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PERSPECTIVE

Hantavirus at Sea: A Cruise Ship Outbreak and Global Lessons

Sayeeda Rahman*

[1] *Bridgetown International University School of Medicine, Bridgetown, Barbados*

*Correspondence: Sayeeda Rahman <drsayeeda.rahman@biuuniversity.org>

Introduction

In May 2026, the World Health Organization reported a multi-country outbreak of Andes hantavirus linked to the cruise ship *MV Hondius*, involving 13 passengers (11 confirmed, 2 probable) and three deaths.[1] Affected individuals developed severe respiratory and gastrointestinal illness, with several requiring intensive care. Although hantavirus is not considered pandemic-prone, this event highlights the need for early detection and strengthened surveillance, particularly in atypical high-mobility settings.

Hantaviruses are rodent-borne zoonotic pathogens within the *Hantaviridae* family. In the Americas, New World hantaviruses cause Hantavirus Cardiopulmonary Syndrome (HCPS), also termed Hantavirus Pulmonary Syndrome (HPS),[1,2] while in Europe and Asia, Old World hantaviruses cause Haemorrhagic Fever with Renal Syndrome (HFRS).[1,3] Despite differences in clinical presentation, both syndromes are associated with severe systemic illness and significant mortality.[3]

Environmental and social factors—including climate variability, urbanization, deforestation, and human encroachment into rodent habitats—have contributed to the resurgence of hantavirus infections. Concerns regarding outbreak preparedness and surveillance have intensified following reports of clusters in diverse regions. The burden of disease varies geographically: WHO notes thousands of HFRS cases annually in East Asia and Europe, particularly in China and the Republic of Korea, whereas HCPS is less frequent but carries a substantially higher mortality rate, often ranging from 20% to 50%.[4]

This article examines the epidemiology of hantavirus infection, the ecological and social drivers of its resurgence, and the major public health challenges in prevention, detection, and control.

Epidemiology of Hantavirus Infection

Global Distribution

Hantaviruses are mainly transmitted through contact with infected rodents and their excreta (urine, saliva, and droppings). Despite being relatively rare, hantavirus infections are an important global public health concern due to their high mortality rates, limited treatment options, and increasing outbreaks worldwide.[2] According to the , hantavirus infections remain uncommon globally but may have fatality rates of up to 50% in severe HCPS cases. In 2025, 229 cases and 59 deaths were reported in the Americas (case fatality rate 25.7%).

Hantaviruses are globally distributed zoonotic viruses maintained in specific rodent reservoirs, with distinct species showing geographic restriction. In Asia and Europe, hantaviruses such as Hantaan, Seoul, Puumala, and Dobrava viruses are main causes of hemorrhagic fever with renal syndrome (HFRS), while in the Americas, Sin Nombre and Andes viruses are the principal agents of hantavirus cardiopulmonary syndrome (HCPS).[3,5] China bears the highest burden of HFRS globally, and endemic or recurrent cases are also reported in several European countries, including Finland, Germany, Sweden, and Russia. In the Americas, HCPS cases have been documented across the United States and multiple countries in Central and South America, including Argentina, Chile, Brazil, Paraguay, and Panama.[3,5,6]

Reservoir Hosts and Transmission

Hantavirus-associated diseases were recognized clinically before the virus was identified, with early cases of hemorrhagic illness (later termed HFRS) reported in Asia and Russia, and major attention during the Korean War as “Korean hemorrhagic fever” in soldiers. The causative agent was later identified by Dr. Ho Wang Lee as Hantaan virus in striped field mice (Apodemus agrarius) near the Hantaan River, confirming rodents as the natural reservoir. Subsequent research identified multiple hantavirus species globally, with HFRS mainly in Europe and Asia and hantavirus pulmonary syndrome (HPS/HCPS) in the Americas, a distinction reinforced by the 1993 Four Corners outbreak in the United States linked to deer mice.[1,4,7]

Rodents serve as the natural reservoir hosts for hantaviruses. Each virus species is usually associated with a specific rodent species. For example, the deer mouse (Peromyscus maniculatus) is the primary reservoir for Sin Nombre virus in North America, while the striped field mouse carries Hantaan virus in Asia.[8,9]

Transmission to humans generally occurs through inhalation of aerosolized viral particles from rodent urine, saliva, or feces. Infection may also occur through rodent bites or direct contact with contaminated materials. High-risk activities include farming, forestry work, cleaning rodent-infested buildings, camping, and occupational exposure in rural settings.[2]

Human-to-human transmission is extremely rare but has been documented with Andes virus in South America. This feature distinguishes Andes virus from most other hantaviruses and raises concerns regarding outbreak potential.[10]

Clinical Manifestations

Haemorrhagic Fever with Renal Syndrome (HFRS)

The HFRS is characterized by fever, headache, abdominal pain, hypotension, hemorrhagic manifestations, and acute kidney injury. Disease severity varies depending on the viral strain involved. Mortality rates range from less than 1% for Puumala virus infection to approximately 15% for Hantaan virus infection.[2]

Hantavirus Cardiopulmonary Syndrome (HCPS)

The HCPS is a severe respiratory illness marked by fever, myalgia, cough, pulmonary edema, respiratory failure, and cardiogenic shock. Patients often deteriorate rapidly, requiring intensive care and mechanical ventilation. The case fatality rate may exceed 40%, especially when diagnosis and supportive care are delayed.[11,12]

Early symptoms are non-specific and resemble influenza-like illnesses, making early diagnosis difficult. This diagnostic challenge contributes significantly to morbidity and mortality.

Resurgence of Hantavirus Infection

Environmental and Ecological Factors

Climate change plays an important role in hantavirus resurgence. Increased rainfall and rising temperatures influence vegetation growth, which in turn affects rodent population density. Larger rodent populations increase the likelihood of human exposure and viral transmission.

Deforestation and urban expansion also force rodents into closer contact with human populations. Agricultural expansion and land-use changes have further increased opportunities for transmission in endemic regions. Extreme weather events such as floods and droughts may alter rodent migration patterns and create conditions favourable for outbreaks.[5,12,13]

Urbanization and Human Behaviour

Rapid urbanization, poor housing conditions, and inadequate sanitation facilitate rodent infestation and increase transmission risks.[14-16] Informal settlements and overcrowded urban environments often lack effective rodent control measures, making vulnerable populations particularly susceptible.[14,17]

Human recreational activities such as camping, hiking, and ecotourism in rodent-infested areas have also increased exposure risk.[15] Occupational exposure among farmers, construction workers, and military personnel remains an important epidemiological factor.[15]

Recent Outbreaks and Emerging Concerns

Recent outbreaks have renewed attention toward hantavirus preparedness and surveillance systems. Reports in 2026 described concerns regarding hantavirus outbreaks associated with cruise ship exposure involving the Andes virus strain.[18-20] Health authorities emphasized that widespread community transmission remained unlikely; however, the events highlighted weaknesses in outbreak coordination, communication, and global preparedness systems.[21,22]

Public health experts noted delays in communication and challenges in interagency coordination during the outbreak response. These incidents demonstrated how even relatively uncommon zoonotic infections can strain public health systems and generate widespread public anxiety in the post-COVID-19 era.[19]

Social media discussions and online public forums further illustrated concerns regarding transparency, misinformation, and public trust in health authorities during infectious disease emergencies.[20,22]

Public Health Challenges

Difficulty in Early Diagnosis

One of the greatest public health challenges associated with hantavirus infection is early diagnosis. Initial symptoms such as fever, headache, fatigue, nausea, and muscle aches resemble many other viral illnesses including influenza, dengue, leptospirosis, and COVID-19.[5,23,24]

Because early symptoms are non-specific, patients may not seek immediate medical attention, and clinicians may fail to recognize the disease during the early stages.[23,24] Delayed diagnosis contributes to poor outcomes and increased mortality.[23,26]

Laboratory confirmation requires specialized testing, including serological assays and reverse transcription polymerase chain reaction (RT-PCR). However, such diagnostic facilities may not be readily available in resource-limited settings.[25,27]

Lack of Specific Treatment

Currently, there is no universally approved antiviral treatment for hantavirus infection. Management is mainly supportive and includes oxygen therapy, mechanical ventilation, hemodynamic support, and renal replacement therapy when necessary. Early intensive care significantly improves survival, particularly in HCPS cases.[26,28,29]

The absence of effective antiviral therapy places considerable emphasis on prevention and early detection strategies.

Absence of Widely Available Vaccines

Although some vaccines have been developed and used in limited settings, particularly in parts of Asia, there is no globally available vaccine providing broad protection against hantavirus infection. Vaccine development remains challenging because of the diversity of hantavirus strains and incomplete understanding of immune protection mechanisms.[16,32]

Investment in vaccine research remains insufficient compared to more common infectious diseases, despite the high mortality associated with severe hantavirus disease.

Rodent Control Challenges

Rodent control is essential for prevention but remains difficult in many settings. Rodent populations are influenced by environmental and climatic factors that are difficult to control. Furthermore, poor sanitation, inadequate housing infrastructure, and food storage practices contribute to persistent rodent infestation.[17,27]

Sustainable rodent control programs require coordinated environmental management, public education, and community participation. However, these interventions may be difficult to implement in low-resource regions.[27]

Surveillance Limitations

Effective surveillance is critical for detecting outbreaks and monitoring epidemiological trends. However, underreporting remains a major problem because of limited diagnostic capacity, lack of awareness, and inadequate surveillance systems.[16]

Many countries lack standardized reporting mechanisms and integrated zoonotic disease monitoring systems. Weak coordination between veterinary, environmental, and human health sectors also limits effective surveillance.[31]

The recent emphasis on the “One Health” approach recognizes the interconnectedness of human, animal, and environmental health in controlling zoonotic diseases such as hantavirus infection.[31]

Public Fear and Misinformation

The emergence of new outbreaks often leads to widespread fear and misinformation, particularly following the COVID-19 pandemic. Online discussions regarding hantavirus outbreaks have demonstrated how rapidly anxiety and misinformation can spread through social media.[33,34]

Public health communication must therefore balance transparency with accurate risk assessment. Authorities must provide timely, evidence-based information while avoiding unnecessary panic.

Prevention and Control Strategies

Rodent Exposure Prevention

The primary strategy for hantavirus prevention is reducing human exposure to rodents and contaminated environments. Public health recommendations include:

• Sealing holes and entry points in homes

• Maintaining clean food storage areas

• Using traps to reduce rodent populations

• Avoiding sweeping rodent droppings without proper disinfection

• Wearing protective equipment during cleaning of infested areas

The CDC recommends wetting contaminated areas with disinfectant before cleaning to prevent aerosolization of viral particles.[35]

Strengthening Surveillance Systems

Improved surveillance systems are essential for early outbreak detection and rapid response. Integrated disease surveillance programs should include:

• Enhanced laboratory capacity

• Timely case reporting

• Cross-border information sharing

• Monitoring of rodent populations

• Environmental risk assessment

Use of digital surveillance tools and geographic information systems may improve outbreak prediction and preparedness.[29,36]

Public Education and Risk Communication

Public education campaigns are critical for increasing awareness regarding transmission routes, preventive measures, and early symptom recognition. Communities in endemic areas should receive culturally appropriate information about rodent control and safe cleaning practices.[30,35]

Effective communication strategies also help counter misinformation and improve trust in public health authorities.[37]

One Health Approach

The One Health framework integrates human medicine, veterinary science, environmental management, and public health. This multidisciplinary strategy is increasingly recognized as essential for controlling zoonotic diseases.[38]

Collaboration among epidemiologists, wildlife experts, veterinarians, ecologists, and policymakers is necessary to identify environmental risk factors and develop sustainable prevention measures.[5,38]

Future Directions

Future research priorities include development of effective vaccines, antiviral therapies, and improved diagnostic tools. Greater understanding of rodent ecology and environmental drivers of outbreaks will also help predict future disease emergence.[5,30]

Advances in molecular epidemiology and genomic surveillance may improve understanding of viral evolution and transmission patterns.[5] Additionally, stronger international collaboration is required to enhance outbreak preparedness and response capacity.[37,38]

The recent resurgence of hantavirus infection demonstrates that zoonotic diseases remain a major threat to global health security. Lessons learned from COVID-19 emphasize the importance of preparedness, rapid communication, and coordinated public health action.[37]

Conclusion

Hantavirus infection is an emerging zoonotic disease with serious public health importance due to its high mortality and severe clinical outcomes. Environmental changes, urbanization, and increased human contact with rodents have contributed to its spread. Major challenges include delayed diagnosis, limited treatment options, lack of vaccines, weak surveillance, and rodent control issues. Effective prevention requires integrated surveillance, public awareness, environmental management, and a One Health approach, along with continued research and global collaboration.

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