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ORIGINAL ARTICLE / ÖZGÜN ARAŞTIRMA MAKALESİ

Pediatric Cases Presenting to the Emergency Department Due to Rabies-Risky Contact and Factors Affecting Immunoglobulin Administration

Kuduz Riskli Temas Nedeniyle Acil Servise Başvuran Pediatrik Olgular ve İmmünglobulin Uygulanmasını Etkileyen Faktörler

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ABSTRACT

Aim: The aim of this study is to determine the demographic and clinical characteristics of pediatric cases presenting to the emergency department due to rabies risk animal contact and to analyze the independent risk factors affecting the administration of rabies immunoglobulin.

Material and Methods: In this study, 204 pediatric cases between the ages of 0 and 18 who applied to a university hospital emergency department between January 1, 2021 and August 1, 2025 due to rabies risk animal contact were retrospectively analyzed. Contact characteristics, wound types and prophylaxis methods applied to the cases were recorded. Factors affecting immunoglobulin administration were evaluated using bivariate analyses and multivariate logistic regression analysis.

Results: The mean age of the cohort was 8.86 ± 4.75 years, with a male predominance (64.2%). The majority of exposures involved cats (50.5%) and dogs (47.1%), and 89.7% of the implicated animals were free-roaming. Notably, despite 99.0% of the cases being classified as Category III exposures, rabies immunoglobulin (RIG) was administered to only 21.1% of the patients. Multivariable logistic regression analysis identified deep wounds, defined as those extending into the dermis and underlying tissues, as the sole independent predictor of RIG administration (OR 2.89; 95% CI: 1.23–6.79; p = 0.015). Patient age, sex, involved animal species, and time to clinical presentation did not independently influence the decision to administer RIG.

Conclusion: In pediatric rabies risk contact cases, the prophylaxis decision, especially the use of immunoglobulin, is shaped by wound depth rather than animal species or admission time. The fact that immunoglobulin use remains low despite the very high rate of Category 3 contact suggests that the indication for immunoglobulin in not deep but high risk contacts should be reconsidered in clinical practice.

Keywords: Pediatric rabies exposure, emergency department, rabies risk assessment, rabies immunoglobulin administration

ÖZ

Amaç: Bu çalışmanın amacı, kuduz riskli hayvan teması nedeniyle acil servise başvuran pediatrik olguların demografik ve klinik özelliklerini belirlemek ve kuduz immünglobulini uygulanmasını etkileyen bağımsız risk faktörlerini analiz etmektir.

Gereç ve Yöntem: Bu çalışmada, kuduz riskli hayvan teması nedeniyle 1 Ocak 2021 ile 1 Ağustos 2025 tarihleri arasında bir üniversite hastanesi acil servisine başvuran 0-18 yaş arası 204 pediatrik olgu geriye dönük olarak analiz edildi. Olgulara ait temas özellikleri, yara tipleri ve uygulanan profilaksi yöntemleri kaydedildi. İmmünglobulin uygulanmasını etkileyen faktörler iki değişkenli analizler ve çok değişkenli lojistik regresyon analizi ile değerlendirildi.

Bulgular: Olguların yaş ortalaması 8,86 ± 4,75 yıl olup %64,2'si erkekti. En sık kedi (%50,5) ve köpek (%47,1) teması görüldü. Hayvanların %89,7'sinin sahipsiz olduğu belirlendi. Olguların %99'u Kategori 3 temas grubunda yer almasına rağmen yalnızca %21,1'ine immünglobulin uygulandı. Çok değişkenli lojistik regresyon analizinde, dermis ve alt tabakaları tutan yara derinliği immünglobulin uygulanması için tek bağımsız risk faktörü olarak bulundu (OR 2,89; %95 GA: 1,23-6,79; p=0,015). Yaş, cinsiyet, hayvan türü ve başvuru zamanının immünglobulin kullanımı üzerinde bağımsız bir etkisi bulunmadı.

Sonuç: Pediatrik kuduz riskli temas olgularında profilaksi kararı, özellikle immünglobulin kullanımı, hayvan türü veya başvuru zamanından ziyade yara derinliğine göre şekillenmektedir. Kategori 3 temas oranının çok yüksek olmasına rağmen immünglobulin kullanımının düşük kalması, derin olmayan ancak yüksek riskli temaslarda immünglobulin endikasyonunun klinik pratikte yeniden gözden geçirilmesi gerektiğini düşündürmektedir.

Anahtar Kelimeler: Pediatrik kuduz maruziyeti, acil servis, kuduz risk değerlendirmesi, kuduz immünglobulin uygulaması

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Introduction

Rabies is a viral zoonosis caused by a virus in the Lyssavirus genus of the Rhabdoviridae family. It affects the central nervous system and results in 100% mortality once clinical symptoms appear (1). According to the World Health Organization (WHO), rabies is a serious public health problem in over 150 countries, particularly in Asia and Africa, causing tens of thousands of deaths annually. Children under 15 years of age account for 40% of these deaths (2, 3). In 99% of human rabies cases, infection results from exposure through bites, scratches, or mucosal contact with infected dogs (2). The most effective method to prevent the virus from reaching the central nervous system is the prompt and proper administration of post-exposure prophylaxis (PEP). PEP involves thorough wound cleansing and irrigation, administration of the rabies vaccine, and, where indicated, administration of rabies immunoglobulin (RIG) in addition to the vaccine (2, 3). The incubation period for rabies can range from one week to one year, depending on the bite site and the viral inoculum. Once clinical symptoms develop, the resulting encephalitis, characterized by signs such as hydrophobia, inevitably leads to death (2). The absence of an approved laboratory test for early diagnosis underscores the importance of risk assessment at the time of exposure and subsequent decisions regarding prophylaxis. In Türkiye, rabies risk exposure management is conducted according to the Rabies Field Guide criteria published by the Ministry of Health of the Republic of Türkiye, which aligns fully with WHO recommendations (2, 4). According to national public health data, the number of rabies-risk exposures was 194,059 in 2015, with two reported rabies cases (5). A previous study conducted in Türkiye found that the most common bite sites were the lower and upper extremities, the dog was the most common biting animal, and there was full compliance with the vaccination protocol (6). However, data supported by multivariate analyses regarding adherence to guidelines, time to presentation, and independent factors influencing the use of RIG, particularly in the pediatric age group, remain limited in the literature. Studies are scarce because changes in rabies immunoglobulin dosage may lead to irreversible complications in patients (7). In developing countries, dogs are the most common source of rabies. In the United States, rabies is most frequently found in bats, raccoons, skunks, and foxes (8).

The aim of this study was to retrospectively examine the demographic and clinical characteristics of pediatric patients presenting to the Afyonkarahisar University of Health Sciences Emergency Department due to exposure to rabies-risk animals, as well as their exposure categories and prophylaxis regimens according to the criteria of the Ministry of Health of the Republic of Türkiye and the WHO. Additionally, we aimed to determine the rate of RIG administration in clinical practice and contribute to the literature by identifying independent risk factors that influence the decision to administer RIG using multivariate logistic regression analysis.

Material and Methods

Research Design and Institutional Review Board Approval

This single-center, retrospective, cross-sectional study evaluated pediatric patients who presented to the Emergency Department of Afyonkarahisar University of Health Sciences following exposure to rabies-suspect animals. The study protocol was approved by the Non-Interventional Research Ethics Committee of Afyonkarahisar University of Health Sciences (Decision No: 2025/648, October 3, 2025). All procedures were conducted in strict accordance with the principles of the Declaration of Helsinki.

Inclusion and exclusion criteria: The study included all pediatric patients (aged ≤18 years) presented to the emergency department between January 1, 2021, and August 1, 2025, following exposure to a rabies-suspect animal. The inclusion criteria were as follows:

(1) Presentation to the emergency department due to rabies risk exposure

(2) Age ≤18 years

(3) Availability of complete electronic or paper-based medical records.

Patients with inaccessible or incomplete clinical data, as well as those strictly over 18 years of age, were excluded. All eligible patients who presented during the study period were consecutively enrolled, and no specific sampling method was applied.

Data Collection and Study Variables

Patient records were retrospectively identified using International Classification of Diseases, Tenth Edition (ICD-10) codes associated with rabies risk exposure: Z24.2 (vaccination due to specific prophylaxis requirements), W54 (dog bite or attack), and Z20.3 (suspected rabies exposure). Relevant clinical and demographic data were extracted from emergency department records, ward records, and rabies vaccination forms within the Hospital Information Management System (HIMS). These data were subsequently recorded onto a standardized data collection form.

The primary clinical and demographic variables extracted included patient age and sex, time from exposure to emergency department presentation, species of the involved animal, animal ownership and vaccination status, wound characteristics, and the number of rabies vaccine doses administered. These variables and the subsequent emergency department management, including the administration of RIG, were evaluated according to the rabies risk exposure categories defined by the Ministry of Health of the Republic of Türkiye and WHO guidelines (2, 4).

According to the hospital's clinical protocol during the study period, patients who had received oral or intramuscular antibiotic therapy had been managed as outpatients, whereas those who had required intravenous therapy had been admitted to the pediatric ward. Based on clinical records, wound depth was categorized into two groups. Wounds confined to the epidermis and upper layers of the dermis were defined as "superficial wounds," while those extending into the deeper dermis and underlying tissues (e.g., subcutaneous fat and muscle) were defined as "deep wounds."

For the multivariable logistic regression model, variables were categorized as follows: the dependent variable was RIG administration (0: not administered; 1: administered). The independent variables included age (continuous variable), sex, species of the involved animal (dog vs. non-dog), time to presentation after exposure (≤24 hours vs. >24 hours), wound depth (superficial vs. deep), and animal ownership status (owned vs. free-roaming animals).

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were expressed as frequencies (n) and percentages (%) for categorical variables and as means ± standard deviations (SD) with ranges (minimum–maximum) for the continuous variable (age). The normality of continuous data distribution was evaluated using both visual (e.g., histograms) and analytical methods (e.g., Kolmogorov-Smirnov/Shapiro-Wilk tests). The Pearson chi-square test was used to evaluate associations between categorical variables (e.g., the relationship between sex, species of the involved animal, wound type, and RIG administration status).

A multivariable logistic regression analysis was conducted to identify independent factors influencing RIG administration. As defined in the data collection section, age was included as a continuous variable. Male sex, dog contact, presentation time of ≤24 hours, deep wounds, and free-roaming animal status were included as categorical independent variables. All variables were entered simultaneously into the model (Enter method) to test their association with the dependent variable (RIG administration). We assessed the overall statistical significance of the model using the omnibus test of model coefficients, while goodness-of-fit was evaluated using the Hosmer-Lemeshow test and the Nagelkerke R^2 coefficient of determination. Logistic regression results are reported as adjusted odds ratios (aOR) with corresponding 95% confidence intervals (CI). A p-value of <0.05 was considered statistically significant in all analyses.

Results

A total of 204 pediatric patients who presented to the emergency department between January 1, 2021, and August 1, 2025, following exposure to rabies-suspect animals were included in the study. Demographic and clinical characteristics of the 204 pediatric patients are summarized in Table 1. The cohort had a mean age of 8.86 ± 4.75 years, with a predominance of males (n = 131, 64%). Most patients (89%) presented within the first 24 hours of exposure. Cats (50.5%) and dogs (47%) were the primary sources of exposure, with most animals being free-roaming (90%) and unvaccinated (96%). Notably, 99% of cases were classified as Category 3 according to risk exposure guidelines, and 55% sustained deep wounds. Despite the high clinical risk profile, RIG was administered to only 21% of the study population.

No mortalities occurred among the study population. Bivariate analyses revealed a statistically significant association between the species of the involved animal and

All patients	Value
Age (years), mean±SD (min–max)	8.86±4.75 (1–17)
Sex, n (%)	
Male	131 (64%)
Female	73 (36%)
Time to presentation after exposure, n (%)	
<24 h	181 (89%)
24–72 h	17 (8%)
>72 h	6 (3%)
Season, n (%)	
Autumn	44 (22%)
Winter	50 (25%)
Spring	34 (17%)
Summer	76 (37%)
Animal species involved, n (%)	
Cat	103 (50.5%)
Dog	96 (47.1%)
Mouse	1 (0.5%)
Donkey	3 (1.5%)
Rooster	1 (0.5%)
Animal ownership status, n (%)	
Owned	21 (10%)
free-roaming animals	183 (90%)

All patients	Value
Animal vaccination status, n (%)	
Vaccinated	8 (4%)
Unvaccinated	196 (96%)
Injury type, n (%)	
Superficial (limited to epidermis)	91 (45%)
Deep (dermis and subdermal tissues)	113 (55%)
Exposure category, n (%)	
Category 2	2 (1.0%)
Category 3	202 (99.0%)
Number of rabies vaccine doses, n (%)	
≤3 doses	49 (24.0%)
≥4 doses	155 (76.0%)
Rabies immunoglobulin (RIG), n (%)	
Received	43 (21%)
Not received	161 (79%)
Clinical management in the emergency department, n (%)	
Simple medical intervention	162 (79%)
Antibiotherapy + suturing	38 (19%)
Hospitalization	2 (1.0%)
Operation	2 (1.0%)

Table 1. Demographic and Clinical Characteristics of Pediatric Patients with Potential Rabies Exposure

Abbreviations: SD, standard deviation; n, number of patients.

Comparison	Category	n (%)	p (χ^2)
Dog contact	Received RIG	29 (30%)	0.003
	Did not receive RIG	67 (70%)	
Non-dog contact	Received RIG	14 (13%)	
	Did not receive RIG	94 (87%)	
Dog contact	Epidermis and above	24 (25%)	<0.001
	Dermis and below	72 (75%)	
Non-dog contact	Epidermis and above	67 (62%)	
	Dermis and below	41 (38%)	
Superficial wound	Received RIG	9 (10%)	<0.001
	Did not receive RIG	82 (90%)	
Deep wound	Received RIG	34 (30%)	
	Did not receive RIG	79 (70%)	

Table 2. Bivariate Analysis Results in Pediatric Rabies-Risky Contact Cases

n: number of patients; χ^2: Pearson chi-square test; RIG: rabies immunoglobulin.

RIG administration (p = 0.003) (Table 2). RIG was administered to 30% (29/96) of patients exposed to dogs, compared with 13% (14/108) of those exposed to other animals. Analysis of the association between the involved animal species and wound depth revealed that deep wounds were significantly more prevalent following dog exposures. Specifically, deep wounds occurred in 75% (72/96) of patients exposed to dogs, whereas superficial wounds were significantly more common following exposure to other animals ($p < 0.001$).

Regarding the association between patient sex and the involved animal species, dog exposures were significantly more common among male patients (59%, 77/131), whereas exposures to non-dog animals were more frequent among female patients (74%, 54/73) ($p < 0.001$). Analysis of wound depth and RIG administration demonstrated that only 10% (9/91) of patients with superficial wounds received RIG. In contrast, RIG was administered to 30% (34/113) of patients with deep wounds, representing a statistically significant difference ($p < 0.001$).

A multivariable logistic regression analysis was performed to identify the independent factors influencing the administration of rabies immunoglobulin (Table 3). The overall model was statistically significant (Omnibus $\chi^2(6)$ = 23.531, $p < 0.001$). Notably, only having a deep wound (extending into the dermis and deeper layers) was identified as an independent predictor for RIG administration (aOR = 2.887; 95% CI: 1.228–6.787; p = 0.015).

Discussion

This study evaluated the demographic and clinical characteristics of pediatric patients presenting to the emergency department following exposure to rabies-suspect animals, alongside the applied prophylaxis regimens and the independent factors influencing RIG administration. Our findings are clinically significant, as they provide valuable insights into current pediatric rabies prophylaxis practices in Türkiye and highlight the specific clinical variables driving RIG administration in emergency settings.

Variable	p value	OR (Exp(B))	95% CI for OR
Age (years)	0.269	1.044	0.967–1.128
Male sex (vs female)	0.269	1.641	0.682–3.945
Dog exposure (vs non-dog exposure)	0.132	1.846	0.832–4.095
Presentation time ≤24 h (vs >24 h)	0.312	1.961	0.532–7.234
Deep wound (vs superficial)	0.015*	2.887	1.228–6.787
Free-roaming animals (vs owned)	0.138	3.214	0.687–15.026

Table 3. Multivariable Logistic Regression Analysis of Factors Associated with RIG Administration

OR: Odds ratio; CI: Confidence interval; h; hour; *p<0.05 was considered statistically significant. Age was included as a continuous variable in the analysis.

Studies conducted in Türkiye, India, and Poland indicate that school-aged boys constitute the most frequently affected demographic among children with high-risk rabies exposures (1, 3, 9). Our results align perfectly with these reports, further demonstrating that high-risk pediatric rabies exposures are predominantly concentrated among school-aged males across diverse geographic regions.

Consistent with our findings, a previous Turkish series by Yalçın Kara et al. reported that approximately 90% of patients presented within the first 24 hours (1). Conversely, Ostrowska et al. reported that in their Polish pediatric cohort, only 39.1% of children were evaluated by a physician on the day of exposure, with a mean time to presentation of two days (9). These findings suggest that parents and caregivers in Türkiye possess a relatively higher level of rabies awareness and act with greater urgency regarding post-exposure prophylaxis compared to certain European populations.

The observation by Ostrowska et al. that emergency department presentations peaked during the summer months aligns with our findings (9). This seasonal increase is likely attributable to children spending more time outdoors, engaging in increased physical activity, and having more frequent encounters with free-roaming animals.

Consistent with our cohort, a previous study in Türkiye by Yalçın Kara et al. reported cat and dog exposure rates of 54% and 46%, respectively (1). In contrast, numerous international studies identify free-roaming dogs as the predominant source of exposure (2, 3, 9). The observation that cat exposures equaled or slightly exceeded dog exposures in our study can be attributed to country-specific dynamics, including rapid urbanization, a large population of free-roaming cats, and a high cultural acceptance of interacting with felines.

The distribution of pediatric rabies exposure categories reported in the literature varies widely by study (1, 3, 6, 9). In our cohort, 55.4% of patients presented with deep wounds, and 99.0% were classified as having Category 3 exposures. These results suggest that our study population mirrors the profile of tertiary care centers managing high-acuity exposures, given the higher prevalence of severe tissue injuries.

Consistent with previous reports, we observed a significantly higher rate of RIG administration for deeper wounds resulting from dog bites. This data reinforce that dog bites typically inflict deeper structural damage, which necessitates more intensive preventive measures across different geographic regions.

In our cohort, the vaccination rate exceeded 75.0%, which is consistent with previous reports (1, 9). These findings suggest that rabies vaccination is widespread and aligns with established guidelines across different centers; however the appropriate administration of RIG remains a primary clinical challenge. On the other hand, the low pet vaccination rate among owned animals is a concerning finding in our study.

Despite the exceptionally high rate of Category 3 exposures in our series, the RIG administration rate was only 21.1%. This suggests a cautious approach, potentially attributable to the practice of monitoring free-roaming animals during a 10-day observation period in lieu of immediate RIG administration, or perhaps to periodic supply-chain constraints (10). Furthermore, a prior study involving Turkish physicians revealed that 38.4% were unaware that vaccines should be co-administered with RIG for post-exposure prophylaxis, a factor that may partially explain the relatively low RIG utilization observed in our study (11).

In our study, RIG was administered to 30.1% of patients with deep wounds and 9.9% of those with superficial wounds. The administration of RIG to patients with superficial wounds may be explained by injuries occurring in highly innervated anatomical regions, such as the head, neck, or fingertips, which necessitate more cautious management regardless of depth. Alternatively, this finding might reflect subjectivity in the clinical assessment of wound depth. Due to the absence of granular data regarding specific wound locations, we were unable to further elucidate this relationship.

Our multivariable logistic regression analysis, which evaluated independent factors influencing RIG administration, identified only deep wounds (involving the dermis and deeper layers) as an independent predictor (aOR: 2.89; 95% CI: 1.23–6.79; p = 0.015).

In this context, the identification of wound depth as an independent predictor for RIG administration is a favorable indicator, suggesting appropriate patient selection and high adherence to clinical indications within our emergency department.

Limitations

Our study has several limitations that warrant consideration. First, the single-center, retrospective design may limit the external validity of our findings to other clinical settings. Second, because our data were derived from retrospective medical reviews, the health status of the involved animals at the end of the mandatory 10-day observation period as well as the long-term clinical outcomes of the patients could not be fully ascertained. Additionally, the lack of granular data in the hospital records, particularly regarding the specific anatomical location of the wounds, prevented the inclusion of these potentially significant variables in our multivariable analyses.

Conclusion

In conclusion, although prophylaxis protocols for suspected pediatric rabies exposures, particularly the use of RIG, are primarily determined by wound depth, our study's high proportion of Category 3 exposures and low RIG usage rate suggest that physicians should review RIG indications more carefully.

The absence of mortality in the study group highlights the high efficacy and safety profile of PEP in the pediatric population. Furthermore, the high prevalence of unvaccinated, free-roaming animals as the primary cause of exposure indicates that controlling rabies requires a multidisciplinary approach that encompasses clinical practice, public health, and veterinary disciplines.

This study provides contemporary insights into post-exposure rabies prophylaxis and RIG utilization, significantly contributing to the current evidence base. However, our findings warrant further validation through prospective, multicenter clinical studies to ensure broader generalizability across diverse clinical settings.

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All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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References

1. Kara Y, Kızıl MC, Kılıç Ö, Şahin S, Dinleyici E. Evaluation of pediatric cases with suspected rabies exposure in the pediatric emergency department. Anatolian J Emerg Med. 2022;5(3):139-44.
2. World Health Organization. Rabies. 2024. Available from: https://www.who.int/news-room/fact-sheets/detail/rabies. Accessed August 20, 2025.
3. Fotedar N, Ravish HS. A prospective study on safety and clinical efficacy of rabies biologicals in paediatric patients with category III animal exposure. Clin Exp Vaccine Res. 2025;14(1):59-66.
4. Republic of Türkiye Ministry of Health, General Directorate of Public Health. Kuduz Profilaksi Rehberi [Rabies Prophylaxis Guideline]. 2019. Available from: https://hsgm.saglik.gov.tr/depo/birimler/zoonotik-ve-vektorel-hastaliklar-db/Dokumanlar/Rehberler/Kuduz_Profilaksi_Rehberi.pdf. Accessed December 12, 2025.
5. Kocabaş BA. Kuduz riskli temas sonrası başvuran çocuk olguların ve profilaksi uygulamalarımızın geriye dönük değerlendirilmesi. Turk J Pediatr Dis. 2018;12(2):104-7.
6. Kara SS, Delice O. Hayvan ısırığı ve kuduz riskli teması olan çocuk hastaların değerlendirilmesi. Kafkas J Med Sci. 2018;8(1):13-9.
7. Hobart-Porter N, Stein M, Toh N, Amega N, Nguyen HB, Linakis J. Safety and efficacy of rabies immunoglobulin in pediatric patients with suspected exposure. Hum Vaccin Immunother. 2021;17(7):2090-6.
8. Centers for Disease Control and Prevention. About rabies. 2025. Available from: https://www.cdc.gov/rabies/about/index.html. Accessed August 20, 2025.
9. Ostrowska A, Susło A, Zabłocka K, Bieńkowski C, Pokorska-Śpiewak M. Analysis of qualification for post-exposure prophylaxis against rabies in children in Poland. Paediatr Int Child Health. 2022;42(3-4):142-7.
10. Bharti OK. Using a modified rabies immunoglobulin protocol in a crisis of unavailability: ethical and practical challenges. Indian J Med Ethics. 2019;4(2):139-43.
11. Gönen I, Soysal A, Topuzoğlu A, Bakir M. Clinical knowledge and attitudes of Turkish physicians toward rabies caused by animal bites. Jpn J Infect Dis. 2011;64(5):382-90.