



PERSPECTIVE

The recent outbreaks of Marburg virus disease in African countries are indicating potential threat to the global public health: Future prediction from historical data

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Abstract

Marburg virus disease (MVD) caused by the Marburg virus has a high mortality rate. *Rousettus aegyptiacus* fruit bats act as the natural reservoir host of the virus. But it can also potentially be transmitted from person to person through direct contact with body secretions. The recent outbreaks have already killed seven people out of nine confirmed cases in Equatorial Guinea and five patients out of eight confirmed cases in Tanzania. In the recent past, Ghana reported three MVD cases and two associated deaths in 2022. Specific treatments or vaccines are unavailable for MVD, and supportive care is the primary treatment option. The history of MVD outbreaks and the current scenario show its potential to become an emerging threat to global public health. The recent outbreaks in Tanzania and Equatorial Guinea have already caused a high fatality rate. The absence of effective treatment and vaccines raises concerns about the potential to cause widespread harm. Besides, its capacity for human-to-human transmission and potential to cross the country's border could result in a multicountry outbreak. Therefore, we recommend intensive surveillance of MVD, preventative measures, and early detection to limit the spread of the disease and prevent another pandemic.

KEYWORDS

communicable diseases, disease outbreaks, hemorrhagic fevers, Marburg virus disease, Marburgvirus, public health

1 | BACKGROUND

The recent outbreak of the lethal Marburg virus disease (MVD) in Tanzania and Equatorial Guinea has caused widespread concern and fear among the general population, who are still fighting the COVID-19 pandemic. Recently, the world health organization (WHO) declared MVD as an outbreak in February 2023 when

Equatorial Guinea reported nine confirmed and 20 probable cases. Seven people out of all the confirmed cases have died, and all the suspected patients have also passed away in Equatorial Guinea. As of March 24, 2023, Tanzania reported five deaths out of eight confirmed cases.^{1,2} According to WHO, MVD causes severe viral hemorrhagic fever. The reported mortality rate of MVD is as high as 88 percent.³ The Marburg virus is a zoonotic virus clinically similar

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to the Ebola virus belonging to the Filoviridae family (filovirus).⁴ Studies have shown that the natural reservoir host of this deadly virus is the *Rousettus aegyptiacus* fruit bat species living in caves or mines.⁵ But the human-to-human transmission of the virus is a matter of concern as it can transmit through direct contact with body secretions.⁶ No specific treatment is available for this disease, and scientists are yet to discover a vaccine or antiviral drug effective against MVD. The treatment of the infected person is mainly supportive.⁴ Besides African people, the high fatality rate of the recent MVD outbreak has created panic among people worldwide. The general population is already struggling to deal with the COVID-19 pandemic that has not ended yet. Among these circumstances, the recent multicountry MVD outbreak is an additional challenge to the public health sector. The Africans have already seen the cruel face of the Ebola virus. The similarity of MVD with the Ebola virus is a matter of concern as well.⁷ The recent outbreak started in Equatorial Guinea. Later, it spread to Tanzania. Hence, MVD can create multicountry-outbreak similar to COVID-19 or Mpox. Therefore, the present study aimed to assess the current scenario of MVD and the potential threat for the multicountry outbreak. Also, we would like to inform the respective authorities about the gravity of the recent MVD outbreaks and suggest possible preventive measures to prevent another pandemic similar to COVID-19.

2 | HISTORY OF MVD

An unknown causative virus infected several laboratory workers in Frankfurt, Germany, and Belgrade, Yugoslavia (now Serbia) in 1967. Later, scientists discovered that the causative agent came from African green monkeys imported from Uganda for research purposes. Among 31 reported cases, 7 died. The scientists of Marburg and Hamburg characterized and identified that unknown agent. Then the pathogen was named Marburg virus as the highest number of cases found in Marburg city, Germany.⁸ Following this incident, we observed no significant rise in MVD cases before 1998. Between 1967 and before 1998, Kenya reported two cases in 1980 and one in 1987. South Africa reported three confirmed cases and one associated death in 1975. Also, Russia reported a confirmed MVD case and related death in 1990.⁹ After that, MVD created two massive outbreaks in the Democratic Republic of the Congo and Angola. From 1998 to 2000, Democratic Republic of Congo reported 154 confirmed cases with a fatality rate of 83%.¹⁰ Also, Angola reported 252 confirmed MVD cases with a fatality rate of 90%.¹¹ The case fatality rates for the subsequent four outbreaks in Uganda ranged from 27% to 100% and occurred in 2007, 2012, 2014, and 2017.¹² In August 2021, the Republic of Guinea identified its first case of Marburg virus infection.¹³ In 2022, Ghana reported three confirmed MVD cases and two associated deaths.¹⁴

Recently, MVD has spread in Tanzania and Equatorial Guinea with an alarming fatality rate. Government representatives in Equatorial Guinea first reported one confirmed case and a few

suspected cases of MVD on February 13, 2023. As of March 21, 2023, Equatorial Guinea has reported nine confirmed MVD cases and 20 potential cases with seven associated deaths. The government officials of Tanzania declared its first-ever outbreak of MVD on March 21, 2023. As of March 22, 2023, the country reported eight confirmed MVD cases and five related deaths from two villages in the Bukoba district, Kagera region. The authorities are testing the suspected cases and isolating many suspected people in both countries.¹⁵ We presented the major outbreaks of Marburg virus infection as of May 2023 in Table 1.

3 | MVD, AN EMERGING PUBLIC HEALTH THREAT

The incubation period of the MVD is around 2–21 days. The most common symptoms of the disease include high fever, headache, malaise, muscle aches, diarrhea, abdominal pain, and cramping. It may also affect the nervous system resulting in confusion, irritability, and aggression. As MVD was previously known as Marburg hemorrhagic fever, hemorrhagic fever is the main characteristic symptom of the disease. Severe blood loss and shock result in death.¹⁰ The cases in Tanzania reported fever, vomiting, bleeding, and renal failure. However, fever, vomiting, and multiorgan failure were the symptoms of infected people in Equatorial Guinea.¹⁶ It is difficult to ascertain the MVD as its symptoms are similar to malaria, typhoid, and other viral fevers. But early detection is the key to managing this disease. Marburg virus infection can be identified through various ways such as antibody-capture enzyme-linked immunosorbent assay, antigen-capture detection tests, serum neutralization test, reverse transcriptase polymerase chain reaction assay, electron microscopy, and virus isolation by cell culture. There are no established preventive and therapeutic options for this disease. The treatment of the infected person is mainly supportive. The patients are usually treated based on their symptoms. The absence of specific treatment measures and the high fatality rate is concerning signs of the disease to the world.

Marburg virus is a zoonotic virus belonging to the Filoviridae family (filovirus). Fruit bats (*Rousettus aegyptii*) are natural reservoir hosts of the Marburg virus. The virus can infect monkeys but cannot act as a reservoir because they usually die once infected. However, pigs are susceptible to filovirus and can shed the Marburg virus. Therefore, it usually transmits through *Rousettus* bat colonies in mines and caves. But it may also get transmitted through body fluids among humans. Human-to-human transmission may happen through blood, secretions, bodily fluids, and tissues. The contaminated material of the infected person may also transmit the virus to another person. Also, sexual transmission of the virus can occur as it remains in semen for a maximum of 7 weeks after clinical remission.³ The virus can transmit to humans through nonhuman primates.¹⁷ Being an RNA virus, the Marburg virus is also prone to mutation like COVID-19.^{18–20} This mutation may increase the power of the Marburg virus in terms of virulence, transmissibility, mortality, and morbidity rate.^{21–25} Therefore, it can become a potential threat to

TABLE 1 Recorded outbreaks of Marburg virus infection as of May 2023.^a

Year(s) of outbreak	Country	Suspected origin	Number of reported cases	Number of reported deaths (%)
1967	Germany and Serbia	Uganda	31	7 (22.6%)
1975	South Africa	Zimbabwe	3	1 (33.3%)
1980	Kenya	Kitum cave (Kenya)	2	1 (50%)
1987	Kenya	Kitum cave (Kenya)	1	1 (100%)
1998–2000	Democratic Republic of Congo (DRC)	Durba (DRC)	154	128 (83.1%)
2004–2005	Angola	Uige (Angola)	374	329 (88%)
2007	Uganda	Kitaka mine (Uganda)	4	2 (50%)
2008 (Jan)	US (ex-Uganda)	Python cave (Uganda)	1	0 (0%)
2008 (July)	Netherlands (ex-Uganda)	Python cave (Uganda)	1	1 (100%)
2012	Uganda	South-western Uganda	15	4 (26.7%)
2014	Uganda	Kampala (Uganda)	1	1 (100%)
2017	Uganda	Kween district (Uganda)	3	3 (100%)
2021	Guinea	Guinea (bat reservoir)	1	1 (100%)
2022	Ghana	Under investigation	3	2 (66.7%)
2023	Equatorial Guinea	Under investigation	40	35 (87.5%)
2023	Tanzania	Under investigation	9	6 (66.7%)

^aThe information in the above table has been adopted from GOV.UK. Link: <https://www.gov.uk/guidance/marburg-virus-disease-origins-reservoirs-transmission-and-guidelines>. Accessed on June 20, 2023.

public health worldwide. We have already seen the devastating outcome of mutation through coronavirus mutation. The recent outbreak started in Equatorial Guinea. Later, it spread to Tanzania as well. Similar to COVID-19, this virus has the potential to cross borders and affect other neighboring countries. Besides, the Marburg virus is genetically close to the lethal Ebola virus. The high mortality rate of the MVD makes it a concern to healthcare professionals and the general population worldwide. The present circumstances indicate that the MVD can potentially become a pandemic as it has already spread to Tanzania from Equatorial Guinea.

4 | STRATEGIES TO FIGHT THE POTENTIAL OUTBREAK OF MVD

At present, there are no vaccines for MVD. Therefore, the implementation of preventive measures is vital to fight outbreaks of Marburg virus infection. To avoid person-to-person transmission, healthcare professionals must need to take precautions while dealing with infected patients. Quick isolation and strict barrier to viral transmission including wearing masks, gloves, and gowns can prevent the further spread of the virus. Other infection prevention practices include the proper use of protective materials, disinfection, and disposal of instruments in caring for patients.

The effective treatment measures have resulted in significantly lesser mortality rates in past outbreaks. Besides, the prompt response

had been successful in curbing the infection. So, healthcare authorities worldwide must implement several short and long-term measures quickly. The healthcare professional should be well-informed and well-equipped to combat this emerging enemy. The laboratory tests should perform following the guidelines to ensure biosafety and avoid biological hazards. As the symptoms of MVD are similar to typhoid, malaria, and other viral diseases, a differential diagnostic test must perform for all the suspected individuals. There should have a global initiative to ensure the diagnostic facilities in all the parts where the infection has spread. Early detection is the pivotal factor to curve any outbreak of infectious disease. Therefore, the authorities should test all suspected cases and confirm quickly. Also, they should treat MVD cases in dedicated hospital wards to prevent primary infection or secondary transmission. Healthcare facilities should provide proper supportive care to the infected individuals as it significantly reduces the mortality rate. The authorities should ensure quick isolation and quarantine for the infected and suspected patients. Also, they can take some measures to nullify bat-to-human transmission. Recently, Bangladesh and India had to endure a Nipah virus outbreak due to bats.²⁶ So, the government should raise awareness among people to avoid bats or bat-infested areas. Respective authorities can organize seminars and workshops to create proper awareness about MVD among the general population across the countries.

COVID-19 has already impacted the mental health of people of all classes.^{27–30} Therefore, the recent MVD outbreaks will have

a tremendous negative impact on the mental health of people of Africa who have been struggling with COVID-19 and the Ebola virus. It will also affect the mental health of people worldwide. Concerned authorities like WHO and CDC must actively come forward to raise awareness and prevent multicountry MVD outbreaks. Community involvement is the key to fighting infectious diseases on a global scale. Most of the countries of Africa are poor and developing. So, international organizations should raise their hands to support them. Moreover, in the recent past, there also has been an upsurge in monkeypox outbreaks in Africa.^{31–36} Researchers and global healthcare organizations should emphasize developing effective vaccines, antiviral agents, and mitigation strategies against this disease.

5 | CONCLUSION

The recent MVD outbreak with a high fatality rate is a threat to the global healthcare authorities as they are already struggling to cope with the COVID-19 pandemic. Due to the high fatality rate, it might be more dangerous than coronavirus disease and can bring catastrophic outcomes worldwide. The human-to-human transmissibility makes it a potential virus to create a global pandemic. Therefore, Healthcare authorities and policy-makers need to take appropriate measures to prevent and control the spread of infectious diseases like MVD. Researchers must remain vigilant about potential MVD outbreaks and conduct research to create effective treatments and suggest preventative practices.

AUTHOR CONTRIBUTIONS

Iftekhar Ahmed: Conceptualization; data curation; writing—original draft. **Lubaba Salsabil:** Conceptualization; data curation; writing—original draft. **Md. Jamal Hossain:** Conceptualization; methodology; project administration. **Mohammad Shahriar:** Conceptualization; methodology; project administration. **Mohiuddin Ahmed Bhuiyan:** Conceptualization; methodology; project administration. **Md. Rabiul Islam:** Supervision; Writing—review and editing.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

TRANSPARENCY STATEMENT

The lead author Md. R. Islam affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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