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Public Health concern for a Nipah Virus disease

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Nipah virus (NiV) is a pathogenic paramyxovirus that has been responsible for sporadic outbreaks of respiratory and encephalitic disease in tropical countries. Elevated case mortality rate has also been connected with recent outbreaks in India (Kerala), Malaysia and Bangladesh. The virus generally infects animals like pigs and bats, but they do not show any symptoms of NiV. The mortality rate in NiV infected humans is more as compared to other mammals. The patient usually shows no symptoms to headache fever, cough, dyspnea, confusion and more consequences lead to a coma. Although there are no drugs or vaccines available against this severe disease, precaution and awareness reduce the risk of NiV-infection. This review will be helpful to save the life of people and decrease death by the NiV-infection outbreak.

Keywords*: Diagnosis, Henipavirus, Nipah virus, Prevention and treatment*

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Abstract

Nipah virus (NiV) is pathogenic paramyxo virus that has been responsible for sporadic outbreaks of respiratory and encephalitic disease in tropical countries. Elevated case mortality rate have also been connected with recent outbreaks in India (Kerala), Malaysia and Bangladesh. The virus generally infects animals like pigs and bats, but they do not show any symptoms of NiV. Mortality rate in NiV infected humans is more as compared to other mammals. The patient usually shows no symptoms to headache fever, cough, dyspnea, confusion and more consequences lead to a coma. Although there are no drugs or vaccine available against this severe disease, precaution and awareness reduces the risk of NiV-infection. This review will be helpful to save the life of people and decrease the death by NiV-infection outbreak.

Key words: Diagnosis, Henipavirus, Nipah virus, Prevention and treatment

1. Introduction

Newly occurring viral diseases have huge affect on community health in the recent years. During past decades, many new viral outbreaks have been documented in the various parts of the Globe[1]. These outbreaks were owing to known viral agents like Crimean Congo haemorrhagic fever, Ebola virus disease as well as Nipah, Lassa fever, Marburg, Middle East respiratory syndrome, coronavirus diseases, Rift Valley fever and severe acute respiratory syndrome[2]. WHO has designated Zika, thrombocytopaenia syndrome and chikungunya as 'serious' diseases. These viral diseases are responsible for extensive mortality, morbidity and great economic loss throughout the world[3]. Yet older viruses like influenza are able to reemerge and causes current threats of the epidemic and pandemic[4]. These viruses infecting humans via direct contact or through infected animals. NiV infection is a recently occurring zoonosis that causes severe disease in mammals. Fruit bats of the genus Pteropus (Family Pteropodidae) is the main host for NiV[5]. In 1998 Kampong Sungai Nipah (Malaysia) the first case of NiV was identified in pigs as intermediate hosts[6]. According to WHO research and development blue print, NiV infection has high priority disease till no medication or vaccines is available for this lethal illness[7]. Supportive care is the preliminary treatment of NiV. Although NiV reported only a few epidemics but the causalities were very high among the humans and animals. Almost 70 - 100% infected people dies due to NiV epidemics as this is very serious public health concern[8]. This review will be useful to create awareness of NiV infection and save lives of human beings.

2. Etiology

Nipah virus from the genus Henipavirus (Paramyxoviridae). Nipah virus name came from the Malaysian village infection where first case was reported. Bats do not show symtoms but only carriers of NiV and infected bats shed virus through their excretions and secretions products like excreta, urine semen and saliva [9]. Through coughing NiV is widely spread amongst pigs. Direct contact from infected pigs, bats and human transmit NiV infection to human beings. In India and Bangladesh this serious infection transmitted directly from human to human through contact with infected humans and caused outbreak[10]. In 2001, 75% hospital employees and visitors in Siliguri in India, transmission of NiV from hospitalized patients were reported. In Bangladesh, Around 50 % cases from 2001 to 2008 were amongst care takers of the NiV infected patients[10]. In 2001, an outbreak in Meherpur in Bangladesh, found that persons who stayed with infected patients or cared for them were more possibly to become infected with NiV [11].

3. Structure of Nipah Virus

Hendra virus and Cedar virus have close resemblance to the newly formed genus Henipavirus i.e. Nipah virus. The diameter of Henipavirus family is 40 to 600 nm [12]. Negative sense single stranded RNA and a linear ribonucleprotein (RNP) comprises of the core of a virion. The three important proteins included in RNP. Nucelocapsid proteins are highly bound to the various nucleotides of the

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RNA strand (Figure 1) [13]. For formation of capsid structure the Nucelocapsid proteins is the principal protein available. Phosphoproteins and polymerase proteins are also bound to the RNA and RNA polymerase in transcribing RNA to mRNA to antigenomic RNA. The virion is covered by a traditional lipid bilayer and also spiked with fusion and receptor-binding glycoproteins [14]. The release of the contents of the virion produces fusion proteins. The fusion proteins are responsible for fusing the viral membrane to the host membrane triggering.

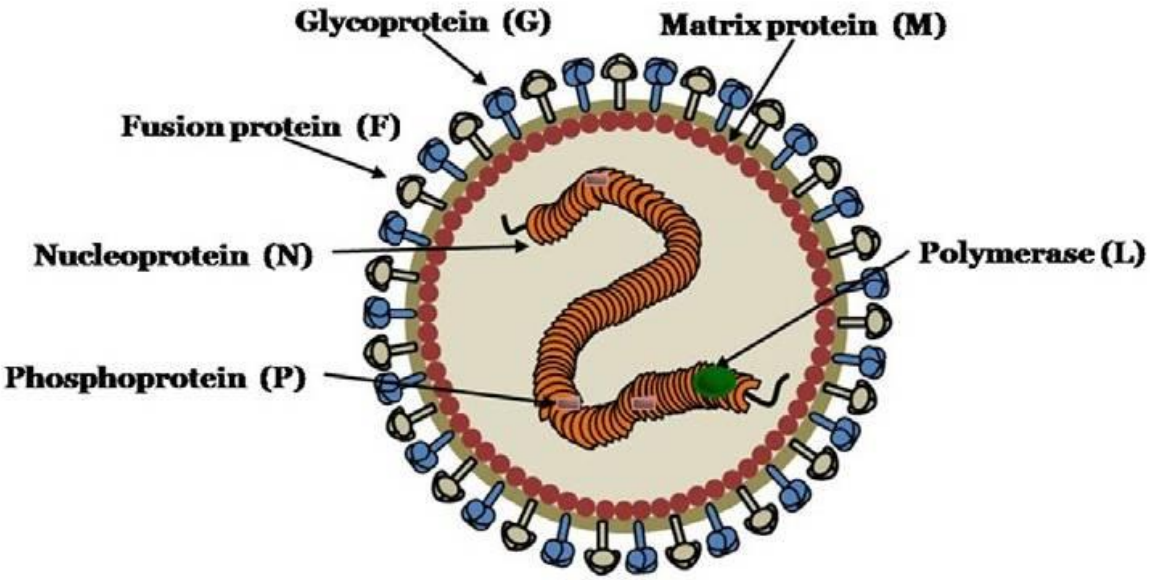

FIGURE 1: Structure of Henipavirus [15]

4. Clinical Spectrum and laboratory diagnosis

4.1. Clinical Signs

Although some Nipah virus infections can be asymptomatic or mild, most recognized clinical cases have been characterized by respiratory disease and/or acute neurological signs. The initial symptoms are flu-like, with fever, headache, sore throat and myalgia11]. Nausea, vomiting and a nonproductive cough may also be seen. This prodromal syndrome may be followed by encephalitis, with symptoms such as disorientation, drowsiness, signs of brainstem dysfunction, convulsions, coma and other signs. Encephalitis and seizures occur in complicated cases leading to coma within 2 to 4 days12 13]. Segmental myoclonus was common in patients with encephalitis in Malaysia, and cases of meningitis, as well as encephalitis, were documented in the Philippines12. NiV infections in few patients emerge as respiratory disease, like atypical pneumonia or acute respiratory distress syndrome. These patients may or may not show neurological signs. Renal impairment, Septicemia, bleeding from the gastrointestinal tract and other complications are observed in severely ill patients14]. Survivors of encephalitis may have mild to severe residual neurological deficits, or in a vegetative state. Some people infected with Nipah virus develop recurred encephalitis or late-onset encephalitis, months or years afterward. The clinical signs usually develop acutely, with symptoms that may include headache, fever, seizures and focal neurological signs. Some cases are life threatening. The incubation period of NiV infection is about 4 to 14 days and also seen some patient upto 45 days15].

4.2. Diagnosis

Oro-pharyngeal/nasal swabs, urine, and serum can be used for isolation from live animals, while brain, lung, kidney, and spleen samples can be used post mortem [21]. If possible, urine should also be collected for analysis. As per biosecurity protocols, stringent use of personal protective equipment, should be used when sampling with suspected NiV infection.

4.2.1. Detection of Nucleic Acids, Virus, or Antigens

Virus separation should be done for exact diagnosis in the affected area with a newly suspected epidemics. The oropharyngeal and nasal swabs in 2 days post-infection are collected for NiV detection. Dignosed NiV infected person go on shedding virus upto 21 days post-infection [4]. A cytopathic effect is generally observed within 2 to 3 days, but multiple passages of 5 days each are recommended before confirming that a sample is NiV negative. Quantitative real-time polymerase chain reaction primers and probes are developed for identification of the nucleocapsid gene of NiV [14, 22].

Immunohistochemistry can be used to detect NiV. The nucleocapsid protein antigen is generally targeted. With the help of immunehistochemistry detection of phosphoprotein antigen is also be possible, although nucleocapsid protein antigen is expressed in larger values than phosphoprotein antigen and hence it has significant diagnostic value.

Immunofluorescence can speedily detect NiV but cannot distinguish between HeV, since mono-specific antisera to characteristic proteins of NiV will cross react with HeV. Negative contrast electron microscopy may be employed to identify viral particles.

4.2.2. Detection of Antibody

An indirect enzyme linked immunosorbent assay (ELISA) using recombinant NiV N protein as an antigen has been employed as a diagnostic test. Recombinant proteins permit use of the ELISA to test samples that have been treated to inactivate the virus in biosafety level (BSL) 2 diagnostic labs [7].

Virus neutralization tests (VNT) have been employed for high-throughput screening in BSL2 diagnostic laboratories using recombinant vesicular stomatitis virus (rVSV) expressing NiV fusion protein and glycoprotein [13].

To detect both, antibody inhibition of ephrin-B2 receptor binding and antibody binding to recombinant soluble HeV or NiV G protein multiplexed microsphere immunoassays have been employed. Spectrally distinct microspheres determine specific and sensitive quantification and distinguish between HeV and NiV antibodies in a sample [23].

5. Prevention, control and Treatment

The treatment is limited to supportive care as there are no medications or vaccine available against NiV-infection till date [24, 25]. After confirmation of diagnosis immediately admit the patient in the ICU under close monitoring for 24 hours. Treatment on fever and the other neurological symptoms should be taken care on priority basis in ICU. The symptoms of nausea, vomiting and convulsions may be alleviated by Ribavirin [7]. Patient should be well hydrated. Preventive measures are only option as there are no other alternatives for treatment of disease. The following preventive measures are recommended [26, 27].

1. All fruits that are bitten by infected animals should be avoided and also these fruits should not be given to farm animals.

2. Infected people or animals should be kept isolated and their movement should be restricted.

Instrument used by patients should be autoclaved with the use gluteraldehyde solution (2%). Disposable materials should be used for the patient.

3. Alcohol based solution is recommended for hand washing for about 20 seconds. Wearing of N95 mask is advised during investigational sampling from patient

4. Clean all the utensils used by infected person with alkaline solution (pH 8.5) and also wash the fruits and vegetables with water after adding some amount of baking soda or sodium hydrogen carbonate for one minute.

5. Alkaline detergents should be used for cleaning and disinfection of farms animals.

6. Suspicion of epidemics, the animals should be quarantined immediately. Killing and burial or incineration of infected animals can be essential to reduce the risk of transmission under expert supervision.

7. Avoid contact of body fluids of patients to the employees, health care team members and others [28].

8. If the domestic animals show weakness and runny nose, a veterinarian should be consulted urgently.

9. NiV infected people should not get in close physical contact with anyone.

6. Conclusion:

Nipah virus infection is newly developed zoonotic disease, hence public should know about this illness. The creation of the awareness regarding NiV will be helpful for preventing the transmission and occurrence of this disease. The clinical signs are headache, fever dizziness and vomiting, followed by disorientation, drowsiness and mental confusion. There is no particular vaccine and medication currently available for either humans or animals. The treatment is currently limited to supportive care. The knowledge about the preventive measures of transmission of disease is the only option available to mankind.

7. Conflicts of Interest: The authors declare no conflict of interest

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