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ORIGINAL ARTICLE

Veterinary students' knowledge, attitudes, and practices regarding rabies transmission, prevention, and control in Bangladesh

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Abstract

Background: Since rabies is one of the fatal diseases in many developing countries including Bangladesh, the study was performed to assess the knowledge, attitudes, and practices (KAP) of rabies among the veterinary students in Bangladesh.

Materials and Methods: A total of 310 veterinary undergraduates participated in this study. A pre-tested questionnaire made of a total of 18 items was used to assess the KAP of the students through a physical interview. IBM SPSS software was used to code and analyze the obtained data. The frequencies of the variables were presented in percent. The associations and the degree of relationships between multiple variables were examined using chi-square and correlation tests with symmetric measures and co-variances.

Results: Only 22.6% of the 310 veterinary students had pets in their homes and halls, and 13.9% of them vaccinated their animals against rabies. However, nearly 97% did not vaccinate themselves. About 48% of the students never attended any seminar/program on rabies. The chi-square statistic revealed the students' KAP level was influenced by their attendance at conferences or seminars (52.3%) and level of class. Another noteworthy finding was that the students who own pets were cognizant of the importance of vaccinating their pets to prevent rabies infection [$\chi 2$ (2, N=310) = 310.00, p<0.001]. Gender is found to be significantly associated and correlated with positive attitudes regarding the knowledge of the wide host range of rabies (p<0.007, R=0.154), application of antiseptics (p<0.001, R=0.195) for reducing the load of the pathogen, and coming to the contacts of the stray animals of the universities.

Conclusion: More seminars and discussions ought to be held by universities to enhance veterinary learners' KAP regarding rabies prevention and control in Bangladesh.

Keywords: KAP, Zoonotic disease, Vaccination, Gender, Wild and domesticated animals

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Introduction

Rabies is a deadly ancient zoonotic virus-borne disease that attacks both humans and animals (Taylor and Nel, 2015; Brunker and Mollentze, 2018). It is endemic in over 150 countries that endanger both animal and public health (Fenelon *et al*., 2017). The rabies virus is most commonly transmitted by wild mammals which then spread to domesticated animals including cats, dogs, cattle, horses, and other livestock through contact with wild animals (Benavides *et al*., 2020). The most prevalent way of rabies virus transmission is the animal bites (Ngugi *et al*., 2018). Additionally, animal scrapings and licking can also be the leading cause of rabies propagation (Nelwan, 2018). Free-roaming dogs (FRD) are the most frequent sources of rabies transmission to both humans and livestock in developing countries including Bangladesh (Noman *et al*., 2021; Rana *et al*., 2020). Every year, >2,000 human deaths are reported to be caused by the rabies virus in Bangladesh (Hossain *et al*., 2012). Livestock mortality is also rising at a rate of rabies propagation, resulting in economic losses (Noman *et al*., 2021). Among some of the major barriers to eradicating rabies in Bangladesh are the free-roaming of unvaccinated stray dogs, limited access to adequate vaccinations, and a shortage of qualified diagnostic procedures (Alam *et al*., 2020; Noman *et al*., 2021). The mortality of rabies-affected patients is still 100% after the manifestation of signs and symptoms of the disease (Gold *et al*., 2020). Being 100% deadly, rabies can be controlled by proper preventive measures like vaccination of free-roaming stray animals, pre-exposure prophylaxis (PrEP) and post-exposure prophylaxis (PEP) as well as enhancement of awareness among both educated and non-educated peoples through different campaigns and programs (Anothaisintawee *et al*., 2019). As a part of routine exams, surgeries, and post-mortem examinations, veterinary learners interact with the animals continuously, putting them at a high risk of transmitting an infection from the rabid animals. As a result, it is necessary to educate the students about rabies. So, this study was conducted to identify the level of knowledge, attitude, and practice (KAP) of rabies transmission and prevention among veterinary students in Bangladesh.

Materials and methods

Study area and population

The research was carried out among the veterinary undergraduates of two reputed public universities of Bangladesh named Patuakhali Science and Technology University (PSTU) and Khulna Agricultural University (KAU) which are situated in Patuakhali and Khulna districts respectively. All veterinary students in Bangladesh were our target population and the students at PSTU and KAU were our study population. The study was conducted between April 27, 2022, and August 1, 2022.The study was designed by selecting two universities in Bangladesh randomly. A total of three hundred and ten (N=310) veterinary undergraduates consented to participate in this study.

Data collection

A pre-tested questionnaire was formed to assess the KAP of the students. The questionnaire comprised 18 items of which 8 items were for evaluating knowledge followed by 5 items for attitudes and 5 items for practices regarding rabies prevention and control. The questionnaire was clustered into 4 segments including the socio-demographic background of the students, knowledge, attitudes, and practices of the students concerning rabies, rabies transmission, prevention, and control.

Data input, processing, and analysis

IBM SPSS (Statistical Package for Social Sciences, Version 25) software was used to import and analyze the raw data. Descriptive statistics were presented as percentages, and mean (±SD) for categorical and numeric data, respectively. The chi-square and correlation statistics were used in the qualitative approach to

illustrate the interconnections of the following factors or items.

Results and discussion

Socio-demographic background of the respondents

Table 1 shows the socio-demographic backgrounds of all the students. Three hundred and ten participants (N=310) in total consented to participate in the interview. The average age of all the responders was 22.42 ± 1.965(Mean ± SD) and ranged from 19 to 26 years old. Among all the students, male participants were 76.5%, whereas female was 23.5%. A significant portion of the population did not have any pet animals in their homes or dormitories at the institutions, although roughly one-fifth of respondents were found to have pets (Figure 1). A large proportion (29.4%) of the total participants who contact with the animals for learning and treating clinical cases as part of veterinary education was from the fourth and fifth levels. Regrettably, only around half of the responders attended the seminar on rabies organized by the universities (Figure 2).

Knowledge of the students about rabies, rabies transmission, and prevention

The respondents' answers to the knowledge-based questions are shown in Table 2. The analysis found that 45.2% of veterinary students were aware of the deadly nature of rabies, whereas 38.7% claimed to be uninformed of such a fatal illness. According to a study conducted in Tamil Nadu, India, the percentage (91.07%) among the veterinary practitioners who were aware of the 100% deadly nature of rabies was more than our research finding (Rana *et al.,* 2021)

Nearly 90% of the total participants answered that the virus is the causal agent of rabies in response to the question, "Which microorganism is involved in causing rabies?" However, the rest incorrectly answered the question. In a study in Senegal, the researchers found that 70% of respondents identified the virus as the etiological agent of rabies (Ba *et al.,* 2021).

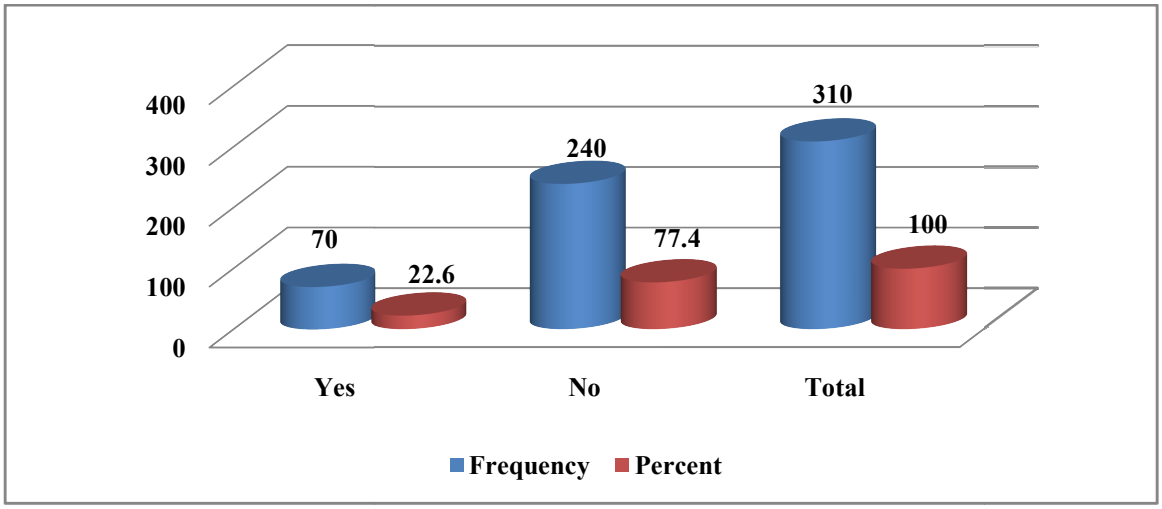

Figure 1: Pet keeping status of the respondents

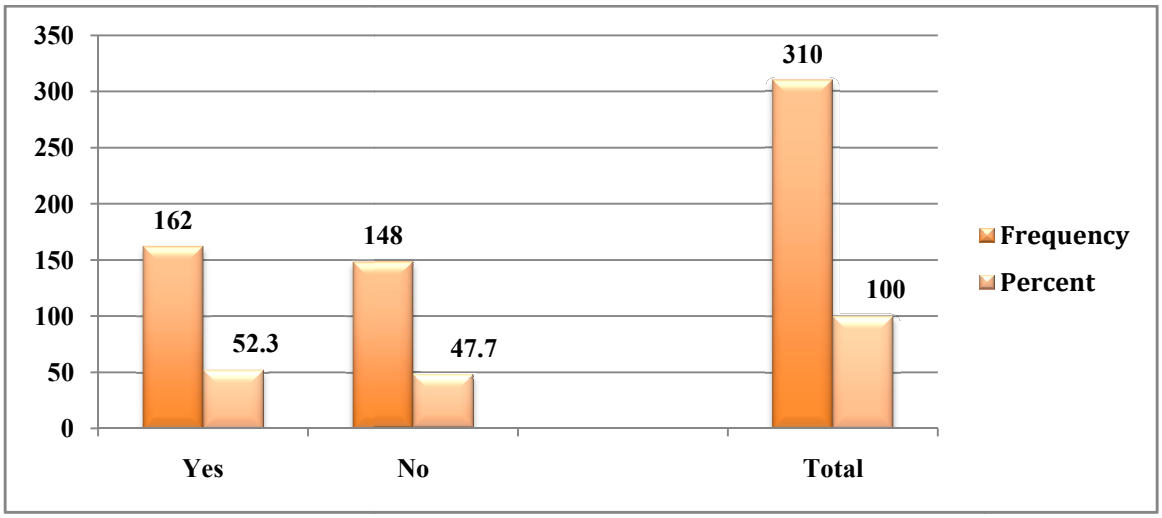

Figure 2: Participation status of the respondents in a seminar on rabies

The majority of students (42.6%) in this research reported that domesticated and wild felines and canines serve as the carriers for the rabies virus. Merely around one-fifth of the respondents appropriately noted that all warm-blooded animals both domesticated and wild can act as reservoir hosts for the rabies virus. All warm-blooded wild animals act as the primary source for rabies transmission which then subsequently spread to secondary sources including domesticated and pet animals (Batista-Morais *et al*., 2000). In a similar research in Ethiopia, 74.2% of the subjects reported being acknowledged that all warm-blooded animals serve as carriers for the rabies virus (Hagos *et al.,* 2020).

In terms of replying to the questions, 'Which system rabies mostly affects?' and 'Can antiseptic application, cleaning hands reduce the invasiveness of the pathogen?' 65.5% answered the nervous system was the primary site of infection and replied positively to the second question. In a research involving 407 participants, it was found that more than half of the attendees did not have any knowledge about the site of infection of rabies that predominantly affects the nervous system (Bouaddi *et al.,* 2020). Comparably, another survey-based study was done in Gujrat among the local families where 31.1% of participants responded favorably to the second question (Singh and Choudhary, 2005).

According to the study, a significant proportion almost 88% was cognizant of rabies transmission from animals to animals which was quite satisfactory. Additionally, when the participants were asked about the mode of transmission of rabies, 35.8% marked animal bites, contact, scratching, and saliva as the sources of transmission. However, a minute percentage was ignorant about the mode of transmission of rabies. The percentage (73.4%) was almost double among households regarding the understanding of the mode of transmission of rabies (Yimer *et al.,* 2012).

In this study, over half of the respondents asserted vaccination as a means of reducing rabies infection and spread, showing that this population is aware that both human and animal vaccines are accessible. Additionally, 10.3% preferred to administer vaccinations for animals only, while the other 36.5% just chose to vaccinate humans.

Table 1: Socio-demographic details of the respondents

Variables			
Total participants (N)		310	
Range of age (in years)		19-26	
Mean age ± SD (in years)		22.42 ± 1.965	
	Category	Frequency (n)	Percentage (%)
Gender	Male	237	76.5
	Female	73	23.5
	Total	310	100.0
Bachelor in veterinary medicine (Running class)	1St level	70	22.6
	2nd level	81	26.1
	3rd level	68	21.9
	4th level	53	17.1
	5th level	38	12.3
	Total	310	100.0
Religion	Islam	266	85.8
	Hinduism	43	13.9
	Buddhism	1	0.3
	Total	310	100.0

Attitudes of the veterinary students towards rabies transmission, prevention, and control

Table 3 shows the perspectives of the veterinary students concerning rabies, rabies transmission, prevention, and control. We found that 83.5% of students ensured and agreed with the statement that the rabies virus can propagate from animals to humans. However, a minority percentage (2.6%) disputed this statement as well. In a recent study in Senegal, the outcome was slightly higher (90.6%) (Ba *et al.,* 2021).

Across this research, 47.7% of respondents correctly assumed that rabies can infect other species of animals including pets. In a research by Ba *et al*., 2021, the percentage was merely double (Ba *et al.,* 2021).

The study revealed that more than three-fourths of the total students thought that the vaccination and immunization program had a significant impact on rabies prevention and control, while only 5.2% of respondents were found to have disagreed with the concept. Furthermore, roughly 38.4% of respondents argued that treatment can cure rabies-affected patients after the commencement of signs and symptoms, which implies the unawareness of the students about this fatal zoonotic disease. Among all the zoonotic infections, rabies is still almost invariably deadly if immunization is not obtained (Nigg and Walker, 2009). However, 48.4% disagreed with the statement. Of the 310 participants, it was satisfactory that 77.1% had the idea that washing the wound area using sterilizers can reduce the invasiveness of the pathogen.

Practices of the students regarding rabies prevention and control

Table 4 illustrates the practices of veterinary students for the prevention and control of rabies. 66.1% of the respondents reported that they directly go to the contacts of the stray animals at the universities. Besides that, more than 90% of respondents confirmed that they wash their hands after coming into contact with the animals.

Table 2: The responses of the students to the knowledge-based items

Variables			
	Category	Frequency	%
Is rabies 100% fatal?	Yes	140	45.2
	No	120	38.7
	Don't know	50	16.1
	Total	310	100.0
Which microorganism is responsible for rabies?	Virus	276	89.0
	Bacteria	6	1.9
	Fungus	3	1.0
	Mycoplasma	1	0.3
	Chlamydia	1	0.3
	Rickettsia	2	0.6
	Don't know	21	6.8
	Total	310	100.0
What type of animals act as reservoirs for rabies?	All warm-blooded domesticated animals	10	3.2
	All warm-blooded wild animals	24	7.7
	Both warm-blooded domesticated and wild animals	61	19.7
	Both domesticated and wild felines and canines	132	42.6
	Domesticated felines and canines only	15	4.8
	Wild felines and canines only	40	12.9
	Don't know	28	9.0
	Total	310	100.0
Which system rabies mostly affects?	Nervous	203	65.5
	Digestive	7	2.3
	Integumentary	17	5.5
	Respiratory	18	5.8
	Uro-genital	7	2.3
	Don't know	58	18.7
	Total	310	100.0
Do you know that rabies can be transmitted from animals to animals?	Yes	272	87.7
	No	38	12.3
	Total	310	100.0
What is the mode of transmission of rabies?	Infected animal bite	53	17.1
	Infected animal contact	9	2.9
	Infected animal scratching	7	2.3
	The saliva of the rabid animal	98	31.6
	All above	111	35.8
	Don't know	32	10.3
	Total	310	100.0
Can antiseptic application and washing hands reduce the invasiveness of the pathogen?	Yes	203	65.5
	Don't know	107	34.5
	Total	310	100.0
How rabies can be prevented?	Vaccinating both humans and animals	165	53.2
	Vaccinating animals only	32	10.3
	Vaccinating humans only	113	36.5
	Total	310	100.0

Table 3: The attitudes of the participants towards rabies transmission, prevention, and control

Variables			
	Category	Frequency (n)	Percentage (%)
Rabies is a zoonotic disease	Agreed	259	83.5
	Neutral	43	13.9
	Disagreed	8	2.6
	Total	310	100.0
Rabies can infect other animals except for pet animals	Agreed	148	47.7
	Neutral	46	14.8
	Disagreed	116	37.4
	Total	310	100.0
Rabies vaccine and immunoglobulin are strongly effective for 100% rabies prevention	Agreed	244	78.7
	Neutral	50	16.1
	Disagreed	16	5.2
	Total	310	100.0
Washing the wound area with soaps, antiseptics, and detergents can reduce the invasiveness of the pathogen	Agreed	239	77.1
	Neutral	39	12.6
	Disagreed	32	10.3
	Total	310	100.0
Rabbis can be cured easily by medication after observation of signs and symptoms	Agreed	119	38.4
	Neutral	41	13.2
	Disagreed	150	48.4
	Total	310	100.0

Table 4: Practice-based responses of the respondents

Variables			
	Category	Frequency (n)	Percentage (%)
Do you go to the contacts of stray animals at the universities?	Yes	205	66.1
	No	105	33.9
	Total	310	100.0
Do you wash your hands with antiseptics after contacting the animals?	Yes	281	90.6
	No	29	9.4
	Total	310	100.0
Have you vaccinated your pet animals against rabies?	Yes	43	13.9
	No	27	8.7
	No pets	240	77.4
	Total	310	100.0
Are you vaccinated against rabies?	Yes	10	3.2
	No	300	96.8
	Total	310	100.0

Transmission of several zoonotic diseases, such as rabies, can be occurred by direct contact (Plowright *et al.,* 2017).

Among 22.6% of pet keepers, 8.7% never vaccinated their animals. In a research in Pakistan, the result was quite low (25.9%) than our findings (Ahmed *et al.,* 2020). Additionally, it was found that nearly 97% did not participate in vaccination programs to vaccinate themselves. Vaccination against rabies for both animals and humans is reported to be a 100% preventive strategy for preventing rabies infection and propagation (Chuchu *et al.,* 2022).

Pet owning effects on the participants' KAP

The participants who owned pets were cognizant of the site of action of the rabies virus [$\chi 2$ (5, N=310) = 14.720, $p<0.05$ with φc = 0.205]. Surprisingly, we found that the students who keep pets were also conscious of the importance of vaccinating their animals for controlling rabies infection [$\chi 2$ (2, N=310) = 310.00, $p<0.001$ with φc = 1.00]. In a similar research carried out in Philippines also found that the respondents who keep pets were conscious of vaccinating their animals to prevent and controlling of rabies infection and transmission indicating the following study outcomes (San Jose *et al.,* 2019).

Effects of seminar participation on the participants' KAP

Interestingly, the investigation revealed that the participants, who joined a conference or seminar (52.3%), answered all of the questions more appropriately than the other subjects who had never attended a rabies workshop. A study of Turkey by KURT *et al* also noted that joining a seminar can influence the KAP level of a participant (KURT *et al.,* 2021). It implies that the university seminar assisted the students to acquire a more comprehensive understanding of rabies transmission, prevention, control, and management. According to the report, there were still about 50% of the respondents who never attended a seminar and who do not have a strong knowledge of the rabies virus which can lead to disease propagation among the students. As a result, the universities must need to ensure the knowledge of rabies among all the learners both clinical and pre-clinical to prevent disease transmission.

Relation of gender and class level with KAP of the students

The results of correlation analysis imply that gender is positively and significantly associated and correlated with the knowledge of the wide host range of rabies (R=0.154, $p<0.05$, co-variance=0.060), application of antiseptics for reducing the load of the pathogen (R=0.195, $p<0.05$, co-variance=0.054) and coming to the contact of the stray animals of the universities (R=0.261, $p<0.05$, co-variance= 0.053). A similar consequence was also observed in a research of 2019 in Ghana (Awuni *et al.,* 2019).
On the other hand, the study also found the class level has a direct strong positive impact on the knowledge of the students about transmitting the rabies from animals to animals (R=0.174, $p<0.05$, co-variance=0.075), mode of transmission (R=0.504, $p<0.05$, co-variance=1.124), treatment (R=0.347, $p<0.05$, co-variance=0.425), and prevention (R=0.243, $p<0.05$, co-variance= 0.300). Since the study explored that the preclinical students who go into direct contact with stray animals had less understanding and knowledge about rabies mortality, propagation, and preventive approach, the institutions must make the required initiatives to inform such students about rabies before clinical learning and practicing in order to minimize the spread of rabies among the students.

Conclusion

The overall findings suggest that veterinary students need to be more informed of this fatal zoonotic disease. We observed that a sizable percentage of veterinary learners, both in the

clinical and preclinical stages, were not vaccinated. In order to prevent, control, and spread rabies, universities should hold more seminars and lectures for educating undergraduates concerning rabies from the very beginning of their veterinary studies.

Limitation of the study

The research was carried out with a short sample size due to the absence of financing. More studies with large sample sizes are highly suggested to be carried out in the future for more appropriate findings.

Competing Interest

The authors declared that they have no competing interests.

Authors' Contribution

A. Sayed designed and conceptualized the experiment, reviewed the literature, collected and analyzed the data, wrote and revised the draft of this manuscript. S. Akter and R. Mahmud were involved in data collection and writing. M. Kawser was involved in data collection. M. A. Jahid supervised and revised the final manuscript. All authors have read and approved the final manuscript.

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