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# NIPAH VIRUS INFECTION (NIV)

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**ABSTRACT:** Nipah virus, a paramyxovirus related to the Hendra virus, first emerged in Malaysia in 1998. It is an emerging zoonotic infection that presents with acute encephalitis and respiratory distress syndrome. It is associated with high mortality and classified as a Biosafety level 4 organism in view of its features which make it a potential agent for Bioterrorism. Experience with the broad-spectrum antiviral agent Ribavirin is promising in reducing mortality and morbidity. In the Malaysia-Singapore outbreak, transmission occurred primarily through contact with pigs, whereas in Bangladesh and India, it is associated with the ingestion of contaminated date palm sap and human-to-human transmission. Bats are the main reservoir for this virus, which can cause disease in humans and animals. There are currently no effective therapeutics, and supportive care and prevention are the mainstays of management.

## INTRODUCTION

Nipah virus (NiV) was first discovered in 1999 following an outbreak of the disease in pigs and people in Malaysia and Singapore. This outbreak resulted in nearly 300 human cases and morethan 100 deaths and caused a substantial economic impact as more than 1 million pigs were killed to help control the outbreak.

NiV is a member of the family Paramyxoviridae, genus Henipavirus. It is a zoonotic virus that initially spreads between animals and people. The animal host reservoir for NiV is the fruit bat (genus Pteropus), also known as the flying fox. Given that NiV is genetically related to the Hendra virus, another henipavirus known to be carried by bats, bat species were quickly singled out for investigation, and flying foxes were subsequently identified as the reservoir.

Infected fruit bats can spread the disease to people or other animals, such as pigs. People can become infected if they have close contact with an infected animal or its body fluids (such as saliva or urine)—this initial spread from an animal to a person is known as a spillover event. Once it spreads to people, the person-to-person spread of NiV can also occur.

The symptoms of NiV infection range from mild to severe, with death occurring in 40%–70% of those infected in documented outbreaks between 1998 and 2018.

## DEFINITION

- Nipah virus (NiV) infection is a newly emerging zoonosis (disease or infection that is naturally transmissible from vertebrate animals to humans) that causes severe disease in both animals and humans.

The Nipah virus is closely related to the Hendra virus. Both are members of the genus Henipavirus, a new class of virus in the Paramyxoviridae family.

- Nipah virus (NiV) is a zoonotic virus (it is transmitted from animals to humans) and can also be transmitted through contaminated food or directly between people. In infected people, **it causes a range of illnesses from asymptomatic (subclinical) infection to acute respiratory illness and fatal encephalitis**.

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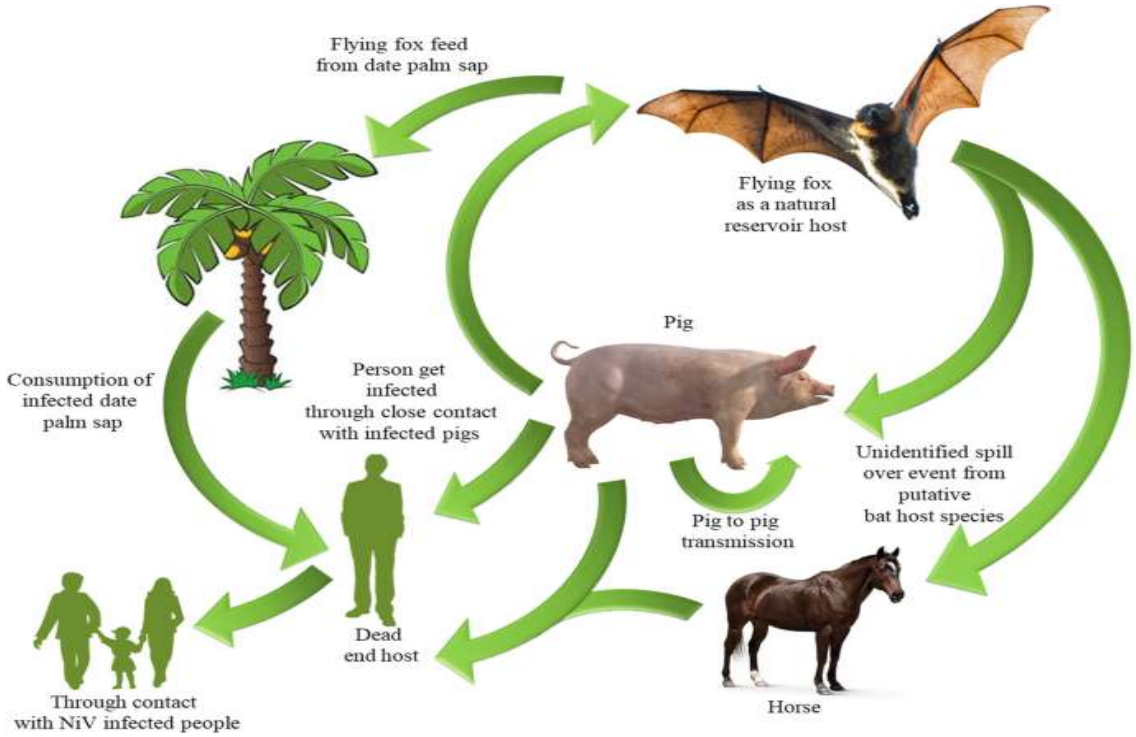
**INCIDENCE**

1. Some cases of relapse have been reported. **The case fatality rate of Nipah virus infection is estimated at 40–75%**.
2. In India, the first Nipah virus disease outbreak was reported in Siliguri town in 2001, followed by a second outbreak in Nadia district in 2007, both in West Bengal state. In 2018, an outbreak was reported in the Kozhikode district, and in 2019, another outbreak in the Kochi district, both in Kerala state.
3. On 4 September 2021, the Kerala State Health Department reported an isolated case of Nipah virus disease in Kozhikode district, Kerala state, India.
4. Nipah has a relatively high case fatality ratio and is an emerging zoonotic disease of public health importance in South East Asia and Western Pacific WHO Regions. This is the fifth outbreak of the disease in India.

**TRANSMISSION**

**Nipah virus (NiV) can spread to people from:**

- Direct contact with infected animals, such as bats or pigs, or their body fluids (such as blood, urine, or saliva)
- Consuming food products that have been contaminated by the body fluids of infected animals (such as palm sap or fruit contaminated by an infected bat)
- Close contact with a person infected with NiV or their body fluids (including nasal or respiratory droplets, urine, or blood)



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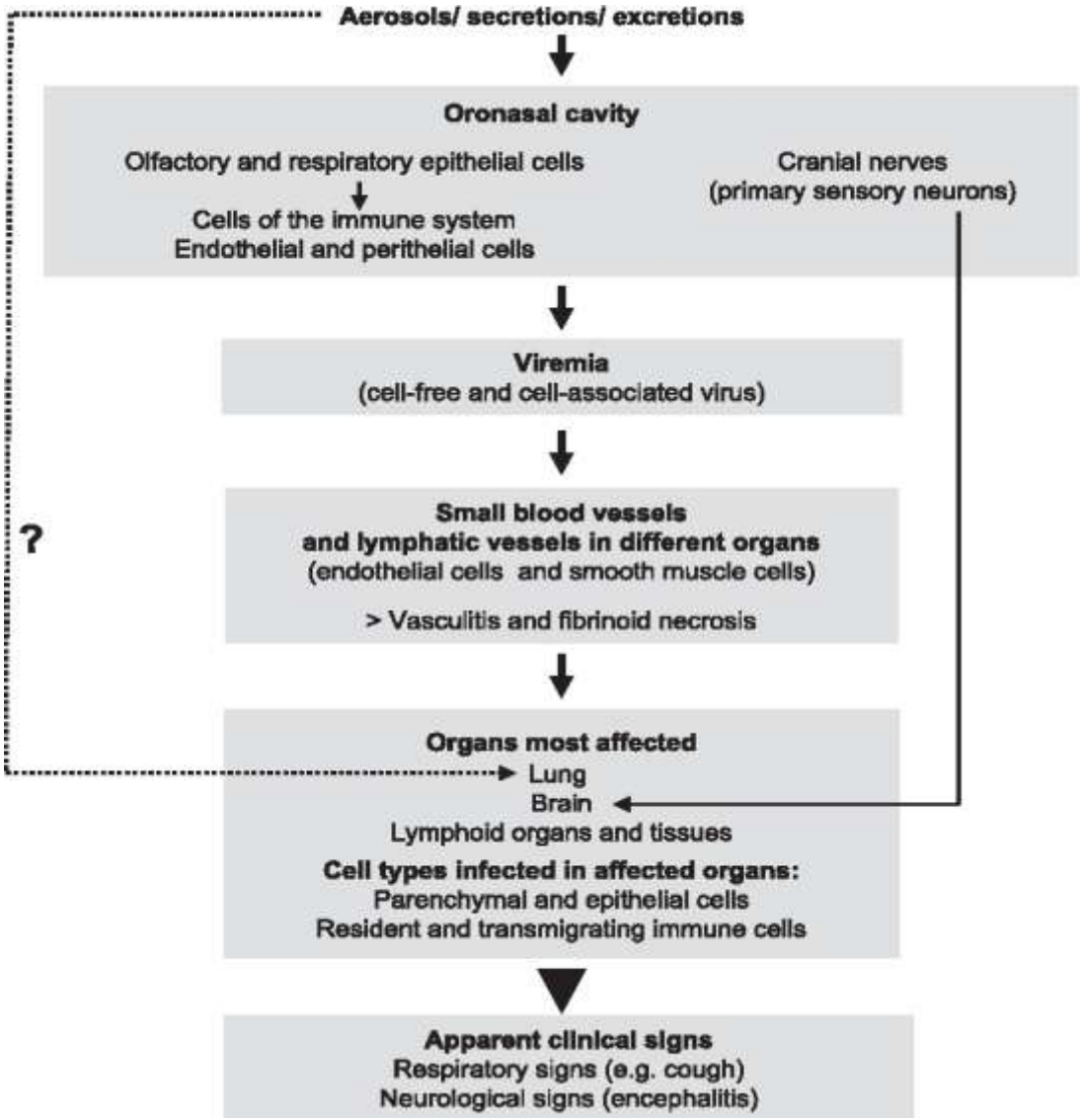
**PATHOPHYSIOLOGY**




**SIGNS AND SYMPTOMS**

**Initial symptoms:**

- Fever
- Headache
- Cough
- Sore throat
- Difficulty breathing
- Vomiting

**Severe symptoms:**

- Disorientation, drowsiness, or confusion
- Seizures
- Coma
- Brain swelling (encephalitis)

Death may occur in 40-75% of cases. Long-term side effects in survivors of Nipah virus infection have been noted, including persistent convulsions and personality changes.

**DIAGNOSTIC EVALUATION**

- Real-time polymerase chain reaction (RT-PCR) from the throat and nasal swabs, cerebrospinal fluid, urine, and blood. Later in the course of illness and after recovery, testing for antibodies is conducted using an enzyme-linked immunosorbent assay (ELISA).
- In live patients, samples like cerebrospinal fluid, throat swabs, swabs, blood, and urine can be used for the diagnosis of NiV infection.
- Samples such as spleen, kidney, and biopsies can be used for diagnosis in dead patients. Isolation and propagation of NiV-infected patients require enhanced biosafety level 3 and 4 facilities.
- A wide array of tests can be employed in the detection of NiV, including virus isolation and

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neutralization, immunohistochemistry, molecular and serological assays, and polymerase chain reaction (PCR). NiV culture can be performed using Vero cells and within three days, cytopathic effects can be observed.

**COMPLICATION**

- Septicemia
- GI bleeding
- Renal impairment
- Relapse or late-onset encephalitis
- Residual neurological deficits
- Massive cerebral hemorrhage
- Death

**TREATMENT**

Currently, there are no licensed treatments available for Nipah virus (NiV) infection. Treatment is limited to supportive care, including rest, hydration, and treatment of symptoms as they occur.

- immunotherapeutic treatments (monoclonal antibody therapies) that are currently under development and evaluation for the treatment of NiV infections.
- One monoclonal antibody, m102.4, has completed phase 1 clinical trials and has been used on a compassionate basis.
- Ribavirin and acyclovir have been administered during past outbreaks to treat NiV infection. Ribavirin was administered either intravenously or orally to patients presenting with NiV encephalitis in Malaysia and approximately a 36% decrease in the mortality rate was observed.
- In Singapore, acyclovir was administered to all patients presenting with NiV encephalitis and only one case of death was reported.
- Recently, there have been ongoing investigations on the potency of vaccine administration and the efficacy of antiviral therapies in the treatment of NiV infection.
- The increased mortality rate of NiV infection and its severe impact on community health, specific antiviral agents must be developed for the early treatment of infected individuals.

**PREVENTIONAND CONTROL**

- **Reducing the risk of bat-to-human transmission.**

Efforts to prevent transmission should first focus on decreasing bat access to date palm sap and other fresh food products. Keeping bats away from sap collection sites with protective coverings (such as bamboo sap skirts) may be helpful. Freshly collected date palm juice should be boiled, and fruits should be thoroughly washed and peeled before consumption. Fruits with signs of bat bites should be discarded.

- **Reducing the risk of animal-to-human transmission**.

Gloves and other protective clothing should be worn while handling sick animals or their tissues, and during slaughtering and culling procedures. As much as possible, people should avoid being in contact with infected pigs. In endemic areas, when establishing new pig farms, considerations should be given to the presence of fruit bats in the area, and in general, pig feed and pig sheds should be protected against bats when feasible.

- **Reducing the risk of human-to-human transmission**.

Close unprotected physical contact with Nipah virus-infected people should be avoided. Regular hand washing should be carried out after caring for or visiting sick people.

**VACCINES**

A number of vaccine strategies have been developed for NiV, several of which have been tested in animal models.

- Vaccine based on G glycoprotein (sG) of NiV and HeV. HeV-sG elicits a cross-protective immune response against both HeV and NiV.
- A horse vaccine against HeV called Equivac is registered in Australia.
- These recombinant viruses express the F or G glycoproteins on their surface. A mammalian cell-derived virus-like particle vaccine has also been produced. All these approaches have produced complete protection against the oro-nasal NiV challenge after a single dose in various animal models.
- The success of the sG vaccine in horses and of the VSV vectored Ebola vaccine (rVSV-ZEBOV) make these two approaches attractive for eventual use in humans.

**Controlling infection in healthcare settings**

- Healthcare workers caring for patients with suspected or confirmed infection, or handling specimens from them, should implement standard infection control precautions at all times
- As human-to-human transmission has been reported, in particular in healthcare settings, contact and droplet precautions should be used in addition to standard precautions. Airborne

precautions may be required in certain circumstances.

- Samples taken from people and animals with suspected Nipah virus infection should be handled by trained staff working in suitably equipped laboratories.

**NURSING MANAGEMENT**

**Public health educational messages should focus on:**

- Practice handwashing regularly with soap and water
- Avoid contact with sick bats or pigs
- Avoid areas where bats are known to roost
- Avoid eating or drinking products that could be contaminated by bats, such as raw date palm sap, raw fruit, or fruit that is found on the ground
- Avoid contact with the blood or body fluids of any person known to be infected with NiV
- Evaluation of novel technologies or methods to minimize the spread of the virus within bat populations.
- Improving tools to detect the virus early in communities and livestock.
- Reinforcing protocols for healthcare settings on standard infection control practices to prevent person-to-person spread.
- Preventive measures, such as the bamboo skirt method, can be used to reduce date palm sap contamination. This bamboo skirt method typically involves the hanging of the pot over a bamboo skirt and covering its shaved part and mouth.
- Another method is the sap branch technique which involves the covering of the shaved part of the tree with branches from the same tree or with clothes or a mosquito net.
- Fruits should be properly washed and after each preparation, individuals should ensure their hands are thoroughly washed to prevent the spread of the disease.
- Media communication like television, radio channels, posters as well as physical-based programs can be utilized to improve awareness of the virus among different populations, especially among impoverished populations.

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