Cureus
Part of SPRINGER NATURE

Open Access Original Article

Clinical Profile and Emergency Department Management of Dog Bite Injuries at a Regional Rabies Center: A Retrospective Cross-Sectional Study

Review began 10/10/2026
Review ended 11/03/2026
Published 11/07/2026

© **Copyright** 2026
Sarihan et al. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY 4.0., which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

DOI: 10.7759/cureus.119262

Muhammed B. Sarihan [1], Yahya Kemal Gunaydin [2], Sertaç Güler [2], Serdal Ates [3]

1. Emergency Medicine, Sincan Training and Research Hospital, University of Health Sciences, Ankara, TUR 2. Emergency Medicine, Ankara Training and Research Hospital, University of Health Sciences, Ankara, TUR 3. Intensive Care Unit, Dr. Abdurrahman Yurtaslan Ankara Oncology Training and Research Hospital, Ankara, TUR

Corresponding author: Muhammed B. Sarihan, drmbehestisarihan@gmail.com

Abstract

Introduction: Dog bites are a preventable cause of injury whose frequency has been reported to be increasing in many countries, and they require both wound care and a rabies prophylaxis decision in the emergency department (ED). The prophylaxis decision is determined by the rabies exposure category and the observability of the biting dog. Studies comparing owned and stray dog bites in terms of clinical outcomes are few, and their findings are inconsistent; studies addressing ED management as a whole are also limited. This study primarily aimed to describe the clinical profile and ED management of dog bite cases; secondary aims were to compare owned and stray dog bites in an exploratory analysis and to describe rabies vaccine administration in Category II and III cases together with the documented recommendation for 10-day observation of the dog.

Materials and methods: In this retrospective cross-sectional study, cases presenting with dog bites to the ED of a tertiary care hospital serving as a regional rabies center in Ankara, Türkiye, between April 1, 2018, and March 31, 2024, were identified by screening the hospital's electronic medical records for International Classification of Diseases, 10th Revision (ICD-10) codes W54 and W55. Demographic characteristics, injury site, clinical findings, rabies exposure category, surgical interventions, hospital admission, and medical treatments were evaluated. The chi-square test was used for comparisons, and Bonferroni correction was used for pairwise comparisons between age groups.

Results: A total of 3,666 cases were included. The median age was 29 years (interquartile range 19-46), and 66.1% of cases were male. Among the 2,464 cases with a recorded injury site, the most frequently affected site was the lower extremity (56.1%); in the under-18-year group, the share of lower extremity injuries decreased (44.1%), while head and neck injuries became more prominent (7.1%). Among the 2,938 cases with known dog origin, the biting dog was a stray dog in 86.1%. Among the 1,709 cases with documented clinical findings, the injury was limited to isolated abrasion in 58.5%, and 71.4% of the 3,078 cases with a recorded rabies exposure category were classified as Category II. Surgical intervention was performed in 4.0% of cases, and only 10 cases (0.3%) required hospital admission. Rabies vaccine administration was documented in 94.9% of the 3,050 Category II and III cases with treatment records, and a recommendation for 10-day observation of the dog was documented in 73.7% of unvaccinated cases. Rates of skin laceration (49.3% vs. 38.9%; p=0.003) and surgical intervention (9.5% vs. 3.8%; p<0.001) were higher among owned dog bites than among stray dog bites.

Conclusions: Among cases with documented clinical findings, most injuries were superficial; most cases were managed in the ED, and hospital admission was rare. Although stray dog bites predominated numerically, rates of skin laceration and surgical intervention were higher among owned dog bites; this unadjusted finding requires confirmation in studies that account for injury location and severity. The findings provide single-center baseline data from the period before the legislation on stray animals that came into force in Türkiye in 2024.

Categories: Trauma, Emergency Medicine, Epidemiology/Public Health
Keywords: dog bites, emergency department, epidemiology, owned dogs, post-exposure prophylaxis, public health, rabies, stray dogs, türkiye, wound management

Introduction

Dog bites are a preventable cause of injury whose frequency has been reported to be increasing in many countries [1-4]. Bites are not limited to physical trauma; potentially fatal zoonoses such as rabies may also accompany the clinical picture [5]. Therefore, emergency department (ED) evaluation encompasses not only wound care but also the decision on post-exposure prophylaxis (PEP).

The global burden of these injuries is substantial. In the United States, an average of 337,103 ED visits per year for dog bites were reported for the 2005-2013 period, with an annual incidence of 1.1 per 1,000 and 1.7% of cases admitted to hospital [6]. In England, the incidence of hospital admission due to dog bites increased from 6.34 to 14.99 per 100,000 population between 1998 and 2018 [2]. According to the 2019 national guideline, approximately 250,000 rabies exposures were reported annually in Türkiye, human rabies cases averaged one to two per year in 2000-2018, and dogs were the most common species among animal rabies cases in 1997-2017 [7].

The framework for the PEP decision is determined by rabies exposure categorization. This four-category classification is defined in the Rabies Prophylaxis Guideline of the Ministry of Health; its first three levels largely correspond to the exposure categories of the World Health Organization, except that the national guideline also places wounds in nerve-dense areas such as the head, neck, and fingertips in Category III and evaluates bat contact separately [1,7]. Category I covers no-risk exposures and requires no prophylaxis. Category II describes non-bleeding scratches and abrasions; vaccination is recommended. Category III includes bites that penetrate the skin, deep injuries, and mucosal contact; rabies immunoglobulin (RIG) is recommended in addition to the vaccine. Category IV is an additional level specific to the national guideline and covers high-risk wild animal exposures [7]. The timing of prophylaxis depends on both the rabies exposure category and whether the biting animal meets the observation criteria of the guideline: if the biting dog or cat is healthy and can be kept under observation for 10 days, the guideline permits deferral of the vaccine in Category II and of RIG in Category III [7]. Therefore, vaccine and RIG administration rates cannot be interpreted as indicators of guideline adherence unless the rabies exposure category and the observability of the animal are considered together.

The demographic distribution [2,6,8-12], anatomical location [3,6,10-15], prophylaxis practices [13,16,17], and treatment modalities [12,15,18] of dog bites have been examined in various studies. There are also studies comparing stray and owned dog bites in terms of frequency [3,13,15,19,20]. In contrast, the number of studies comparing the two groups by origin in terms of clinical outcomes such as injury severity and need for intervention is limited, and their findings on the association between dog origin and these outcomes are inconsistent [3,21,22]. Studies examining post-exposure ED management as a whole also appear to be scarce. In addition, Law No. 7527 on stray animals came into force in August 2024 [23]; data from the period before the law may serve as a baseline for future comparisons.

In this study, we aimed primarily to describe the clinical profile and ED management of dog bite injuries in patients presenting to a tertiary care hospital that serves as a regional rabies center in the capital of Türkiye, including injury characteristics, surgical interventions, hospital admission, and rabies prophylaxis. Secondary objectives were to compare skin laceration and surgical intervention between owned and stray dog bites in an exploratory analysis and to describe rabies vaccine administration in Category II and III exposures together with the documented recommendation for 10-day observation of the dog. Because the data come from a single regional rabies center, the findings describe this center's case mix and are not intended to estimate dog bite patterns in the general population.

Materials And Methods

This retrospective cross-sectional study was derived from a residency thesis completed at the Department of Emergency Medicine, Ankara Training and Research Hospital, University of Health Sciences, Ankara, Türkiye. The study site is a tertiary care hospital that serves Ankara Province, the capital of Türkiye, and also functions as a regional rabies center. The study data were obtained from this center. The study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations and the REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) statement; the completed checklist is provided in the Appendices.

Cases presenting to the ED with a dog bite between April 1, 2018, and March 31, 2024, were included in the study. Cases presenting with bites from animals other than dogs, cases presenting for a follow-up dose, and cases with inaccessible or incorrectly entered data in the hospital records system were excluded. Only dog bites were analyzed because the study questions, including the comparison of owned and stray dogs, are specific to dogs.

Data were collected by a single investigator from the hospital electronic records system between June 2024 and February 2025, using a predefined standardized Excel data form (Microsoft Corp., Redmond, WA, USA). Only explicitly documented information was used, and variables that were not documented were treated as missing. The search covered cases recorded in the hospital records system under the International Classification of Diseases, 10th Revision (ICD-10) codes W54 (bitten or struck by dog) and W55 (bitten or struck by other mammals) [24]. The primary target was dog bites. However, records coded W55 were added to the list so that inadvertently miscoded cases could also be captured, with the aim of reducing selection bias. Each record coded W54 or W55 was reviewed individually in the hospital information system, and a case was included only when a dog bite was explicitly documented. Injuries without a bite, such as falls while running away from a dog, were excluded. A total of 12,849 cases were screened, and data were inaccessible or incorrectly entered for 6,272 cases. Records were considered incorrectly entered when the ICD-10 code did not correspond to the documented presentation, when the record contained no note describing the

presentation, or when the biting animal was not specified or was recorded inconsistently. Of the remaining 6,577 cases, 3,666 had presented with a dog bite, 2,322 with other animal bites, and 589 for a follow-up rabies vaccine dose or RIG administration. The 3,666 dog bite cases were included in the study (Figure *1*). All cases meeting the inclusion criteria during the study period were enrolled, and no a priori sample size calculation was performed. The unit of analysis was the presentation. Follow-up visits for the same bite were excluded at screening, and a presentation was counted as a new case only when the record documented a new bite on a different date.

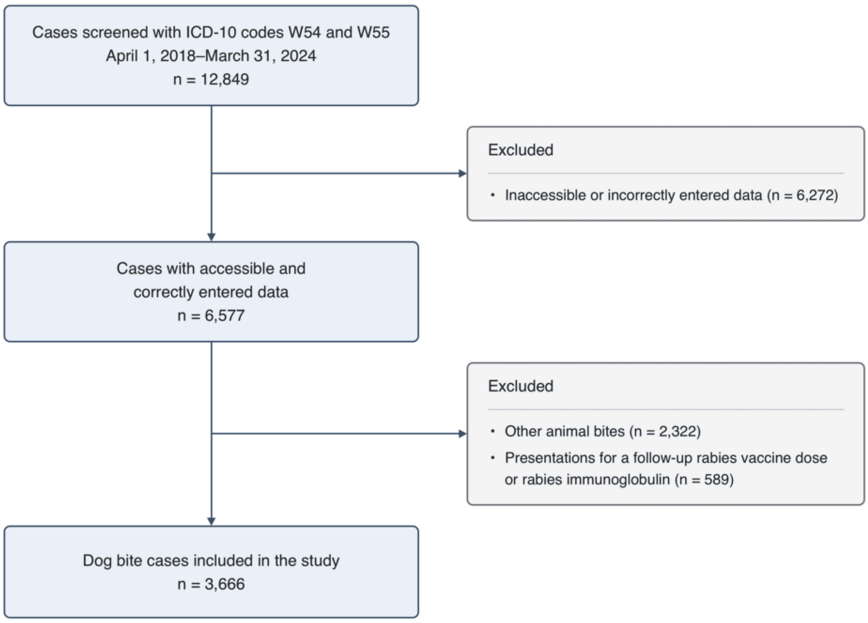


FIGURE 1: Flowchart of case selection

ICD-10: International Classification of Diseases, 10th Revision; n: number of cases; W54: bitten or struck by dog; W55: bitten or struck by other mammals

Demographic data and presentation details were recorded for each case. Age was categorized into three groups: under 18 years, 18-64 years, and 65 years and older. This grouping was used to distinguish pediatric and geriatric cases from adult cases. Injury site was classified into six categories. These categories were lower extremity, upper extremity, gluteal region, trunk, head and neck, and inguinal region. Clinical findings were coded as abrasion; skin laceration; tendon, muscle, or vascular injury; bone fracture; motor or sensory deficit; amputation; and eyelid injury. More than one finding could be present in a single case. Therefore, these variables were not mutually exclusive. Cases in which abrasion was the only clinical finding were defined as isolated abrasion. In addition, the rabies exposure category (Category I-IV) defined in the Rabies Prophylaxis Guideline of the Ministry of Health [7], the medical and surgical interventions performed, consultations, and hospital admission status were recorded. Rabies exposure categories were extracted as documented by the treating physician at presentation and were not reassigned by the investigators. Surgical intervention included procedures other than routine wound care (irrigation, dressing) that were performed for wound closure (sutures, tissue adhesive), tissue repair (muscle, tendon, grafting, reconstructive surgery), and fracture management (reduction, splinting). For fracture reduction, muscle repair, and tendon repair, whether the procedure was performed in the ED or after hospital admission was also recorded. Recommendation for 10-day observation of the dog referred to cases in which, in line with the guideline, observation of the biting dog for 10 days was recommended [7].

Dog origin was based on the statement of the presenting individual or a relative at the time of presentation. Dogs whose owner was identified and could be reached, so that the dog could be observed for 10 days, were recorded as owned dogs; this classification did not indicate that the animal was vaccinated. Dogs whose ownership could not be verified at presentation, for example, a dog being walked by another person whose owner could not be reached, were recorded as stray dogs. In both groups, the prophylaxis decision at presentation was based on the national guideline, with the animal assumed to be unvaccinated [7]. If a veterinarian-certified dog vaccination card was presented later, PEP could be revised by the Department of Infectious Diseases during follow-up.

All analyses were performed using jamovi (version 2.5.7; The jamovi project, Sydney, Australia). Categorical variables were presented as numbers and percentages, and age as median and interquartile range (IQR). The

chi-square test was used for comparisons; Fisher's exact test was applied to comparisons of bone fracture, muscle repair, and tendon repair by dog origin because of small cell counts. No multivariable analysis was performed; the comparisons by dog origin are unadjusted and exploratory and were not corrected for multiple testing. For the distribution of injury site by age group, subgroup comparisons were evaluated using Bonferroni-corrected p-values. Each variable was analyzed among cases with available data for that variable (available-case analysis), and no imputation was performed. Data were available for all cases for age, sex, and hospital admission, and for 2,464 cases for injury site, 1,709 for clinical findings, 2,938 for dog origin, and 3,078 for rabies exposure category. Overall treatment rates are reported as documented administration proportions; cases without a treatment record were not classified as untreated. In comparisons by origin, dog origin (owned or stray) was the grouping variable, and abrasion, skin laceration, bone fracture, surgical intervention, sutured primary closure, muscle repair, and tendon repair were the outcome variables. In the comparison by age group, age group was the grouping variable and injury site was the outcome variable. The rabies vaccination rate was calculated for all cases and, separately, for cases in rabies exposure Category II or III with medical treatment records. In cases that did not receive rabies vaccine, the frequency of the recommendation for 10-day observation of the dog and the origin of the biting dog were presented descriptively, and no statistical test was applied in this subgroup. A p-value <0.05 was considered statistically significant.

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. It was approved by the Scientific Research Ethics Committee of the Ankara Training and Research Hospital, University of Health Sciences (Decision No. 160/2024, June 5, 2024). All data were anonymized in accordance with the Personal Data Protection Law No. 6698. Because the study was based solely on a retrospective review of existing medical records and involved no contact with patients, individual informed consent was not obtained.

Results

The case selection process is summarized in Figure *1*.

A total of 3,666 dog bite cases meeting the inclusion criteria during the study period were included in the analysis. The median age of the cases was 29 years (IQR 19-46); 20.8% were under 18 years, 73.9% were 18-64 years, and 5.3% were 65 years and older. Of the cases, 2,423 (66.1%) were male, and 1,243 (33.9%) were female. A total of 74 individuals presented to the ED more than once during the study period for separate dog bites; each presentation was analyzed as a separate case.

Injury site was recorded in 2,464 (67.2%) of the 3,666 cases and was not available in the medical records of the remaining 1,202 (32.8%). The overall distribution of injury sites among these 2,464 cases and their distribution by age group are presented in Table *1*. For lower extremity injuries, the under 18 years group differed from both the 18-64 years and the 65 years and older groups (p<0.001), whereas no difference was observed between the 18-64 years and 65 years and older groups. For trunk injuries, a significant difference was found only between the under 18 years and 18-64 years groups (chi-square test, adjusted p=0.006).

Injury site	Total (n=2,464)	<18 years (n=560)	18-64 years (n=1,764)	≥65 years (n=140)	p
Lower extremity	1,382 (56.1)	247 (44.1)	1,049 (59.5)	86 (61.4)	<0.001
Upper extremity	730 (29.6)	183 (32.7)	501 (28.4)	46 (32.9)	0.107
Gluteal region	227 (9.2)	69 (12.3)	151 (8.6)	7 (5.0)	0.006
Trunk	110 (4.5)	39 (7.0)	68 (3.9)	3 (2.1)	0.003
Head and neck	82 (3.3)	40 (7.1)	36 (2.0)	6 (4.3)	<0.001
Inguinal region	15 (0.6)	2 (0.4)	13 (0.7)	0 (0.0)	-

TABLE 1: Overall distribution of injury sites and distribution by age group

Data are presented as n (%). Percentages were calculated among the 2,464 cases with a recorded injury site; the injury site was not available in the medical records of 1,202 of the 3,666 cases (32.8%). Because more than one site could be affected in a single case, column totals may exceed the number of cases.

p: overall chi-square test across the three age groups; Bonferroni-adjusted pairwise comparisons are reported in the text; -: no test was applied

The distribution of clinical findings and rabies exposure categories is presented in Table *2*. Clinical findings were recorded in 1,709 (46.6%) of the 3,666 cases and were not available in the medical records of the remaining 1,957 (53.4%). Of these 1,709 cases, 999 (58.5%) had injuries limited to isolated abrasion. Because

more than one finding could be present in a single case, these variables were not mutually exclusive.

Variable	n (%)
Clinical findings (n=1,709)	
Abrasion	1,692 (99.0)
Skin laceration	692 (40.5)
Tendon, muscle, or vascular injury	16 (0.9)
Bone fracture	9 (0.5)
Motor or sensory deficit	5 (0.3)
Amputation	1 (0.1)
Eyelid injury	1 (0.1)
Rabies exposure category (n=3,666)	
Category I	9 (0.2)
Category II	2,199 (60.0)
Category III	869 (23.7)
Category IV	1 (<0.1)
Unknown	588 (16.0)

TABLE 2: Clinical findings and rabies exposure categories

Data are presented as n (%). Clinical finding percentages were calculated among the 1,709 cases with recorded clinical findings; clinical findings were not available in the medical records of 1,957 of the 3,666 cases (53.4%). Because more than one clinical finding could be present in a single case, totals may exceed the number of cases. Rabies exposure category percentages are given out of all cases (n=3,666); in the text, percentages are reported out of cases with a recorded category (n=3,078).

Rabies exposure category was recorded in 3,078 (84.0%) of the 3,666 cases. Among the recorded cases, nine (0.3%) were Category I, 2,199 (71.4%) were Category II, 869 (28.2%) were Category III, and one (<0.1%) was Category IV.

Surgical intervention was performed in 145 cases (4.0%). Because a case could undergo more than one procedure (for example, wound closure and fracture reduction), the number of procedures listed below exceeds the number of cases. Of the 145 cases, 142 underwent sutured primary closure; in addition, splinting was applied in 10 cases, fracture reduction in seven, muscle repair in six, tendon repair in four, tissue adhesive in two, surgical grafting in two, and reconstructive surgery in one. Five of the seven fracture reductions, four of the six muscle repairs, and one of the four tendon repairs were performed in the ED. A total of 10 cases (0.3%) required hospital admission; five admissions were to Plastic and Reconstructive Surgery, two to Urology, and one each to Ophthalmology, Orthopedics and Traumatology, and Pediatrics. No patient was transferred to another hospital. For imaging, plain radiography was requested in 132 cases (3.6%), computed tomography in 18 (0.5%), and ultrasonography in 12 (0.3%). Apart from the Department of Infectious Diseases consultation requested for all cases, consultations were also requested from Pediatrics (73 cases, 2.0%), Plastic and Reconstructive Surgery (27 cases, 0.7%), Orthopedics and Traumatology (16 cases, 0.4%), and Otorhinolaryngology (13 cases, 0.4%).

Administration was documented for rabies vaccine in 2,935 cases (80.1%), tetanus vaccine in 2,638 (72.0%), RIG in 636 (17.3%), tetanus immunoglobulin in eight (0.2%), and antibiotic therapy in 2,843 (77.6%). A recommendation for 10-day observation of the dog was documented in 413 cases (11.3%). Of the 3,068 cases identified as rabies exposure Category II or III, medical treatment records were available for 3,050. Rabies vaccination was initiated in 2,894 (94.9%) of these cases, and 156 (5.1%) did not receive the vaccine. Of the 156 unvaccinated cases, a recommendation for 10-day observation of the dog was documented in 115 (73.7%), and no such recommendation was recorded in 41 (26.3%). Of these 115 cases with a documented observation recommendation, the dog was classified as owned in 99 (86.1%), as stray in 15 (13.0%), and dog origin was unavailable in one (0.9%).

Among cases with known dog origin, 2,529 involved stray dogs and 409 involved owned dogs. Stray dog bites accounted for 86.4% of male cases and 85.5% of female cases with known dog origin, and the distribution of

dog origin did not differ by sex (p=0.506). The distribution of age groups differed by dog origin (p=0.046). Among owned dog bites, 25.4% of cases were under 18 years, 71.4% were 18-64 years, and 3.2% were 65 years and older; among stray dog bites, the corresponding proportions were 21.6%, 73.0%, and 5.5%. No pairwise comparisons were performed to identify which age group accounted for the difference.

Clinical findings and interventions by dog origin are presented in Table 3. Among cases with recorded clinical findings (owned, 227; stray, 1,395), skin laceration was found in 112 cases (49.3%) of owned dog bites and 543 cases (38.9%) of stray dog bites (p=0.003). The frequencies of abrasion (owned dog, 224 cases, 98.7%; stray dog, 1,386 cases, 99.4%; p=0.270) and bone fracture (one case, 0.4%, and eight cases, 0.6%, respectively; p=1.000) did not differ between groups. Among all cases with known dog origin (owned, 409; stray, 2,529), surgical intervention was performed in 39 cases (9.5%) of owned dog bites, and 97 cases (3.8%) of stray dog bites (p<0.001); sutured primary closure was used in 37 (9.0%) and 96 (3.8%) cases, respectively (p<0.001). Muscle repair was performed in one (0.2%) and five (0.2%) cases, respectively (p=0.594), and tendon repair in one (0.2%) and three (0.1%) cases (p=0.451). Among cases with both known dog origin and known rabies exposure category (owned, 356; stray, 2,499), the proportion of Category III was 43.5% (155 cases) for owned dog bites and 24.9% (623 cases) for stray dog bites; no statistical test was applied to this difference.

Variable	Owned dog, n (%)	Stray dog, n (%)	p
Clinical findings (owned, n=227; stray, n=1,395)			
Skin laceration	112 (49.3)	543 (38.9)	0.003
Abrasion	224 (98.7)	1,386 (99.4)	0.270
Bone fracture	1 (0.4)	8 (0.6)	1.000*
Interventions (owned, n=409; stray, n=2,529)			
Surgical intervention	39 (9.5)	97 (3.8)	<0.001
Sutured primary closure	37 (9.0)	96 (3.8)	<0.001
Muscle repair	1 (0.2)	5 (0.2)	0.594*
Tendon repair	1 (0.2)	3 (0.1)	0.451*

TABLE 3: Clinical findings and interventions by dog origin

Data are presented as n (%). Clinical findings were compared among cases with recorded clinical findings and known dog origin, and interventions were compared among all cases with known dog origin. Because more than one clinical finding could be present in a single case, clinical findings are not mutually exclusive.

p: chi-square test; *Fisher's exact test

Discussion

This retrospective cross-sectional study describes the demographic characteristics, clinical profile, and ED-level management of 3,666 cases presenting with dog bites to a regional rabies center serving the capital of Türkiye. Among cases with documented clinical findings, most injuries were superficial; overall, hospital admission was rare. Although owned dog bites were a numerical minority, unadjusted comparisons showed higher rates of skin laceration and surgical intervention in this group, a difference that may also be explained by other factors, such as injury location and age. The findings were also compared with a previous study from the same center that examined 7,423 animal-related injury cases in 2010-2011 [8].

In terms of demographic profile, the median age in our study was 29 years, and male sex predominated at 66.1%. This distribution is consistent with the international literature [9,10,20,25]. A similar demographic profile was reported in the previous study from the same center, which included injuries from all animal species [8].

In our study, the lower extremity was the most frequently affected site (56.1%), and stray dog injuries predominated by origin (86.1%). The literature includes studies in which the lower extremity [9,13,14] or the upper extremity [6,11,12,15] predominates. Similarly, with regard to origin, there are studies in which stray dogs [4,13,25] and studies in which owned or familiar dogs [15,20] predominate. When these two distributions are considered together, the lower extremity predominates in studies in which stray dogs are the majority [13,25], whereas the upper extremity predominates in the study in which owned dogs are the majority [15]. Because injury site was not compared by origin in our study, this relationship was not tested

with our own data; nevertheless, the predominance of the lower extremity in all age groups, together with the preponderance of stray dog injuries, may suggest a pattern similar to that reported in the literature [13,25].

In our findings, the distribution of dog origin did not differ by sex (p=0.506) but differed by age group (p=0.046); descriptively, the proportion of cases under 18 years was higher among owned dog bites (25.4%) than among stray dog bites (21.6%). In addition, the predominance of the lower extremity decreased in the under-18-year group (44.1%; p<0.001), and the proportions of head and neck (7.1%), trunk (7.0%), and gluteal region (12.3%) injuries were numerically highest in this group (overall comparison across the three age groups, p<0.001, p=0.003 and p=0.006, respectively). The literature reports that bites in young children largely originate from familiar dogs and occur in the home environment [26,27], and that, in children, the proximity of the head and neck region to the level of the dog's jaw is a factor contributing to this anatomical distribution [10,18,28]. In our findings, the higher proportion of cases under 18 years among owned dog bites and the peak proportion of head and neck injuries in the under-18-year group are consistent with these observations.

In our study, among cases with recorded clinical findings, the injury was limited to isolated abrasion in the majority (999/1,709; 58.5%), skin laceration was found in 40.5%, and deep structure injuries were rare (tendon, muscle, or vascular injury, 0.9%; bone fracture, 0.5%). Surgical intervention was performed in 145 of the 3,666 cases (4.0%); primary closure with sutures was used in the great majority of these cases (142/145; 97.9%). The literature likewise indicates that injuries are generally superficial and that the need for surgical intervention is relatively low [18,28]. The surgical intervention rate has been reported as 8.6% in Eskişehir [12] and 5.6% in Tembisa [29]; the rate in our study is below these, but above that of a large Iranian study that reported a primary repair rate of 1.4% [30]. Among the procedures requiring surgical intervention, five of the seven fracture reductions, four of the six muscle repairs, and one of the four tendon repairs were performed in the ED. The admission rate in our study (0.3%) is lower than those reported in the literature [6,9,29]. That only 10 cases were admitted, compared with 145 cases that underwent surgical intervention, indicates that most procedures requiring surgical intervention were performed in the ED. The low admission rate may partly reflect the management of these procedures in the ED, although differences in case mix between studies may also have contributed.

Antibiotic therapy was documented in 77.6% of cases, compared with 45.1% in Tembisa [29] and 90.8% in Kimberley [25]. The national guideline recommends antibiotic prophylaxis for animal bites to the face or hands, wounds with possible bone or joint penetration, wounds near a prosthetic joint, genital wounds, deep puncture wounds, wounds requiring closure, and bites in immunocompromised patients, and for other wounds with edema or crush injury presenting within eight hours; it also recommends that all patients be evaluated for tetanus prophylaxis [7]. Tetanus vaccine administration was documented in 72.0% of cases, compared with 57.4% in Tembisa [29] and 94.2% in Kimberley [25]. Assessing the appropriateness of individual prescriptions against these criteria was beyond the scope of this study.

In our study, rabies exposure category was recorded in 3,078 (84.0%) of the 3,666 cases, and Category II predominated among the recorded cases at 71.4%. The predominance of Category II is consistent with the Lucknow [16] and Kimberley [25] studies, whereas the proportion of Category III is higher in Kashmir [14]. In our study, rabies vaccine administration was documented in 80.1% of all cases; this rate was 94.9% among Category II and III cases with treatment records. In Kimberley, the vaccine was administered to 92.6% of all cases and to 97.1% (401/413) of cases with known vaccination status [25], and in Tembisa it was administered to 89.1% of all cases [29]. The difference between the rates calculated for all cases narrows markedly when the analysis is restricted to cases with records. Missing records may therefore have contributed to the lower overall rate in our study, as may differences between studies in patient populations, exposure categories, treatment protocols and methods. RIG administration was documented in 17.3% of all cases; this rate was 1.1% in Tembisa [29], and the rate of rabies vaccine plus RIG administration in the previous study from the same center was 7.1% [8]. Because the previous study covered all animal species and predates the 2019 guideline, this difference may reflect a change in the practice framework rather than in the level of adherence. The national guideline permits deferral of the vaccine in Category II and of RIG in Category III if the animal is healthy and can be observed for 10 days [7]. In our findings, a recommendation for 10-day observation of the dog was documented in 115 (73.7%) of the 156 unvaccinated cases, and the biting dog was classified as owned in 99 (86.1%) of these cases. This pattern is compatible with the observation-based approach of the guideline; however, because the rabies exposure category was not known for all cases and outcomes after the initial ED presentation, including the result of the 10-day observation, were not systematically recorded, these findings do not allow assessment of guideline adherence.

In most studies, the distinction by origin or familiarity has been addressed at the level of frequency, incidence, or injury site [13,15,19,20,25]. However, studies comparing the two groups in terms of clinical outcomes such as injury severity and need for intervention are few, and their findings are inconsistent [3,21,22]. In our study, clinical findings could be compared only among cases in which they were documented. Unadjusted comparisons showed higher rates of skin laceration (49.3% vs. 38.9%; p=0.003) and surgical intervention (9.5% vs. 3.8%; p<0.001) among owned dog bites, whereas rates of abrasion, bone fracture, muscle repair, and tendon repair did not differ between the two groups. Although the proportion of Category III was descriptively higher in the owned dog group (43.5% vs. 24.9%), this difference was not

statistically tested. Regarding the association between severe injury and origin, severe injury was associated with familiar dog bites in a study from Korea [3] and with unowned dog bites in Ireland [21]. In the United States, unowned dog bites have also been associated with more operations and readmissions [22]. A study covering four EDs in Rome reported that head and neck bites were less frequent with unowned dogs [27]. Thus, the association of origin with injury severity or surgical intervention differs between studies. It should also be considered that the decision for surgical repair may depend on clinical practice that varies by injury location. Indeed, facial wounds tend to be closed for cosmetic reasons, whereas extremity wounds are often left open [5]. Although surgical intervention was more frequent among owned dog bites in our study, injury site was not evaluated by origin. Therefore, it cannot be determined whether the difference in surgical intervention is related to the context of exposure or to injury location. Because dog origin was defined operationally at presentation, some owned dogs whose owners could not be reached may have been recorded as stray, and this misclassification may have affected the comparison. In addition, because the comparisons were unadjusted, differences in age distribution between the groups may also have contributed to these associations.

Because the study period ended on March 31, 2024, the findings reflect the period before the regulations of Law No. 7527 on stray animals [23], which came into force in August 2024. In this respect, the proportion of stray dog injuries, the anatomical distribution of injuries, the rabies exposure category profile, and prophylaxis administration rates together constitute baseline data from the available records of a single center for future comparisons.

Limitations

The most important limitation is that 6,272 of the 12,849 screened records were excluded because their data could not be accessed or were incorrectly entered; their year of presentation, age, sex, and dog origin were not available for comparison with the included cases. If dog bites among them differed from the included cases, selection bias may have affected the results. Dog bites recorded under other ICD-10 codes may also have been missed. Second, clinical findings and injury site were not documented in 53.4% and 32.8% of cases, respectively, and each analysis was restricted to cases with available data. If data were not missing at random, the proportions observed among documented cases may not apply to all cases. Third, dog origin was an operational category recorded at presentation: dogs whose ownership could not be verified were recorded as stray, which may have lowered the proportion of owned dog bites. These dogs were not recorded separately and could not be reclassified, and the direction of the resulting misclassification bias in the comparisons by origin cannot be determined. Fourth, the comparisons by dog origin were unadjusted and exploratory. Age and injury site may have confounded the associations of dog origin with skin laceration and surgical intervention. Surgical intervention also depends on wound location, wound characteristics, and clinical practice and is not a direct measure of injury severity; these associations should therefore not be interpreted as causal or as differences in severity. No correction for multiple testing was applied beyond the pairwise comparisons between age groups, so p-values close to 0.05, such as that for the age distribution by dog origin (p=0.046), should be interpreted with caution.

Fifth, outcomes after the initial ED presentation were not systematically recorded. Wound infection and other complications, subsequent human rabies, the outcome of the 10-day observation of the dog, and laboratory confirmation of rabies in the biting animals could therefore not be assessed, and the findings are limited to the initial presentation. Data were extracted by a single investigator without assessment of interobserver agreement, so extraction and classification errors cannot be excluded. Presentations of the 74 individuals with more than one bite were analyzed as separate cases and are not fully independent. The distribution of cases across study years, including the COVID-19 period, was not examined. Finally, incidence could not be calculated because no population-based denominator was available, and findings from a single regional rabies center cannot be generalized to the population of Türkiye.

Conclusions

This retrospective cross-sectional study, conducted at a single regional rabies center, examined cases presenting to the ED with dog bites; among cases with documented clinical findings, the injury remained superficial in most cases. Most cases requiring surgical intervention were managed in the ED, and hospital admission was rare. Although stray dog bites predominated numerically, rates of skin laceration and surgical intervention were higher among owned dog bites. Because these comparisons were unadjusted and surgical intervention is not a direct measure of injury severity, this association should not be interpreted as causal and requires confirmation in studies that account for injury location and severity. Rabies vaccine administration was documented in the great majority of Category II and III cases with treatment records; in most unvaccinated cases, a recommendation for 10-day observation of the dog was documented. These findings reflect the available records of a single center and cannot be generalized to the population of Türkiye. The findings provide baseline data from the period before Law No. 7527 but cannot by themselves be used to assess the effect of the law, which will require multicenter pre-post or interrupted time-series studies using comparable case definitions and data collection procedures before and after its implementation, population-based denominators, and adjustment for relevant confounders.

Appendices

Section/topic	Item no.	Recommendation	Location in manuscript
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract. (b) Provide in the abstract an informative and balanced summary of what was done and what was found.	(a) Title; Abstract, Materials and Methods. (b) Abstract.
Title and abstract	RECORD 1.1	The type of data used should be specified in the title or abstract. When possible, the name of the databases used should be included.	Abstract, Materials and Methods (hospital electronic medical records; ICD-10 codes W54 and W55).
Title and abstract	RECORD 1.2	If applicable, the geographic region and time frame within which the study took place should be reported in the title or abstract.	Abstract, Materials and Methods (Ankara, Türkiye; April 1, 2018-March 31, 2024).
Title and abstract	RECORD 1.3	If linkage between databases was conducted for the study, this should be clearly stated in the title or abstract.	Not applicable (no database linkage).
Introduction			
Background/ rationale	2	Explain the scientific background and rationale for the investigation being reported.	Introduction, paras. 1-4.
Objectives	3	State specific objectives, including any prespecified hypotheses.	Introduction, para. 5 (primary and secondary objectives); Abstract, Introduction.
Methods			
Study design	4	Present key elements of study design early in the paper.	Title; Abstract, Materials and Methods; Materials and Methods, para. 1.
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection.	Materials and Methods, paras. 1 (setting), 2 (study period) and 3 (data collection period). Follow-up: not applicable (cross-sectional design).
Participants	6	Give the eligibility criteria and the sources and methods of selection of participants.	Materials and Methods, paras. 2 (eligibility criteria) and 3 (case identification and selection).
Participants	RECORD 6.1	The methods of study population selection (such as codes or algorithms used to identify subjects) should be listed in detail. If this is not possible, an explanation should be provided.	Materials and Methods, para. 3 (ICD-10 codes W54 and W55; review of each record; exclusion criteria).
Participants	RECORD 6.2	Any validation studies of the codes or algorithms used to select the population should be referenced. If validation was conducted for this study and not published elsewhere, detailed methods and results should be provided.	Materials and Methods, para. 3; Figure 1 (each record identified by the codes was reviewed individually, and only explicitly documented dog bites were included).
Participants	RECORD 6.3	If the study involved linkage of databases, consider use of a flow diagram or other graphical display to demonstrate the data linkage process, including the number of individuals with linked data at each stage.	Not applicable (no database linkage).
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable.	Materials and Methods, paras. 4 (variables and definitions), 5 (dog origin) and 6 (grouping and outcome variables). Potential confounders: Discussion, para. 8; Discussion, Limitations, para. 1.
Variables	RECORD 7.1	A complete list of codes and algorithms used to classify exposures, outcomes, confounders, and effect modifiers should be provided. If these cannot be reported, an explanation should be provided.	Apart from the ICD-10 codes used for case identification (Materials and Methods, para. 3), variables were extracted from the documented clinical information using the definitions in Materials and Methods, paras. 4-5.
Data sources/ measurement	8	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of	Materials and Methods, paras. 3 (data source and extraction), 4 (rabies exposure category) and 5 (dog origin). The same data source and data form were used

		assessment methods if there is more than one group.	for both dog-origin groups.
Bias	9	Describe any efforts to address potential sources of bias.	Materials and Methods, paras. 3 and 6; Discussion, para. 8; Discussion, Limitations, paras. 1-2.
Study size	10	Explain how the study size was arrived at.	Materials and Methods, para. 3 (all eligible cases included; no a priori sample size calculation).
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why.	Materials and Methods, paras. 4 (age groups and rationale) and 6 (median and IQR).
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding. (b) Describe any methods used to examine subgroups and interactions. (c) Explain how missing data were addressed. (d) If applicable, describe analytical methods taking account of sampling strategy. (e) Describe any sensitivity analyses.	(a) Materials and Methods, para. 6 (no multivariable analysis; comparisons by dog origin unadjusted and exploratory). (b) Materials and Methods, para. 6 (age-group comparisons with Bonferroni correction; Category II and III subgroup); interactions not examined. (c) Materials and Methods, para. 6 (available-case analysis without imputation). (d) Not applicable (all eligible presentations included). (e) Not applicable (no sensitivity analyses).
Data access and cleaning methods	RECORD 12.1	Authors should describe the extent to which the investigators had access to the database population used to create the study population.	Materials and Methods, para. 3 (records reviewed in the hospital electronic records system; records with inaccessible data excluded); Figure 1.
Data access and cleaning methods	RECORD 12.2	Authors should provide information on the data cleaning methods used in the study.	Materials and Methods, para. 3 (criteria for incorrectly entered records; undocumented variables treated as missing; definition of a new case).
Linkage	RECORD 12.3	State whether the study included person-level, institutional-level, or other data linkage across two or more databases. The methods of linkage and methods of linkage quality evaluation should be provided.	Not applicable (single hospital records system; no linkage).
Results			
Participants	13	(a) Report the numbers of individuals at each stage of the study (e.g., numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed). (b) Give reasons for nonparticipation at each stage. (c) Consider use of a flow diagram.	(a) Materials and Methods, paras. 3 and 6; Results, paras. 1-2; Figure 1. (b) Materials and Methods, para. 3; Figure 1. (c) Figure 1.
Participants	RECORD 13.1	Describe in detail the selection of the persons included in the study (i.e., study population selection), including filtering based on data quality, data availability, and linkage. The selection of included persons can be described in the text and/or by means of the study flow diagram.	Materials and Methods, para. 3; Figure 1 (records with inaccessible or incorrectly entered data excluded first, then other animal bites and follow-up presentations).
Descriptive data	14	(a) Give characteristics of study participants (e.g., demographic, clinical, and social) and information on exposures and potential confounders. (b) Indicate the number of participants with missing data for each variable of interest.	(a) Results, paras. 2-5 and 8; Tables 1-2. (b) Materials and Methods, para. 6; Results, paras. 3-5 and 7; footnotes to Tables 1-2.
Outcome data	15	Report numbers of outcome events or summary measures.	Results, paras. 6-7 and 9; Tables 2-3 (outcomes by dog origin in Table 3).
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included. (b) Report category boundaries when continuous variables were categorized. (c) If relevant, consider translating estimates of relative	(a) Results, paras. 3 and 8-9; Tables 1 and 3 (unadjusted comparisons with numerators, denominators and p values); no confounder-adjusted analyses (Materials and Methods, para. 6). (b) Materials and Methods, para. 4; Results, para. 2. (c) Not applicable (no relative risk estimates).

		risk into absolute risk for a meaningful time period.	
Other analyses	17	Report other analyses done - e.g., analyses of subgroups and interactions and sensitivity analyses.	Results, paras. 3 (age-group comparisons; Table 1), 7 (Category II and III subgroup) and 8 (dog origin by sex and age group); no sensitivity analyses.
Discussion			
Key results	18	Summarise key results with reference to study objectives.	Discussion, para. 1.
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	Discussion, Limitations, paras. 1-2; Discussion, para. 8.
Limitations	RECORD 19.1	Discuss the implications of using data that were not created or collected to answer the specific research question(s). Include discussion of misclassification bias, unmeasured confounding, missing data, and changing eligibility over time, as they pertain to the study being reported.	Discussion, Limitations, paras. 1-2 (excluded records, case identification by codes, missing data, misclassification of dog origin, confounding, outcomes after the initial presentation, distribution across study years).
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	Discussion, paras. 2-9; Discussion, Limitations, para. 1 (multiple testing); Conclusions.
Generalisability	21	Discuss the generalisability (external validity) of the study results.	Introduction, para. 5; Discussion, para. 9; Discussion, Limitations, para. 2; Conclusions.
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based.	Disclosures (Payment/services info); Acknowledgements (residency thesis).
Accessibility of protocol, raw data, and programming code	RECORD 22.1	Authors should provide information on how to access any supplemental information such as the study protocol, raw data, or programming code.	Acknowledgements (datasets available from the corresponding author on reasonable request); Materials and Methods, para. 6 (jamovi version 2.5.7).

TABLE 4: STROBE and RECORD checklist

STROBE checklist for cross-sectional studies combined with the RECORD extension for observational studies using routinely collected health data. Locations refer to the revised manuscript. Paragraph (para.) numbers are counted within each section and exclude headings and figure and table legends; the Limitations subsection of the Discussion is numbered separately.

ICD-10: International Classification of Diseases, 10th Revision; IQR: interquartile range; para./paras.: paragraph(s); RECORD: REporting of studies Conducted using Observational Routinely-collected health Data; STROBE: Strengthening the Reporting of Observational Studies in Epidemiology

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Muhammed B. Sarihan, Yahya Kemal Gunaydin, Sertaç Güler

Acquisition, analysis, or interpretation of data: Muhammed B. Sarihan, Yahya Kemal Gunaydin, Sertaç Güler, Serdal Ates

Drafting of the manuscript: Muhammed B. Sarihan

Critical review of the manuscript for important intellectual content: Yahya Kemal Gunaydin, Sertaç Güler, Serdal Ates

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Scientific Research Ethics Committee of the Ankara Training and Research Hospital, University of Health Sciences issued approval 160/2024. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Acknowledgements

This article was derived from the emergency medicine residency thesis of Muhammed B. Sarihan. The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request. During the preparation of this manuscript and its revision, the authors used Claude (Anthropic, San Francisco, CA, USA) for language editing and drafting assistance. The authors reviewed and edited all output and take full responsibility for the content of the publication.

References

1. World Health Organization: rabies. (2026). Accessed: June 15, 2026: https://www.who.int/news-room/fact-sheets/detail/rabies.
2. Tulloch JSP, Owczarczak-Garstecka SC, Fleming KM, Vivancos R, Westgarth C: English hospital episode data analysis (1998-2018) reveal that the rise in dog bite hospital admissions is driven by adult cases. Sci Rep. 2021, 11:1767. 10.1038/s41598-021-81527-7
3. Park JW, Kim DK, Jung JY, Lee SU, Chang I, Kwak YH, Hwang S: Dog-bite injuries in Korea and risk factors for significant dog-bite injuries: a 6-year cross-sectional study. PLoS One. 2019, 14:e0210541. 10.1371/journal.pone.0210541
4. Vural T, Erbaş M, Karaca Baysal I: Medical and legal evaluation of injuries due to dog bites: a Türkiye study . Ulus Travma Acil Cerrahi Derg. 2024, 30:43-9. 10.14744/tjtes.2024.77550
5. Davies HD: When your best friend bites: a note on dog and cat bites . Can J Infect Dis. 2000, 11:227-9. 10.1155/2000/761025
6. Loder RT: The demographics of dog bites in the United States . Heliyon. 2019, 5:e01360. 10.1016/j.heliyon.2019.e01360
7. Republic of Türkiye Ministry of Health: rabies prophylaxis guideline (in Turkish) . (2019). Accessed: June 15, 2026: https://ekutuphane.saglik.gov.tr/Ekutuphane/kitaplar/Kuduz_Profilaksi_Rehberi.pdf.
8. Demirtaş E, Güler S, Duymaz H, Soyuduru M, Kınıklı S, Coşkun F: Evaluation of animal-related injuries from the perspective of 7423 cases admitted to emergency department. Cumhuriyet Med J. 2016, 38:40-5. 10.7197/cmj.v38i1.5000169338
9. Yılmaz S, Delice O, İba Yılmaz S: Epidemiological characteristics, seasonality, trends of dog bite injuries, and relationship with meteorological data. Ann Agric Environ Med. 2023, 30:229-34. 10.26444/aaem/162308
10. Weiss HB, Friedman DI, Coben JH: Incidence of dog bite injuries treated in emergency departments . JAMA. 1998, 279:51-3. 10.1001/jama.279.1.51
11. Campagna RA, Roberts E, Porco A, Fritz CL: Clinical and epidemiologic features of persons accessing emergency departments for dog and cat bite injuries in California (2005-2019). J Am Vet Med Assoc. 2023, 261:723-32. 10.2460/javma.22.11.0494
12. Gündüz T, Elçioğlu O, Balcı Y: An evaluation of dog and cat bites over a five-year period: a sample case from Eskişehir [Article in Turkish]. Ulus Travma Acil Cerrahi Derg. 2011, 17:133-40. 10.5505/tjtes.2011.86846
13. Tenzin, Dhand NK, Gyeltshen T, et al.: Dog bites in humans and estimating human rabies mortality in rabies endemic areas of Bhutan. PLoS Negl Trop Dis. 2011, 5:e1391. 10.1371/journal.pntd.0001391
14. Bashir K, Haq I, Khan SMS, Qurieshi MA: One-year descriptive analysis of patients treated at an anti-rabies clinic-a retrospective study from Kashmir. PLoS Negl Trop Dis. 2020, 14:e0007477. 10.1371/journal.pntd.0007477
15. Igde M, Yasar B, Unlu RE: Epidemiology and reconstruction options of dog bite injuries . Akdeniz Med J. 2017, 3:185-9. 10.17954/amj.2017.92
16. Sahu KK, Manar MK, Singh SK, Singh H: Epidemiological characteristics of patients attending for rabies post-exposure prophylaxis at the infectious diseases hospital of Lucknow, India. J Glob Infect Dis. 2015, 7:30-2. 10.4103/0974-777X.150888
17. Sachdeva A, Vinay, Kumar T, Yadav G, Tondwal J: Epidemiological profile and management practices of animal bite cases in a tertiary care hospital of Haryana: a cross-sectional study. J Family Med Prim Care. 2022, 11:7886-90. 10.4103/jfmpc.jfmpc_549_22
18. Morgan M, Palmer J: Dog bites. BMJ. 2007, 334:413-17. 10.1136/bmj.39105.659919.BE
19. Vucinic M, Djordjevic M, Radenkovic-Damnjanovic B, Jankovic L, Mirilovic M: Bites to humans caused by stray and owned dogs in Belgrade. Acta Vet (Beogr). 2008, 58:563-71. 10.2298/AVB0806563V
20. Barrios CL, Bustos-López C, Pavletic C, Parra A, Vidal M, Bowen J, Fatjó J: Epidemiology of dog bite incidents in Chile: factors related to the patterns of human-dog relationship. Animals (Basel). 2021, 11:96. 10.3390/ani11010096

21. O'Sullivan EN, Jones BR, O'Sullivan K, Hanlon AJ: Characteristics of 234 dog bite incidents in Ireland during 2004 and 2005. Vet Rec. 2008, 163:37-42. 10.1136/vr.163.2.37
22. Hovell M, McKnight C, Proffitt G, Hungerford A, Rowe A, Berry D: Behind the bite: ownership and breed as predictors of dog bite severity. J Surg Res. 2026, 321:303-7. 10.1016/j.jss.2026.03.023
23. Law No. 7527 Amending the Animal Protection Law (in Turkish). Official Gazette of the Republic of Türkiye, No. 32620. (2024). Accessed: September 23, 2026: https://www.resmigazete.gov.tr/eskiler/2024/08/20240802-5.htm.
24. World Health Organization: International Statistical Classification of Diseases and Related Health Problems 10th revision (ICD-10) version 2019. (2019). Accessed: November 6, 2026: https://icd.who.int/browse10/2019/en.
25. Ishaya N, Habib T, Van Rooyen C, Steinberg WJ: Profile of dog bite injuries in patients presenting at Kimberley Hospital Complex's emergency and gateway centres, 2015 to 2017. Afr J Prim Health Care Fam Med. 2020, 12:e1-7. 10.4102/phcfm.v12i1.2301
26. Matthias J, Templin M, Jordan MM, Stanek D: Cause, setting and ownership analysis of dog bites in Bay County, Florida from 2009 to 2010. Zoonoses Public Health. 2015, 62:38-43. 10.1111/zph.12115
27. Aulino G, Cittadini F, Castaldo E, et al.: Multicenter analysis of dog bite injuries: clinical patterns, demographics, and health outcomes for public safety enhancement. Forensic Sci Int. 2026, 384:112946. 10.1016/j.forsciint.2026.112946
28. Hon KL, Fu CC, Chor CM, Tang PS, Leung TF, Man CY, Ng PC: Issues associated with dog bite injuries in children and adolescents assessed at the emergency department. Pediatr Emerg Care. 2007, 23:445-9. 10.1097/01.pec.0000280509.67795.a9
29. Nkomo M, Mahomed Z, Laher AE: An audit of patients with dog-bite wounds presenting to a tertiary level hospital emergency department in South Africa. Cureus. 2020, 12:e6558. 10.7759/cureus.6558
30. Khoubfekr H, Rahmanian V, Jokar M, Balouchi A, Pourvahed A: Epidemiological analysis of cases of animal bite injuries at rabies prevention centers affiliated with Iranshahr University of Medical Sciences. J Prev Med Hyg. 2024, 65:E491-8. 10.15167/2421-4248/jpmh2024.65.4.3246