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Mini Review

Hantavirus Infections: A Mini-Review of the Literature

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Abstract

Hantavirus can cause various clinical manifestations mainly categorised as: hemorrhagic fever with renal syndrome HFRS and hantavirus pulmonary syndrome HPS. It belongs to the family Bunyaviridae that gets transmitted through rodents, bats and several insectivores species. There are various species which are getting discovered on a regular basis. There are various immune responses noticed due to the intervention of hantavirus in a host There are various commercial vaccines found against hantavirus, in which HANTAVAX - Korean commercial vaccine. This mini review aims to present the history of hantavirus, it's all aspects, its effect over the world, public health and spread awareness.

***Keywords**: Hantavirus; History; Disease; Epidemiology; Hosts; Prevention*

Abbreviations

HFRS: Hemorrhagic Fever with Renal Syndrome; HPS: Hantavirus Pulmonary Syndrome; RIVAM: National Institute for Public Health and the Environment

Introduction

Hantavirus is large group of viruses. In humans, cases vary based on severity from mild to severe. Fatality rate due to these viruses are generally 30% and above [1]. Species mainly affected are rodents like Norway rats, black rats, mouse genera, deer mice it also affects [2]. Hantavirus belongs to genus Hantavirus, large family Bunyaviridae with 300 viruses. It Infects animals, plants, humans, and arthropods [3]. More than 24 pathogenic hantaviruses are prone to infect humans, worldwide. Diseases are classified as two major divisions which are hemorrhagic fever with renal failure [HFRS] and hantavirus pulmonary syndrome [HPS] [4]. HFRS are mainly found in Europe, Asia, Africa whereas HPS is found in America. Hantavirus is one of the emerging zoonotic pathogens where infections spread fast for the past decade. Yet, many cases are left undiagnosed [5].

Hantaviruses are considered as bioterror weapons, Zoonotic pathogens which were left unnoticed until the four-corner outbreak in 1993. Future studies should be done with user-friendly tools for rapid diagnosis, study over the rodent reservoir, more cost-effective diagnostic tools, awareness should be spread about the same [6].

Epidemiology

- **China:** Hemorrhagic fever with renal failure syndrome [HFRS] is considered to be a great risk to public health because, about 30 provinces out of 32.
- **Korea:** Korea is the area where hantavirus was first isolated. About 300 - 400 cases are recorded annually with a death rate contributing 1%. 35.6% of the population infected were farmers which occurred mostly in the month of October, November, December [7].
- **Japan:** There have been no cases reported in Japan for the past few decades. Though there are no new cases, the repeated survey has been continuing.
- **Thailand Vietnam Singapore:** There are less HFRS cases referred to with the symptoms of this disease, whereas there are many cases with fever of unknown origin with serological evidence of hantavirus infection.
- **Indonesia:** There were hantavirus infections during the dengue outbreak [8]. In the past 35 years, the seroprevalence was showed 35% in rodents whereas in humans it's 15%.
- **India Srilanka:** There have been many cases reported with the correlation between leptospirosis and hantavirus infection. But there are so many cases with fever of unknown origin but diagnosed with positive results of hantavirus antibody [9].
- **Europe:** Puumala, is a hantavirus of the genus Orthohantavirus. This one was detected in Europe, mainly in British Isles, southern Mediterranean areas, and northernmost tundra regions and in Central and Western Europe. HFRS is a common disease found in most European countries like Finland, northern Sweden, France, Belgium, Germany, Balkans and part of European Russia. Epidemiological data is not available for some areas like Greece, Ukraine, Poland, UK [10].
- **Russia:** In Russia First case was recorded in 1934, by 1995 there were 3145 cases found. The viral infection showed similarity to that of Korea and China [11].
- **Africa:** The first case was reported in 1984. There are hantavirus antibodies found in hosts like rodents, humans, etc. in areas like Egypt, Guinea, Djibouti, Nigeria and Senegal. In 2010, a novel hantavirus was discovered in Africa which causes HFRS.
- **America:** The infections started with an acute respiratory disease outbreak in four regions of the USA in 1993. Out of 30 pathogenic hantavirus species, 15 are reported to be present in different area of USA [12].

Taxonomy

Hantavirus genus has an expanding group of species which belongs to the family bunyaviridae, like murine borne viruses, arvicoline borne diseases, neotaminae-borne viruses, etc. there has been new discovery of about 14 new virus species in the past decade, mostly of socio morph mammals infected ones. There are many molecular methods done to identify new virus species to accurately determine the biological and geographical distribution of the viruses and its host in this world [13]. The genus hantavirus has 36 recognised species in 2019.

Genome

Family bunyaviridae predominantly has four genera: *Loanvirus*, *Mobatvirus*, *Thottimvirus*, and *Ortho Hantavirus*. It is a negative sense RNA genome virus with 3 fragments, namely large, middle and small segments. It encodes mainly four proteins - viral polymerase, viral surface glycoproteins and nucleocapsid proteins [14]. RNA dependent RNA polymerase is the enzyme used for transcription and replication.

Life cycle

There are various steps involved in the life cycle of hantavirus. First, the virus attaches to the cell surface through alpha-v-beta-3 by endocytosis or micropinocytosis, then there is uncoating of the viral genome and transcription of complementary RNA to the viral DNA, which forms the 3 segments of the virus which gets replicated more [15].

Major outbreaks

In 1982, Dr. Wang Lee found in northern and Eastern Asia [16] an etiological agent responsible for hemorrhagic fever with unique renal complications from an infected wild rodent species, *Apodemus.* In future it was named hantaan as it was first isolated from an infected rodent near Hantan river. similar clinical complications, hemorrhagic fever with renal syndrome (HFRS) cases referred to as Korean hemorrhagic fever, found in more than 3000 US troops faced Korean hemorrhagic fever during Korean world war [1951- 1953] [17] 30% of them suffered further hemorrhagic complications with a mortality rate more than 10% [18]. Then there were similar cases found in Europe and Scandinavia commonly known as Nephropathia Epidemica.

The virus was isolated in cultured human cell lines which showed a shared etiology with all these outbreaks which proved that this virus was responsible for HFRS type of illness for the past 140 years including the world wars [19].

There was evolution of human pulmonary syndrome which had a massive outbreak in 1993 at southwestern United States. On analysis, tests and various diagnoses these infections was found to share the etiology of hantavirus which had already affected nearly 21 states, left unrecognized It was called an HPS outbreak in four corner regions of the USA [1993- 1994]. It was mainly transmitted through deer mice. which had a quite large population Like New Mexico, Colorado, Arizona and Utah intersect [20].

Global circulation

Hantavirus infections remain relatively uncommon worldwide, but severity varies according to the virus involved and the geographic region. Globally, most cases occur in Asia and Europe, particularly as hemorrhagic fever with renal syndrome. In the Americas, hantavirus pulmonary syndrome is rarer but often more severe.

In 2025, eight countries in the Americas reported confirmed hantavirus pulmonary syndrome cases, with 229 cases and 59 deaths, corresponding to a case-fatality rate of 25.7%. The affected countries included Argentina, Bolivia, Brazil, Chile, Panama, Paraguay, the United States, and Uruguay [21].

Current situation

On 3 May 2026, the World Health Organization (WHO) reported a possible hantavirus outbreak aboard the Dutch cruise ship *MV Hondius*, travelling from Ushuaia, Argentina.

As of 5 May 2026, two laboratory-confirmed cases and five suspected cases had been identified among the 147 passengers and crew members. Three individuals died, and one patient was admitted to intensive care in South Africa.

On 6 May 2026, South African authorities confirmed the presence of the Andes hantavirus strain through viral sequencing [22]. Andes virus is the only known hantavirus capable of limited human-to-human transmission, although infection occurs primarily through exposure to infected rodents.

The vessel remains under medical supervision, and health authorities currently consider the risk of wider international spread to be low.

In France, between January and March 2026, the National Reference Centre (CNR) for Hantaviruses at Institut Pasteur reported 19 confirmed cases of recent hantavirus infection, a figure consistent with the country's usual monthly average.

20-05-2026 | 16:50 Ship crew test results.

On Monday 18 May 27 people still on board of the ships. The samples taken from them were examined in the laboratory and the test results were negative. This means that no Andes virus was detected in these individuals.

Previously, on board, samples had also been taken from these people. Those test results were also negative. Regardless of the test results, Dutch people are subject to mandatory Home quarantine. Dedicated quarantine sites are available for the remaining persons from the ship. Andean virus detected in a total of 11 people. The Andes virus has so far been detected in a total of 9 people and 2 people are suspected of being infected with the Andes virus. Among these people are 3 Dutch nationals. To date, three people have died from the virus, including two Dutch nationals.

No further updates on test results as long as the test results continue to be negative.

Clinical characteristics

Transmission

Hantavirus is a bunyavirus transmitted through rodent species, bats and insectivores. Initially, it was believed that hosts had no actual disease due to the virus, but then it was discovered there would be risk in the hosts survival, characteristic changes in the hosts infected tissue. Slowly the virus and host relation evolved within various ranges of species which brings in more chance of a pandemic outbreak with new virus species evolving putting public health in danger [23]. The infection is spread through the contact of bodily fluids of the infected rodent species, particularly from saliva, urine and feces. This transmission is the same for both the disease caused.

Symptoms

Hantavirus infections in humans range from mild disease to severe life-threatening syndromes. The incubation period averages approximately two to four weeks, although it may vary depending on the viral species and the degree of exposure.

Early manifestations are generally nonspecific and resemble influenza-like illness, including:

- Fever,
- Headache,
- Myalgia,
- Fatigue,
- And occasionally gastrointestinal symptoms.
- Low blood pressure, bleeding under skin and finally kidney dysfunction which leads to death.

Two principal clinical syndromes may subsequently develop:

- Hemorrhagic fever with renal syndrome (HFRS), characterized by renal impairment, vascular leakage, thrombocytopenia, and hemorrhagic manifestations, with reported case-fatality rates ranging from approximately 0.4% to 10%;
- Hantavirus cardiopulmonary syndrome (HCPS), also referred to as hantavirus pulmonary syndrome (HPS), characterized by severe pulmonary edema, respiratory distress, and cardiac failure, with case-fatality rates estimated between 30% and 60% [24,25].

Although both syndromes may occasionally be associated with the same hantavirus species, HFRS is predominantly linked to Old World hantaviruses circulating in Europe and Asia, whereas HCPS is mainly associated with New World hantaviruses found in the Americas.

Laboratory testing

Acute hantavirus infections are commonly diagnosed using serological assays. The Centers for Disease Control and Prevention primarily relies on enzyme-linked immunosorbent assay (ELISA) detection of hantavirus-specific IgM antibodies for the diagnosis of recent infection.

Confirmed cases are established through compatible clinical presentation together with supportive laboratory evidence, including:

- Detection of hantavirus-specific IgM antibodies,
- Rising IgG antibody titers in paired sera,
- Positive immunohistochemistry findings,
- Or detection of viral RNA by polymerase chain reaction (PCR) [26].

Infection prevention, control, and protection against hantaviruses

To date, there is no approved specific antiviral treatment or universally validated vaccine for hantavirus infections. Clinical management is therefore mainly supportive and focuses on relieving symptoms and preventing complications. Severe cases may require hospitalization, often in intensive care units, with close monitoring and respiratory support, including oxygen therapy or mechanical ventilation.

Because no specific curative treatment is currently available, prevention remains the most effective strategy. Preventive measures aim to reduce exposure to rodents and their excreta, especially in enclosed or poorly ventilated environments such as basements, attics, barns, sheds, garages, cabins, and storage areas. Hantaviruses are mainly transmitted through inhalation of aerosolized viral particles from the urine, feces, or saliva of infected rodents.

Key preventive measures

- Avoid direct contact with wild rodents, whether alive or dead.
- Prevent rodents from entering homes and buildings by sealing holes and gaps.
- Limit access to food sources by storing food in airtight containers.
- Dispose of waste properly.
- Maintain regular sanitation in areas where rodents may be present.

Safe cleaning procedures

When cleaning areas potentially contaminated by rodents:

- Ventilate the area for at least 30 minutes before entering.
- Avoid dry sweeping or vacuuming, as these activities may aerosolize infectious particles.
- Wet contaminated surfaces with disinfectant, such as diluted bleach or an approved virucidal agent, before cleaning.
- Wear protective gloves.
- In high-risk situations, use appropriate respiratory protection, such as a filtering mask or respirator.

Hands should be washed thoroughly with soap and water after any exposure or cleaning activity.

Personal protective equipment for healthcare workers

All personnel entering the room of a patient with suspected or confirmed ANDV infection should use:

- Fit-tested N95, FFP2, FFP3, or equivalent respirator, or higher respiratory protection according to local policy;
- Long-sleeved gown;
- Gloves;
- Eye protection (goggles or face shield).

Hand hygiene must be performed in accordance with World Health Organization (WHO) guidelines, before putting on PPE, after removing PPE, after contact with the patient or the patient environment, and after contact with potentially contaminated materials. Gloves do not replace hand hygiene.

PPE should be removed and disposed safely when exiting the isolation room, following supervised or clearly established donning and doffing procedures. Healthcare facilities should ensure that staff are trained and competent in the correct use of PPE [27].

Treatment and prevention

No specific treatment or vaccine is currently approved, fully effective, and widely available internationally for hantavirus infection.

Vaccines

There are various vaccines developed from the killed virus and recombinant DNA technology. Mostly the inactive killed virus is derived from the infected rodent's brain. The main successful commercial Korean invented vaccines - HANTAVAX, proved efficient against the rodent and human infections [28].

Antiviral therapy

Ribavirin drug has to some extent showed antiviral activity against the hantavirus increasing the survival rate. Ribavirin drug has to some extent showed antiviral activity against the hantavirus increasing the survival rate. Persons infected with hantavirus infections are admitted in hospital with proper ventilation to support their respiratory distress. Immunotherapy, antibodies neutralisation treatments are provided [29].

In a study, chloroquine demonstrated potent *in vitro* antiviral activity against both Old World and New World hantaviruses. In animal models, it showed significant prophylactic and therapeutic efficacy against Hantaan virus infection and lethal Andes virus infection [30].

Last information cruise ship Hondius

The last information, about the hantavirus out breaks on 22-05-2026, One person who has been in quarantine in the Netherlands has been diagnosed with Andes virus as the Lab RIVAM, National Institute for Public Health and the Environment. The risk of spread is still very low. RIVM understands that this news may raise questions or concerns. Nevertheless, the risk of spread in the Netherlands remains very small. Strict precautions were immediately taken during the outbreak on the cruise ship and while transferring those on board to the Netherlands.

Conclusion

Hantavirus is a group of viruses with severe clinical symptoms. Due to the cost of diagnostic testing, cases often go undiagnosed and untreated, increasing mortality rates. Therefore, we recommend providing appropriate vaccinations and preventative measures in at-risk areas to prevent outbreaks. We also suggest that future research focus on early diagnosis, vaccines, and affordable treatments for this infection, and we advise taking and adhering to necessary precautions.

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