

IMPACT OF RABIES EXPOSURE CASES ON EMERGENCY DEPARTMENT VISITS IN KIRŞEHİR

KIRŞEHİR'DE KUDUZ RİSKLİ TEMAS OLGULARININ ACİL SERVİS BAŞVURULARINA ETKİSİ


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ABSTRACT

Aim: This study aimed to analyze the demographic and clinical characteristics, exposure types, and post-exposure prophylaxis (PEP) management of patients presenting to the emergency department in Kırşehir due to rabies-risk contact. It also sought to identify factors influencing vaccination completion and to provide data that may guide public health interventions and policy planning.

Method: This retrospective, descriptive study was conducted at Kırşehir Training and Research Hospital Emergency Department and included all patients who presented with suspected rabies exposure between March 1, 2022, and March 1, 2023. Patients with incomplete records or those who only received follow-up vaccine doses initiated elsewhere were excluded. Data was collected from hospital information systems and PEP registration logs. Statistical analyses were performed using chi-square and Fisher's exact tests, with $p < 0.05$ considered significant.

Results: A total of 488 patients were included in the study. Male patients accounted for 55.5% of the cases. The majority of exposures were caused by cats (66.8%) and dogs (32.2%), with stray and unvaccinated animals responsible for most incidents (87.1%). The most frequently affected body parts were the right and left hands. Four vaccine doses were administered to 98.2% of patients, and immunoglobulin was given to 31.4%. Observation was performed in 12.7% of patients. A significant relationship was found between gender and type of attack, as well as between gender and animal species ($p < 0.001$).

Conclusion: This study highlights that rabies-risk exposures in Kırşehir are predominantly associated with stray, unvaccinated cats, and that the right hand is the most injured region. Although PEP adherence was high, the lack of observation and limited infectious disease consultations highlight areas requiring improvement. Enhancing interdepartmental coordination, strengthening stray animal vaccination programs, and improving community education are essential for optimizing rabies prevention and control strategies in Turkey.

Keywords: rabies, post-exposure prophylaxis, rabies vaccines

ÖZET

Amaç: Bu çalışma, Kırşehir’de kuduz riskli temas nedeniyle acil servise başvuran hastaların demografik ve klinik özelliklerini, temas türlerini ve maruziyet sonrası profilaksi (post exposure profilaksi- PEP) süreçlerini analiz etmeyi amaçlamıştır. Ayrıca, aşı tamamlama oranlarını etkileyen faktörleri belirleme ve halk sağlığı müdahaleleri ile politika planlamalarına veri sağlamayı hedeflemiştir.

Yöntem: Bu retrospektif, tanımlayıcı çalışma Kırşehir Eğitim ve Araştırma Hastanesi Acil Servisi’nde yürütülmüş olup, 1 Mart 2022 – 1 Mart 2023 tarihleri arasında kuduz şüphesiyle başvuran tüm hastaları kapsamaktadır. Kayıtları eksik olan veya başka merkezde başlatılan aşıların devam dozlarını almak için başvuran hastalar çalışma dışı bırakılmıştır. Veriler, hastane bilgi yönetim sistemi ve kuduz profilaksi kayıt defterlerinden elde edilmiştir. İstatistiksel analizlerde ki-kare ve fishers exact testleri kullanılmış, $p<0,05$ değeri anlamlı kabul edilmiştir.

Bulgular: Çalışmaya toplam 488 hasta dâhil edilmiştir. Hastaların %55,5’i erkektir. Temasların çoğu kedi (%66,8) ve köpeklerden (%32,2) kaynaklanmış olup, sahipsiz ve aşısız hayvanların oranı %87,1 olarak saptanmıştır. En sık etkilenen vücut bölgeleri sağ ve sol el olarak saptanmıştır. Olguların %98,2’sine dört doz aşı, %31,4’üne immünoglobulin uygulanmıştır. Hastaların %12,7’si gözlem altına alınmıştır. Cinsiyet ile saldırı türü ve hayvan türü arasında istatistiksel olarak anlamlı ilişki bulunmuştur ($p<0,001$).

Sonuç: Bu çalışma, Kırşehir’deki kuduz riskli temasların çoğunlukla sahipsiz ve aşısız kedilerle ilişkili olduğunu ve en sık yaralanma bölgesinin sağ el olduğunu göstermektedir. PEP uyumu yüksek olmasına rağmen, gözlem eksikliği ve enfeksiyon hastalıkları konsültasyonunun sınırlı olması geliştirilmesi gereken alanlar olarak belirlenmiştir. Bölümler arası koordinasyonun artırılması, sahipsiz hayvan aşılama programlarının güçlendirilmesi ve toplumsal farkındalığın artırılması, Türkiye’de kuduzun önlenmesi ve kontrolü açısından kritik öneme sahiptir.

Anahtar kelimeler: kuduz, maruziyet sonrası profilaksi, kuduz aşıları

Introduction

Rabies is a zoonotic disease with a near 100% mortality rate; however, it is entirely preventable with timely and appropriate administration of post-exposure prophylaxis (PEP). According to the World Health Organization (WHO), approximately 59,000 people die from rabies annually, with more than 95% of this burden occurring in Africa and Asia. Furthermore, underreporting may cause the actual figures to be higher (1,2).

In Türkiye, PEP is primarily initiated in emergency departments (EDs), and in many centers, follow-up doses are also administered in these units. This model places an additional workload on busy EDs, particularly regarding the coordination of subsequent doses and monitoring patient adherence. International ED data suggest that a substantial proportion of visits for vaccination alone after initial assessment are non-urgent or avoidable. Proper referral systems and outpatient vaccine access have been shown to reduce ED utilization. For instance, the “walk-in clinic referral protocol” implemented in an adult ED in 2025 significantly decreased repeat ED visits for PEP (2).

Moreover, managing follow-up and completion processes remains a global challenge. Studies published between 2024 and 2025 report that different follow-up models affect vaccine series completion rates. Process complexity, communication gaps, and barriers to outpatient access are associated with delayed or incomplete PEP (3,4).

These gaps not only pose clinical risks but also create economic burdens at both patient and system levels. A 2025 study demonstrated that post-animal bite PEP is associated with psychological and behavioral stress alongside direct costs, and adequate patient education improves completion rates (5).

In Turkey, fluctuations in media-driven risk perception have been shown to cause sudden increases in ED visits at certain periods, resulting in capacity pressures, as noted in a 2025 analysis (6).

Veterinary public health programs, such as the 2019–2022 oral rabies vaccination campaign in Anatolian foxes, have improved the epidemiological landscape, particularly in western regions, yet effective surveillance remains essential (6,7).

Globally, initiatives to improve access are ongoing; for example, Gavi's 2024 program aims to expand access to human rabies vaccines for PEP in over 50 countries (8).

Within this context, the ED-centered approach to PEP in Turkey highlights evidence-based opportunities for improvement regarding unnecessary vaccination, ED-dependent dose follow-up, coordination gaps, and patient adherence. This study in Kırşehir aims to describe the demographic and clinical characteristics of patients presenting to the ED for rabies exposure, exposure circumstances, PEP administration, and follow-up processes, while providing a snapshot of current practice and informing policies and practices for rational resource utilization.

This study aimed to evaluate the epidemiological and clinical characteristics of patients presenting to the emergency department with rabies exposure.

Materials and Methods

Study Design and Setting

This retrospective, descriptive study was conducted at the Emergency Department of Kırşehir Training and Research Hospital. All patients presenting with potential rabies exposure, including bites, scratches, or mucosal contact between March 1, 2022, and March 1, 2023, were included.

Study Population and Sample

During the study period, a total of 643 patients presented to the ED due to the risk of rabies exposure. Patients with incomplete records (n=57) and those who had initiated PEP elsewhere and presented solely for follow-up doses (n=98) were excluded. The final sample consisted of 488 patients meeting the inclusion criteria.

Inclusion and Exclusion Criteria

All patients presenting to the ED with rabies exposure and complete medical records were included. Patients with incomplete records, those who initiated PEP elsewhere, and those presenting solely for follow-up doses were excluded.

Data Collection

Data was obtained from the hospital information management system (HIMS) and the Emergency Department rabies prophylaxis registry.

Ethical Approval

Ethical approval was obtained from the Non-Interventional Clinical Research Ethics Committee of Kırşehir Ahi Evran University Faculty of Medicine (Date: 21/03/2023; Decision No: 2023-06/39). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Statistical Analysis

The collected variables included gender, animal type, exposure type, anatomical site of injury, animal vaccination status and post-exposure prophylaxis administration. Statistical analyses were performed using SPSS Statistics for Windows, Version 20 (IBM Corp., Armonk, NY, USA). Continuous variables were presented as mean \pm standard deviation or median (minimum–maximum), and categorical variables as number and percentage (%). Chi-square or Fisher's exact tests were used for group comparisons. A p-value <0.05 was considered statistically significant.

Results

A total of 488 patients were included in the analysis. Distributions of variables such as sex, animal species, animal ownership status, patient observation, wound dressing, immunoglobulin administration, number of vaccine doses, and infectious disease consultation are presented in Table 1. Vaccine doses were not randomly distributed, with four-dose administration significantly more frequent ($p<0.001$).

Significant differences were observed for sex ($p=0.015$), with males accounting for 55.5% of rabies exposure cases. Exposures were significantly higher in certain animal species, particularly cats and dogs, and notably more frequent with unowned and unvaccinated animals ($p<0.001$). Most patients were neither placed under observation nor administered rabies immunoglobulin. The distribution of cases by incident location was not homogeneous, with clustering observed in specific regions ($p<0.001$).

A significant association between sex and type of attack was found ($p<0.001$; see Table 2).

Injuries most frequently involved the upper extremities, particularly the hands ($p<0.001$; see Table 3).

There was no significant association between injury site and sex ($p=0.663$). Cat-related injuries were more common in females, whereas dog-related injuries predominated in males ($p<0.001$), see Table 4).

Male patients were placed under observation significantly more often than female patients. ($p=0.038$, see Table 5)

Table 1. Distribution of Cases

Variables	n(%)	p*
Gender, n(%)		
Female	217(44.5)	0.015
Male	271(55.5)	
Type of Attack, n(%)		
Bite	169(34.6)	<0.001
Scratch	319(65.4)	
Type of Animal, n(%)		
Cat	326(66.8)	<0.001
Dog	157(32.2)	
Cow	1(0.2)	
Mouse	1(0.2)	
Hedgehog	2(0.4)	
Fox	1(0.2)	
Animal Information, n(%)		
Stray unvaccinated	425(87.1)	<0.001
Owned unvaccinated	33(6.8)	
Owned vaccinated	30(6.1)	
Was Observation Done? (%)		
Yes	62(12.7)	<0.001
No	426(87.3)	
Wound Dressing, n(%)		
Yes	488(100.0)	-
Immunoglobulin, n(%)		
Yes	153(31.4)	<0.001
No	335(68.6)	
Vaccine, n(%)		
Yes	488(100.0)	
Dosage of Vaccine, n(%)		
2	1(0.2)	<0.001
3	8(1.6)	
4	479(98.2)	
Infectious Diseases Consultation n(%)		
Yes	136(27.9)	<0.001
No	352(72.1)	

*: Chi-square test

Table 2. Distribution of Attack Types by Gender

Attack Types	Female	Male	p*
Bite	52(24.0)	117(43.2)	<0.001
Scratch	165(76.0)	154(56.8)	

*: Fisher's Exact Test

Table 3. Observed Values for Individuals' Injury Regions

Injury Location	n(%)
Left Hand	90(18.4)
Right Hand	188(38.5)
Left Hand Finger	9(1.8)
Right Hand Finger	22(4.5)
Left Wrist	1(0.2)
Right Wrist	11(2.3)
Left Arm	19(3.9)
Right Arm	34(7.0)
Left Leg	14(2.9)
Right Leg	30(6.1)
Face	21(4.3)
Chest	2(0.4)
Abdomen	3(0.6)
Neck	4(0.8)
Right Foot	13(2.7)
Left Foot	6(1.2)
Hip	7(1.4)
Multiple Injuries	14(2.9)
p*	<0.001
*: Chi-square test	

Table 4. Number of Male and Female Rabies Cases

Type of Animal	Female	Male	p*
Cat	169(77.9)	157(57.9)	<0.001
Dog	48(22.1)	109(40.2)	
Cow	0(0.0)	1(0.4)	
Mouse	0(0.0)	1(0.4)	
Hedgehog	0(0.0)	2(0.7)	
Fox	0(0.0)	1(0.4)	
*: Fisher-Freeman-Halton Exact Test			

Table 5. Observation Status Between Male and Female Cases

Was Observation Done?	Female	Male	p*
Yes	20(9.2)	42(15.5)	0.038
No	197(90.8)	229(84.5)	
*: Chi-square test			

The interval between the bite and hospital admission did not differ statistically significantly between genders ($p=0.103$; Mann-Whitney U test). However, the mean time between bite date and hospital admission was

found to be longer for females (0.74 ± 2.64) than for males (0.55 ± 2.01). The latest presentation among males was 16 days, and among females, 28 days post-exposure.

Discussion

This study presents a current and comprehensive analysis of the demographic and clinical characteristics, exposure patterns, treatment approaches, and vaccine completion rates of patients presenting to the emergency department due to rabies-risk exposure in Kırşehir province. Our findings were consistent with national trends, particularly regarding the high rate of exposure to stray and unvaccinated animals (87.1%) and cats being the most common source of exposure (66.8%).

In Turkey, rabies prophylaxis is mostly initiated in emergency departments, and the continuation of subsequent doses through these units imposes a significant burden on both clinicians and the healthcare system. Our study provides valuable data-driven insights into the extent of this burden and the deficiencies in follow-up, contributing to both clinical practice and public health planning.

In our study, the proportion of males presenting due to rabies-risk exposure was found to be significantly higher. Consistent with our findings, the World Health Organization (WHO) and other international studies have also reported that males are more frequently represented among post-exposure cases; this has been attributed to greater outdoor activity among men (e.g., agriculture, livestock handling, and outdoor work) (9).

It was found that males were more likely to be bitten, whereas females were more likely to be scratched. This difference is thought to be associated with variations in interaction styles between individuals and animals, as well as animal behavior patterns.

In our study, 66.8% (n=326) of the animals responsible for exposure were cats, and 32.2% (n=157) were dogs. This finding differs from studies conducted in urban areas but reflects the high density of stray cats in regions such as Kırşehir. Globally, dogs are recognized as the source of approximately 99% of human rabies cases. The higher proportion of cat-related exposures observed in our study may be attributed to the increasing human-cat interactions in urban settings, the exclusion of stray cats from vaccination programs, and the rising risk of accidental bites or scratches (10,11).

Most of the cases in our study were caused by stray and unvaccinated animals. This creates challenges in the prophylaxis decision-making process, as the 10-day observation protocol cannot be applied to stray animals. A draft national evaluation emphasizing the need to control the stray animal population in Turkey also supports these findings (12). These data clearly demonstrate the necessity of targeted public

health interventions—such as urban vaccination campaigns, stray animal management, and community education—particularly in cities with a high density of stray animals and frequent cat exposures.

Our study revealed that rabies-risk exposures were concentrated in certain locations. This suggests that the epidemiological dynamics of rabies may vary depending on specific factors, indicating the need for regionally differentiated control strategies and emphasizing the importance of regional risk assessments in rabies prevention and control. In particular, implementing more effective quarantine and vaccination strategies in high-incidence areas appears to be crucial.

In our study, post-exposure rabies prophylaxis was administered in accordance with WHO and the Turkish Ministry of Health guidelines in the majority of cases. However, a noteworthy finding was the low rate (1.8%) of patients who failed to complete the vaccination series. This finding contrasts with the frequently reported issue of poor compliance with follow-up doses in the literature.

However, it has been suggested that, particularly in emergency departments, this may be related to shift-based work patterns and the lack of patient follow-up. Indeed, physicians who administer the first dose may not be available for follow-up doses after their shift, and coordination problems between vaccination units and emergency departments may occur.

In our study, infectious disease consultations were found to be relatively infrequent. Moreover, most of the patients presenting with suspected rabies were neither placed under observation nor administered rabies immunoglobulin. To ensure appropriate risk assessment and treatment decision-making, greater involvement of infectious disease specialists may improve risk stratification and treatment accuracy.

The most frequently affected body region in our study was the upper extremities, followed by the lower extremities and the head-neck region. It is well known that head and neck injuries pose a higher risk for rabies due to their proximity to the central nervous system, which shortens the incubation period and accelerates the onset of symptoms. The literature has highlighted that delayed prophylaxis in head and neck injuries can lead to fatal outcomes; therefore, these cases should be prioritized for evaluation. In our data, although the rate of head and neck injuries was lower than in some national studies, it was notably higher among children. This finding can be explained by the closer proximity of children's head and facial areas to the level of animal bites or scratches and their weaker defensive reflexes (13).

Conclusion

Effective rabies prevention requires the identification of high-risk animals, prevention of exposure, and improvement of vaccine completion rates; all of which are critically important. Future studies incorporating spatial analysis methods to investigate environmental and sociodemographic risk factors in areas with high rabies incidence, as well as ensuring coordinated follow-up of emergency department patients with infectious disease clinics and completion of vaccination schedules, will significantly contribute to public health.

Disclosures

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Conflict of Interest: None declared.

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