola Virus Disease at Intensive Care Unit of Tertiary Care Center

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Abstract

Aim: Containment of a dangerous and fatal disease outbreak and measures to control in present and future. *Design*: Retrospective observational Study. *Material and Methods*: A team of researchers studied the demographic characteristics of international passengers, to India during Public health emergency of International concern declared on 8 August 2014 for Ebola Virus disease. A person with history of fever, bleeding from any site, stomach pain, diarrhea, vomiting, headache, joint pain, muscular pain, bleeding from any site and rashes should report to tertiary care center. In our study, we observed person under investigation for Ebola virus disease under integrated disease surveillance program for forty-two days. If the contacts had any clinical symptoms, they were supposed to inform immediately [1]. The tertiary care facility was responsible for treatment and management of suspected patients suffering from Ebola virus disease. Sample collection for confirmation of Ebola disease was responsibility of Airport Authority of India. One passenger was quarantined for 165 days at the airport authority of India, as he was Ebola treated patient. His semen sample tested positive for Ebola virus [2]. *Statistical Analysis:* Collected data was analyzed and the categorical variables were presented in number and percentage. Qualitative variable was compared using Chi-Square test. *Results*: Satisfactory containment of Ebola virus disease during Public health emergency of International concern. *Conclusion and Recommendation*: To design intensive care facilities for future control and spread of Ebola Virus disease.

Keywords: Ebola Virus disease; Personal prophylaxis equipment; N-95 mask; sharp needle container; quarantine; PIUs; infection control.

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Introduction

Public Health emergency of International concern declared on 8 August 2014 for the outbreak of Ebola virus disease in west Africa [3]. 28,616 were confirmed cases worldwide of Ebola virus disease and 11,316 deaths as found on 10 June 2016. There are 10000 survivors of Ebola Virus disease at that time. As there was no vaccine or definitive treatment robust step taken to control spread of infection. The Public health emergency of International concern lifted on 24th march 2016 [3].

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India has a staggering population of 1.35 billion based on the most recent UN data and faced challenges to control the spread of Ebola disease [4]. A 24-hour emergency help line was set up. Thermal scanners and a "virus tracking equipment" was installed at 18 airports, seaports and roadway and steps were taken to track and isolate passengers suspected to be carrying the virus. All health care workers dealing with the suspected patients asked to wear personal prophylaxis equipment. Health care workers instructed about donning and doffing of personal prophylaxis equipment. All health care workers were advised to wear personal prophylaxis equipment while carrying samples The Indian missions had contacted resident Indians in the affected countries and they were supplied all instructive materials so that they can take preventive measures [5,6].

Material and Method

A team of researchers studied the demographic characteristics of international travelers to India during Public health emergency of International concern declared on 8 August 2014 for Ebola Virus disease.

Provisions to quarantine passengers with Ebola-like symptoms at Airport Authority of India. and arrangement made to keep them under observation was made at the tertiary center. The tertiary center was set up to manage Ebola virus disease suspects and infected patients. The suspected patients were passengers from countries Guinea, Sierra Leone, Liberia, Nigeria and Congo who were having signs and symptoms of disease or who traveled as medical tourists to India from these Nations. The tertiary center also deployed a team of doctors and nurses, round the clock for identifying high-risk suspects at the Airport. Patients having symptoms such as fever, headache, joint pain, vomiting, diarrhea, bleeding from any site transferred to the designated tertiary care center by the airport authority of India. Highly suspicious patients got transfer to nodal center for further management. The airport authority of India collected samples of suspected patient's. Report for Ebola virus disease was dispatched within 24 hours. Data collected and the variables described in descriptive analysis. Advisory issued to State Surveillance Officers of all the states/Union territories, Airlines, travelers visiting from/to affected countries and families staying in the affected countries [7,8].

The total samples tested for Ebola virus disease were 106 at NCDC. The passengers with clinical symptoms transferred to tertiary center. Fourteen patients managed as A person under investigation for Ebola virus disease at the tertiary Center. Two patients out of fourteen patients tested positive for malaria disease, three patients were medical tourists with symptoms, and four patients were Indian Nationals who had visited area of disease outbreak. The most common symptom was febrile illness and the most common age group was between 30-50 years age. Two patients were of extreme age group (4 years and 70 years). Eighty percent Person under investigations for Ebola Virus disease belonged to Nigeria and rest from other West African countries.

Eighty percent patients had febrile illness and 20 percent had headache and muscle pain and close contact with Person under investigations for Ebola Virus disease.

All the patients received supportive treatment

Maintaining fluids and electrolytes in the patient's body

Maintaining oxygen level of the body

Maintaining blood pressure

Treatment for pain relief

Treatment of fever

Medicines used for infections according to the culture and sensitivity report.

Superadded infections of A person under investigation for Ebola virus disease were treated with appropriate medicines. The average duration of stay in the hospital ranged from one to three days.

All the samples tested at NCDC* Delhi for ELISA and R T-P C R were negative for Ebola virus disease. Some samples were sent for confirmation to NIV Pune. Ebola virus not detected by commercial ELISA test and No evidence of Ebola virus- Specific gene found on RT-PCR in any of the patients tested for EVD* at the Nodal center.

India, had diagnosed an Indian resident's semen sample showing traces of Ebola virus in virus isolation by cell culture at NIV Pune. The man, a 26-year old Indian, working in Liberia, was earlier treated and cured of the deadly virus, was kept in isolation at Delhi's Airport Health Authority Quarantine Center for 165 days. The passenger discharged from Airport authority of India when his sample tested negative.

Case Definition EVD

*Suspected (clinical) case**: Any person ill or deceased who has or had fever with acute clinical symptoms and signs of hemorrhage, such as bleeding of the gums, nose-bleeds, conjunctiva injection, red spots on the body, bloody stools and/ or Melena (black liquid stools), or vomiting blood (haematemesis) with the history of travel to the affected area. Documented prior contact with an EVD case is not required.

Probable case (with or without bleeding): Any person (living or dead) having had contact with a clinical case of EHF and with a history of acute fever. OR Any person (living or dead) with a history of acute fever and three or more of the following Symptoms: headache/vomiting/nausea/loss of appetite/ diarrhea/intense fatigue/abdominal pain/ general muscular or articular pain/difficulty in swallowing/difficulty in breathing/hiccoughs OR Any unexplained death. The distinction between a suspected case and a probable case in practice relatively unimportant as far as outbreak control is concerned.

Contact: A person with no clinical symptoms of EVD* but had Physical contact with EVD* case or Physical contact with the body fluids of EVD* case within three weeks of exposure. The notion of physical contact may be proven or highly suspected such as having shared the same room/bed, cared for patient, touched body fluids, or closely participated in a burial (e.g. physical contact with the corpse).

Confirmed Case: A suspected or probable case with laboratory confirmation (positive I g M antibody, positive PCR or Viral isolation).

APUI: A person under investigation for Ebola Virus Disease:

Defined as person having signs and symptoms of EVD*, Temperature ≥100.4 or subjective fever, headache, fatigue, pain in muscle, abdominal pain, vomiting, diarrhea, or unexplained hemorrhage, and epidemiological risk for EVD, with history of travel to a country with widespread transmission, within 21 days before onset of symptoms. Because of the known possibility of falsely negative results early in the disease, the decision to perform specific Ebola testing based on the degree of exposure and clinical assessment.

Sample Collection

Samples collected at AAI* and Nodal center for Ebola virus disease North India for confirmation of EVD*.

Blood collected by venipuncture into a special vacutainer in which the serum separates out. The tube packaged very carefully into a 3-bag container. A triple packaging for bio-safety provided protection from spillage. Then, shipping took place according to the CDC/WHO guidelines.

As soon as the sample arrived at NCDC in BSL-3/4 Containment Lab and opened in the contained environment. The sample processed as per CDC guidelines and infections confirmed using a real-time RT-PCR assay. Results of tests obtained within 24-48 hours. The NCDC, further sent the sample to NIV Pune* bio safety lab for confirmation if deemed necessary [5,6,9,10].

Ebola virus infections diagnosed definitively in a laboratory through several types of tests: antibody-capture enzyme-linked immunosorbent assay (ELISA), antigen detection tests, serum neutralization test, reverse transcriptase polymerase chain reaction (RT-PCR) assay, electron microscopy. Virus isolation by cell culture samples from patients are an extreme biohazard risk; testing conducted under maximum biological containment conditions [9,10].

Table 1:

No. of passengers screened

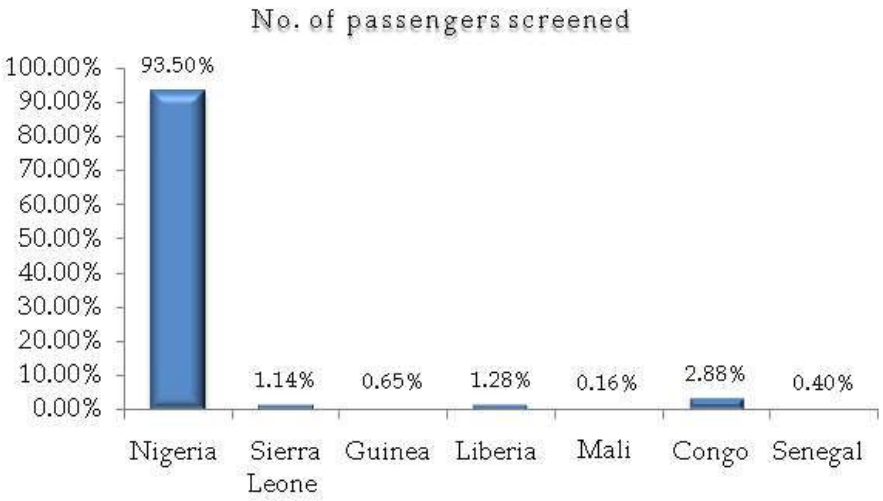
	Percentage
Nigeria	93.50%
Sierra Leone	1.14%
Guinea	0.65%
Liberia	1.28%
Mali	0.16%
Congo	2.88%
Senegal	0.40%
Total	100.00%

Suspected/non suspected

	Percentage
Non suspected	99.53%
Suspects	0.47%
Total	100.00%

Suspected patients

	Percentage
Taken to hospital	16.87%
Not taken to hospital	83.13%
Total	100.00%



Graph 1:

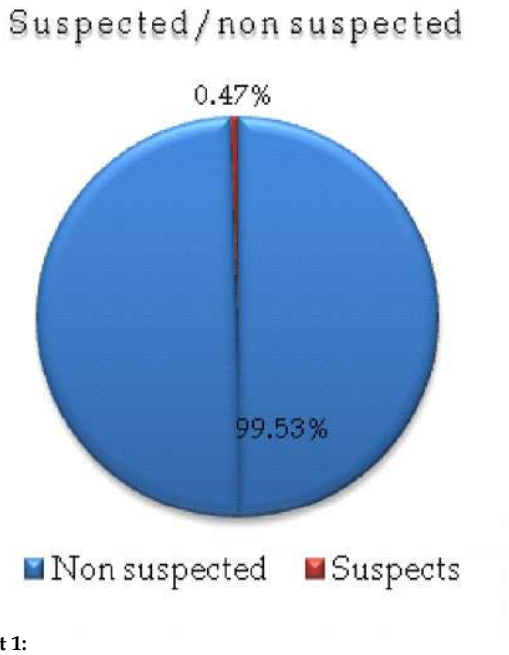


Chart 1:

Chart 2:

Discussion

Nearly 45,000 Indian nationals lived and worked in Guinea, Liberia, Sierra Leone and Nigeria, the worst Ebola virus affected places. In case of further deterioration of the Ebola outbreak situation in the affected countries, Indian nationals would have certainly travelled back to India. Therefore, India was at a high risk of EVD as even a single case could have meant disaster for human security and seriously affected the environment. The risk was even higher since the patients were likely to travel back by air to one of India's megacities like Delhi, Mumbai or Chennai [11].

Since neither vaccine nor definitive treatment was available, prevention was the only option available to control the spread of disease. Therefore, robust surveillance measures were taken to control the spread of the disease.

(i) The study focuses on Screening of passengers travelling from countries having Ebola outbreak, namely Nigeria, Sierra Leone, Guinea, Liberia, Mali, Congo and Senegal from August 2014 to august 2015.

The number of passengers screened was 774683. The table shows that majority 93.50 percent of passengers screened were from Nigeria and rest only 7 percent from the remaining Ebola hit countries.

Medical Tourism in India is the largest service industry, with a contribution of 6.23% to the National GDP and 8.78% of the total employment in India [12] It focuses on medical treatment and utilization of Health care services. India is the choicest destination for people from Low socioeconomic countries because of its high standards of health care and affordability in terms of health care and visa services. In this study, we found that three PUIs were medical tourist with febrile illness. The Nodal center for EVD managed all PUIs. Before international travel, the medical tourist should undergo necessary investigations to avoid quarantine and discomfort in a foreign country. A protocol and specific travel guidelines should be in place for medical tourist during public health emergencies of International concern. Out of the total number of passengers screened only 83 passengers were suspects, which is a statistically significant lower value as shown in the Pie charts. Even the value of suspects or PUIs was statistically insignificant. Although statistically insignificant, the values are clinically of notable significance, as even a single undiagnosed case could have spread into uncontrolled outbreak of EVD. The challenges to India were a high population density, middle lower income status, poor adult literacy rate 13 and greater than 70 percent population lived in rural India. Apart from this, India had highest number of people living below poverty line.

(ii) Our study indicates that during alert or Pre-epidemic our surveillance system was robust to identify the suspected cases at the earliest possible time. A public health Surveillance system and active monitoring was in place to immediately report cases of Ebola virus disease like symptoms [14,15].

In our study, we found that surveillance for 42 days which was double the incubation period. This was done as a doubly safety measure. If the contacts had any fever, intense weakness, muscle pain, headache, sore throat, vomiting, diarrhea, rash, impaired kidney and liver function, and In some cases, both internal and external bleeding then they had to inform Immediately.

(iii). Out of these 83 suspected patients, one 26-year-old passenger was Ebola treated patient from Liberia and 14 patients were with clinical symptoms. He was the first confirmed patient diagnosed with the virus to have landed in India, according to Health Ministry officials. Though his blood samples tested negative for three different tests, his semen samples, tested positive for the virus. Despite the efforts of Indian missions abroad giving advice to the Indian residents abroad, one patient who was Ebola virus cured patient tested positive as his semen samples showed traces of Ebola virus. The patients sample was tested in NIV Pune* and NCDC Delhi. Ebola virus persists in immune-privileged sites in some people who have recovered from Ebola virus disease. These sites include the testicles, the inside of the eye, and the central nervous system. In women infected while pregnant, the virus persists in the placenta, amniotic fluid and fetus. In women who have been infected while breastfeeding, the virus may persist in breast milk. The most common mode is human-to-human transmission.

Studies of viral persistence indicate that in a small percentage of survivors, some body fluids may test positive on reverse transcriptase polymerase chain reaction (RT-PCR) for Ebola virus for longer than 9 months.

Relapse-symptomatic illness in someone who has recovered from EVD due to increased replication of the virus in a specific site is a rare event. In our study, we found that patients treated of EBV recently could transmit; disease via body fluid should avoid travel. As long as blood and secretions contain virus, the person can spread infection [16]. Such patient need to follow protocol while travelling to prevent further spread of infection. The most common mode of human-to-human transmission is direct contact through broken skin or unprotected mucous membranes e.g., the eyes, nose, or mouth, with the blood or body fluids (urine, feces, saliva, semen, and other secretions) of a person who is sick or has died of EVD.

This patient was travelling by air and the he travelled according to the Ministry of Health and Family Welfare guidelines issued to the Airlines. The airline advised to keep first aid kits, triple layer masks, hand sanitizers, disposable bags, isolation management of the patient on board and aircraft disinfection as per the international civil aviation organization (ICAO) guidelines. The ill passenger assisted by dedicated crewmembers. The crewmembers followed all universal precautions and biomedical waste guidelines while handling this passenger. In addition, the crew assisted the Airport Health officer (APHO) and health personnel's in contact tracing. Universal precaution kits as per the International Civil.

Aviation Organization (ICAO) guidelines and a stock of triple layer masks, disposable hand gloves, hand sanitizer and disposal bags were available on board. The NCDC issued guidelines for isolation and management of the cured patient on-board and subsequent aircraft disinfection to the airline. On arrival, aircraft crew helped the Airport Health Officer (APHO) and health personnel's in contact

tracing. Health alerts displayed on airports and at strategic locations. A health declaration card and point of screening of all passengers was at airport.

(iv) According to this study, 14 passenger with clinical symptoms transferred to the Nodal center, as they were APUIs* [17]. In our study, we found that most of the patients admitted in the tertiary care center were due to febrile illness. Two patients turned out to be malaria positive. The initial symptoms of suspected patients of Ebola virus disease were similar to other endemic illnesses like malaria, dengue and it was difficult to diagnose Ebola virus disease based on initial clinical symptoms. Thus, clinical symptoms led to suspicion of EVD and not confirmation. Laboratory tests were the only means to confirm the illness. Suspected patients of EVD* triaged with positive clinical symptoms and travel to country with widespread transmission is direct contact through broken skin or unprotected mucous membranes e.g., the eyes, nose, or mouth, with the blood or body fluids (urine, feces, saliva, semen, and other secretions) of a person who is sick or has died of EVD.

(v) Researchers in this study found that a mother had to accompany a 3.5-year-old child who had febrile illness. Since mother was close contact of PUIs*, and developed fever subsequently she was kept under investigation for EVD*. A contact is any person who has been exposed to a suspect, probable, or confirmed case of EVD in at least one of the following ways: - has slept in the same household as a case - has had direct physical contact with the case (alive or dead) during the illness - has had direct physical contact with the (deceased) case at a funeral or during burial preparation rituals - has touched the blood or body fluids of a case during their illness - has touched the clothes or linens of a case - a baby who has been breastfed by the patient Family, friends, co-workers, and medical staff are the most at risk (WHO)

(vi) Our study showed that the passengers suspected for Ebola virus disease was statistically insignificant. India is a low middle-income country with high density of population. Even a single positive case of EVD* could have become source of uncontrolled spread of the disease. Prevention was the best way of controlling spread of the disease [18].

(vii) Our study showed that all International guidelines for infection control and waste disposal followed meticulously.

(viii) Our study showed the initial symptoms of suspected patients of Ebola virus disease were similar to other endemic illnesses like malaria, dengue and it was difficult to deferentially diagnose EVD* solely on clinical symptoms. A laboratory test was the only means to confirm the illness. Positive clinical symptoms and travel to country with widespread transmission identified suspected patients of EVD*. Other diseases ruled out before a diagnosis of EVD: malaria, typhoid fever, shigellosis, cholera, leptospirosis, plague, rickettsiosis, relapsing fever, meningitis, hepatitis and other viral hemorrhagic fevers, while dealing with Ebola virus disease suspected passengers [19].

(ix) Guidelines for Ministry of Health and Family welfare for Management of Ebola Virus disease patients are single room with attached toilet or patient bed separated at least 3 meters apart, the intensive care facility of EVD* to be designed outside the hospital for isolation.

We faced many challenges in managing Ebola virus disease suspected patients in our tertiary care facility. The facility is a seven-bedded ICU with a common washroom. It is an open ICU where patient beds are kept 3 meter apart.

Since we received international patients, we had to arrange special diet for them, as they were not comfortable with the native diet. The quarantined travelers also brought luggage with them unlike routine ICU patients. Because all the patients were conscious and stable patients, they demanded permission to use mobile phones and laptops inside the ICU. The EVD* suspect patients were from Nigeria and west Africa and had difficulty in communication because of language problem.

Ideally, a biological toilet and treatment of sewerage is essential while dealing with such patients. In our study, we did not have this facility.

Our study indicates that health care workers, doctors and nurses had apprehensions for working with Ebola virus disease patients and counseling was necessary.

Our study shows that the ICU staff was trained in dealing with EVD* patients and also donning and doffing of PPE Kit. Trexler negative pressure isolator system was not available.

Our research indicates that the PPE Kit and N95 mask were used while handling EVD* suspect patients.

Statistical Analysis

Categorical variables were presented in number and percentage (%). Qualitative variable was compared using Chi-Square test. A p value of <0.05 was considered statistically significant. The data collected and entered in MS EXCEL spreadsheet

and analysis done using Statistical Package for Social Sciences (SPSS) version 21.0.

Results

Satisfactory containment of Ebola virus disease during Public health emergency of International concern.

Conclusion and Recommendation

(A) To interrupt all remaining chains of Ebola transmission

(B) To respond to the consequences of residual risks

(C) To work on health systems recovery

(D) To design ICU facility for future use.

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Abbreviation

PUIs* Person Under Investigation for Ebola Virus Disease

EVD* Ebola Virus disease

WHO* World Health Organization

PHEIC* Public Health Emergency of International Concern

NCDC* National Center for Disease Control, New Delhi

NIV* National Institute of Virology Pune.

AAI* Airport Authority of India

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