

# Ebola—a dentist's concern?

## Abstract

Ebola virus disease is a rare, deadly disease prevalent in West Africa. The recent outbreak has been the deadliest so far and cases have been reported far and wide also. The Ebola virus is spread through direct contact with blood and body fluids of an infected person, or with contaminated objects. Chief symptoms include fever, severe headache, weakness, muscle pain, diarrhea, vomiting and unexplained hemorrhages. The case-fatality rate of the current outbreak is approximately 71%. Recovery from Ebola depends on the patient's immune response. No specific vaccination or treatment is available and only symptomatic treatment can be given but a range of blood, immunological and drug therapies are under development. Supportive care-rehydration and treatment of specific symptoms, improves survival. Even though it is highly unlikely that someone with Ebola symptoms will seek dental care, dentists should take a proper medical and travel history and follow standard precautions with effective barrier techniques when giving palliative care for serious oral conditions. Dentists should delay routine dental care wherever possible. It is important to educate and update health care workers including dentists about the various aspects of Ebola and drastic improvements in control measures be done to contain the disease.

**Keywords:** Ebola, dentist, prevention

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Amit Rekhi,<sup>1</sup> Aaron Gomes,<sup>2</sup> Mona Yadav,<sup>3</sup>  
Karan Thakur<sup>4</sup>

<sup>1</sup>Department of Public Health Dentistry Uttaranchal Dental and Medical Research Institute, Dehradun, India

<sup>2</sup>Department of Periodontics Uttaranchal Dental and Medical Research Institute, Dehradun, India

<sup>3</sup>Department of Endodontics and Conservative dentistry Army College of dental sciences, Secunderabad, India

<sup>4</sup>Department of District Quality Manager Haryana State Health Resource Centre, Rohtak, India

**Correspondence:** Amit Rekhi, Department of Public Health Dentistry Uttaranchal Dental and Medical Research Institute, Mazri Grant, Haridwar Road, Dehradun, Uttarakhand, India, Email rekhamit@gmail.com

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## Introduction

Ebola Virus Disease, caused by Ebola virus and previously known as Ebola hemorrhagic fever. It is a rare and deadly viral illness which is prevalent mostly in the Western part of the African sub-continent. This virus can cause acute febrile illness associated with high mortality.<sup>1</sup> Ebola virus has four readily distinguishable subtypes named after the site where they were first discovered (Zaire, Sudan, Cote d'Ivoire, and Reston). Except for sub type 'Reston', all cause severe and often fatal disease in humans.<sup>2</sup> Epidemics have occurred in the Democratic Republic of Congo, Sudan, Gabon, Republic of Congo, and Uganda. Reston ebolavirus circulates in the Philippines. It has caused disease in nonhuman primates but not in humans.<sup>3</sup> The first epidemics associated with inter human spread of severe hemorrhagic fever caused by Ebola virus were reported in Zaire and Sudan in 1976 which were caused by different strains.<sup>4</sup>

In a major epidemic, the Zaire subtype recurred in Democratic Republic of Congo in 1995 where mortality was high and transmission to caregivers and people in direct contact with bodies was common. Initial Ebola 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.<sup>2</sup> Epidemics usually occur with a single case acquired from an unknown reservoir in nature and spread mainly through close contact with sick persons or their body fluids.<sup>5,6</sup> March 2014 saw an outbreak of a highly fatal communicable disease in Guinea characterized by fever, severe diarrhea, vomiting and was notified to the World Health Organization. Virologic investigation identified Zaire Ebolavirus (EBOV) as the causative agent.<sup>2</sup> As for the reservoir, no conclusive animal source could be elucidated but bats were speculated to have a possible role in transmission. Apes, man, and perhaps other mammalian species are regarded as end hosts of Ebola virus.<sup>1-4</sup>

## Pathology and pathogenesis

The Ebola virus replicates in all cell types of multiple organs. Viral replication is associated with cellular necrosis. Pro-inflammatory cytokines are found to be in high levels which contribute to severity of illness. Acute infections are associated with high levels of circulating virus and viral antigens which may escape through small breaks in skin or through sweat glands and may hence contribute in its spread. The infected patients have high circulating levels of pro-inflammatory cytokines which are thought to contribute to the severity of illness.<sup>4-6</sup>

## Transmission

The Ebola virus is spread through direct contact (broken skin or mucous membranes) with blood and body fluids (urine, feces, saliva, vomit and semen) of a person who is sick with Ebola, or with objects (like needles) that have been contaminated with the virus. Ebola is not spread through the air, water or food. However, in Africa, Ebola may be spread as a result of handling bushmeat (wild animals hunted for food) and contact with infected bats.<sup>1-7</sup> 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.<sup>1</sup> Such a case was seen during the 1995 epidemic in Congo where poor hygiene in hospitals and lack of personal protective equipment exacerbated the spread.<sup>5</sup>

## Symptoms

The most common symptoms associated with Ebola are:<sup>6,8</sup>

- Fever (greater than 38.6°C or 101.5°F)
- Severe headache

- c. Muscle pain
- d. Weakness
- e. Diarrhea
- f. Vomiting
- g. Abdominal (stomach) pain
- h. Unexplained hemorrhage (bleeding or bruising)

After an incubation period (2 to 21 days), patient abruptly develops fever, severe headache, myalgia, malaise, nausea and vomiting. Chest pain with cough and severe diarrhea follow. A maculopapular rash may be seen in light skinned people around 5 to 7 days and is followed by desquamation. Bleeding usually begins at this time apparent from any mucosal site into the skin. Around 10 to 12 days after the onset, fever may break and improvement occurs. In fatal cases, death occurs usually between 6 and 16 days after infection, and multiple organ failure.<sup>1,5</sup> The case-fatality rate of the current outbreak is approximately 71%. Complications may include:

- a. Hypovolemia
- b. Electrolyte abnormalities
- c. Hematologic abnormalities
- d. Refractory shock
- e. Hypoxia
- f. Hemorrhage
- g. Septic shock
- h. Multiorgan failure
- i. Disseminated intravascular coagulation.<sup>7</sup>

## Diagnosis

Diagnosing Ebola in a 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 or even common flu. 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: Antigen-capture Enzyme Linked Immunosorbent Assay (ELISA), IgM ELISA, Polymerase chain reaction and virus isolation to be done within a few days after symptoms begin. For later in the disease course or even after recovery, IgM and IgG antibodies tests can be done. For deceased persons, PCR Or Virus Isolation Can Be Done For Retrospective Confirmation.<sup>1,9</sup>

## Treatment and prevention

Several challenges have prevented containment of the outbreak in Ebola hit areas such as inadequate awareness regarding epidemics, improper health care systems, lack of resources, limited facility for timely and coordinated response among governing bodies, inadequate surveillance and monitoring, improper isolation and

containment measures and lack of laboratory facilities.<sup>10</sup> 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.<sup>1</sup> No specific treatment is available and only symptomatic treatment can be given but a range of blood, immunological and drug therapies are under development. Supportive care-rehydration with oral or intravenous fluids and treatment of specific symptoms, improves survival. Clinical management focus is on supportive care of complications. Recommended care includes volume repletion, maintenance of blood pressure and oxygenation, pain control, nutritional support and treatment of secondary bacterial infections or pre-existing co-morbidities.<sup>7</sup> Research on an effective vaccine for Ebola has been ongoing but currently no vaccination is available. Hence, effective barrier techniques and personal protective equipments (PPE) are the main focus now. PPE should feature PAPR or an N95 respirator with facemask, double gloves, disposable gown, and boot covers.<sup>11</sup> Regular hand washing is required after visiting patients in hospital, as well as after taking care of patients at home. Community engagement is key and 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 mobilization.<sup>1-12</sup> For reduction in animal to human transmission, animals should be handled with gloves and other appropriate protective clothing. Animal products should be properly cooked before consumption.<sup>1</sup> Although it is highly unlikely that a person infected with Ebola would seek dental care, health-care workers should always take standard precautions when caring for patients even if they are not suspected to have Ebola. These include basic hand hygiene, respiratory hygiene, use of personal protective equipment (to block splashes or other contact with infected materials) and safe injection practices. In case of patients with suspected or confirmed Ebola virus, treatment should be deferred and extra infection control measures should be applied to prevent contact with the patient's blood and body fluids and contaminated surfaces or materials such as clothing and bedding.<sup>1-13</sup> A study of Canadian pediatric emergency medicine physicians<sup>14</sup> published in March 2011 found that 22% of physicians had not received training in the use of PPE and 32% had not been trained in the past 2 years. Nearly half of physicians were unsure of their knowledge of transmission-based isolation practices. Another review of infection control practices of healthcare workers following the SARS (severe acute respiratory syndrome) outbreak revealed that failure to implement appropriate PPE is responsible for most hospital-acquired infections.<sup>15</sup> These studies somewhat serve as a warning regarding our collective preparedness for a serious infectious disease. If a person travels to or are in an area affected by an Ebola outbreak, make sure to practice careful hygiene and 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 and 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 and after you return, monitor your health for 21 days and seek medical care immediately if you develop symptoms of Ebola.

In wake of the current Ebola crisis, the nation of Ghana planned out a program in which participants were trained about the current outbreak with the aim to orient them on the available tools, guidelines and strategies for prevention, surveillance, case management and control. Also to review current country preparedness and response

plans in line with recent WHO recommendations on Ebola. The goal was to make sure that all trained personnel had sufficient knowledge of the disease and its transmission routes and the training also focused on the psychological dimension associated with the patients and their families along with reduction of the impact of fear, stigma and stress among the health care personnel. Similar training program was also organized in Brussels for experienced doctors, nurses and sanitation specialists recruited for the first time into a program for fighting an Ebola outbreak in affected countries.<sup>16</sup> Data collection, collation and analysis are critical components of surveillance and epidemiological investigations for any disease. Keeping this in mind, the country of Sierra Leone conducted such a procedure and in spite of initial setbacks, found that surveillance and data management improved at the district and national levels over time. A complete data could not be finalized since the initial data had lots of variables which were dropped later and were not compensated for.<sup>17</sup> Alternate methods such as mobile phone based surveys have also found to be effective in data collection especially when coupled with regular methods.<sup>18</sup>

## Guidance to dental professionals on the Ebola virus

It is important that dental healthcare workers appreciate the low level of risk in dentistry and understand the concept of how Ebola spreads. A review of infection control policies and procedures is done. Dentists should be prepared to address any transmissible disease including influenza and other diseases that are more likely to present in a dental practice. A person infected with Ebola is not considered contagious until symptoms appear. Due to the virulent nature of the disease, it is highly unlikely that someone with Ebola symptoms will seek dental care when they are severely ill. However, according to the Centers for Disease Control and Prevention<sup>7</sup> and the ADA Division of Science,<sup>13</sup> dental professionals are advised to take a medical history which should include a travel history from their patients with symptoms associated with viral infection. Any person within 21 days of returning from the West African countries may be at risk of having contacted persons infected with Ebola and may not exhibit symptoms and dental professionals are advised to delay routine dental care of the patient until 21 days have elapsed from their trip. In case palliative care for serious oral health conditions, dental infections and pain is needed, it can be provided after consulting with the patient's physician and conforming to standard precautions and physical barriers. The wearing of protective eye-ware is strongly recommended especially when using high speed instrumentation.<sup>19</sup> It is however advised not to treat dental patients if they have these signs and symptoms for Ebola. If a patient is feeling feverish and their travel history indicates they may be at risk of Ebola, dental professionals and staff in contact with the patient should immediately protect themselves by using standard precautions with physical barriers (gowns, masks, face protection, and gloves), notify the appropriate government health department authorities and ask the health department to provide you with the appropriate guidance on removing and disposing of potentially contaminated materials and equipment.<sup>12,13</sup> Frequent decontamination with a disinfectant wipe or alcohol-based hand rub, even while still wearing potentially soiled gloves, is important when disposing of PPE. Visibly soiled areas in the patient's room should be cleaned immediately. Dentist or assistant should perform cleaning tasks while engaging in patient care activities in order to limit the number of workers in the patient's room. Practical precautions should be ensured during patient care such as keeping hands away from face, limit

touching surfaces and body fluids, preventing needle stick and sharp injuries and using an alcohol based hand scrub for disinfection of gloved hands.<sup>12</sup> Newly emerging diseases in the future will probably have yet different features again. Therefore infection control measures in the dental surgery should be evaluated from the point of view of a wider range of possible routes of infection and pathogen behaviors. Those measures should, where possible, be optimized to meet hitherto unforeseen situations. Jain et al conducted a program among dental health care professionals in which information was provided about the various aspects of Ebola. A high response rate and good knowledge level attained by most of the participants established evidence of a successful program. Such programs are a great help in disseminating knowledge about diseases like Ebola which are relatively newer to various countries worldwide.<sup>20</sup>

## Conclusion

The current Ebola epidemic has been the worst one in history with the highest recorded deaths. Never before in recorded history have so many people been infected so quickly, over such a broad geographical area, for so long. Although it was limited to West African nations, due to the increase in global travel from these areas, cases have been detected in other regions of the world too and Ebola clearly has a potency to become a global disease. Ebola virus disease currently has no vaccines or approved medicines and the emphasis has shifted to its prevention of spread than its cure. Health care workers including dentists from not only the West African nations but from around the world need to be educated about the various aspects associated with Ebola and without drastic improvements in control measures, the numbers of cases and deaths will continue to increase in the near future.

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## Conflicts of interest

Authors declare that there is no conflict of interest.

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