ABOUT NIPAH VIRUS

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Nipah virus (NiV) is a deadly virus that causes Nipah encephalitis and is spread by fruit bats, with pigs acting as intermediate hosts. The virus was first isolated in 1998 from a NiV-infected patient in Malaysia. In India, the first NiV outbreak occurred in Siliguri in 2001, followed by the Nadia outbreak in 2007, and the recent third outbreak in Kozhikode. NiV is a highly virulent and contagious virus that can cause high fatalities. The virus can be detected by ELISA and RT-PCR, based on which a specific diagnosis can be made. There is no definitive treatment for Nipah disease and is managed by supportive care only.

Nipah virus (NiV) recently hit the headlines as a result of an outbreak in Kozhikode in Kerala. There were a total of 18 NiV+ cases with 17 deaths. As of 11th June, 2018, the outbreak has been declared to be over by the Kerala Health Ministry[1]. Of note is the fact that this is not the first outbreak of Nipah on Indian soil. In fact, this is the third, preceded by the Siliguri outbreak in 2001[2] and the Nadia outbreak in 2007[3], both in West Bengal. Naturally, there has been heightened curiosity amongst the general public – bordering on panic – due to the Kozhikode outbreak. There are many misconceptions about the virus, which stems from the fact that since Nipah outbreaks are few-and-far-between, not much information is available in the public domain. Therefore, the present article is aimed at providing an overview of Nipah disease, presenting the established facts and simultaneously weeding out the misconceptions that are currently prevalent in society.

What is Nipah Virus?

Nipah virus is named after a village called Kampung Sungai Nipah in Malaysia, where it was first isolated from a NiV-infected patient in 1998, who eventually died from the infection. Nipah virus is an RNA (ribonucleic acid) virus, which belongs to the Family *Paramyxoviridae* and Genus *Henipavirus*. Nipah virus encephalitis is an important emerging zoonotic disease that is spread by fruit bats (also known as 'flying foxes'), which belong to the Family *Pteropodidae* and Genus *Pteropus*. These bats are the natural hosts of the virus.

Nipah Virus Outbreaks

There have been several major outbreaks of NiV in the past, which are briefly highlighted below:

First Outbreak of Nipah – Malaysia: The first outbreak of Nipah occurred in 1998 in peninsular Malaysia during September 1998 to April 1999[4]. A total of 265 NiV encephalitis cases were reported from Malaysia. All these patients had close contact with infected pigs or infected patients. Nipah disease was so devastating to the pig population that over 1 million pigs were culled to control the outbreak in Malaysia. Importantly, huge economic losses and adverse social disruption occurred in the aftermath of the outbreak.

In March 1999, the virus spread to Singapore, where 11 abattoir workers contracted the disease from imported pigs from Malaysia[5]. Of note is the fact that, since May 1999, no new NiV outbreaks have been reported from Malaysia or Singapore till date. However, evidence of the virus, without clinical disease, has been found in fruit bats in Madagascar, Cambodia, Thailand, Timor-Leste, and Indonesia.

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Meherpur Outbreak, Bangladesh[6]: Nipah virus was isolated during an outbreak in April-May, 2001 in Meherpur district of Bangladesh. In this outbreak, there were 13 cases and 9 deaths, making the case fatality rate at 69%. Since 2001, NiV encephalitis has been reported almost every year from Bangladesh.

Siliguri Outbreak, West Bengal, India[2]: The Siliguri outbreak is the first Nipah outbreak in India. It occurred in January to February, 2001. Nipah virus-specific antibodies were detected in 9 out of 18 patients by ELISA (enzyme-linked immunosorbent assay). RT-PCR (reverse transcription-polymerase chain reaction) detected viral RNA in 5 patients. In this outbreak, there were 66 cases and 45 deaths, making the case fatality rate at 68%.

Nadia Outbreak, West Bengal, India[3]: This is the second Indian outbreak, which occurred in Nadia district of West Bengal in April, 2007. In this outbreak 5 cases from the same family were reported who tested positive for NiV by RT-PCR. Since all the patients died, the case fatality rate was 100%.

- The Bangladesh and Indian outbreaks, since 2001, have collectively reported 263 NiV encephalitis cases and 196 deaths. Nipah virus encephalitis exhibits a case fatality rate of 0-100%, with an average case fatality rate of 74.5%.
- In the Bangladesh and Indian outbreaks, there was no involvement of pigs in the transmission of NiV infection, unlike the Malaysian outbreak. Consumption of raw date palm sap infected by fruit bats was the primary cause of the spread of NiV.

Transmission of Nipah Virus

Nipah virus is transmitted by fruit bats[7]. The virus is present in bat urine, feces, and saliva. It has been reported that fruit bats can infect date palm sap, during tapping of palm trees. Upon consumption of raw sap, the infection can spread to humans. Likewise, fruits bitten by fruit bats can become infected, which upon consumption can cause NiV disease in humans. Pigs are the intermediate hosts, which can infect other pigs as well as domestic animals. Infected pigs can also transmit the disease to humans, especially to pig handlers or through consumption of under-cooked pork. Importantly, the disease can easily spread between humans by nasal discharges and other body fluids, as well as through fomites such as clothing, equipment and boots.

Symptoms of Nipah Virus Infection?

The initial presentation of NiV infection is non-specific. It is characterized by a sudden onset of fever, often called *brain fever*. This is accompanied by headache, drowsiness, nausea and vomiting. The patient can also experience photophobia (an aversion for sunlight). Neck rigidity and severe muscle pain/spasm can also occur. The patient's condition deteriorates rapidly and is accompanied by mental confusion and disorientation, often leading to coma within a couple of days. In the absence of prompt supportive care, the patient is very likely to die.

How is Nipah Virus Infection Diagnosed?

The disease is very difficult to diagnose based on clinical symptoms alone. However, a definitive diagnosis can be made based on laboratory tests such as ELISA and RT-PCR, which are briefly discussed below:

- **ELISA:** This is a very accurate and sensitive immunological test for detecting either antigens or antibodies. In case for NiV infection, antibodies are generated against the virus surface proteins that act as antigens. These antibodies circulate within the patient's blood. So, a small sample of blood can be used for detecting as well as quantifying the level of virus-specific antibodies in the patient's body using the ELISA technique.
- **RT-PCR:** This is one of the most sensitive molecular tests currently available for detection of viral infections. Since NiV has a RNA genome, a minute sample of blood is taken from the patient, which will contain the viral RNA. The RNA is unstable, so it must be converted to DNA, which is much more stable. This is done by *reverse transcription* of the RNA to produce cDNA (complementary DNA), which is subsequently amplified by PCR to generate millions of copies of the DNA from even a single DNA molecule. A positive test indicates the presence of NiV in the patient's body.

Treatment of Nipah Virus

There is no specific treatment for NiV infection. No specific antiviral drugs are currently available. Primary treatment involves intensive supportive care in an ICU setting. There is also no vaccine currently available for preventing NiV infections. However, a recent study has shown that a Hendra virus G protein subunit vaccine can

protect African green monkeys from NiV challenge, indicating that this vaccine has a great potential for protecting humans against NiV infection[8].

Prevention of Nipah Virus

Nipah virus infection can be prevented by taking the following precautions:

- Avoid contact with ill patients, infected animals such as pigs and horses, as well as the natural host, namely, the fruit bat.
- Do not drink raw date palm sap/juice or toddy.
- Date palm tappers should cover their vessels with netting so that the fruit bats cannot cause contamination.
- Maintain personal hygiene and hand washing practices.
- Do not consume raw fruits.
- Eat thoroughly cooked, homemade food until the outbreak subsides.
- Use personal protective equipment (PPE) like goggles, head-gear and masks e.g. N95 mask while traveling and working in public areas to reduce the chances of human-to-human transmission.

Conclusion

From the foregoing discussion, it is quite evident that NiV is undoubtedly a dangerous virus, considering the fact that the virus spreads rapidly between individuals and also because no specific antiviral agent or vaccine is currently available. Having said this, it is also evident from the foregoing discussion that virus transmission can be thwarted by institution of established and time-tested preventive measures. What needs to be done is to create more awareness about the disease so that suitable precautions can be taken beforehand. The correct information, dissipated at the correct time, to the susceptible populations, could prevent major calamities like the Kozhikode outbreak, in the future. ❐

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