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Forensic Medical Evaluation of Injuries Due to Dog Bites: 5-Year Descriptive Retrospective Study

Köpek Isırmalarına Bağlı Yaralanmaların Adli Tıbbi Değerlendirilmesi: 5 Yıllık Tanımlayıcı Retrospektif Çalışma

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ABSTRACT Objective: This study aims to analyze the forensic medical characteristics of injuries caused by dog bites, demographic patterns, injury severity, and related legal implications in cases evaluated at a forensic medicine unit. **Material and Methods:** This retrospective study examines forensic reports and hospital records of dog bite cases admitted to Eskişehir Osmangazi University Forensic Medicine Department between 2019-2023. Cases were analyzed based on age, gender, site of injury, severity, forensic reporting details, and treatment outcomes. Statistical analyses were performed using the chi-square test and frequency distribution, with significance set at $p<0.05$. **Results:** A total of 108 cases were evaluated, of which 65.7% (n=71) were male. The most affected age group was <18 years (47.2%), with injuries most commonly occurring in the extremities (71.5%). Head and neck injuries were significantly more frequent in children than in adults ($p=0.001$). While the majority of cases were treated as outpatients (77.8%), 22.2% required hospitalization, and 14.8% underwent surgical intervention. **Conclusion:** Dog bite injuries have both medical and forensic implications, especially in pediatric cases. Our findings highlight the need for improved legal regulations, preventive strategies, and increased public awareness regarding responsible pet ownership and the forensic handling of dog bite cases.

Keywords: Dog bites; forensic medicine; injury patterns; public health

ÖZET Amaç: Bu çalışmanın amacı, adli tıp biriminde değerlendirilen köpek ısırığı olgularına ait yaralanmaların adli tıbbi özelliklerini, demografik dağılımı, yaralanma şiddetini ve buna bağlı hukuki sonuçları incelemektir. **Gereç ve Yöntemler:** Bu retrospektif çalışmada, 2019-2023 yılları arasında Eskişehir Osmangazi Üniversitesi Adli Tıp Anabilim Dalına başvuran köpek ısırığı olgularına ait adli raporlar ve hastane kayıtları incelenmiştir. Olgular yaş, cinsiyet, yaralanma bölgesi, şiddeti, adli rapor özellikleri ve tedavi sonuçları açısından değerlendirilmiştir. İstatistiksel analizlerde ki-kare testi ve frekans dağılımı kullanılmış, anlamlılık düzeyi $p<0,05$ olarak kabul edilmiştir. **Bulgular:** Toplam 108 olgu değerlendirilmiş olup, %65,7'si (n=71) erkekti. En sık etkilenen yaş grubu %47,2 ile <18 yaş aralığıydı. Yaralanmalar en çok ekstremitelerde (%71,5) görülmüştür. Baş-boyun bölgesi yaralanmaları çocuklarda, erişkinlere kıyasla anlamlı düzeyde daha sık görülmüştür ($p=0,001$). Olguların büyük çoğunluğu ayaktan tedavi edilmiş (%77,8), %22,2'si hastaneye yatırılmış, %14,8'ine ise cerrahi müdahale uygulanmıştır. **Sonuç:** Köpek ısırığına bağlı yaralanmalar, özellikle pediatrik olgularda hem tıbbi hem de adli açıdan önem arz etmektedir. Bulgularımız, köpek sahipliğine ilişkin yasal düzenlemelerin güçlendirilmesi, önleyici stratejilerin geliştirilmesi ve kamu farkındalığının artırılması gerekliliğine dikkat çekmektedir.

Anahtar Kelimeler: Köpek ısırığı; adli tıp; yaralanma paternleri; halk sağlığı

Dog bites are a problem that can be observed in all societies with varying rates, affecting especially the pediatric age group and may cause fatal injuries.[1-7] Dog bites rank first among animal-induced injuries worldwide.[1-4] It has been reported that 80-90% of animal bite injuries occur as dog bites.[3,5] In a study conducted in Sivas province in Türkiye, in which cases admitted to the emergency department due to animal-related injuries were evaluated, it was reported that 70% of the cases were dog bite injuries.[4] Epidemio-

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logical work from North America shows that dog bites constitute an important public-health concern in Canada and the United States, and-though uncommon-fatal outcomes are documented in the United States.[8,9] Although injuries due to dog bites have recently been frequently reported in the written and visual media in our country, the statistics of injuries and deaths due to dog bites are not known exactly.

Article 177 of the Turkish Penal Code states that individuals may be sentenced to imprisonment for up to 6 months if animals under their care cause harm to others.[10] In Türkiye, it is forbidden to own some dog breeds known to be more aggressive. Injuries due to dog bites can be considered as forensic cases depending on the nature of the incident. In addition to their medical duties such as treatment and vaccination in dog bite injuries, physicians have to prepare a forensic report according to the nature of the incident.[11]

Dog bites can cause direct injuries and may lead to various infectious complications, notably rabies.[12-15] It is reported in the literature that injuries due to dog bites are more common in children and the site of injury is usually the extremities.[2,4,16]

In this study, dog bite cases admitted to a forensic medicine unit were evaluated. We aimed to discuss the demographic data, event characteristics, and injury severity of the cases and to contribute to the literature.

MATERIAL AND METHODS

This retrospective study was conducted in accordance with the ethical standards outlined in the Declaration of Helsinki (revised 2024) and was approved by the Ethics Committee of Eskişehir Osmangazi University (date: November 28, 2024; no: 09). Since the study was based on hospital records and did not involve direct contact with patients, the requirement for informed consent was waived by the ethics committee. All necessary measures were taken to ensure the confidentiality of participants, and no identifying information has been included in this study.

In the 5-year period between 2019-2023, cases admitted to Eskişehir Osmangazi University Forensic Medicine Department due to dog bites were evaluated. Forensic reports and hospital documents of these cases were analyzed. The cases were evaluated in terms of age, gender, site of injury, severity of injury, content of the forensic report, treatment and hospitalization period. Age group, gender and injury sites were compared. Forensic reports were prepared in accordance with the Guideline for the Forensic Medical Evaluation of Injury Offenses Defined in the Turkish Penal Code.[17] For statistical purposes, cases were categorized into three age groups: <18 years, 18-35 years, and ≥36 years, consistent with commonly used classifications in forensic and epidemiological research.

Whether the dogs were owned or not and their vaccination status, if any, were evaluated. This information was obtained from the statements of the dogs' owners, the victims and/or their relatives, and when available, from the official health records documented in hospital and forensic reports. Animal-induced injuries other than dog bites or injuries that occurred in another way while escaping from the dog were not included in the study. Data were analyzed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics (mean, standard deviation, frequency, and percentage) were calculated, and the chi-square test was applied to compare categorical variables. p values below 0.05 were considered significant.

RESULTS

During the 5-year period, forensic reports were issued for 108 cases injured due to dog bites. It was determined that 71 (65.7%) of the cases were male and 37 (34.3%) were female. When the distribution of the cases according to age groups was analyzed, it was determined that the <18 age group was the most frequently exposed to dog bites (n=51, 47.2%). The youngest case was 2 years old and the oldest was 67 years old, and the mean age was 17±9.3 years. The number of cases in the 0-7 age group was 30 (27.8%). The evaluation of age groups and gender is presented in Table 1. No significant result was found in the comparison of age groups and gender (p>0.05).

When the cases were evaluated according to the site of injury, it was observed that 85 (71.5%) cases had injuries in the extremities. The most common site

TABLE 1: Distribution of age groups of cases according to gender

	Gender				Total	
	Male		Female			
Age group	n	%	n	%	n	%
<18 years old	29	40.8	22	59.5	51	47.2
18-35 years old	24	33.8	9	24.3	33	30.6
35 years and older	18	25.4	6	16.2	24	22.2
Total	71	100.0	37	100.0	108	100.0

χ^2=3.414; p>0.05

TABLE 2: Distribution of injury sites according to age groups

	Age group				Total	
	<18 years		18 years and over			
Region of injury	n	%	n	%	n	%
Lower extremity	20	32.8	29	50.0	49	41.2
Upper extremity	15	24.6	21	36.2	36	30.3
Head, neck, face	19	31.1	2	3.4	21	17.6
Chest, abdomen and back	7	11.5	6	10.3	13	10.9

χ^2=16.427; p=0.001

Note: A total of 11 cases had injuries in more than one region.

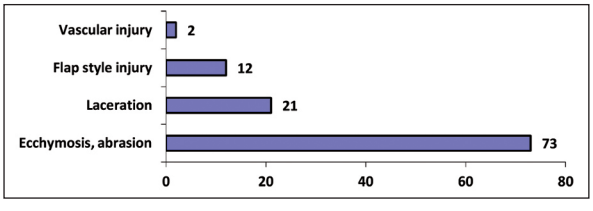


FIGURE 1: Distribution of cases according to injuries

of injury was the lower extremity (41.2%, n=49). A significant relationship was found between children and adults in terms of the site of injury. Injuries to the head, neck and face were more common in children than in adults (Table 2, p=0.001). In childhood, 31.1% of the injuries occurred in the head, neck and face region. This rate was found to be 3.4% in those older than 18 years of age. Of the head, neck and face injuries, 90.5% (19/21) occurred in children younger than 18 years of age. 11 cases were found to have injuries in more than one region. It was determined that 10 of the 11 patients injured at more than one site were younger than 18 years of age.

The distribution of the injuries is presented in Figure 1. Injuries such as ecchymosis and abrasions occurred in 67.6% (n=73) of the cases. Two (1.9%) cases had vascular injuries.

There was no information that any dog was rabid. When only the forensic report contents of the injuries were evaluated, it was determined that 25.9% (n=28) of the cases had lesions that could not be removed by simple medical intervention (Table 3). In 2 (1.9%) cases, life-threatening injuries occurred. In one of these 2 cases, the radial artery and nerve and in the other the femoral artery and vein were injured. One of the 2 life-threatening cases was 9 years old and the other was 13 years old. In 6 (5.6%) cases, a fixed scar lesion was left on the face.

Information about the treatment of the cases is presented in Table 3. 77.8% (n=84) of the cases were treated as outpatients or kept under observation. The cases were most frequently treated in state hospitals (81%, n=75). A total of 24 (22.2%) patients were hospitalized. The length of stay ranged from 1 to 12 days, with a mean of 3.7 days. Among them, 20 (83.3%) patients were hospitalized for 7 days or less, while 4 (16.7%) patients stayed for 8 days or longer. Sixteen (14.8%) of the patients received surgical treatment. In the hospital documents, it was recorded that all cases were vaccinated against tetanus and rabies.

It was determined that 51 (47.2%) of the attacking dogs were owned, 57 (52.8%) were unowned or

TABLE 3: Information about the treatment of the patients

	n	%
Type of treatment		
Outpatient/consultation	84	77.8
Inpatient	24	22.2
In which health institution he was treated		
University hospital	33	19.0
State hospital	75	81.0
Number of days hospitalised		
7 days or less	20	83.3
8 days or more	4	16.7
Type of treatment		
Medical	92	85.2
Surgery	16	14.8
Surgical treatment method		
Primary repair	10	62.5
Skin graft	4	16.0
Vascular repair	2	12.5

unknown. It was determined that 45 (41.7%) dogs were fully vaccinated and followed up. It was determined that 13 (12%) dogs were known to be unvaccinated, and in 50 (46.3%) cases there was no information about the vaccination status of the dogs. Only 5 (4.6%) dogs were kept under observation after the attack.

DISCUSSION

Injuries due to dog bites are a common problem involving people of all ages, although they are usually seen in the childhood age group.[2,4,6,7,18,19] In a random telephone survey in Belgium, it was reported that the rate of children under the age of 15 who were exposed to dog bites in the families participating in the study was 22/1,000.[20] In a study conducted by Derinöz and Akar in Ankara, it was reported that 74.5% of the cases admitted to the pediatric emergency department due to animal bites were dog bites.[14] In the present study, it was found that the <18 age group was most frequently exposed to dog bites (n=51, 47.2%) and the mean age of the cases was 17±9.3 years. In a study conducted in Eskişehir by Gündüz et al. in which cat and dog bite cases were evaluated, it was reported that 98 (58.7%) of the cases were male and 69 (41.3%) were female.[1] In a study by Vural et al. in which 149 cases of dog bites were analyzed with the data of the Forensic Medicine Institute, 57% of the cases were reported to be male.[2] Similarly, 71 (65.7%) of the cases were male and 37 (34.3%) were female in our study. These data may be explained by the fact that boys playing outside are more likely to be in contact with dogs than girls and adults.

In previous studies, it has been emphasized that injuries due to dog bites occur most frequently in the extremities.[1,16,21] In a study conducted in İstanbul in which only dog bite cases were evaluated, it was reported that injuries occurred in the extremities in 62.6% of the cases.[2] Shetty et al. reported that lower extremities were injured in 64.8% of all animal bite cases.[22] In a study from Türkiye, it was reported that the lower extremities accounted for 48.2% of all injuries, followed by the upper extremities.[21] In accordance with the literature, when the cases were evaluated according to the site of injury, it was observed that 85 (71.5%) cases had injuries in the extremities. It was found that the lower extremity was injured most frequently (51.9% n= 56). The lower extremity is the closest part of the body that the dog can reach when escaping from a dog attack, so it is normal that injuries to this area are more common.

There was a significant relationship between children and adults in terms of the site of injury. It was determined that head and neck injuries were more common in children, while adults were more frequently exposed to extremity injuries (p=0.001). In childhood, 31.1% of the injuries occurred in the head, neck and face region. This rate was 3.4% in those older than 18 years of age. Of the head, neck and face injuries, 90.5% (19/21) occurred in patients younger than 18 years of age. 11 cases were found to have injuries in more than one region. It was determined that 10 of the 11 cases with injuries in more than one region were younger than 18 years of age. Fatal injuries due to dog bites usually occur in the pediatric age group and in areas other than the extremities. In a study evaluating 28 cases who died due to dog bites in Canada, 85.7% of the cases were reported to be children.[12] It was found that dog bite injuries in the head and neck region were more frequently observed in children.[9,12,18,23,24] Aslan et al. presented a case of a 2-year-old child who was attacked by a pitbull dog with multiple injuries in the head region in Türkiye.[23] In the present study, it was determined that the 2 patients with life-threatening injuries were also children. Since children are shorter and lighter in height, dogs can directly reach the head and neck region. Again, children can fall to the ground more easily when attacked by dogs. Therefore, they are more likely to be injured in more than one body part.

Injuries such as ecchymosis and abrasions occurred in 67.6% (n=73) of the cases. Our data were found to be compatible with the relevant literature.[2,6,7,11,24] Vascular injury occurred in 2 (1.9%) cases. In one of these 2 cases, the radial artery and nerve were injured and in the other the femoral artery and vein were injured. One of the 2 life-threatening cases was 9 years old and the other was 13 years old. There are many case reports and studies including vascular injuries due to dog bites.[2,25,26] The teeth of dogs penetrate under the skin with a cutting-piercing tool-like effect and penetrate deep into the skin with

the pressure caused by the strong jaw structure of dogs. The risk of vascular injuries increases if there is a vascular structure in the bite site or if there is a soft tissue structure as in children. Vascular injuries due to dog bites were described in 4.7% of the cases in the study by Vural et al. and in 1.8% of the cases in the study by Karbeyaz et al.[2,11]

Facial fixed scars include lesions that can be clearly recognized at first glance from a verbal dialog distance (1-2 meters) in daylight or in a well-lit environment within the borders of the face. Injuries involving skin-subcutaneous incisions, lacerations and tissue loss in the facial area are considered in this context.[27] Fixed scarring may occur on the face due to dog bite. In a study conducted in İstanbul, it was reported that 16.7% of the patients who were injured due to dog bite had a fixed scar on the face.[2] In the present study, 6 (5.6%) cases had a fixed scar lesion on the face. Five (83.3%) of the 6 patients with fixed facial scarring were children. The more frequent injuries to the head, neck and face of children increased the likelihood of fixed scars on their faces.

Dog bite cases should also be evaluated in terms of rabies and tetanus.[28] In a 2016 study conducted in Eskişehir it was reported that 12.8% of the cases admitted with dog bites were vaccinated against rabies, 11.6% were vaccinated against tetanus, 4.9% of the cases did not require any vaccination, and 82.3% of the cases did not have information on whether vaccination was performed in hospital records.[11] In the present study, it was recorded in the hospital documents that tetanus and rabies vaccines were administered to all cases. No rabies case was reported in the follow-up of the patients. In our study, it was observed that the awareness of healthcare workers about rabies prophylaxis increased in cases with dog bites.

Most cases were treated in public hospitals (81%,n=75). Twenty-four (22.2%) cases were hospitalized as inpatients. Inpatients were hospitalized for the shortest 1 day, the longest 12 days and an average of 3.7 days. 20 (83.3%) of these cases were hospitalized for 7 days or less, while 4 (16.7%) cases stayed for 8 days or longer. Sixteen (14.8%) of the cases underwent surgical treatment. Mild injuries caused by dog bites can usually be treated on an outpatient basis, whereas serious injuries may require surgical treatment, as reported in the literature.[3]

It was determined that 51 (47.2%) of the attacking dogs were owned and 57 (52.8%) were unowned or unknown whether they were owned or not. Similarly, in a study conducted by Bernardo et al. in Pennsylvania, it was reported that 52.8% of the dog attack cases had an owner.[29] It was determined that 45 (41.7%) dogs were fully vaccinated and followed up. It was determined that 13 (12%) dogs were known to be unvaccinated, and in 50 (46.3%) cases there was no information about the vaccination status of the dogs. Only 5 (4.6%) dogs were kept under observation after the attack. Attacks by stray dogs or dog breeds that are forbidden to be kept, especially against children, are a current topic of discussion in our country. For this reason, legal regulations have been made on the subject, but discussions continue. In Türkiye, according to Article 177 of the Penal Code, dog owners may face criminal responsibility if animals under their care cause injury. Therefore, documentation of injury characteristics, the vaccination status of the animal, and the presence of permanent disability such as facial scarring are not only of medical significance but also of legal importance. Our findings highlight that forensic physicians play a crucial role in bridging medical evaluation with judicial processes.

Very serious injuries can occur due to dog bites, particularly in children. These cases should always be considered within a forensic context, as attacks by owned or stray dogs constitute forensic cases that must be reported. Dog bites also represent a significant Türkiye health issue, and local authorities and families-especially dog owners-carry important responsibilities for prevention.

CONCLUSION

Dog bite injuries pose serious medical and forensic concerns, especially in pediatric cases, where the risk of head and neck injuries and permanent damage is higher. These findings underline the need for stricter legal enforcement, responsible pet ownership, and preventive strategies. Strengthening community-based interventions such as vaccination, sterilization,

and animal control policies will be essential to reduce both the incidence and consequences of dog bites.

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During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Ümit Şimşek, Neslihan Polat, Bahadır Saka, Tuğrul Kılıboz, Kenan Karbeyaz;* ***Design:*** *Ümit Şimşek, Neslihan Polat, Bahadır Saka, Tuğrul Kılıboz, Kenan Karbeyaz;* ***Control/Supervision:*** *Ümit Şimşek, Neslihan Polat, Bahadır Saka, Tuğrul Kılıboz, Kenan Karbeyaz;* ***Data Collection and/or Processing:*** *Ümit Şimşek, Neslihan Polat, Bahadır Saka, Tuğrul Kılıboz, Kenan Karbeyaz;* ***Analysis and/or Interpretation:*** *Ümit Şimşek, Bahadır Saka, Tuğrul Kılıboz, Kenan Karbeyaz;* ***Literature Review:*** *Ümit Şimşek, Neslihan Polat, Tuğrul Kılıboz, Kenan Karbeyaz;* ***Writing the Article:*** *Ümit Şimşek, Neslihan Polat, Bahadır Saka, Tuğrul Kılıboz, Kenan Karbeyaz;* ***Critical Review:*** *Ümit Şimşek, Neslihan Polat, Bahadır Saka, Kenan Karbeyaz;* ***References and Fundings:*** *Ümit Şimşek, Neslihan Polat, Bahadır Saka, Kenan Karbeyaz;* ***Materials:*** *Ümit Şimşek, Neslihan Polat, Bahadır Saka, Tuğrul Kılıboz, Kenan Karbeyaz.*

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