Current Situation and Global Perspective of Nipah Virus

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ABSTRACT

The Nipah virus (NiV) is a highly pathogenic zoonotic virus associated with recurrent outbreaks in South and Southeast Asia. Since its first identification in 1998 among the pig farmers in Sungai Nipah Village in Malaysia, NiV has demonstrated high case fatality rates (40–75%) and significant epidemic potential. At that time, the virus spread to Singapore, and human cases were also identified in India, Bangladesh, and Philippine afterwards. No human cases have been reported in Indonesia; the country remains on high alert due to geographic concerns and the intensity of mobilization of people. To review the current global epidemiological situation of Nipah virus (as of 2026), evaluate public health preparedness, and analyze ongoing research efforts, including vaccine and therapeutic development.

Nipah virus outbreaks remain geographically concentrated in Bangladesh and India, with seasonal spillover events linked primarily to bat-to-human transmission through contaminated food products. Human-to-human transmission occurs but remains limited. Improved surveillance, rapid case isolation, and contact tracing have reduced outbreak sizes in recent years. Vaccine candidates are currently in Phase II clinical trials.

While the global pandemic risk remains low at present, the Nipah virus continues to represent a high-consequence emerging pathogen. Sustained surveillance, vaccine development, ecological research, and strengthened health systems are critical to mitigating future risks.

Keywords: *Nipah virus, zoonotic diseases, emerging infections, encephalitis, outbreak preparedness.*

INTRODUCTION

Emerging zoonotic diseases pose continuous threats to global health security. Among them, the Nipah virus (NiV) stands out due to its high mortality rate, recurrent outbreaks, and potential for human-to-human transmission. Classified as a priority pathogen by the World Health Organization (WHO), NiV demands urgent research and preparedness planning.[1] NiV was first identified in 1998 during an outbreak among pig farmers in Malaysia. Since then, outbreaks have been reported primarily in Bangladesh and India, with occasional cases in other Southeast Asian regions.[2] Although NiV has not achieved sustained global transmission, its epidemiological characteristics raise concerns regarding future pandemic potential. Indonesia, as a neighboring country, has reported zero cases until now. However, alertness to the potential spread of the virus remains high. This review examines the current global situation of Nipah virus (2026), reviewing epidemiology, virology, clinical features, public health responses, and research developments.

METHODS

Data from WHO situation reports, national public health agencies, peer-reviewed journals,

and surveillance updates published between 2001 and 2026 were analyzed. Databases reviewed included PubMed, Scopus, and official reports from international health authorities. Information on outbreak data, transmission dynamics, and prevention strategies was highlighted.

VIROLOGY AND TRANSMISSION

NiV belongs to the genus Henipavirus within the family Paramyxoviridae (**Figure 1**). Its natural reservoir hosts are fruit bats of the Pteropodidae family, commonly known as flying foxes.[3]

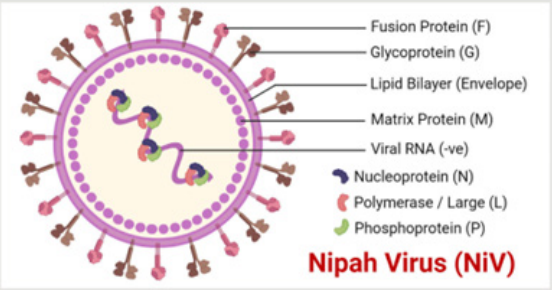

Figure 1. Structure of Nipah Virus.[4]

ZOONOTIC TRANSMISSION

Transmission pathways include direct contact with infected bats, consumption of bat-contaminated food products (notably raw date palm sap), contact with infected livestock (particularly pigs), and close contact with infected humans (**Figure 2**). Unlike respiratory viruses such as SARS-CoV-2, NiV transmission generally requires close exposure. However, nosocomial (hospital-acquired) transmission has been documented, particularly in settings with inadequate infection control.[5] This limited transmission is believed to be one reason why NiV has not caused a global pandemic. However, its high case fatality rate and periodic reemergence make it a serious local and regional concern.

VIRAL PATHOGENESIS

NiV primarily targets endothelial cells and neurons, leading to systemic vasculitis and encephalitis. Neurological involvement is a hallmark of severe infection and is associated

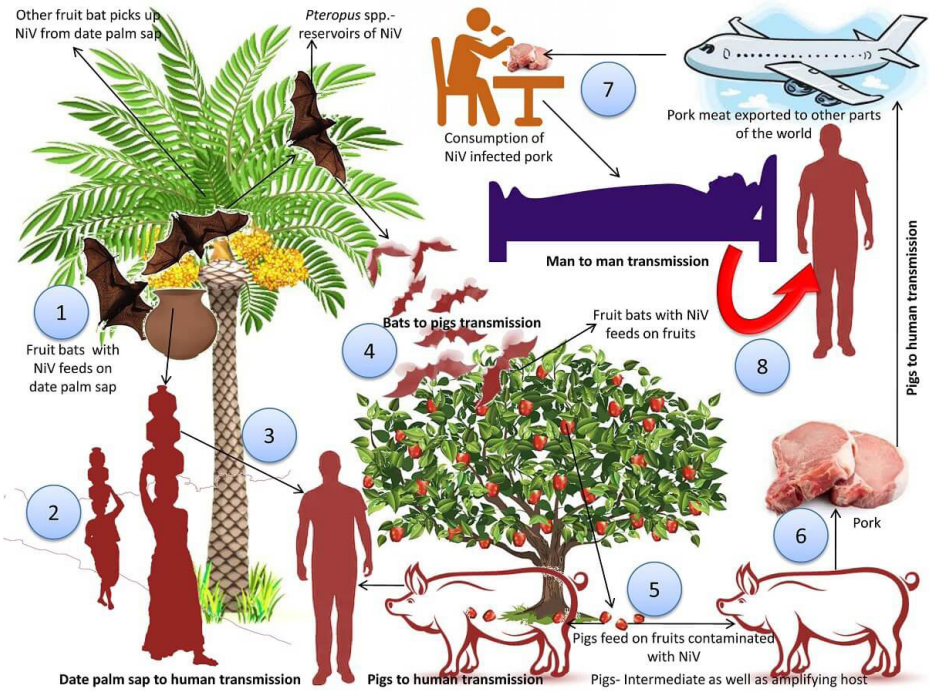

Figure 2. Transmission of Nipah Virus.[4]

with high mortality (**Figure 3**).[6] When the virus enters the host cell, it attaches through the viral glycoprotein G to the ephrin-B2 receptor on the host cell surface. This attachment initiates conformational changes that activate the fusion (F) protein, causing the virus to merge with the host cell membrane. NiV is a negative-sense, single-stranded RNA virus that replicates in the cytoplasm. The virus spreads via leucocytes and infects endothelial cells, causing viremia and might lead to vasculitis, thrombosis, and tissue necrosis. NiV efficiently escapes the host immune system. The V and W proteins block interferon production, while protein P and C facilitate uncontrolled viral replication lead to severe inflammation.[6,7]

GLOBAL EPIDEMIOLOGY (1998–2026)

Malaysia and Singapore (1998–1999)

The first outbreak involved 265 cases and over 100 deaths, primarily among pig farmers. Mass culling of pigs successfully controlled the outbreak.[2]

Bangladesh (2001–Present)

Since 2001, Bangladesh has reported nearly annual outbreaks, often during winter months (December–April). Most cases are associated with consumption of fresh date palm sap contaminated by bats.[8] Case fatality rates have ranged from 40% to 75%.

India

India has reported multiple outbreaks, notably in Kerala (2018, 2021, 2023–2025) and West Bengal (2026). Improved rapid response systems have limited outbreak sizes in recent years.[9]

Current Situation in 2026

As of early 2026, Confirmed cases remain limited to India and Bangladesh. No sustained international transmission has been reported. Neighboring Southeast Asian countries have heightened surveillance but report no confirmed local outbreaks. WHO currently assesses the global risk as moderate regionally and low internationally.[1]

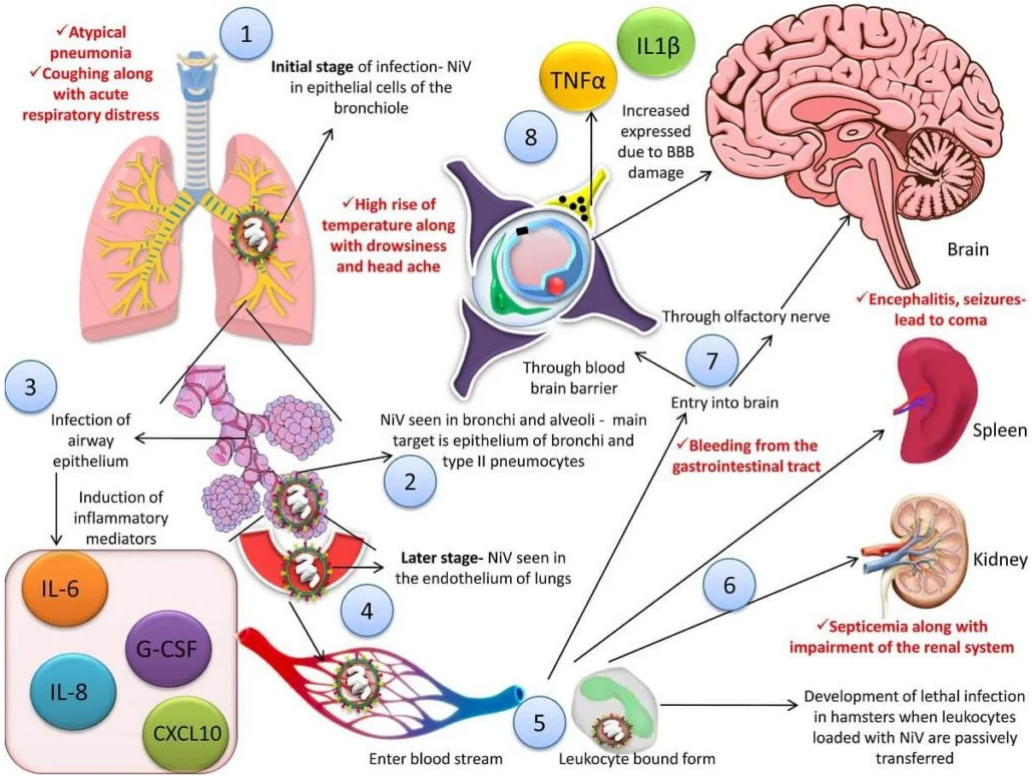

Figure 3. Viral Pathogenesis.[4]

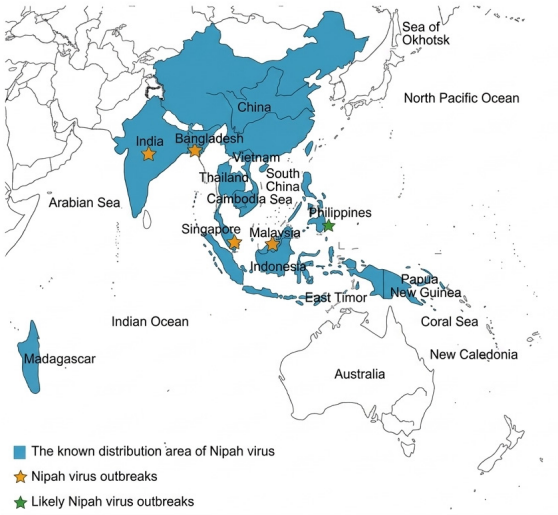

Figure 4. Geographical distribution of Nipah Virus in the world.[9]

CLINICAL MANIFESTATIONS

The incubation period ranges from 4 to 14 days, occasionally extending up to 45 days.[1] Initial symptom includes fever, headache, myalgia, vomiting, and sore throat. Severe disease could manifest as an acute encephalitis with altered consciousness with or without seizures. The respiratory distress and coma could lead to mortality between 40-75%, depending on the outbreak context and healthcare access.[1,8] Survivors may experience persistent neurological deficits, personality changes, or seizure disorders.[6]

PUBLIC HEALTH RESPONSE

Rapid identification and isolation are critical. Polymerase chain reaction (PCR) testing remains the gold standard diagnostic method. A Comprehensive contact tracing and quarantine measures have significantly reduced outbreak magnitude in India's recent responses.[10] In a health care setting, personal protective equipment (PPE), strict hand hygiene, dedicated isolation wards, and nosocomial outbreaks underscore the importance of IPC adherence.[6] Furthermore, at the community-level, an education to discourage consumption of raw date palm sap, contact with sick animals, and handling of bats. Physical barriers on sap collection pots have reduced spillover events in Bangladesh.[8]

VACCINE AND THERAPEUTIC DEVELOPMENT

Currently, no licensed vaccine or specific antiviral therapy exists. A promising vaccine candidate using the ChAdOx1 viral vector platform has entered Phase II trials. Early-phase trials demonstrate immunogenicity and acceptable safety profiles.[11] Experimental monoclonal antibody therapies have shown protective effects in animal models, suggesting potential future therapeutic options.[12] Ribavirin has been used experimentally but lacks definitive efficacy evidence. Research continues into novel antiviral agents targeting henipavirus replication pathways.

ECOLOGICAL AND ENVIRONMENTAL DRIVERS

Deforestation, agricultural expansion, and climate change contribute to increasing bat-human interaction.[13] Urban encroachment into bat habitats may heighten spillover risks. Ecological surveillance of bat populations is therefore essential.

PANDEMIC POTENTIAL ASSESSMENT

NiV possesses several concerning features due to potential high mortality, zoonotic reservoir, limited therapeutic options, and documented human-to-human transmission. However, sustained respiratory transmission has not been observed. Current R_0 estimates remain below levels required for widespread pandemic spread.[5] Continuous viral mutation monitoring is essential, as evolutionary changes could alter transmissibility. Challenges in low-resource settings include limited diagnostic capacity that might cause delays in diagnosis, cultural practices promoting exposure, and the healthcare infrastructure constraints. Strengthening primary healthcare systems in endemic regions remains a priority. The Key priorities for the infections should address completion of vaccine trials, strengthening genomic surveillance, integrating One Health approaches, and enhancing global research collaboration. Investment in outbreak preparedness infrastructure is critical to preventing escalation.

CONCLUSION

The Nipah virus remains a high-fatality emerging pathogen with regional persistence in South Asia. Although global pandemic risk remains low, its epidemic potential necessitates sustained vigilance. Advances in surveillance, rapid response, and vaccine research offer optimism. However, ecological pressures and zoonotic spillover risks continue to challenge containment efforts. A proactive, coordinated international approach grounded in the One Health framework is essential to mitigating future Nipah virus outbreaks.

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