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Review Article

Global hantavirus outbreak and the lessons to be learnt for India: epidemiology, clinical manifestations, investigations, surveillance and way forward

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ABSTRACT

Hantaviruses are emerging zoonotic pathogens of the family *Hantaviridae* that are present in rodent and insectivore reservoirs. They are transmitted primarily through inhalation of contaminated aerosols. Globally, it causes two major clinical syndromes: hemorrhagic fever with renal syndrome (HFRS), predominantly in Asia and Europe and Hantavirus cardiopulmonary syndrome (HCS), primarily seen in the Americas. The 2026 multinational Andes virus Outbreak linked to the expedition cruise ship MV Hondius demonstrated the potential for rapid international dissemination of Hantavirus through global travel, resulting in multiple cases, deaths, and large-scale cross-border public health responses. The outbreak highlighted the importance of genomic surveillance, international collaboration, contact tracing, and preparedness for emerging zoonotic threats. India possesses ecological conditions favorable for hantavirus circulation and has documented evidence of hantavirus-related viruses. The apparent absence of major hantavirus outbreaks in India may reflect surveillance and diagnostic gaps rather than the true absence of disease. Strengthening one health surveillance, laboratory capacity, rodent monitoring, genomic sequencing, and clinician awareness is essential to enhance preparedness against emerging hantavirus threats.

Keywords: Hantavirus, Hemorrhagic fever with renal syndrome, Hantavirus cardiopulmonary syndrome, Hantavirus outbreak 2026

INTRODUCTION

The genus Orthohantavirus belongs to the family *Hantaviridae*, within the order *Bunyavirales*, and is distributed globally.[1] They are enveloped viruses characterized by trisegmented negative – sense single – stranded RNA genome. The segments are designated as the small (S) segment, which encodes the nucleocapsid protein (NP). The medium (M) segment encodes the envelope glycoproteins (Gn and Gc), and lastly the large (L) segment, which encodes the RNA-dependent RNA polymerase (RdRp). The surface glycoproteins are very important for viral entry into host cells and are the primary targets for neutralising antibodies.[2]

In the previous century, two major outbreaks of the disease introduced the Hantavirus in the old and new world with worldwide distribution geographically. The first outbreak occurred during Korean war (1950 to 1953), where thousands of United nation troops fell ill with Korean hemorrhagic fever due to Hantaan virus which is now known as hemorrhagic fever with renal syndrome (HFRS). The second outbreak of disease occurred in four corners region of United states in 1993 by Sin Nombre virus, known as four corners disease, which is now known as Hantavirus cardiopulmonary syndrome (HCPS).[3]

Unlike other Bunyaviruses, hantaviruses are rodent-borne (roboviruses) or Insectivore-borne, rather than arthropod-borne. The virus is chronically and asymptomatically

carried by specific reservoir hosts, and human infection typically occurs via inhalation of aerosolised particles from contaminated rodent saliva, urine, or faeces.[4]

METHODS

A narrative review of published literature, WHO and CDC outbreak reports, and international public health communications was done to summarize current evidence regarding Hantavirus disease, outbreak dynamics, diagnostic challenges, preparedness measures, measures to be taken in India.[1,3,5-9]

HANTAVIRUSES ARE BROADLY CATEGORIZED GEOGRAPHICALLY AND CLINICALLY INTO OLD WORLD VIRUSES AND NEW WORLD VIRUSES

Old world Hantaviruses

Predominantly seen in Asian and Europian regions, include Hantaan (HTNV), Seoul (SEOV), Puumala (PUUV), and Dobrava-Belgrade (DOBV) viruses causing hemorrhagic fever with renal syndrome (HFRS).[1,3] HFRS is a triad of fever, hemorrhage, and acute kidney injury with varying severity.

HTNV and DOBV infections often severe has case fatality rate of 15% while PUUV infections causing milder variant nephropathica epidemica has case fatality rate of 1%. It follows classic five phase clinical trajectory: febrile phase (3-7 days), hypotensive phase (hours to 2 days), oliguric phase (3-7 days), polyuric phase (days to weeks), and convalescent phase (months).[10-12]

New world Hantaviruses

Found in North and South America, the Sin Nombre virus (SNV), Choclo (CHOV) and Andes (ANDV) virus are cause behind Hantavirus cardiopulmonary syndrome (HPCS). ANDV is unique among these as it is only strain with documented person to person transmission.[1,3]

HCPS is a rapid fulminant disease with mortality reaching 40–50% having three phases: prodromal phase (3-5 days) cardiopulmonary phase with massive capillary leakage, severe non cardiogenic pulmonary edema, profungd hypoxia, cardiogenic shock, and a convalescent phase.[1,10-12]

DETAILED ANALYSIS OF THE 2026 INTERNATIONAL ANDES HANTAVIRUS OUTBREAK

The 2026 ANDV outbreak abroad the Dutch – flagged expedition cruise ship MV Hondius serves as a critical paradigm for modern hantavirus epidemiology, demonstrating how localized zoonotic spillover can swiftly escalate into multinational public health emergencies.[6,7]

2026 outbreak timelines and events

01 April 2026

The MV Hondius departed Ushuais, Argentina, with 147 passengers and crew of 23 nationalities, travelling the south Atlantic towards Antartica.[1,6]

06 to 25 April 2026

The index case (case1), who had travelled extensively in Argentina, Chile, Uruguay for 3 months prior to embarkation, developed symptoms and subsequently developed SARI and respiratory failure en route, he died on board the ship on 11 April. His partner (patient 2) also started to have similar illness and died on 25 April.[6,7]

Late April to May 2026

Samples from patient 3 sent to National Institute of Communicable Diseases, South Africa and diagnosis was confirmed on 02 May by Pan Hantavirus RTPCR assay. Antemortem sample from patient 2 confirmed ANDV infection on 08 May. Multiple passengers disembarked at various ports and flew to their homes. Several developed HCPS en route or upon arrival. Medical evacuations and hospitalizations spanned South Africa, the Netherlands, Switzerland, Spain, and France.[6,7]

27 May 2026

A total of 13 cases (11 confirmed, 2 probable) and 3 deaths were recorded, case fatality rate shifted from 38% on 08 May to 23% by 27 May.[6,7]

Outbreak investigation

Extensive international collaboration enabled rapid RT-PCR testing and genomic sequencing, which identified the Andes virus.[7]

Three hypotheses for outbreak spread formulated by epidemiologists: preboarding environmental exposure of index case, onboard environmental exposure due to potential contamination of ship's food storage by infected rodents, and human to human transmission in confined environment suggestive of ANDV.[5-7]

Surveillance system and outbreak management

The WHO, ECDC, and national IHR focal points launched an unprecedented contact tracing operation. Over 600 contacts across 32 countries monitored. High risk were quarantined for 42 days.

This emphasized the need for cross-border surveillance, point- of – entry health protocols, and immediate isolation of respiratory distress cases in traveler's returning from the cruise.[7]

THE INDIAN SCENARIO

Why India has not reported major outbreaks despite ecological suitability?

India possesses diverse ecological niches- ranging from dense tropical forests to extensive agricultural belts-capable of supporting robust rodent and insectivore population. However, no major outbreak of HFRS or HCPS remain officially unrecognized. This represents severe gap in detection. Thottapalayam virus (TMPV), a highly divergent virus was isolated in Vellore, India, from and insectivore (*Suncus murinus*) as early as 1964.[13] Recent seroepidemiological studies indicate a 4% hantavirus seropositivity in the general Indian population.[14] Furthermore, India harbors both HTNV like and Thialand virus (THAIV) like strains. The lack of documented cases is primarily due to unavailability of accessible, cost-effective diagnostic kits, and general lack of clinical awareness among physicians regarding hantavirus manifestation.

Laboratory diagnosis relies heavily on identifying IgM and Igg antibodies.[9] Diagnostic overlap of hantavirus infection with leptospirosis, scrub typhus, dengue, and viral pneumonias create massive confusion. Co-infections futher can alter the clinical picture.[4]

Policy recommendations for India

Strengthening the integrated disease surveillance programme, operationalizing one health, rodent monitoring systems, laboratory network expansion, emergency preparedness and cross-border surveillance and community awareness and risk communications.[1,4,7,14,15]

Largescale surveys to map the true burden of disease in India, identifying specific environmental triggers like climate change, monsoon patterns and deforestation that can drive spillover, one health implementation, cost-effective point of care diagnostic tests for strains specific to Indian subcontinent, genomic sequencing, progression in vaccines and therapeutics as there are no FDA-approved vaccines or specific therapeutics for hantaviruses globally can be the future priorities.[11,16,17]

CONCLUSION

The 2026 International Andes hantavirus outbreak clearly illustrates the ongoing threat of these emerging pathogens. For India, the absence of massive outbreaks is likely an illusion fostered by diagnostic masking. By strengthening surveillance, one health approach, and targeted research India can prepare its public health infrastructure against the silent but imminent threat of hantavirus zoonosis.

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