

A small-scale survey to evaluating the perception of the Nipah virus in Bangladeshi rural community

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Research Article

Keywords: Nipah Virus, Knowledge, Awareness, Rural people, Outbreak, Bangladesh

Posted Date: July 9th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-692963/v1>

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Abstract

Background Nipah virus is a zoonotic agent causing diseases with extremely high mortality rate and several outbreaks have been reported from different parts of the world. Bangladesh is one of the country having repeated Nipah outbreaks since 2001.

Objective To prevent an outbreak, it is necessary to understand public awareness and knowledge about the epidemic agent. This study was aimed to determine the level of knowledge and awareness related to NiV infection and to assess the potential risk of NiV disease among the rural population of Bangladesh.

Methods This cross-sectional study was conducted with the participation of 200 respondents from different villages of Bangladesh. The data were collected through face-to-face interviews in January 2021 using structured questionnaire.

Results From the survey it was found that 58.5% respondent of the study unknown about the term Nipah virus. However, maximum people seem to be aware of the fact that a virus infected person should be isolated as they can spread the disease further. The awareness level of the people is classified as “very poor”, “poor”, “good” and “excellent” with a percentage of 20%, 23%, 25.5% and 31.5% respectively based on some questions. Binomial regression analysis showed that education and government campaign were variables associated with the awareness of NiV disease.

Conclusion Education and government campaigns need to be stepped up to make rural people aware about this zoonotic disease.

Introduction

Nipah virus (NiV), a highly pathogenic zoonotic agent, can cause severe diseases such as severe encephalitis and respiratory illness in humans and wide range of animals, resulting significant economic loss (Allocati et al. 2016; Luby et al. 2009b). NiV is the member of paramyxoviridae family and henipavirus genus (Singh et al. 2019). The first outbreak began among the farmers in the pig farming industry near the city of Ipoh in the state of Perak, Malaysia in 1998 (Ang et al. 2018) and after that several outbreak occurred in India, Bangladesh, Singapore (Singh et al. 2019) and Philippines (Ching et al. 2015). Though it has resulted in a lower number of cases and less human transmission but it is one of the deadliest emerging infectious disease with a mortality rate of around 40–70% (Devnath and Masud 2021).

Bangladesh is one of the area affected significantly by repeated small NiV outbreaks (Lo et al. 2012). Since the first outbreak in the district of Meherpur in 2001, NiV outbreaks have been identified almost every year in Bangladesh (Hegde et al. 2016). From April 2001 to February 2015, several areas including Naogoan, Rajbari, Faridpur, Tangail, Thakurgaon, Kushtia, Pabna, Natore, Manikganj, Gaibandha, Rangpur, Nilphamari, Madaripur, Gopalganj, Lal Mohirhat, Dinajpur, Comilla, Joypurhat, Rajshahi, Jhenaidah, Mymensingh, Panchagarh and Magura were reported to encounter NiV outbreaks with some

recurrent one (Soman Pillai et al. 2020). Interestingly, Bangladesh is the home of around 33 bat species, including the big Indian fruit bats (*Pteropus giganteus*), which is the main reservoir of NiV (Deka and Morshed 2018; Epstein et al. 2020). Apart from person to person transmission, NiV can also be spread via various specimen of fruit bat such as urine, saliva (Luby et al. 2009b). It has been also reported that contaminated raw unpasteurized juice and bitten, unwashed, uncooked and unpeeled fruits can transmit the virus (Rahman 1970). Cross-transmission of NiV from bats to people via domestic animals had also been found in Bangladesh (Epstein et al. 2020). Naturally, domestic animals move freely and can consume partially eaten saliva-laden fruit of fruit bats which can subsequently leads to infection and later animal to human transmission (Luby et al. 2009a).

Bangladesh has reported 225 deaths out of 319 positive cases in 20 years (2001–2020), according to The Institute of Epidemiology, Disease Control and Research (IEDCR) (The Institute of Epidemiology 2020, January 30) and nearly one-third of cases occurred from person-to-person transmission (Rahman et al. 2021). Previously, the NiV disease were found to be linked with consuming date palms juice but now infection has been found in various places with no link to such food habit (McKee et al. 2021). Epidemiological studies revealed clustering around household members and hospital contacts without clear animal exposure (Hauser et al. 2021). Thus further epidemiological investigations of such case should be properly conducted to avoid epidemics.

According to World Health Organization (WHO), NiV is in their top 10 priority diseases which pose the greatest public health risk due to their epidemic potential (Organization 2021) and unfortunately, no specific antivirals or antibodies presently effective against the disease (Soman Pillai et al. 2020). Public awareness is highly warranted for such diseases as lack of reasonable knowledge about the disease can leads to low detection rates, high mortality rate and several endemic (Hassan et al. 2020; Liu et al. 2013). Although many researchers have investigated the knowledge and awareness of rural inhabitants about other zoonotic diseases such as rabies (Ghosh et al. 2016), COVID-19 (Rahman et al. 2020) but very little research exists that sheds light on knowledge and beliefs related to bats and NiV disease among the general rural population who are in the most risk (Hassan et al. 2020). Furthermore, deaths by unknown disease are reported from Bangladesh every year, some are investigated, and some remain unknown (Ao et al. 2016). Previously people were unfamiliar with viruses that can kill people upon a small contact, however, such awareness has been increased since COVID-19 pandemic. People now seems to understand virus more easily and researchers are talking about the possibilities of other viral outbreaks including NiV (Devnath and Masud 2021).

A perfect plan to control zoonotic diseases largely depends on public health awareness which can decrease the risk of infections along the livestock production and processing chain (Alemayehu et al. 2021). To control the spread of zoonotic infection from animal to the human population, change in behavioral practices of high-risk groups through better public health education is always crucial (Alemayehu et al. 2021).

In this study, we lead a population based epidemiological study to evaluate the current level of awareness about NiV. The aim of this survey is to assess the intensity of awareness among Bangladeshi villagers and farmers about the NiV transmission and diseases.

Material And Methods

Population and sampling

This cross-sectional population based epidemiological study was conducted in January 2021 in different rural areas of Bangladesh. A total number of 200 villagers including farmers were selected randomly from the Purbapara, Vuarpara, Chitrapara village of Gopalganj districts, Gobardhanpur village of Moulvibazar district, Gobindapur village of Habiganj district and Banglabazar of Noakhali District of Bangladesh to evaluate the current level of awareness about Nipah virus (NiV).

Questions and data collection:

The questionnaire consists of 26 questions. First part of the questionnaire consists demographic characteristics, including age, sex, education, and monthly income. Rest of the questionnaire consists of questions about practice and knowledge about NiV. Six of the questions were about NiV knowledge. Each question was awarded 1 mark (total 6 marks) for the correct answer, while each incorrect answer was given 0. The total marks of questions were evaluated as follows, scores of 80% to 100% were considered "excellent", while score of 70% to 79%, 50% to 69% and 0% to 49% were considered "good", "poor" and "very poor", respectively. In analyzing the relationship between awareness of NiV and demographics, "aware" was defined as "excellent" and "good" while "not aware" was defined as "poor" and "very poor".

The survey has been managed by skilled team. Investigators have a face-to-face discussion with participants from the local community. If there was any difficulty understanding questions, the questions were asked again without any explanation. All participants provided verbal informed consent before the survey.

Data Analysis:

Statistical Package for Social Science (SPSS) version 25.0 is used to manage and analyze data. To test the differences among the variables, we used the χ^2 test for categorical variables relating to concern about NiV. Multivariate analysis was performed with multiple logistic regression to determine significant independents variables for predicting infectious diseases awareness. The alpha level of significance for the multivariate analysis was set at 0.05 for a two tailed test (i.e, $p < .05$).

Results

Demographic characteristics of the respondents:

A total of 200 people participated in the investigation. Ages of the study participants ranged from 14 to 90 and the mean age was 39.76 years (SD = 15.73). Almost half of the respondent's occupation depends on farming (50.5%) and 36.5% of them have no education. Around 68.5% of the respondent's family consists of more than 4 members in their family (Table 1).

Knowledge of Nipah Virus:

The responses to the questions related to knowledge of diseases are provided in Table 2. Surprisingly, 58.5% respondent revealed that they never heard the name of the Nipah virus. However, 73% and 70% respondent admit that a virus infected person should be isolated and they can spread the virus further respectively. Overall, 31.5% of the respondent have excellent awareness of NiV. In addition, 25.5% of the respondent have good awareness of NiV, 23% of the respondents have poor awareness and 20% of the respondents have very poor awareness of Nipah Virus. The details of these responses are provided the Table 3.

Factors associated with Knowledge of Nipah Virus:

Table 4 shows the data related to the association of the knowledge regarding NiV disease with selected demographic variables and govt. campaign.

Binomial regression analysis indicated that education and Govt. campaign in that area were predictors of awareness of NiV. Economic profile, gender and age group have no association with the knowledge of NiV.

Discussion

Around twenty years ago first NiV outbreak was recorded from Bangladesh. However, still many people find the term "Nipah virus" new both in rural and urban communities of Bangladesh. Recently, many scientists from all over the world presumed that NiV could be the next pandemic agent (Devnath and Masud 2021; Gómez Román et al. 2020; Luby 2013). Thus, One Health approach in human-animal-environment interfaces to control the viral transmission is urgently needed.

Bangladesh faced consecutive NiV outbreaks since 2001, hence, public awareness about the virus and preventive measures to prevent the spread is warranted in many parts of the country. The present study is a population-based cross-sectional study, aimed to assess the knowledge and awareness of rural residents of Bangladesh about the deadliest NiV. The study had been conducted utilizing a representative sample design and based on face-to-face interviews.

Many of the most devastating human disease have been originated from livestock or wildlife, including HIV infection, influenza, bubonic plague, and a large Ebola outbreak in West Africa (Gurley et al. 2017; Wolfe et al. 2007). Presence of bats in the vicinity of locality increases the likelihood of zoonotic spillover of virus from the bats to human population (Gurley et al. 2017; Cappelle et al. 2020). Our survey data showed that majority (91%) of people have fruit trees, including date palms, and 87% have seen bats in

the vicinity of these fruit trees. From a previous study, data of serological test revealed that henipavirus are likely to infect domestic animals (Chowdhury et al. 2014) and those animals are mainly infected by eating fruits or food contaminated by the saliva and urine of bats (Hsu et al. 2004). In our study, we also found 93% of the people owned domestic animals and rural people in Bangladesh can be at high risk of contracting the virus since domestic animals serve as a route of transmission of NiV from bats to humans (Aditi and Shariff 2019; Halpin and Rota 2015). And result from different studies corroborates the fact that previous NiV outbreaks of Bangladesh occurred in rural area only (Chakraborty et al. 2016; Luby et al. 2009a).

Historical data supports the awareness about a disease can successfully eradicate it for example; Cholera. As we mentioned earlier around most of the study participants agreed that NiV infected person should be isolated, though, maximum of the total respondents don't even heard the name of NiV. One reason for such awareness could be arise from the current COVID-19 situation as repeated announcement had been made including requisite of isolation of infected person (Islam et al. 2020; Banik et al. 2020). Among the respondents 70% people are concerned about the person to person transmission through close contact. Surprisingly, having being residing in the COVID-19 era rest of them believe that close contact with NiV infected person is not a matter of worry and there is no chance of spreading the virus by close contact to the nearby people. Though person to person transmission is one of the major route of this virus transmission (Gurley et al. 2007a) and nosocomial infection could also occur like the Siliguri outbreak in India where 33 became infected including hospital workers and visitors (Chadha et al. 2006). Luckily, no nosocomial infection had found in Bangladesh, but study showed that there are high possibilities of nosocomial infection as the healthcare workers do not maintain enough protective measures while exposed to body fluids of potential NiV infected patient (Gurley et al. 2007b).

From our study, another misconception was observed that 75% of the people assume vaccine could prevent NiV, without the concern that there is no vaccine currently available against this disease (Geisbert et al. 2014). Several vaccines are being developed and vaccination program is ongoing around the world against the current COVID-19 pandemic (Kashte et al. 2021; Fernandes et al. 2021), however, not for the NiV. Their perspective indicates that the study population do not have clear concept about this deadly virus and proper steps needs to be taken to aware them. Though "National Guideline for Management, Prevention and Control of Nipah Virus Infection including Encephalitis" had been published by IEDCR, proper implementation is needs to be taken everywhere in the country accordingly.

From the study data we found that, age, gender or income of the rural people does not have any relation to NiV related knowledge and awareness. But education and government campaign have a great influence in the people's belief and conception. Thus, government-initiated proper planning campaign and improvement of the quality of education can reduce the rate of NiV infection (Nahar et al. 2017). After the total analysis we found that more than half of the people have satisfactory awareness level but 43% people's awareness level is either poor or very poor and the amount is not very few to neglect.

The limitation of the study is the low number of respondents from few districts of Bangladesh. As we did the survey during the COVID 19 pandemic, and it was not feasible to reach more people due to the lockdown. Moreover, we gave priority in face-to-face interview as the main target was rural community and farmer who are not enough familiar with the online survey.

Conclusion

Nipah is an infectious zoonotic disease with an extremely high mortality rate. We know that several mutation of the virus could create a more vulnerable strain which could lead to a deadly global pandemic. Previous all outbreaks were reported from rural areas. Thus this study gives an idea about the current knowledge and awareness level of the rural people of Bangladesh. The data of the study indicates that education and continuing government campaign is necessary to conduct among the rural people to rise the knowledge and awareness level of the people.

Declarations

Funding: No fund was available.

Ethical approval: No approval of research ethics committees was required to accomplish the goals of this study because experimental work does not contain any animal.

Conflicts of interest: Author discloses no conflict of interests.

Code or data availability: Study participants response can be provide as per requirement.

Authors' contributions: **SW:** Conceptualization, Supervision, Review and writing, Writing main draft, Resources; **MMH:** Conceptualization, Data analysis, Review and writing, Writing main draft; **AB:** Review and writing, Writing main draft, Resources, **SB:** Review and writing, **PD:** Conceptualization, Supervision, Review and writing, Writing main draft.

Consent to participate: All the participants were informed about the objective of the study and they gave consent before starting the questionnaire based direct interviews.

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Tables

Table 1: Demographic characteristics of the respondents (N= 200)

Table 2: Distribution of Nipah Virus Knowledge of respondents:

Questions	Categories	Frequency	Percentage
Do you ever hear about Nipah Virus?	Yes	83	41.5
	No	117	58.5
Should a Nipah virus infected person be isolated?	Yes	146	73
	No	54	27
Can close contact with a Nipah virus infected person spread the virus?	Yes	140	70
	No	60	30
Do you think vaccine can prevent Nipah Virus?	Yes	150	75
	No	50	25
Do you believe animals can spread disease?	Yes	159	79.5
	No	41	20.5
Ever heard about a disease that can be transmitted from bats to people?	Yes	144	72
	No	56	28

Variables	Categories	Frequency	Percentage
Age Group	10-29	61	30.5
	30-49	76	38
	50-69	55	27.5
	70+	8	4
Gender	Male	128	64
	Female	72	36
Educational Qualification			
	No Education	73	36.5
	High School	43	21.5
	Secondary School	46	23
	Diploma	8	4
	Bachelor	20	10
	Masters or above	10	5
Occupation depends on farming?			
	Yes	101	50.5
	No	99	49.5
Number of family member			
	<=4	63	31.5
	>4	137	68.5
Monthly Income			
	<10000	86	43
	10000-30000	98	49
	30000-50000	16	8
Ownership of domestic animal			

	Yes	186	93
	No	14	7
Own fruit trees or orchid			
	Yes	182	91
	No	18	9
Noticed bat around orchard			
	Yes	174	87
	No	26	13
	No	26	13

Table 3: Awareness of Nipah Virus Disease among the respondents

<u>Excellent</u>		<u>Good</u>		<u>Poor</u>		<u>Very Poor</u>	
n	%	n	%	n	%	n	%
63	31.5	51	25.5	46	23	40	20

Table 4: Influence of characteristics on “aware” grade for Nipah virus

Characteristics	Aware	Not aware	P Value	Result
Age Group				
10-29	39	22		
30-49	47	28	.095	Not Associated
50-69	25	30		
70+	3	5		
Gender				
Male	70	58		
Female	44	28	.290	Not Associated
Education				
No Education	38	35		
High School	21	22		
Secondary School	23	23	.034	Associated
Diploma	7	1		
Bachelor	15	5		
MS+	10	0		
Economic Profile Depends on Education				
Yes	50	49	.371	Not Associated
No	64	37		
Govt. campaign in area				
Yes	92	6	.034	Associated
No	22	80		