JBAAR

Journal of Bioscience and Applied Research
https://jbaar.journals.ekb.eg
SPBH-IC: Biomedical pISSN: 2636-4077, eISSN: 2636-4085

SPBH

Nipah virus infection and characteristics: A Review

Jinu. K. Rajan[1], Samira Alsenany[2], Nalini Ramakrishnan[3]

[1]Assistant Professor, Department of Nursing, Dar Al Uloom University, Riyadh, KSA

[2]Associate Professor in Gerontology, Public Health Nursing Department, Faculty of Nursing, King Abdulaziz University, Jeddah, Saudi Arabia.

[3]Uloom University, Riyadh, KSA, email: Nalini.r@dau.edu.sa

Corresponding author: Dr. Jinu. K. Rajan

Assistant Professor, Department of Nursing, Dar Al Uloom University, Riyadh, KSA

Email: j.rajan@dau.edu.sa, Mobile:0966-597297810

DOI:10.21608/jbaar.2024.395630

ABSTRACT

A single-stranded RNA virus belonging to the Paramyxoviridae family, the Nipah virus (NiV) is extremely pathogenic. Since 2001, it has caused numerous outbreaks in Bangladesh, India, Singapore, Malaysia, and other countries. It is a common zoonotic disease that initially appeared among pig breeders in northern Peninsular Malaysia in 1998. Animals and humans can contract diseases caused by the Nipah virus. Fruit bats (genus Pteropus), commonly called flying foxes, are carriers of the Nipah virus. Nipah was initially identified in 1999 due to an outbreak that affected humans and pigs in Malaysia and Singapore. Three hundred people were ill, and over a hundred of them passed away. The Nipah virus was first transmitted to pigs by bats in this early outbreak. Those who had direct contact with the diseased pigs also became ill. Only Bangladesh, India, Malaysia, the Philippines, and Singapore have recorded Nipah outbreaks. To avoid complications and enhance patient outcomes, the review's conclusion highlights the significance of early diagnosis and control.

KEYWORDS: Nipah virus infection, Paramyxoviridae, zoonotic disease

---

INTRODUCTION

The Nipah virus (NiV) is an extremely pathogenic single-stranded RNA virus belonging to the Paramyxoviridae family (1). Since 2001, it has caused numerous outbreaks in Bangladesh, India, Singapore, Malaysia, and other countries. It is a common zoonotic disease that initially appeared among pig breeders in northern Peninsular Malaysia in 1998 (2).

A report of an incident that occurred in Bangladesh between December 15, 2004, and January 31, 2005, states that people contracted NiV after ingesting date palm sap contaminated with bat urine, which was incubated for two to three weeks (3). The biggest known outbreak of the Nipah virus disease happened in Kerala, India, on August 30, 2023. There were 30 instances of infection with a high mortality rate of 40–75% (4). In Kerala, human-to-human transmission was involved in about half of the cases. In 1998, NiV surfaced in Malaysia after a pig farmer outbreak. Since then, five South and Southeast Asian nations—Bangladesh, India, Malaysia, the Philippines, and Singapore—have reported NiV outbreaks. As of May 2024, these five countries reported 754 confirmed human NiV cases and 435 deaths (CFR: 58%).

Received: September 10, 2024. Accepted: December 3, 2024. Published: December 13, 2024

Malaysia (283 cases and 109 deaths; CFR: 39%), India (102 cases and 74 deaths; CFR: 73%), the Philippines (17 cases and nine deaths; CFR: 53%), Singapore (11 cases and one death; CFR: 9%), and Bangladesh had the highest incidence (341 cases and 241 deaths; CFR: 71% (5).

To avoid complications and enhance patient outcomes, the review's conclusion highlights the significance of early diagnosis and control.

Only Bangladesh, India, Malaysia, the Philippines, and Singapore have recorded Nipah outbreaks. However, the Nipah virus-carrying fruit bats are widespread in Australia, the South Pacific, and Asia (6).

In 1998 and 1999, the viral disease known as Nipah virus disease initially affected farmed pigs in Malaysia and Singapore. The word Nipah comes from the name of the Malaysian village where the pig breeders contracted the disease (7). The RNA virus that causes Nipah virus disease belongs to the genus Henipavirus and the family Paramyxoviridae. It is closely related to the Hendra virus, which causes acute respiratory infections in people and animals.

There is proof that some domestic animal species, including pigs, horses, dogs, and cats, can contract the Nipah virus (8). Pigs with the disease exhibit respiratory and sometimes neurological clinical symptoms. Humans contracted NiV in the early outbreaks in Malaysia and Singapore in the 1999s after coming into close contact with sick pigs. Since then, though, the majority of human cases of NiV have either been brought on by exposure to infected bats or contact with other affected people. Human infections with the Nipah virus can manifest clinically in a variety of ways, ranging from asymptomatic infection to severe respiratory symptoms and lethal encephalitis (9).

AETIOLOGY:

Nipah is a zoonotic virus that belongs to the genus Henipavirus and the family Paramyxoviridae. The virus can be spread to humans and other animals, including pigs, by fruit bats (genus Pteropus). This bat is widespread in Australia, the South Pacific, and Southeast Asia. If a person comes into intimate touch with an infected animal or its bodily fluids, they could contract the infection. Nipah can spread from person to person once it has infected someone (6,10).

SIGNS & SYMPTOMS:

A Nipah virus infection can result in mild to severe illness, including encephalitis and sometimes even death.

Nipah patients typically experience fever, headache, cough, sore throat, and dyspnea for three to fourteen days. The patient may become ill and develop encephalitis later in the infection. Within 24 to 48 hours, this condition may worsen and result in a coma.

The following are possible initial symptoms:

• A fever
• Headache
• Cough
• A sore throat
• Having trouble breathing
• Throwing up

The following are severe encephalitis symptoms:

• Bewilderment, fatigue, or disorientation
• Convulsions
• Coma
• Nipah can result in minor to severe illnesses, such as cerebral edema and even death.

Nipah patients usually have fever, headache, cough, sore throat, and trouble breathing for three to fourteen days. Confusion, drowsiness, and seizures are among the severe symptoms of encephalitis, or brain swelling, which some people may encounter later in the infection. Within 24 to 48 hours, those with these symptoms may go into a coma (6,11).

PROGNOSIS:

Although previous outbreaks have had a 100% case fatality rate, 40 to 70% of Nipah virus infections are fatal (12,13).

HOW IT SPREADS:

Nipah infections can spread from:

• Close contact with animals that are affected, such

as pigs or bats

• Eating or drinking items contaminated by infected animals, such as fruit or raw date palm sap

• Direct contact with an infected person's bodily fluids

• Eating fruit contaminated by an infected bat or drinking raw date palm sap can infect a person. A spillover event is the term used to describe this initial transmission from an animal to a human.

• Nipah is a virus that can be transmitted from person to person once an individual has contracted it (14).

Fruit bats, sometimes referred to as "flying foxes," are Nipah virus15's natural reservoir hosts. Bat urine, as well as perhaps bat feces, saliva, and birthing fluids, contain the virus. Bats were linked to the virus's introduction to pig herds during the 1998–1999 outbreaks in Malaysia, possibly as a result of the pigs consuming food and water tainted with bat feces. The virus can be transferred from one pig farm to another by direct contact between the pigs and from one pig farm to another by fomites (carrying the virus on clothing, equipment, boots, automobiles, etc.) (15).

PUBLIC HEALTH RISK:

Human death rates from the zoonotic Nipah virus range from 40% to 75%. Humans have nearly always contracted the disease by direct contact with the secretions or excretions of sick pigs during the 1998–1999 outbreaks in Malaysia and Singapore. Reports of outbreaks since then, particularly in Bangladesh and India, indicate that bats can spread the disease without the need for an intermediary host by eating raw palm sap or fruits or by climbing trees that have bat feces.

Direct contact with contaminated fluids during the slaughter of sick horses and ingestion of undercooked meat was blamed for a reported NiV outbreak in humans in the Philippines in 2014. Human NiV instances linked to close and extended contact with an infected person have been reported recently. As a result, those who care for infected patients must take precautions. Additionally, people who work closely with susceptible animals and slaughterhouses from at-risk areas should take precautions while handling and submitting laboratory samples from suspected cases.

The epidemiology of NiV infection has changed within the last 20 years. Domestic animals have a minor role in the transmission of NiV, with human-to-human and bat-to-human transmission accounting for the majority of recent occurrences (16).

INCUBATION PERIOD:

Usually, 4–14 days after viral exposure, symptoms start to show.

Months or even years after exposure, some infections have been documented. These infections are referred to as latent or dormant (6).

REDUCING RISK:

The risk of infection is increased for caregivers and medical professionals who treat a patient with Nipah.

If you visit or reside in a region where outbreaks of the Nipah virus have happened, you should:

• Regularly wash your hands with soap and water.

• Steer clear of sick pigs and flying fox bats.

• Stay away from places where bats roost or

• Refrain from touching anything that bats could contaminate.

• Steer clear of raw date palm sap and fruit that bats might contaminate.

TESTING AND DIAGNOSIS

- It can be difficult to diagnose Nipah infections early because of their vague early signs.
- To increase survival, stop transmission, and control an outbreak, early discovery is essential.
- For those with pertinent symptoms who have visited regions where the virus is endemic, Nipah should be taken into consideration.

- It is possible to diagnose a Nipah infection while unwell or after recovery. Use real-time polymerase chain reaction (RT-PCR) to check for Nipah in the early stages of infection Reverse transcriptase polymerase chain reaction (RT-PCR) can be used to identify RNA from throat swabs, cerebrospinal fluid, urine, and blood tests during the acute and convalescent phases of the illness.
- Use an enzyme-linked immunosorbent assay (ELISA) to check for antibodies later in the course of the illness and after recovery (6).
- IgG and IgM antibody testing during recovery can verify a previous Nipah virus infection. The condition is also confirmed by immunohistochemistry on tissues taken during autopsy (12).

PREVENTION AND CONTROL:

To keep domestic animals from becoming infected, good biosecurity is essential. Reducing the possibility that sensitive animals would come into touch with the bat reservoir is one of the most crucial biosecurity measures for impacted areas. Pigs and horses should not be allowed near fruit tree plantations in affected areas, and animals should not be fed fruits that may have come into touch with bats.

The Veterinary Authorities should be notified of any suspected or confirmed cases, and veterinarians and animal keepers should be vigilant. Eradication depends on the early identification and killing of diseased and vulnerable animals because there is no known cure or vaccination for NiV. Chlorinated lime should be used to cleanse the graves of infected animals (17).

Reducing human contact with bats and bat secretions, such as washing fruits and vegetables before eating them, washing your hands a lot after handling or preparing them, and using covered containers when collecting palm sap and boiling it before eating, are all ways to prevent infection in humans (18,19). It is strongly advised that anybody who comes into touch with potentially sick animals receive education and wear personal protective equipment (PPE).

TREATMENT AND RECOVERY:

Nipah does not currently have any approved treatments.

The only available treatment is supportive care, which includes rest, hydration, and symptom management.

Although there isn't a licensed treatment, several alternatives are being developed:

• Phase 1 clinical trials for the immunotherapeutic therapy m102.4 are now complete.

• Compassionate usage has been applied to m102.4.

•When administered to exposed nonhuman primates, the medication remdesivir has been shown to help prevent Nipah.

Remdesivir may be used in conjunction with immunotherapeutic interventions such as m102.4.

• Although its effectiveness is unknown, ribavirin was used to treat a small number of patients during the 1999 Malaysian Nipah outbreak (6).

IMMUNIZATION:

A human monoclonal antibody, m102.4, which targets the ephrin-B2 and ephrin-B3 receptor-binding region of the henipaviral Nipah G glycoprotein, was used to assess passive vaccination as a post-exposure prophylactic in the ferret model (20,12). m102.4 was in pre-clinical development in 2013 and has been used compassionately in humans in Australia (20).

CONCLUSION:

Reducing the risk of infection requires stopping the transmission of NiV. Further direct contact with viral carriers like bats and intermediate hosts like pigs and cattle should be avoided to stop and restrict the transmission of NiV, particularly in the early stages of suspected NiV outbreaks. To prevent the pandemic from spreading over the world, strict

isolation measures should be put in place if a case is confirmed. Raising public awareness of NiV prevention and coordinating government and organizational capabilities to create wildlife management plans—especially for the conservation of bats and other wildlife habitats—are necessary to respond to a global pandemic swiftly and effectively (21).

Author Contributions: All the authors have contributed significantly.
Conflict of interest: Nil
Ethical Issues – No
Financial Aid- No

REFERENCE

1.Chua, KB · Goh, KJ · Wong, KT · et al. Fatal encephalitis due to Nipah virus among pig-farmers in Malaysia Lancet. 1999; 354:1257-1259

2. Hsu, VP · Hossain, MJ · Parashar, UD · et al. Nipah virus encephalitis reemergence, Bangladesh Emerg Infect Dis. 2004; 10:2082-2087

3. Luby, SP· Rahman, M · Hossain, MJ · et al. Foodborne transmission of Nipah virus, Bangladesh. Emerg Infect Dis. 2006; 12:1888-1894

4. Thiagarajan, KNipah virus: India's Kerala state moves quickly to control fresh outbreak BMJ. 2023; 382:2117

5. Sakirul Khan "Twenty-five years of Nipah outbreaks in Southeast Asia: A persistent threat to global health Author links open overlay panel" https://www.sciencedirect.com/science/article/pii/S277270762400105X?via%3Dihub Volume 13, December 2024, 100434

6. "Nipah Virus" (February 23, 2024). Retrieved from https://www.cdc.gov/nipah-virus/about/index.html

7. Centers for Disease Control and Prevention (CDC). Outbreak of Hendra-like virus–Malaysia and Singapore, 1998-1999. MMWR Morb Mortal Wkly Rep. 1999;48(13):265-269.

8. Ang BSP, Lim TCC, Wang L. Nipah Virus Infection. J Clin Microbiol. 2018;56(6):e01875-17. doi:10.1128/JCM.01875-17.

9. Calisher CH, Childs JE, Field HE, Holmes KV, Schountz T. Bats: Important Reservoir Hosts of Emerging Viruses. Clin Microbiol Rev. 2006;19(3):531-545. doi:10.1128/CMR.00017-06.

12. Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases (NCEZID), Division of High-Consequence Pathogens and Pathology (DHCPP), Viral Special Pathogens Branch (VSPB). 19 October 2022. Retrieved 17 September 2023

13. Shoemaker T, Choi MJ (24 June 2019). "Henipaviruses - Chapter 4 - 2020 Yellow Book | Travelers' Health | CDC". Centers for Disease Control and Prevention. Retrieved 12 December 2021.

14. "Nipah virus" Retrieved from https://www.woah.org/en/disease/nipah-virus/

15. Calisher CH, Childs JE, Field HE, Holmes KV, Schountz T. Bats: Important Reservoir Hosts of Emerging Viruses. Clin Microbiol Rev. 2006;19(3):531-545. doi:10.1128/CMR.00017-06.

16. Nipah virus infection – Bangladesh. Accessed September 22, 2023. https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON442.

17. Information for General Public: Ministry of Health and Family Welfare. Accessed September 22, 2023. https://ncdc.mohfw.gov.in/showfile.php?lid=230.

18. Spickler AR. Nipah Virus Infection. Center for food safety and public health; 2016.

19 Seven things you need to know about Nipah virus | Gavi, the Vaccine Alliance. Accessed September 22, 2023.

https://www.gavi.org/vaccineswork/seven-things-you-need-know-about-nipah-virus.

20. Broder CC, Xu K, Nikolov DB, Zhu Z, Dimitrov DS, Middleton D, et al. (October 2013). "A treatment for and vaccine against the deadly Hendra and Nipah viruses". Antiviral
21. Cui, Ziqi, et al. “Nipah virus: a re-emerging public health concern”. The Lancet Microbe, Volume 5, Issue 3, e212