



Research Article

NIPAH VIRUS (NiV) INFECTION: OVERVIEW OF THE DEADLY DISEASE

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ABSTRACT

Nipah virus infection, a deadly emerging zoonotic disease in south east and south Asian region, has drawn tremendous attention after it's yet another recent outbreak in India. It is categorized as zoonotic biosafety level 4 (BSL4) agent. The symptoms of clinical illness in an infected patient range from no symptoms or mild flu like symptoms to severe fatal encephalitis with or without multi organ failure carrying mortality. The NiV is a single stranded RNA virus, member of the genus Henipavirus, in the Paramyxoviridae family. The natural hosts are the fruit bats and domestic animals are the intermediate hosts. Although carrying a high mortality rate, there has been no specific approved treatment or vaccination against this virus. Treatment is mostly intensive support and symptomatic relief.

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INTRODUCTION

In recent decades various zoonotic infectious diseases (transmitted to humans from animals or animal products) have newly emerged or re-emerged causing a real concern amongst the worldwide population. Most of these zoonotic diseases (SARS, Ebola, Marburg, Middle East Respiratory Syndrome (MERS) coronavirus and Melaka viruses) are related to wildlife, and include bats as their reservoir [1]. Healthcare workers and researchers are baffled as these zoonotic diseases carry high morbidity and mortality.

Nipah virus (NiV) infection is a deadly newly emerging zoonotic disease that causes severe life threatening disease in both humans and animals. It is currently (May, 2018) a cause of concern in southern part of India, Kerala state (northern district) where many cases are constantly being reported with high fatality [2]. NiV is named after the place Kampung Sungai Nipah in Malaysia, where it was first isolated after the disease outbreak occurred in 1998 involving high case fatality [1-5]. Initially confused as swine fever with encephalitis (pigs were the intermediate hosts) and led to culling of millions of pigs. The NiV is a single stranded RNA virus, member of the genus Henipavirus, in the Paramyxoviridae family. The natural hosts identified carrying this deadly virus are fruit bats (flying foxes) of the Pteropodidae family, Pteropus genus [1-4].

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In humans, NiV causes a range of illnesses from asymptomatic (subclinical) infection to acute respiratory illness and fatal encephalitis. The virus is also responsible for causing severe disease in animals, most commonly pigs and domestic animals (horses, goats, sheep, dogs, cats). Considering its high case fatality and high pathogenicity, it is categorized as zoonotic biosafety level 4 (BSL4) agent [3, 6].

Epidemiology

The period since the first isolation of the NiV (1998) till recent (2018) has seen multiple outbreaks in the region of south Asia, including Indian subcontinent [1-5]. The case mortality ranges from 40-70%, tough 100% mortality has also been reported [1-3]. In Bangladesh, there have been almost yearly outbreaks of NiV infection since 2001. India has seen the previous outbreaks in 2001 and 2007, both in the state of West Bengal [1-3, 6].

Transmission

NiV infection is a zoonotic disease. The initial outbreaks (Malasia, Singapore) the human infection resulted due to direct contact with infected pigs or their contaminated respiratory droplets, throat or nasal secretions, or contact with the tissue of a sick animal. The outbreaks in Bangladesh and India were thought to be via consumption of fruits or fruit products (e.g. raw date palm juice) contaminated with urine or saliva of the infected fruit bats [1-3, 8]. The human to human transmission is also possible and has been the main transmitting factor in the later outbreaks of NiV infection [1, 2, 8].

Sources of NiV

NiV has been isolated from urine, kidney and uterine fluids of wild pteropid bats. Virus can also be found in fruits or juice (e.g. unpasteurised date palm sap) that has been contaminated with bat saliva or urine [1-3]. The other infective sources include contaminated drinking water and aborted bat fetuses or other fluids/tissues of parturition. Infected pigs shed Nipah virus in respiratory secretions, saliva and urine. Virus has also been isolated from other domestic animals like sheep, goats, horses, cats, dogs (respiratory secretions, urine, placenta and embryonic fluids) [1-7].

NiV can survive for long time if given favorable conditions (for days in fruits, bat urine and contaminated fruit juices). The virus gets inactivated at 60°C for 60 minutes, and is susceptible to common soaps and disinfectants (Lipid solvents such as alcohol and ether, and sodium hypochlorite solution) [1].

Signs and Symptoms

The incubation period of NiV infection varies from four days to two weeks, but may extend up to 45 - 60 days [1-3, 5, 9]. Human infection with NiV can have a varied presentation ranging from asymptomatic infection to life threatening encephalitis [1-3, 9]. Patients initially present with influenza-like symptoms of fever, headache, myalgia, sore throat and vomiting. Patients can develop progressive symptoms of dizziness, altered consciousness, drowsiness and neurological signs of acute encephalitis [1-3, 5, 9]. Few of the patients present with atypical pneumonia and severe respiratory distress (acute respiratory distress syndrome). In severe cases, seizures and multi organ failure can occur and the patient progress to coma within 24 to 48 hours [1, 3, 5, 9]. About 20% of the patients who recover are left with residual neurological consequences including seizure disorder or personality changes.

Nipah virus in domestic animals

During the outbreaks, NiV infection has been reported in pigs and various domestic animals (horses, sheep, goats, dogs, cats). The NiV infected pigs are highly contagious during the incubation period, which lasts from 4 to 14 days. An infected pig may be asymptomatic or can develop symptoms of pyrexia, breathing difficulty, neurological symptoms (trembling, twitching, muscle spasms) and unusual barking cough.

Diagnosis

The diagnosis of NiV infection poses a challenge to the healthcare personnel as the initial presenting signs and symptoms are non-specific and often NiV is not suspected. This has hampered the early detection and often leads to large outbreaks before diagnosis can be reached and timely preventive interventions cannot be undertaken.

Samples to be sent:

- a) throat swab in viral transport medium.
- b) urine (10ml) in universal sterile container.
- c) blood in plain vial (at least 5ml).
- d) CSF (at least 1ml) in sterile container.

Samples must be collected as early as possible (within 4-5days of onset of illness) using all bio safety precautions.

Sample should be transported (preferably in triple container pack) at 2-8oC if they are expected to be delivered at the laboratory within 48 hours. If the shipping time is expected to be longer then the samples should be transported in dry ice at minus 70oC.

In addition, clinical sample quality, quantity, type, timing of collection and the time necessary to transfer samples from patients to the laboratory can affect the accuracy of laboratory results.

The diagnosis of NiV infection is suspected on the basis of clinical history and examination during the acute and convalescent phase of the disease, and confirmed by real time polymerase chain reaction (RT-PCR) as well as antibody detection via ELISA from the body fluids and respiratory secretions. Different tests include:

- enzyme-linked immunosorbent assay (ELISA)
- polymerase chain reaction (PCR) assay
- virus isolation by cell culture.

In India, presently the diagnostic facility for the NiV detection is at the National Institute of Virology (NIV), Pune, Maharashtra in public sector and Manipal centre for virus research (MCVR), Manipal, Karnataka in private sector.

Treatment

Currently there are currently no specific drugs or vaccines available for the deadly NiV infection although this is a priority disease on the WHO research and development blueprint. The present line of patient management is intensive supportive care to treat severe respiratory and neurologic complications [1-3]. Some studies have suggested the use of Ribavirin, which may reduce the symptoms of nausea, vomiting, and seizures [1, 10]. There have been few reports of successful use of antiviral Favipiravir against henipaviruses in animal models that have given some hope, but needs further evaluation for human use [11].

Prevention and Control

Controlling Nipah virus in domestic animals [1, 2]

Recommendations include: The pig farms must be cleaned and disinfected routinely and thoroughly with detergents. Upon suspicion of an outbreak is, the animal and its premises should be quarantined immediately. Culling of infected animals including burial or incineration of carcasses and animal products under proper supervision may be necessary. To provide early warning to the health authorities, steps can be taken for establishing an animal health surveillance system for detecting new cases.

Decreasing the risk of infection in humans [1, 2]

The best preventive strategy to prevent infection in humans is by proper education of the people and spreading the awareness of the risk factors and the measures they can take to reduce exposure.

Public health educational messages should focus on the following:

- Minimize the risk of bat-to-human transmission: Use of protective coverings and other measures to be taken to decrease access of the bats to fresh food products including date palm sap. It is advisable, before human

consumption, to boil the freshly collected date palm juice and thoroughly wash and peel the fruits.

- Minimize the risk of animal-to-human transmission: While handling the sick animals and their tissues/products proper use of protective clothing and gloves is advised.
- Minimize the risk of human-to-human transmission: Avoid close contact with infected patients. Regular hand hygiene should be followed after coming in contact with sick people.

Control of infection in health-care settings [1, 2]

- Proper implementation of standard precautions along with contact and droplet precautions by the healthcare personnel while caring for patients and their samples with suspected or confirmed NiV infection.
- The trained staff of the equipped laboratories should carefully handle the samples received from the patients and sick animals with suspected NiV infection.

CONCLUSION

NiV infection is a highly contagious zoonotic disease with high fatality rate. A multidisciplinary approach is required to control and prevent its spread, with adequate healthcare facilities. Although research is in progress but till present no effective vaccine or anti viral medicine has been developed against NiV.

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