



Marburg virus disease outbreak in Tanzania: current efforts and recommendations – a short communication

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Abstract

On 21 March 2023 the Tanzania's Ministry of Health reported the first Marburg virus disease (MVD) outbreak in Bukoba District reporting a total of eight cases and five fatalities including one health care worker with a case fatality ratio of 62.5%. MVD is a filoviral infection with an estimated incubation of 3–21 days and causes severe hemorrhagic fever in humans. Fruit bats are significant reservoir host leading to animal-to-human transmission and human-to-human transmission by direct contact of body fluids from an infected person. Symptoms and signs include fever, vomiting, diarrhea, body malaise, massive hemorrhage, and multiorgan failure. Currently, no definitive treatment or licensed vaccines are available to date but only supportive care. This outbreak is an alarming concern to the neighboring countries to contain the outbreak. Within 3 years from 2020 to 2023 Tanzania has already recorded one pandemic, which is the novel coronavirus disease 2019 and two epidemics, which are Cholera, Dengue, and now MVD. Tanzanian's Ministry of Health is drawing lessons from the previous health emergencies to contain this particular epidemic. To impede the MVD outbreak in Tanzania, the focus of this commentary is on highlighting the efforts performed and the significant recommendations provided to relevant organizations and the general public.

Keywords: disease outbreak, Marburg virus disease (MVD), Marburgvirus (MARV), public health

Introduction

Marburg virus disease (MVD) is one of the deadly viral diseases that causes a severe hemorrhagic fever to the infected subject and occurs infrequently compared to Ebola virus disease in the filovirus family. The reservoir hosts of MVD are considered to be fruit bats, where transmission of the disease occurs between fruit bats and humans and through human-to-human transmission with an estimate of 3–21 days of incubation. MVD presents initially with

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HIGHLIGHTS

- MVD is one of the dangerous hemorrhagic disease with very high mortality rate whose transmission is mainly from fruits bats and humans and through human-to-human transmission.
- MVD has been confirmed for the first time in Tanzania on 21st March, 2023 in Bukoba district as a result calls for safety precautions for the neighboring countries.
- MVD outbreak requires early containment to prevent quick spread, that makes Tanzanian MoH well deserving for efforts implemented and lessons learnt for a successful disease containment in short period of time. Despite the containment efforts, a need for research to establish specific treatment is warranted.

prodromal symptoms comprising high fever, rigors, nausea, diarrhea, vomiting, and malaise, then progresses to a severe hemorrhagic fever presenting as intense myalgia, extensive hemorrhage, and possibly multiple organ failure postprodrome^[1,2].

The first outbreaks of MVD occurred concurrently in German and Serbia in 1967, when laboratory workers were exposed to African green monkeys developed the disease, MVD has occurred in 17 countries with documented outbreaks worldwide^[1]. On 21 March 2023, Tanzania's Ministry of Health (MoH) in Tanzania declared an outbreak of MVD in Bukoba district a critical domicile for the neighborhood's interaction with Uganda, where four MVD outbreaks have been recorded^[1,3,4].

The key factors for this recent outbreak might be significant contact of humans with unknown pathogens and reservoir hosts

A MAP OF TANZANIA SHOWING MVD OUTBREAK.



Figure 1. Green color shows region in Tanzania with Marburg virus disease outbreak.

following an increase in human activities such as agriculture in the region, which expose people to the wildlife. However, it is also paramount to appreciate that Tanzania falls within the ecological distribution of filoviruses thus, becoming a potential location for unanticipated Filovirus outbreaks^[5]. This recent outbreak gives a red light to the nation and its neighboring countries to take the necessary precautions to mitigate MVD's dissemination and ultimately prevent further repercussions in the near future as a result of this most recent outbreak. Therefore, this paper focuses on highlighting efforts employed and salient recommendations to the bodies and the whole community in mitigating MVD (Fig. 1).

Epidemiology of MVD

Despite the report of the first outbreak being in Europe, there have been multiple outbreaks of the disease in Africa that have sometimes been in small cluster of cases while other have resulted into marked mortality and morbidity^[6]. Two cases with one individual who had visited the Kitum caves, a well-known bat habitat, was a part of the 1980 epidemic in Kenya, and there were

three cases in the 1975 outbreak in Zimbabwe and South Africa^[7]. There were 374 confirmed cases in the 2004–2005 outbreak in Angola, and 154 confirmed cases in the 1998–2000 outbreak in the Democratic Republic of the Congo with an 83% mortality rate^[8].

In 2007, it was found that bats inhabited the disease-prevalent mining tunnel, and four Ugandan employees subsequently contracted MVD. A new fatal case was reported in 2014, and this was succeeded by 197 more cases^[9].

A strategic risk assessment conducted by the WHO in 2012 elucidated that Tanzania is at very high risk of developing recurrent infectious disease outbreaks. For a period of 3 years from 2020 to 2023, Tanzania has already recorded one pandemic, which is the novel coronavirus disease 2019, and two epidemics, which are cholera, dengue, and now MVD^[3]. On 21 March 2023, the first outbreak of MVD was declared by the MoH in the lake zone district of Bukoba, Kagera^[10]. Eight cases were reported with five mortalities including a health worker while the other three being on management with case fatality ratio of 62.5%, further epidemiological investigations

Year	Location of outbreak	Cases	Deaths	CFR (%)	References
1998–2000	Democratic Republic of Congo	154	128	83	[11]
1975	South Africa/Zimbabwe	3	1	33	[12]
1980	Kenya	2	1	50	[13]
1987	Kenya	1	1	100	[14]
2004–2005	Angola	374	329	88	[15]
2007	Uganda	4	1	25	[5]
2012	Uganda	15	4	27	[5]
2014	Uganda	1	1	100	[11]
2017	Uganda	3	3	100	[16]
2023	Tanzania	8	5	63	[17]

CFR, case fatality ratio.

have been deployed with 205 contacts being under follow-up^[3] (Table 1).

Etiology of MVD

The *Mononegavirales* virus group, family *Filovirinae*, genus Marburg virus, and the only Marburg virus strain, comprise the virus that causes Marburg hemorrhagic fever^[11]. The reservoir host of Marburg virus is the fruit bat by the other name *Rousettus aegyptiacus* also discovered in monkeys and chimpanzees. Numerous outbreak have occurred in mines as attributed to the habitat of various bat species^[2].

Human-to-human transmission is mainly via direct contacts with body fluids from an infected person, such as blood, saliva, mucus, tears, vomits, semen, and feces. It also spreads through fomites or contaminated surfaces^[12,13]. This increases the chance of transmission to medical workers and other family members attending funeral services or caring for the sick. When the virus enters the patient's body, it replicates in endothelial cells and trigger release of cytokines, which increase vascular permeability and extravasation. This in turn results in severe symptoms including fever, malaise, blood coagulability, and bleeding diatheses comprising hemorrhage to appear rapidly. Further complications such as immunosuppression, systemic inflammation, multiple organ failure, shock, and eventually leading to death of victim^[14].

Current efforts to mitigate MVD in Tanzania

After reports of unusual illness among patients from two villages in the Northwest Kagera region, the MoH issued a statement describing the situation^[15]. The government through the MoH, responded by taking the following measures:

Samples from the patients, suspects, and contacts were collected and sent to the National Public Health Laboratory for subsequent testing to reach an official diagnosis for the unknown illness, later confirmed to be MVD. The tracing of individual case contacts among family members and caregivers for testing and isolation was employed to contain the spread of the disease alongside early initiation of management for newly detected cases. As of 28 March 2023, a total of 205 contacts were reported found and kept in a special isolation facility for monitoring of symptoms^[16]. Rapid Response Teams from the district and regional levels were deployed immediately to implement response

measures. The Ministry also sent Internal Medicine specialists and Nephrologists to join the response team in the region to advance care for the affected populace^[16].

A mass education campaign for preventive measures is being given to the general public, and emphasis on Infection Prevention and Control protocols among health care workers is being mandated. It has been noted that the government kept the international organizations informed of the situation on the ground. The Minister, along with resident representatives of the WHO and UNICEF, visited the facilities and response team to supervise the implementation on site^[17]. Tanzania is drawing lessons from the previous outbreaks which are coronavirus disease 2019, Cholera to contain this particular epidemic^[3].

Recommendations

It is a challenge to effectively control MVD as no definitive treatment or licensed vaccines are available to date but only supportive care, hence highly important to break the vicious cycle of viral dissemination by targeting secondary transmission^[6]. WHO recommendations suggest implementing The One Health strategy to health threats at the animal–human–environment interface and rapidly contain zoonotic diseases like MVD^[2,18]. Safe sex practice to male survivors of MVD for a duration of 1-year from clinical manifestation or required to receive two MVD tests performed on their semen, with the results of both tests having to be negative^[7].

It is important to provide health care workers with adequate personal protective equipment in order to implement infection prevention and control measures for the protection of their colleagues and contacts. Social leaders must be well informed of MVD to be in a position of raising awareness to the community on associated risk factors. These include the avoidance of bodily fluid contact, the proper sanitary preparation of animal products and the thorough cooking of blood and meat, adequate hand hygiene, preventing contact with the disease's natural reservoir, the fruit bat and apes, the donning of in-date personal protective equipment (application of facemasks, gloves, and gowns) when in contact with animals, and safe burial procedures for the victims who have succumbed to MVD^[2,6]. To appreciate local beliefs that could lead to rejection and late disease detection during contact tracing, which may perpetuate the outbreak of MVD, designs of leaflets and posters in Swahili and the respective local languages may target the rural populace^[19].

Conclusion

The MVD outbreak in Tanzania is a clear indication that the East African community needs to take the necessary measures to mitigate the dissemination of the disease, eventually avoiding further implications. The disease, which has been documented in many countries worldwide, is linked to high mortality rates. Major human–pathogen interactions and reservoir hosts have been the main etiologies of this epidemic due to an increase in local human activities like agriculture that expose humans to wildlife. For its efforts, which include contact monitoring and epidemiological study, the Tanzanian MoH deserves praise. However, there is a need for a One Health approach involving multisectors to address health threats in animal–human–environment interfaces for rapid containment of MVD. Future research is warranted to develop a specific treatment or licensed vaccination program for the disease.

Ethical approval and consent

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All authors contributed in writing the draft, revised, and approved the final draft.

Conflicts of interest disclosure

No conflicts of interest declared.

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Availability of data and materials

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