

Knowledge Levels of Medical Faculty Clinical Term Students About Rabies Prophylaxis: An Observational Study

Aybüke Nisa GERÇEK¹, Baki DERHEM¹

¹ Department of Family Medicine, Kırıkkale University Faculty of Medicine, 71300 Kırıkkale, Türkiye

ABSTRACT

Aim: Rabies is a 100% preventable disease with pre- and post-exposure prophylaxis. The aim of this study is to investigate the level of knowledge of clinical term students at Kirikkale University Faculty of Medicine regarding rabies prophylaxis. **Method:** This cross sectional study was performed between May 2025- July 2025 among 201 pre-graduate medical students who were studying at Kirikkale University Faculty of Medicine. The questionnaire form, which aimed to measure the level of knowledge about rabies prophylaxis, was prepared by the researchers based on the Turkish Ministry of Health Field Guidelines for Rabies and consisted of 20 questions in total. Correct answers are scored 1 point, while incorrect or "I don't know" answers receive 0 points. Scores of 0-7 represent an insufficient level of knowledge, 8-16 represent an intermediate level of knowledge, and 17 and above represent a sufficient level of knowledge. The comparison of categorical variables was done using the Fisher's exact test and the chi-square test. $P < 0.05$ was considered as significant for all tests. **Results:** The mean age of the 201 participants was 23.58 ± 2.97 and 52.7% (n=106) were female. We found a moderate levels of knowledge (12.37 ± 3.97 total score) about rabies prophylaxis among medical students. According to sufficiency level, only 17.9% of the participants had adequate knowledge level. **Conclusion:** This study highlights that, both in terms of implementing the right management in practice and preventing unnecessary use of resources, students and post-graduate physicians should be reminded through lectures, courses or online trainings in order to repeat the knowledge about rabies prophylaxis and keep it up to date.

Keywords: Knowledge, Medical students, Post-exposure prophylaxis, Rabies

ÖZET

Amaç: Kuduz, temas öncesi ve sonrası profilaksi ile %100 önlenabilir bir hastalıktır. Bu çalışmanın amacı, Kırıkkale Üniversitesi Tıp Fakültesi klinik dönem öğrencilerinin kuduz profilaksisi konusundaki bilgi düzeyini araştırmaktır. **Yöntem:** Bu kesitsel çalışma, Mayıs 2025-Temmuz 2025 tarihleri arasında Kırıkkale Üniversitesi Tıp Fakültesi'nde öğrenim gören 201 lisans öncesi tıp öğrencisi arasında gerçekleştirilmiştir. Kuduz profilaksisi ile ilgili bilgi düzeyini ölçmeyi amaçlayan anket formu, araştırmacılar tarafından Türkiye Sağlık Bakanlığı Kuduz Profilaksi Rehberi'ne dayalı olarak hazırlanmış ve toplam 20 sorudan oluşmuştur. Doğru yanıtlar 1 puanla değerlendirilirken, yanlış veya bilmiyorum yanıtlarına 0 puan verilmiştir. 0-7 puan yetersiz bilgi düzeyini, 8-16 puan orta bilgi düzeyini, 17 ve üzeri puan ise yeterli bilgi düzeyini temsil edecek şekilde kategorize edilmiştir. Kategorik değişkenlerin karşılaştırılması Fisher'in kesin testi ve ki-kare testi kullanılarak yapılmıştır. $P < 0,05$ tüm testler için anlamlı kabul edilmiştir. **Bulgular:** Katılımcıların yaş ortalaması $23,58 \pm 2,97$ idi ve %52,7'si (n=106) kadındı. Tıp öğrencilerinin kuduz profilaksisi hakkında orta düzeyde bilgiye sahip oldukları (toplam puan $12,37 \pm 3,97$) tespit edildi. Yeterlilik düzeyine göre, katılımcıların sadece %17,9'u yeterli bilgi düzeyine sahipti. **Sonuç:** Bu çalışma hem doğru tedavinin uygulanması hem de kaynakların gereksiz kullanımının önlenmesi açısından, öğrencilere ve tıpta uzmanlık öğrencilerine dersler, kurslar veya çevrimiçi eğitimler yoluyla kuduz hakkında bilgilerin tekrar edilmesi gerektiğini vurgulamaktadır.

Anahtar kelimeler: Bilgi düzeyi, Tıp öğrencileri, Temas sonrası profilaksi, Kuduz

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INTRODUCTION

The rabies virus is an enveloped, single-stranded RNA virus that falls within the Lyssavirus genus of the Rhabdoviridae family, which is part of the Mononegavirales order. This virus causes an acute, progressive and fatal disease. One of the oldest zoonotic diseases is rabies. If left untreated, rabies is a completely fatal disease (1). Rabies is usually transmitted through bites. The bites come from animals infected with the rabies virus. It can also be transmitted through direct contact. This contact can be with infectious material. Examples of this material include saliva, cerebrospinal fluid, or nerve tissue. The material can come into contact with mucous membranes or open wounds (2). When clinical symptoms appear, it almost always results in death, and there is no effective treatment yet (3).

According to World Health Organization (WHO) data, rabies is estimated to cause 59,000 human deaths annually. This estimate is based on data that is not fully reported. The disease is estimated to cause these deaths in more than 150 countries. 95% of cases originate in Africa and Asia (4). Our country is also considered an endemic region for rabies. There are approximately 250,000 reports of rabies exposure each year, with an

average of one or two cases reported annually (5).

Dogs are responsible for the vast majority (approximately 99%) of cases of rabies worldwide. In our country, animals that cause rabies cases are dogs, cattle, cats, farm animals, and wild animals (respectively) (5,6).

Vaccination strategies for rabies prevention include pre-exposure rabies prophylaxis and post-exposure rabies prophylaxis. When applied correctly, it provides almost 100% protection. Pre-exposure prophylaxis should be administered to individuals working in high-risk occupations (veterinarians, rabies vaccine laboratory workers, animal handlers, etc.), individuals at high risk of exposure to wildlife, and individuals traveling to areas with a high incidence of rabies and where access to medical care is difficult in the event of exposure (6).

The Centers for Disease Control and Prevention (CDC) and the Advisory Committee on Immunization Practices (ACIP) state that prophylaxis should be administered as soon as possible after exposure to the rabies virus (7). The basic components of this prophylaxis are thorough wound cleaning with soap and water for at least 15 minutes as soon as possible after exposure, and administration of rabies vaccine obtained from cell culture to appropriate patients and human rabies

immunoglobulin in appropriate cases according to the contact category, after categorizing the rabies-risk animal according to ACIP recommendations (8).

Rabies prophylaxis in Türkiye is carried out in accordance with the Rabies Prophylaxis Guide, which was updated by the Ministry of Health in 2019 and serves as the basis for practice. According to this guide, pre-exposure prophylaxis in our country is provided by two doses of intramuscular vaccination on days 0 and 7. In post-exposure prophylaxis, the rabies vaccine is administered in a total of four doses: one dose on days 0, 3, and 7, and another dose between days 14 and 28.

Rabies remains a serious public health problem due to its lethality after infection and the high cost of post-exposure prophylaxis (9).

As in our country, it has been determined that approximately half of the prophylaxis administered in other countries is inappropriate; this situation has been determined to be caused by unnecessary prophylaxis administered due to reasons such as bites from healthy dogs, human bites, or contact with the saliva of healthy animals (10). The high cost of post-exposure prophylaxis and the difficulty of accessing vaccines and immunoglobulin in low- and middle-income countries require careful evaluation of cases to determine whether post-exposure prophylaxis is necessary (11).

By the WHO, over 29 million people worldwide are vaccinated every year to protect against rabies. The global cost of rabies is

estimated to be approximately \$8.6 billion per year, including deaths, lost livelihoods, medical care expenses, and unaccounted psychological trauma (12).

The aim of this study is to investigate the level of knowledge of clinical term students at Kirikkale University Faculty of Medicine regarding rabies prophylaxis.

MATERIAL AND METHODS

Study Setting

This cross-sectional study was performed between May 2025- July 2025 among pre-graduate medical students who were studying at Kirikkale University Faculty of Medicine. Before starting data collection, the ethical approval for the study obtained from Kirikkale University Institutional Review Board (No. 2025.05.11). All methods and protection of personal information were performed in accordance with the Declaration of Helsinki, and the study was conducted in accordance with Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

The total of 201 students of semester 4-5-6 who voluntarily agreed to participate in the study were included in the study, and the students of semester 1-2-3 who have not yet taken clinical science courses were excluded from the study. An electronic informed consent explaining the purpose of the study and including anonymity and confidentiality guarantees was obtained from all participants, and participants were included in the study if

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they voluntarily agreed to participate in the survey by answering “Yes” to a mandatory consent question before starting the survey.

Data Collection

The questionnaire form, which aimed to measure the level of knowledge about rabies prophylaxis, was prepared by the researchers based on the Turkish Ministry of Health Field Guidelines for Rabies and consisted of 20 questions in total. Correct responses were scored with 1 point, while incorrect or “I don’t know” responses were given 0 points, providing a maximum possible score of 20 points. 0-7 points will be categorized as representing inadequate knowledge level, 8-16 points as moderate knowledge level, 17 or higher points as adequate knowledge level according to expert opinions. Additionally, a questionnaire containing the sociodemographic information of the participants was developed by the researchers and applied to the participants.

All survey questions were constructed via Google Forms and the link was sent to the participants. To increase the reliability of the collected data, the questionnaire was distributed through Google Forms, which limits responses to one per respondent by requiring a Gmail login. Thus, the risk of resubmitting the same form was eliminated and data integrity was ensured.

Statistical Analyses

For all statistical analyses, IBM SPSS version 25 was used. The normality of the

variables was checked using the Kolmogorov-Smirnov test, and the kurtosis and skewness values of the data were also taken into account. Mean \pm standard deviation was given for normally distributed values. The expression of categorical variables was in numbers and percentages. The comparison of categorical variables was done using the Fisher's exact test and the chi-square test. $P < 0.05$ was considered as significant for all tests.

RESULTS

The mean age of the 201 participants was 23.58 ± 2.97 and 52.7% (n=106) were female. Percentage of people who adopted a cat or dog living with them was 32.3%. 17.4% of the students participating in the study had family members who worked in animal husbandry. The mean total score of the knowledge about rabies prophylaxis was 12.37 ± 3.97 . When classified according to sufficiency level, only 17.9% of the participants had adequate knowledge level (Table 1).

Table 2 shows the number and percentage of correct and incorrect answers to all questions measuring the level of knowledge about rabies prophylaxis. Approximately half of the participants believed that the rabies vaccine administered in our country is a live vaccine (55.7%) and responded that it is unsafe for mothers who have received the rabies vaccine to breastfeed their babies (44.3%). The vast majority of students thought that rabies prophylaxis is necessary after human bites

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(81.1%). The necessity of prophylaxis after cattle, sheep, goat, horse, or donkey bites was correctly answered by 48.8% of participants, while 40.3% incorrectly answered that rabies prophylaxis should be initiated for bites from mice, rats, squirrels, hamsters, and rabbits.

Table 3 shows the comparison of knowledge levels about rabies prophylaxis with demographic variables. A statistically significant difference was found only in terms of the year of study at the faculty of medicine ($p= 0.021$).

Table 1. Demographic features of participants

	Mean ± SD	
Age	23.85 ± 2.97	
Total rabies prophylaxis knowledge score	12.37 ± 3.97	
	n	%
Gender		
Female	106	52.7
Male	95	47.3
Years of study		
4th year	79	39.3
5th year	53	26.4
6th year	69	34.3
Domestic pet owned		
Yes	65	32.3
No	136	67.7
Previously vaccinated pet against rabies		
Yes	54	26.9
No	147	73.1
Presence of family members engaged in animal husbandry		
Yes	35	17.4
No	166	82.6
Vaccinated against rabies		
Yes	45	22.4
No	156	77.6
Knowledge level of rabies prophylaxis		
Inadequate	27	13.4
Moderate	138	68.7
Adequate	36	17.9

Table 2. Responses about rabies prophylaxis

	Correct response, n (%)	Incorrect response, n (%)
In line with the guidelines, rabies prophylaxis is 4 doses in total, one dose on days 0, 3, 7 and one more dose between days 14-28.	161 (80.1)	40 (19.9)
The rabies vaccine administered in our country is a live vaccine.	112 (55.7)	89 (44.3)
Rabies prophylaxis and immunoglobulin should be administered immediately in animal bites such as wolf, fox, jackal, pig, ferret.	174 (86.6)	27 (13.4)
No need for rabies prophylaxis after bites of cattle, sheep, goats, horses and donkeys.	98 (48.8)	103 (51.2)
Rabies prophylaxis should be started for bites of poultry such as chickens and roosters.	177 (88.1)	24 (11.9)
Rabies prophylaxis is recommended for human bites.	38 (18.9)	163 (81.1)
Consuming meat or milk from animals suspected of having rabies should receive rabies prophylaxis.	104 (51.7)	97 (48.3)
Rabies prophylaxis should be started for bites of mice, rats, squirrels, hamsters and rabbits.	81 (40.3)	120 (59.7)
A mother who has been vaccinated against rabies can breastfeed her baby.	112 (55.7)	89 (44.3)
Rabies pre-exposure prophylaxis is administered to people working in high-risk occupations.	188 (93.5)	13 (6.5)
Pre-exposure prophylaxis is administered in a total of 4 doses, one dose on days 0, 3, 7 and one more dose between days 14-28.	70 (34.8)	131 (65.2)
Touching, feeding or licking intact skin of a rabies risk animal requires rabies prophylaxis.	159 (79.1)	42 (20.9)
Feeding or drinking pasteurized milk from an animal later found to be rabid requires rabies prophylaxis.	146 (72.6)	55 (27.4)
Prophylaxis is necessary in the case of provoked minor, non-bleeding cat scratching if it is not known whether the animal has been vaccinated in the last year and observation is not possible.	77 (38.3)	124 (61.7)

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In case of minor scratching or bruising without bleeding on bare skin by a rabies risk animal, the animal is observed for 10 days without prophylaxis.	157 (78.1)	44 (21.9)
If prophylaxis is required for category 2, 4 doses of vaccine and 1 dose of immunoglobulin are administered, one dose on days 0, 3, 7 and one more dose between days 14-28.	39 (19.4)	162 (80.6)
Licking of open skin wounds, compromised skin or mucous membranes by a rabies risk animal is considered a Category 3 risk.	158 (78.6)	43 (21.4)
In case of rabies risk contact, the vaccine is administered with the same scheme and doses in infants, children, adults and pregnant women.	107 (53.2)	94 (46.8)
All rabies risk contacts should be recorded, whether or not rabies prophylaxis is applied.	163 (81.1)	38 (18.9)
In category 3, if it is not known whether the contact animal has been vaccinated against rabies in the last 1 year and the animal cannot be observed, Immunoglobulin should be administered up to 7 days after the first dose of vaccine.	165 (82.1)	36 (17.9)

Frequencies were given in numbers and percentages.

Table 3. Comparison of rabies prophylaxis knowledge levels

	Knowledge level of rabies prophylaxis			p value
	Inadequate n (%)	Moderate n (%)	Adequate n (%)	
Gender				
Female	15 (14.2)	74 (69.8)	17 (16.0)	0.752
Male	12 (12.6)	64 (67.4)	19 (20.0)	
Years of study				
4th year	10 (12.7)	60 (75.9)	9 (11.4)	0.021
5th year	10 (18.9)	27 (50.9)	16 (30.2)	
6th year	7 (10.1)	51 (73.9)	11 (15.9)	
Domestic pet owned				
Yes	9 (13.8)	44 (67.7)	12 (18.5)	0.979
No	18 (13.2)	94 (69.1)	24 (17.6)	

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Previously vaccinated pet against rabies				
Yes	4 (7.4)	40 (74.1)	10 (18.5)	0.312
No	23 (15.6)	98 (66.7)	26 (17.7)	
Presence of family members engaged in animal husbandry				
Yes	2 (5.7)	26 (74.3)	7 (20.0)	0.336
No	25 (15.1)	112 (67.5)	29 (17.5)	
Vaccinated against rabies				
Yes	6 (13.3)	29 (64.4)	10 (22.2)	0.687
No	21 (13.5)	109 (69.9)	26 (16.7)	

Chi-square test was applied to compare categorical variables

DISCUSSION

In this study, we found a moderate levels of knowledge (12.37 ± 3.97 total score) about rabies prophylaxis among medical students. When evaluating the answers to the questions, we observed that students showed a defensive attitude toward prophylaxis both before and after exposure. Indeed, a high percentage of participants believed that vaccination was necessary even for human bites and rodent bites (81.1% and 59.7%, respectively). When comparing sociodemographic characteristics with rabies prophylaxis knowledge levels, statistically significant differences were found only between the years of study. In a study conducted with 892 medical students in Türkiye, Pervane et al. concluded that the overall level of knowledge about rabies differed between classes ($p < 0.001$) (13). However, this difference was significant between students in years 4-5-6 and years 1-2-3. In our study, students in years 1-2-3 were not included in the research, and the group

with the highest level of knowledge and the most significant difference was the fifth-year students. Rather than implying a general cumulative effect of medical education, this difference is likely due to the infectious diseases internship in the fifth year.

A study performed in Ghana with primary care providers (include nurses and doctors), Kenu et al. stated that, only 12% of the participants knew the correct pre-exposure prophylaxis (PrEP) Schedule (14). Another study performed in Türkiye among physicians, only 17.9% had correct information about PrEP (15). The higher rate of correct answers (34.8%) about PrEP in our study may be due to the difference of involved participants (only medical students).

In our study, the rate of correct answers to the question that no prophylaxis was required after rodent bites was 40.3%, while in a study conducted with 84 family physicians in Türkiye, the rate of physicians who knew that rodents were not a source of rabies was also reported as 66.7%. We can assume that this difference is due to the high

rate of application to primary care physicians after rabies contact and the experience of family physicians in this field (15).

In a study conducted in Kolkata, India, the percentage of intern doctors who had correct information about vaccine and immunoglobulin administration for category 2 was found to be 57.5%. In our study, this rate was 19.4 percent for category 2. Also in this study, open skin wounds, broken skin, or mucous membranes contaminated by a rabies-risk animals were classified as category 3 by 75% of participants, while in our study this rate was similarly 78.6% (16).

Shaban et al. performed a study on licensed physicians, the percentage of correct answers to the question regarding the management of category 2 animal bites was 37.4%, while in our study, this percentage was similarly low at 19.4%. However, only 21.6% of the participants were aware of the guidelines that say the Ig administrations should be given within seven days after the first vaccine dose (17). In our study, a significantly higher rate was found (82.1%). Also, in this study, the percentage of people who knew that rabies vaccine could be administered during pregnancy and breastfeeding was low, just like in our study (41.3% and 55.7%, respectively). In a study conducted with medical students in India, this rate was found to be 40.6 percent, similar to our study. However, in a study conducted in India and involving family physicians, this rate was also 66.7 percent. We assume that the main reason for this difference

is the population in which the studies were conducted.

The rate of those who knew the correct post-exposure prophylaxis scheme according to the guidelines was 49.4 percent in the study by Nair et al. whereas this rate was 80.1 percent in our study. The possible explanation for this difference is that our study was conducted with clinical term students (18).

In Gönen's survey, 35% of doctors were not aware of the need for a 10-day observation period after contact for dogs suspected of rabies, compared to 21.9% of us (19).

Rabies is among the notifiable diseases in Türkiye. Physicians are obliged to report suspected cases of contact and information on deaths from rabies to the institution to which they are affiliated. The rate of awareness of this obligation was similarly high in the study by Gönen et al. and in our study (98% and 81.1%, respectively).(19) Another study performed in Türkiye with medical senior students, Akçalı et al. showed, 82.8% of students knew that rabies is a notifiable disease (20).

Because rabies is a fatal disease, the fact that the medical students think that even the suspicion of this disease must be reported and the low rate of knowledge of in which cases prophylaxis should be done and if it should be done, it should be done according to the correct schemes of practice according to the categories is actually a consistent result between each other. In our study, physician candidates argued that even human bites and

rodent bites require prophylaxis, indicating that a kind of defensive approach is dominant. This poses a problem both in terms of the financial burden on health systems and paves the way for unnecessary vaccination of individual patients.

Limitations and Strengths

The main limitations of our study are the small sample size, incomplete participation rate (52%), cross-sectional and single-center design. As such, it is not possible to generalize the results obtained from the study. Moreover, in the absence of a valid and reliable questionnaire to measure the level of knowledge about rabies prophylaxis, a questionnaire created according to the “Turkish Ministry of Health Field Guidelines for Rabies” was administered to the participants. Longitudinal studies are needed to help us understand better how well training programs work to improve rabies prophylaxis practices.

On the other hand, the study provides original evidence on medical students’ knowledge gaps in rabies prophylaxis, a topic with limited prior research. The study provides an opportunity for educators to identify misconceptions (e.g., unnecessary prophylaxis after human or rodent bites) and it can inform curriculum improvements and continuing medical education.

CONCLUSION

Rabies, a preventable disease, is still a major cause of mortality and morbidity in developing countries. It is important for all physicians to keep themselves up to date in terms of the prophylaxis scheme, the approach according to the source of the bite and the management according to categorization. In our study, the higher level of knowledge of semester 5 students are due to the recentness of the information. We believe that both students and post-graduate physicians should be reminded through lectures, courses or online trainings in order to repeat the information and keep it up to date.

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Ethics Approval: Ethical approval was obtained from the Kırıkkale University Institutional Review Board (No. 2025.05.11). All methods were performed in accordance with the Declaration of Helsinki, and personal information was protected.

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