eISSN: 2455-1716
Verma *et al*., 2018
DOI:10.21276/ijlssr.2018.4.3.16

Review Article

open access

Nipah Virus- Infectious Agent: An Overview

Manish Kumar Verma[1], Poonam Verma[2*], Sunita Singh[3], Priyanka Gaur[4], Areena Hoda Siddiqui[5], Sarika Pandey[6]

[1]Research Scholar, Department of Biochemistry, Santosh University, Ghaziabad, India
[2]Research Scholar, Department of Biotechnology, IFTM University, Moradabad, India
[3]Research Officer, Department of Microbiology, King George's Medical University, Lucknow, India
[4]Research Scholar, Department of Physiology, King George's Medical University, Lucknow, India
[5]Microbiologist, Department of Lab Medicine, Sahara Hospital, Lucknow, India
[6]Research Scholar, Department of Respiratory Medicine, King George's Medical University, Lucknow, India

***Address for Correspondence:** Poonam Verma, Research Scholar, Department of Biotechnology, IFTM University, Moradabad, India

ABSTRACT

Nipah virus (NiV) is extremely pathogenic in nature, recently emerged paramyxovirus that has been dependable for scattered outbreaks of metastasis and encephalitic ill health in Southeast Asia. The multiplied urbanization and dynamic climate have led to rising in epidemics with incidences of recent diseases disturbing human health per annum. Most of these are zoonotic. Nipah Virus Encephalitis (NVE) is one such example that is caused by bats (flying foxes). NiV may be a new detected extremely pathogenic virus with the capability to cause devastating morbidity and mortality (an expected 100% in some cases) rate among the human populations. The illness was recorded within the sort of a significant outbreak in the Republic of India in the year of 2001 and then a tiny low incidence in the year of 2007, each the outbreaks in West Bengal only in humans without any involvement of pigs. About 1.1 million pigs had to be damaged to control the outbreak. The infection transmission from pigs acting as an intermediate host throughout Malaysian and Singapore outbreaks has adapted in NIV outbreaks in Republic of India and Bangladesh, transmission of the disease directly from bats to human followed by an individual to person. The drinking of raw date palm sap contaminated with fruit bat urine or saliva containing NiV that the only known cause of an outbreak of the disease in Bangladesh outbreaks. High death rates have also been related to recent outbreaks in Malaysia and Bangladesh.

Key-words: Nipah Virus Infection, NiV, Fruit bats, Encephalitis disease, Infectious agent, Illness, Outbreak

INTRODUCTION

According to the World Health Organisation (WHO), Nipah Virus is a latest emerging zoonosis which causes a severe illness in both animals and humans. Nipah Virus Infection (NiV), an infectious agent that caused the severe diseases by the Nipah (genus Henipavirus) in humans and animals also [1]. It was earliest identified in fruit bats of the Pteropodidae family, Pteropus genus, i.e. besides natural hosts of the virus [2] and primarily identified and acquired NiV during an eruption of disease that took place in Kampung Sungai Nipah, Malaysia village in 1998 to 1999 wherever the pig farmers become sick with the encephalitis illness. In the instance, pigs were the intermediate hosts. However, in subsequent NiV outbreaks, there were no intermediate hosts. In Bangladesh, the humans became infected with NiV as a result of consuming date palm sap that had been contaminated by infected fruit bats in 2004. Human-to-human transmission has also been documented, including by the hospital scenario in India. Out of a 582 NiV infected human cases, 54% were lethal [3,4].

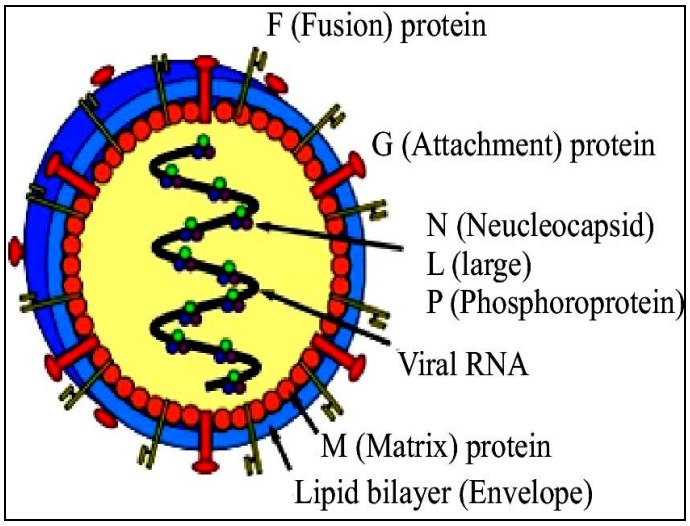
Infection of Nipah virus in humans has a range of medical presentations, from asymptomatic disease to the acute respiratory syndrome and fatal encephalitis. Nipah virus is also capable of causing disease in pigs and other domestic animals. Recently, no vaccine for either humans or animals had been discovered. The crucial treatment for human cases is rigorous supportive care. Nipah virus is placed at "top of the list" explores 10 priority diseases that the World Health Organization has recognized as potentials for the next major outbreak [5].

How to cite this article
Verma MK, Verma P, Singh S, Gaur P, Siddiqui AH, Pandey S. Nipah Virus- Infectious Agent: An Overview. Int. J. Life Sci. Scienti. Res., 2018; 4(3): 1844-1850

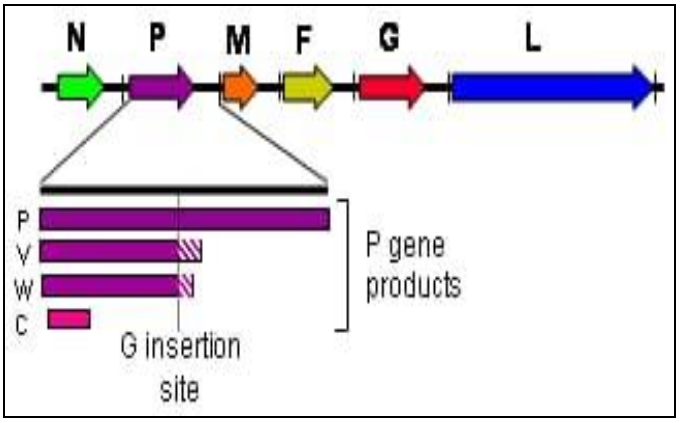
Access this article online
www.ijlssr.com

eISSN: 2455-1716
Verma *et al.*, 2018
DOI:10.21276/ijlssr.2018.4.3.16

The NiV integrate with the tendency to adapt or alter, similarly like the H1N1 virus. If you get suffered from swine flu or influenza vaccination presently or in the future, the outcome of the vaccination might not be lost through because the virus would have mutated by the virus and got highly lethal. Another one deadliest disease in the world is viral-borne diseases. [6]



A: Structure of Henipaviruses



B: Henipavirus genome (3` to 5` orientation) and products of the P gene

Fig. 1: Structure of Nipah Virus Infection (NiV)
Source: https://en.wikipedia.org/wiki/Henipavirus#Nipah_virus

Origin and Distribution of NiV Infection

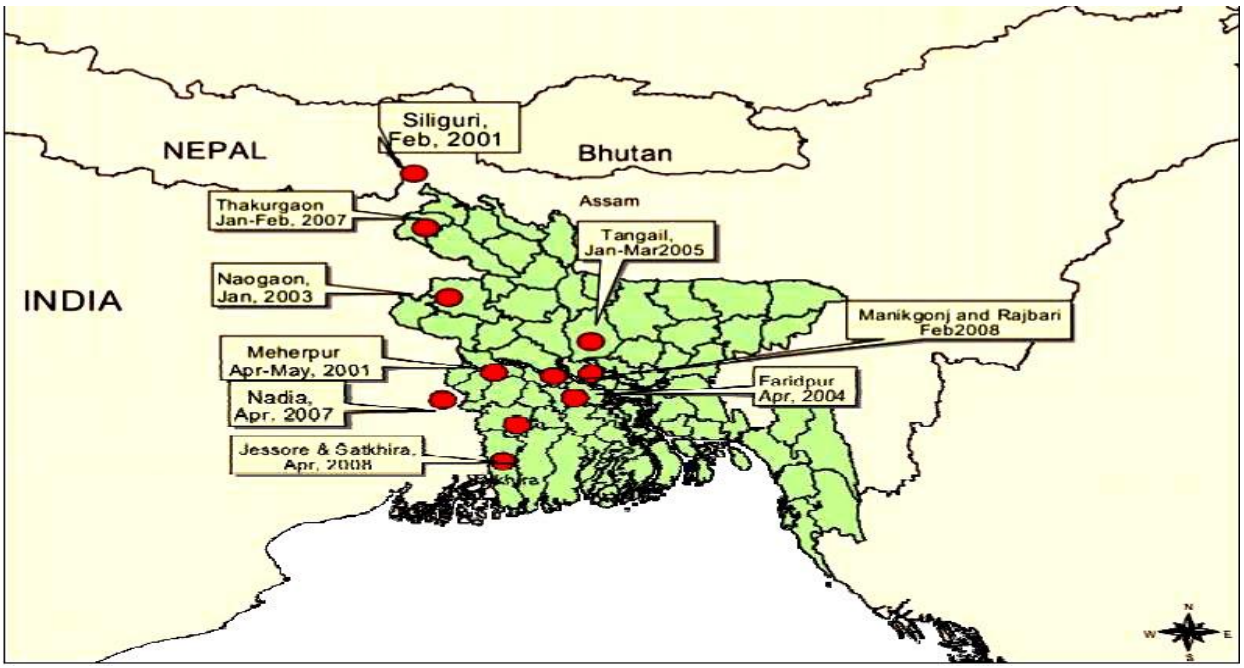
International (Malaysia, Singapore, and Bangladesh) outbreak- Nipah Virus was initial known in Singapore and Malaysia (1998-1999) where it suffers illness in pigs and humans. Throughout the 1998 to 1999 outbreaks, the virus affected the 265 persons flawlessly and concerning 40% of these patients that were hospitalized with the rigorous nervous infirmity and died [7].

Nipah virus outbreaks are reported in Malaysia, Singapore, Bangladesh, including India that was unpredicted. The maximum mortality due to NiV infection has been transpiring in Bangladesh. In Bangladesh, the outbreaks seem frequently in the winter [8]. Nipah virus is earliest reported in Malaysia in 1998 in Peninsular Malaysia in pigs and pig farmers. By 1999, over 265 human cases of encephalitis, as well as 105 deaths, had been reported in Malaysia, and 11 cases of either encephalitis or respiratory illness with one fatal outcome were reportable in Singapore [9]. In 2001, NiV was reported from Meherpur District located in Bangladesh [8,10] and Siliguri located in India [11]. The outbreak again appeared in 2003, 2004 and 2005 in Naogaon District, Manikganj District, Rajbari District, Faridpur District and Tangail District [10]. In Bangladesh, there have been outbreaks in consequent years besides [4,11].

India (Kerala, West Bengal) outbreak- In India, circumstantial evidence of person-to-person transmission of the virus was reported in 2001. Further two individual's death was reported due to NiV infection in Kerala, thus taking the full range of deaths caused by the rare virus up to 5 on Tuesday, 22 May 2018. The information provided on May 20, 2018, by the National Institute of Virology (NIV), Pune reported the that 3 samples shows positive results for Nipah virus that were before now sent to the NIV institute. Nowadays, Kerala Health Secretary Rajiv Sadanandan communicate with individuals to get calm and alleged for shutout the critical condition and inform them government's forthcoming actions towards quite a lot of deaths. He further converses about an identical issue in Bangladesh and it has been managed well.

In India, the virus has been reportable within Kozhikode district located in Kerala state, in May 2018 [12]. Over 10 deaths are confirmed, including one member of healthcare staff [13]. Most died persons are mainly belongs to the districts of Kozhikode and Malappuram together with 31-year-old nurse that was treating patients infected with the virus [14] shown in Fig. 2.

eISSN: 2455-1716
Verma *et al.*, 2018
DOI:10.21276/ijlssr.2018.4.3.16



The boundaries and names shown on this map do not imply any expression or any opinion what so ever on the part of World Health Organization concerning the legal status of any country, territory, city or area of its authorities or concerning the delimitation of its frontiers or boundaries

Fig. 2: Chronological distribution of outbreak of Nipah virus infection in South Asia, 2001-2008
Source: http://www.searo.who.int/entity/emerging_diseases/links/CDS_Nipah_Virus.pdf?ua=1

Table 1: Distribution of Nipah Virus (NiV) infection according to WHO

			Nipah virus infection		
S. No			**In India**		
	Places	**Infected patients**	**Death patients No.**	**Death ratio (%)**	**Year**
1.	Siliguri (WB)	66	45	68.18%	2001
2.	Nadia (WB)	5	5	100%	2007
3.	Kerala	22	10	45.45%	2018
			In Abroad		
	Countries	**Infected patients**	**Death patients No.**	**Death ratio (%)**	**Year**
4.	Malaysia	265	105	39.62%	1998-1999
5.	Singapore	11	1	9.09%	1999
6.	Bangladesh	13	9	69.23%	2001
7.	Bangladesh	36	27	75%	2004
8.	Bangladesh	12	11	91.66%	2005
9.	Bangladesh	4	4	100%	2008
10.	Bangladesh	12	10	83.33%	2012

eISSN: 2455-1716
Verma *et al.*, 2018
DOI:10.21276/ijlssr.2018.4.3.16

Transmission in humans- Direct contact with unhygienic pigs, different infected animals, or through contaminated fruits (half-eaten fruits left by fruit bats), and even direct contact with sick persons are cited because of the underlying reason for outbreaks.

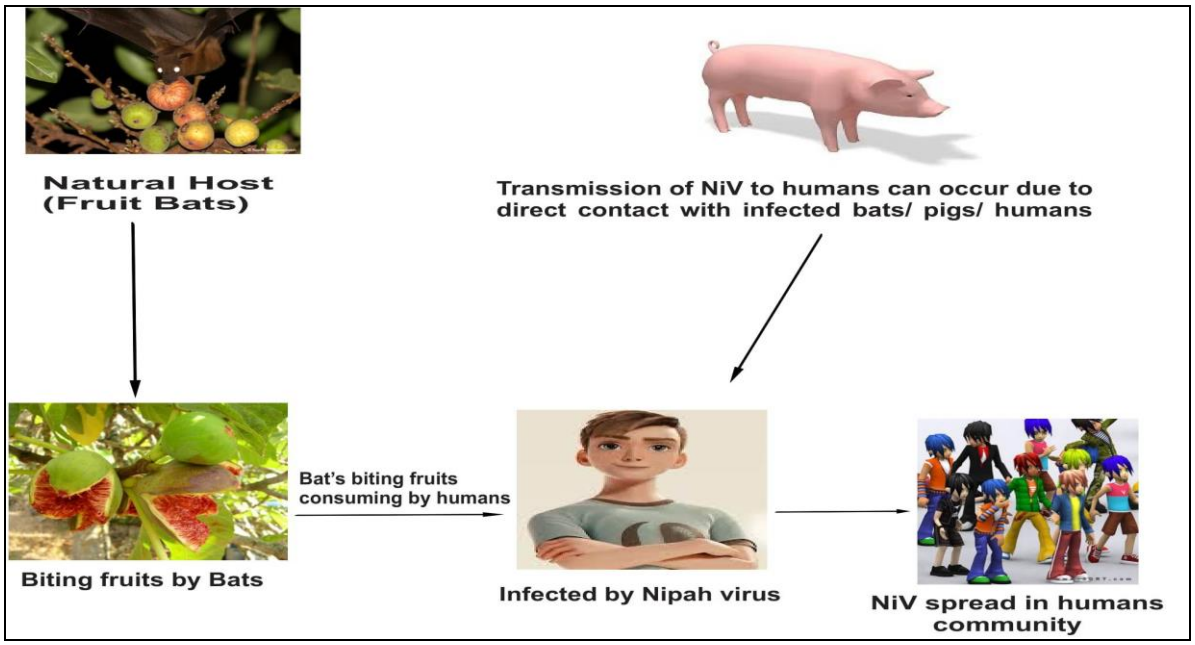


Fig. 3: Transmission cycle in human

Signs and symptoms

- NiV was observed in the patients of Malaysia outbreak and it was found that traces of NiV were present in urine samples furthermore, besides saliva as well as throat swabs sample. So, be cautious if you are sharing a washroom with an infected person [15].
- The symptoms signify on exposure and incubation period of 5-14 days, sickness with 3-14 days of fever and headache followed by the opposite symptoms. Initial symptoms are sleepiness, fever, headache, body pain followed by disorientation and mental confusion.
- These symptoms can progress followed by coma as quickly as in 24–48 hours. Encephalitis is the dreaded complication of NiV infection. Respiratory infirmity can also be present during the early part of the infection [2].
- Nipah-case patients with respiration problem are more likely than those without the respiratory disorder to transmit the virus [16]. The illness is suspected in symptomatic people within the context of an epidemic outbreak.

Table 2: Sign and symptom of Nipah virus infection in human beings

Symptom of Nipah virus infection	
Early stages	Fever, Vomiting, Cough, Headache, Stomach Pain
Advanced stages	Myalgia, Sleepiness, Epilepsy, Fatigue, Fainting, Nausea, Convulsions, Lethargy, Choking, Respiratory illness, Encephalitis, Disorientation, Mental confusion, Coma, Potential death

Diagnosis

- Laboratory identification of a patient with NiV infection can be made during the acute and convalescent phases of the virus by dissimilar laboratory tests. In the early stages of disease, for virus isolation via real time polymerase chain reaction (RT-PCR) from throat and nasal swabs, urine, blood, and cerebrospinal fluid should be performed.
- Antibody identification by ELISA assay (IgG and IgM) can be used later on. In lethal cases, immunohistochemistry analysis for tissues collected during autopsy can be the only way to confirm a diagnosis.

DOI:10.21276/ijlssr.2018.4.3.16

Prevention and control- The sickness will be prevented by avoiding exposure to bats in endemic areas and sick pigs. Drinking of raw palm sap (palm toddy) contaminated by bat eject [17], consumption of fruits partially consumed by bats and using water from wells infested by bats [18] should be avoided. Bats are notorious while drinking toddy i.e. collected in open containers and sometimes urinate in it thus makes it contaminated with the virus [17]. Surveillance and awareness are important for preventing future outbreaks. The association of this infection within the reproductive cycle of bats isn't well studied. Typical infection control practices should be implemented to stop nosocomial infections. A subunit vaccine using the Hendra G macromolecule or protein was found to produce cross-protective antibodies against henipavirus and NiV has been used in monkeys to shield against Hendra virus, though its potential to be used in humans has not been studied [19]. Don't eat party consumed fruits and be careful about your kids all through the mango season. Eat fruits after proper cleaning with fresh water. Keep personal hygiene confirms that you're unit well properly sheltered.

Treatment or Clinical diagnostic and Vaccines- Prevention of NiV infection is crucial since there is no powerful treatment for the illness.

- Primary treatment is intensive supportive care that incorporates the morbidity rate of 70%. However, the death ratio has been reported at anywhere between 75% and 100%. The treatment is prescribed to support care.
- It is important to practice standard infection management practices and proper obstacle nursing techniques to avoid the transmission of the infection between individuals.
- All suspected cases of NiV infection should be isolated and given intensive supportive care. Ribavirin has been shown effective in the *in vitro* tests, however has not nonetheless been proved effective in humans.
- Passive immunization using a human monoclonal antibody that targets the Nipah G glycoprotein has been evaluated in within the ferret model as post exposure prophylaxis [2,3].
- The antimalarial drug i.e. chloroquine was shown to block the important functions required for maturation of Nipah virus, though no clinical profit has nonetheless been determined [20]. m102.4, a person's antibody has been used in people on a compassionate basis in Australia and is presently in pre-clinical development [3].

Risks of exposure- The chance of exposure is high for hospital employees and caretakers of those infected with the virus. In Malaysia and Singapore, NiV infection occurred in persons amid safe contact with infected pigs. In Bangladesh, and In India, the infection has been allied among consumption of raw date palm sap (toddy) and drops a line with bats [21].

CONCLUSIONS

Nipah virus, a recently discovered zoonotic disease causing, in South Asia, where sporadic outbreaks have been reported in Malaysia, Singapore, India, and Bangladesh. The case-fatality varies from 40% to 70% depending on the severity of the clinical manifestations such as encephalitis as well as the availability of adequate healthcare facilities. There is no antiviral drug available for Nipah virus disease at present and the treatment has been just supportive care. NiV infection can be considered as an emerging disease and a public health problem as a consequence of the lack of effective vaccines and therapies. This epidemic highlights the importance and urgency of creating a strong surveillance system supported by a network of progressive laboratories equipped to handle and diagnose new pathogens and as well as patient isolation techniques, use of private protecting instrumentality, obstacle nursing and safe disposal of potentially infected material in the prevention and control measures for Hendra/Nipah virus infection. This review paper provides spotlight on Nipah virus- An infectious agent. Consequently, the necessity for the multidisciplinary approach to stop and management zoonotic infections in this country is evident. Phylogeny and evolutionary analysis represent promising tools to evidence epidemics, to study their origin and evolution and finally to act as an effective preventive measure. Research over the last 20 years has provided insight for mechanisms of pathological process and transmission of Nipah Virus. The exposure-based screening will find patients at high risk for Nipah virus encephalitis with low-income, resource-constrained settings, such as Bangladesh.

DOI:10.21276/ijlssr.2018.4.3.16

The upcoming years is likely to see the advancement of this indulgent and significantly, practi¬cal applications as a vaccines for Nipah virus to get into human clinical trials, prevention of infection through modifying risk factors for the development of therapeutics and techniques capable for treat infected patients to diminish morbidity and mortality. Also, there is a possibility that NiV might be use as a bio-weapon in the future, therefore what the probabilities for this event taking place are? And is it impending that NiV becomes deadlier than HIV? However, immense questions are faced, and might have a tendency to effectively reduce human-bat interactions? An approach will be to leave the bat habitats on your own and condense wide scale deforestation.

CONTRIBUTION OF AUTHORS

All authors are equally contributed to this review paper.

REFERENCES

[1] WHO Nipah Virus (NiV) Infection. www.who.int. Archived from the original on 18 April 2018, Retrieved 21 May 2018.

[2] Nipah Virus (NiV) CDC. www.cdc.gov. CDC. Archived from the original on 16 December 2017, Retrieved 21 May 2018.

[3] Broder CC, Xu Kai, Nikolov DB, Zhu Z, Dimitrov DS, Middleton D, Pallister J, Geisbert TW, Bossart KN, Wang LF. A treatment for and vaccine against the deadly Hendra and Nipah viruses. Antiviral Research, 2013; 100(1): 08-13.

[4] Nipah virus outbreaks in the WHO South-East Asia Region. South-East Asia Regional Office, WHO. Retrieved 23 May 2018.

[5] Deadly Nipah virus claims victims in India [Accessed on 21 May 2018]. http://www.bbc.com/news/world-asia-india-44193145.

[6] Nipah virus spread by fruit bats: 5 points on Infection in Kerala [Updated: May 22, 2018], https://www.ndtv.com/india-news/nipah-virus-5-points-to-know-about-nipah-virus-from-doctors-kerala-on-alert-after-nipah-6-dead-in-ko-1855351.

[7] Nipah virus outbreak in Kerala: Signs and symptoms of NiV, transmission, treatment, prevention [Updated: May 22, 2018]. http://www.timesnownews.com/health/article/what-is-nipah-virus-know-the-symptoms-of-niv-how-does-it-spread-and-how-can-you-avoid-contracting-it/230115.

[8] Chadha MS, Comer JA, Lowe L, Rota PA, Rollin PE, et al. Nipah virus associated encephalitis outbreak, Siliguri, India. Emerging Infect. Dis., 2006; 12(2): 235-40.

[9] Eaton BT, Broder CC, Middleton D, Wang LF. Hendra and Nipah viruses: different and dangerous. Nature reviews Microbiol., 2006; 4(1): 23-35.

[10] Hsu VP, Hossain MJ, Parashar UD. Nipah virus encephalitis reemergence, Bangladesh. Emerging Infect. Dis., 2004; 10(12): 2082-7.

[11] Arguments in Bahodderhat murder case begin. The Daily Star. 18 March 2008. Archived from the original on 24 October 2012, Retrieved 21 May 2014.

[12] Bever, Lindsey. Rare, brain-damaging virus spreads panic in India as death toll rises. Washington Post. Retrieved 23 May 2018.

[13] Lini Puthussery: India's 'hero' nurse who died battling Nipah virus. BBC News. Retrieved 22 May 2018.

[14] Hermesauto. Rare brain-damaging Nipah virus kills 10 in India, prompts rush to hospitals. The Straits Times. Retrieved 23 May 2018.

[15] Here's how you can protect yourself from the deadly Nipah Virus [Updated: May 23, 2018]. https://timesofindia.indiatimes.com/life-style/health-fitness/health-news/heres-how-you-can-protect-yourself-from-the-deadly-nipah-virus/articleshow/64271448.cms.

[16] Luby SP, Hossain M, Gurley ES, et al. Recurrent Zoonotic Transmission of Nipah Virus into Humans, Bangladesh, 2001-2007. Emerging Infect. Dis., 2009; 15(8): 1229-35.

[17] Islam MS, Sazzad HMS, Satter SM, Sultana S, Hossain MJ, et al. Nipah virus transmission from bats to humans associated with drinking traditional liquor made from date palm sap, Bangladesh, 2011-2014. Emerging Infectious Dis., 2016; 22(4): 664-70.

[18] Balan S. 6 Nipah virus deaths in Kerala: Bat-infested house well of first victims sealed. The News Minute. Archived from the original on 22 May 2018. Retrieved 21 May 2018

[19] Bossart KN, Rockx B, Feldmann F, Brining D, Scott D, et al. A Hendra Virus G Glycoprotein Subunit Vaccine Protects African Green Monkeys from Nipah Virus Challenge. Sci. Translational Med., 2012; 4(146): pp. 01-08.

[20] Broder CC, Xu K, Nikolov DB, Zhu Z, Dimitrov DS, et al. A treatment for and vaccine against the deadly Hendra and Nipah viruses. Antiviral Res., 2013; 100(1): 08-13.

[21] Luby SP, Gurley ES, Jahangir HM. Transmission of human infection with Nipah virus. National Academies Press (US). Archived from the original on 22 May 2018. Retrieved 21 May 2018, 2012.

eISSN: 2455-1716
Verma *et al*., 2018
DOI:10.21276/ijlssr.2018.4.3.16

Received: 23 May 2018/ Revised: 25 May 2018/ Accepted: 28 May 2018