Bio Vet Innovator Magazine

Volume 2 (Issue 1) JANUARY 2025

OPEN ACCESS

Popular Article

Marburg Virus Disease: A Deadly Viral Zoonosis

Dr Nivedita Khiriya[1] and Dr Karishma Choudhary[2]
[1]*Department of Veterinary Public Health and Epidemiology, RR College Veterinary and Animal Science, Rajasthan University*
[2]*Department of Livestock Production and Management, College of Veterinary and Animal Science, Navania, Vallabhnagar, Udaipur*
***Corresponding Author:** avishek.bardhan@tnu.in
DOI: https://doi.org/10.5281/zenodo.14836567

Received: January 25, 2025
Published: January 29, 2025

Introduction:

Marburg virus disease is a rare disease of humans and non-human primates in which haemorrhagic fever occurs. It is a zoonotic disease which has the potential to cause severe epidemics with significant case fatality rates. The case fatality rates of this disease vary from 23 – 90%. The incubation period of this viral infection is 2-21 days. Earlier this disease was known as Marburg haemorrhagic fever. This disease occurred simultaneously in laboratory workers in Marburg, Frankfurt (Germany) and Belgrade (Yugoslavia) in 1967. Infection arose when the laboratory workers were exposed to the tissues of African green monkeys. These monkeys were imported from Uganda. Several outbreaks and sporadic cases of this disease have been reported from Angola, Democratic Republic of Congo, Kenya, Uganda, and South Africa.

Causative Agent:

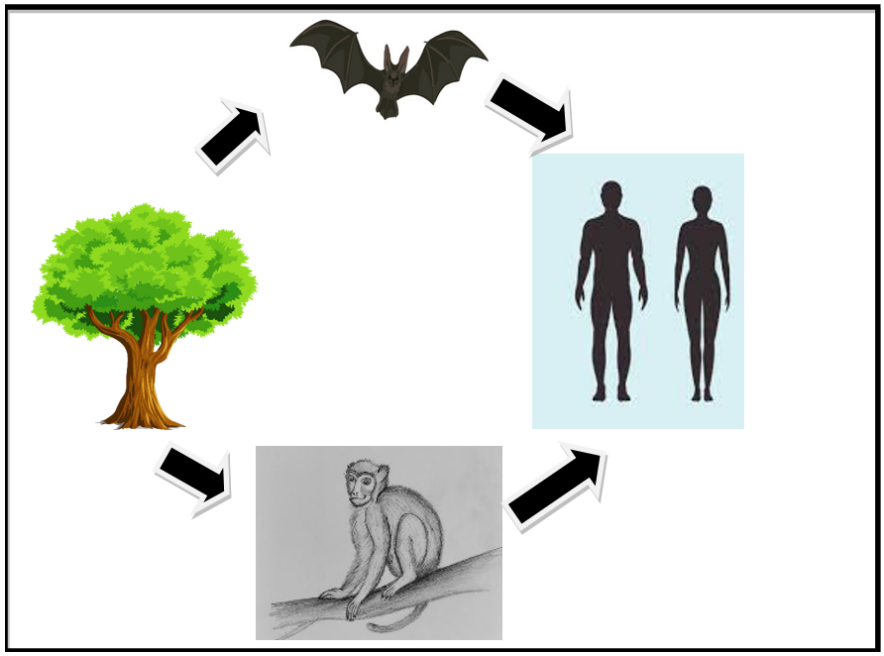
Marburg disease viruses are long thread like viruses. They belong to family Filoviridae (*filum* means thread). This virus was isolated in guinea pigs and tissue culture from the blood and tissues of the patients.

Transmission Potential:

The infection with virus occurs due to exposure to bats. It is well documented that viruses are shed in oral secretions, faeces and urine from Egyptian rousette bats. Initially the virus spilled over from animals to humans and then person to person transmission started taking place. Human to human transmission takes place through direct contact with blood, secretions and body fluids. Transmission of virus from person to person requires extreme close contact with the infected person. Direct transmission takes place through the broken skin and mucous membranes. Body fluids like urine saliva, sweat, vomit, amniotic fluid and semen acts as the potential source of infection. Transmission can also take place through surfaces and materials contaminated with body fluids. Also, contact with dead and living infected animals including bush meat can be a source of infection.

Three type of transmission cycles are occurred: -

1. **Primary Cycle:** The Marburg virus is naturally found in fruit bats, especially the Egyptian fruit bat. It is thought that humans can contract the virus from bats by coming into touch with their urine, feces, or saliva.
2. **Human to Human Transmission:** Humans can contract the Marburg virus by coming into close contact with an infected person's bodily fluids, such as blood, vomit, feces, saliva, or semen. It's especially risky in medical environments. Exposure to infected surfaces or items, such as needles, can also result in transmission, which is why isolation procedures and good hygiene are essential.
3. **Infected Wildlife:** When people come into contact with infected animal blood or tissues, other animals (like primates) can also get infected with the virus and spread it to humans.



Clinical Manifestations:

Illness begins with high fever, chills, fatigue, conjunctivitis, severe headache, myalgia and malaise. On the third day of illness, watery diarrhoea accompanied by abdominal pain, chest pain, sore throat, nausea and vomiting is encountered. A non-itchy maculopapular rash is seen between 2 to 7 days of the onset of illness. Severe haemorrhagic manifestations are evident which include bleeding from nose, gums, gastrointestinal tract and vagina. Fresh blood is seen in vomit and faeces.

1. **Initial phase (Early phase):**

- ***Fever:*** A high temperature, occasionally as high as 40°C (104°F), is frequently indicative of the disease's beginning.
- ***Headache:*** During the early stages of the illness, severe headaches are a typical symptom.
- ***Myalgia:*** Pain in the muscles and aches throughout the body.
- ***Fatigue:*** Severe exhaustion, occasionally coupled with malaise.
- ***Abdominal pain*** is frequently present together with nausea & vomiting, which might start in the first few days.
- ***Sore Throat:*** In the early stages of the illness, people often report having a painful throat. Since many viral infections share these early symptoms, diagnosing the virus in its early stages can be difficult.

2. **Progressive Symptoms (Middle Phase):** As the disease progresses, patients often develop more severe symptoms, including:

- ***Diarrhoea:*** In the initial days following the development of a fever, watery, occasionally bloody diarrhoea may occur (Feldmann & Geisbert, 2011).
- ***Vomiting:*** As the illness worsens, persistent vomiting that frequently contains blood (hematemesis) happens.
- ***Abdominal Pain:*** Diarrhoea and vomiting are frequently accompanied by severe, cramping abdominal pain.
- ***Rash:*** Around day five of the disease, a maculopapular rash that has the potential to become haemorrhagic frequently develops across the chest, back, and belly.

3. **Haemorrhagic Phase (Severe Stage):** Around **day 5 to 7**, the disease can progress into the haemorrhagic phase, which is characterized by:

- ***Severe Haemorrhage:*** Internal bleeding as well as spontaneous bleeding from mucous membranes (such as the nose, eyes, or gums). Blood in the urine, vomit, or faeces of infected people is possible.
- ***Shock:*** Dehydration and blood loss can result in hypovolemic shock.
- ***Organ Failure:*** The virus can cause multiple organ failure, including liver and renal impairment, as it travels throughout the body.
- ***CNS Involvement:*** Confusion, agitation, delirium, and in extreme situations, coma, are examples of neurological symptoms that may also appear.

Symptoms may become severe leading to jaundice, pancreatitis, encephalitis, severe weight loss, liver failure, delirium, irritability, aggression, seizures and coma. Arthralgia, uveitis, orchitis and pericarditis are some of the complications encountered during convalescence. Disseminated intravascular coagulation, thrombocytopenia and lymphopenia are seen within 7 days of the onset of the disease. Death usually occurs due to blood loss, multiple organ dysfunction syndrome (MODS) and shock.

Diagnosis:

Diagnosis on the basis of history, clinical signs and symptoms is often difficult as the clinical manifestations match with those of other viral haemorrhagic fevers. It can also confuse with malaria, dengue, typhoid fever, shigellosis, cholera, EHEC enteritis and rickettsial diseases. History related to occupation, travel and exposure to bats in wildlife settings is an important indicator of the infection. Antigen capture ELISA, IgM (indicate recent infection) and IgG (can be detected 8-10 days after the onset of infection and persist for upto 2 years after infection) capture ELISA and RT-PCR can be used to diagnose the infection. Electron microscopy and immunofluorescence assay can also be used for the identification of the virus. Virus isolation can be done only in high containment facilities having BSL-4 laboratories. The samples used for the testing of infection can be handled in BSL-3 laboratories. Histological techniques like immunohistochemistry can be used for post-mortem diagnosis.

Public Health Control Measures:

- Till date there is no approved vaccine for this infection. So, the prevention mainly relies on the isolation of patients along with the use of personal protective equipment's (face mask, gloves, goggles, etc).
- Avoid contact with the blood and body fluid (urine, faeces, vomit, semen, amniotic fluid, saliva, breast milk, and vaginal fluids) of infected individuals.

- Avoid contact with the items (clothes, bedding, medical instruments, etc) that have come in contact with the blood and body discharges of infected person.
- Avoid touching the dead body of the patient died from this disease.
- Avoid travelling to the areas (wildlife settings) where exposure to bats can take place.
- High level of precautions must be taken while handling the virus or samples in high containment zone.
- Early detection, contact tracing and community awareness also play an important role in the prevention and control of this infection.
- Avoid contact with semen from a person who recovered from Marburg until testing shows that the virus is gone from their semen.
- Avoid contact with Egyptian rousette bats and non-human primates if in areas where Marburg is found.
- Understanding the modes of Marburg virus transmission is crucial for controlling outbreaks. By improving awareness, implementing strict infection control measures, and ensuring rapid response to cases, public health authorities can reduce the spread of this deadly virus.

References:

Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases (NCEZID), Division of High-Consequence Pathogens and Pathology (DHCPP), Viral Special Pathogens Branch (VSPB) (https://www.cdc.gov/vhf/marburg assessed on 12/07/2023).

Chakraborty, S., Chandran, D., Mohapatra, R. K., Alagawany, M., Yatoo, M. I., Islam, A., Sharma, A. K. & Dhama, K. (2022). Marburg virus disease–a mini-review. *J. Exp. Biol. Agric. Sci*, 10 (2320), 689-696.

European Center for Disease Prevention and Control (https://www.ecdc.europa.eu/ assessed on 13/07/2023).

Kortepeter, M. G., Dierberg, K., Shenoy, E. S. & Cieslak, T. J. (2020). Marburg virus disease: A summary for clinicians. *International Journal of Infectious Diseases*, *99*, 233-242.

World Health organization 2023 (https://www.who.int/news-room/fact-sheets/detail/marburg-virus-disease assessed on 10/07/2023)

Centre for Disease Control 2024 (About Marburg | Marburg | CDC assessed on 1 May 2024)

Knust, B., Schafer, I. J., Wamala, J., Nyakarahuka, L., Okot, C., Shoemaker, T., Dodd,K., Gibbons, A.,Balinandi, S., Tumusiime, A., Campbell, A., Newman, E., Lasry, E., DeClerck, H., Boum, Y., Makumbi, I., Bosa, H. K., Mbonye, A., Aceng, J. R. & Rollin, P. E. (2015). Multidistrict outbreak of Marburg virus disease—Uganda, 2012. *The Journal of infectious diseases*, 212(suppl_2), S119-S128.

Muvunyi, C. M., Ngabonziza, J. C. S., Bigirimana, N., Butera, Y., Nsanzimana, S., Kaseya, J. & Ahmed, A. (2024). Emerging Threat of Marburg Virus Disease: Epidemiology, Clinical Management, and the One Health Strategy for Prevention and Control.

Leendertz, S. A. J., Gogarten, J. F., Düx, A., Calvignac-Spencer, S., & Leendertz, F. H. (2016). Assessing the evidence supporting fruit bats as the primary reservoirs for Ebola viruses. *EcoHealth*, 13, 18-25.

Muvunyi, C. M., Ngabonziza, J. C. S., Bigirimana, N., Ndembi, N., Siddig, E. E., Kaseya, J., & Ahmed, A. (2024). Evidence-Based Guidance for One Health Preparedness, Prevention, and Response Strategies to Marburg Virus Disease Outbreaks. *Diseases*, 12(12), 309.

Gire, S. K., Goba, A., Andersen, K. G., Sealfon, R. S., Park, D. J., Kanneh, L. & Sabeti, P. C. (2014). Genomic surveillance elucidates Ebola virus origin and transmission during the 2014 outbreak. *science*, *345*(6202), 1369-1372.