



Correspondence

The Ebola Resurgence in Democratic Republic of Congo

Ebola virus which belongs to Filoviridae family is a highly communicable infection with a high case fatality rate [1]. The genus Ebolavirus contains five species of which the Zaire ebolavirus is commonly known as the Ebola virus (EBOV). It is the primary causative agent of Ebola virus disease (EVD) and is commonly related to human outbreaks [2].

The first filovirus cases were detected at Germany in 1967, and the responsible agent was identified as the Marburg virus [3]. Related incidents about hemorrhagic fever were reported in 1976 from outbreaks in two neighboring countries: South Sudan at first followed by and North Zaire (now Democratic Republic of the Congo (DRC)) [4,5]. An unknown causative agent was isolated from these and named geographically after a river in Northwestern DRC as "Ebola virus" which years later was identified as Sudan Ebola virus and Zaire Ebola virus [6].

EVD has high mortality rate (30–90%) and affects both humans and animals. EBOV is ubiquitous in nature with fruit bats being a natural reservoir known to keep the virus in an enzootic cycle [1]. A human infection is an accidental event that occurs in case of a human-animal interface when contacted with infected humans or animals' blood or body fluids [2]. The disease begins with symptoms such as fever, malaise, bodyache, fatigue, and muscle aches. Gradually other severe symptoms may be seen like persistent vomiting, diarrhea, hemorrhage, disorientation which may eventually lead to coma and death. Surviving patients' convalescence phase lasts several months post primary infection. It is classified as "Post EVD syndrome" presenting as fatigue, joint pains, loss of appetite and memory loss [7].

EVD caused minor outbreaks in scattered villages in Africa till 2014. Being a neglected disease, there was minimal research performed in EBOV disease management and main focus was laid on biological aspects of viral infection [8]. Nevertheless, the latest EVD outbreak in Western Africa with 28,616 cases and 11,310 deaths underlined the disease's global threat and the impact it had on the world economy [9].

On August 2022, the DRC government declared an Ebola resurgence after the first case of EVD was detected in the Eastern province of North Kivu. The patient was identified as a 46-year-old woman, resident of a town in North Kivu who succumbed to her illness and died in Beni on August 15, 2022. She was initially treated for other ailments, but later developed signs and symptoms consistent with Ebola virus disease [10]. The present case has been genetically linked to the 2018–2020 outbreak in the similar geographic area [11]. Contact tracing and surveillance was started and WHO personnel and health officials identified 134 hospital contacts and 9 close family members, all of whom are being closely monitored for any new signs and symptoms. The vaccination status of the confirmed case is still being investigated. In order to control the situation, 200 of the total one thousand doses of rVSV-ZEBOV Ebola vaccines available in the country are expected to be sent to Beni this week. "Ring-vaccination" - a strategy where the first and second level contacts of the confirmed cases are vaccinated to curb the spread of the

virus was launched on 25th Aug 2022 [12]. Ring vaccination is one of the pivotal strategies to put a halt to the transmission and to control the spread of the disease [12].

Democratic Republic of Congo is an endemic zone for the disease. It accounts for the maximum number of Ebola outbreaks seen in the world. Out of the total fourteen outbreaks seen, six of them have been reported after 2018 [13]. A French province in the eastern part of DRC witnessed one of the largest and deadliest ever documented Ebola outbreak from August 2018 to June 2020. The nearly two yearlong out-break took place in an active conflict zone and was particularly challenging to control. The DRC health officials ably supported by the WHO and its partners responded at the earliest and prevented the global spread of the disease. There was surveillance of around 2, 50,000 registered contacts, extensive testing of 2, 20,000 patients, provision of high-end medicines to patients. Ring vaccination of more than three lakh people with the best available vaccine and care for all survivors after their recovery was given. More than 16,000 local frontline health care responders and 1500 people deployed by WHO worked hand in hand during this period [14]. On February 7, 2021 the MOH in the DRC announced that a case of EVD was confirmed in Biena Health Zone, North Kivu Province. Sequencing of samples linked the cases in the area to the 2018–2020 outbreak. The likely cause was suspected to be relapse or sexual transmission of virus due to persistent infection in the survivors. After 42 days (two incubation periods) of the viral disease on May 3, 2021, with no new cases tested positive and the last survivor tested negative and released from the Ebola treatment centre, the DRC MOH and World Health Organization (WHO) announced the cessation of outbreak. 12 cases (probable and confirmed) and 6 deaths were reported in this outbreak [15]. In the last three months of year 2021, eleven cases were reported in total of which eight were laboratory confirmed and three were probable from Beni HZ. Of the total 11, 9 deaths occurred demonstrating a high case fatality ratio (CFR) of 82%. A total of 21,916 alerts were reported from nine health zones including 15,642 from Beni during the same time period, 21,558 (98%) of which were investigated and 1709 were validated as suspected cases of EVD [16].

High CFR is a huge concern with EVD and another red flag which is of great concern is "Post EVD sequel" as not only it affects a large number of survivors also it manifests itself over a long interval. Many survivors experience cognitive, psychiatric, or physical abnormalities. Researchers have stated that one-third of the survivors have uveitis leading to blindness. Some of the survivors also have experienced memory loss too. During the 1 year of evaluation, survivors were more likely than controls to have abnormalities on neurologic, muscle, joint, chest, and abdominal examination. Ebola virus was detected on an average of 19 months post the disease in semen of one-third of the male survivors, however its genetic/teratogenic effects needs further evaluation [17].

EVD epidemic had a major influence on the entire world. 28,000

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cases of EVD and 11,300 deaths were reported in Guinea, Liberia, and Sierra Leone in 2014–2016. An additional 36 cases and 15 deaths were also reported when the outbreak spread out to other neighboring and non-endemic countries [18]. During the epidemic, Liberia lost a significant proportion of its health care workers to EVD. The situation was further worsened by the outbreak as regular health care delivery services were severely impacted along with management of the major infectious diseases prevailing in these countries. Most of the EVD cases were seen in children under fifteen years of age with an estimated 30,000 children orphaned during the epidemic. It led to a huge financial burden with a loss of about \$4.3 billion USD [18].

A potential outbreak is again expected in near future due the high frequency of Ebola resurgences in the country, which is alarming. Along with Ebola, DRC is juggling to respond to other diseases, such as cholera, measles, polio, yellow fever and monkeypox while putting further pressure on the healthcare system and resources. Extreme preventive and surveillance measures must be undertaken to prevent a significant loss in financial growth in all sectors along with preventing decrease in cross-border trade and tourism. WHO is raising public knowledge about preventative measures about the existing situation by recommending processes in seeking health care, with regards to isolation and is training healthcare personnel on how to limit the transmission of the disease. Finally, efforts should be focused on adequate and early disease suspicion, surveillance, case identification, isolation, care, and prevention.

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RS and AM design and draw the original draft, VM, PS, BKP and AJRM review the literature, critically edit the manuscript. All authors read and approve for the final manuscript.

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Declaration of competing interest

No conflicts of interest.

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