

Evaluation of wounds due to animals at an emergency department

Bir acil serviste hayvan kökenli yaralanmaların incelenmesi

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Abstract

Aim: Due to the risk of rabies contamination and infection, wounds by animals are a significant public health concern. Rabies are still encountered in Turkey. The knowledge of the epidemiology and surveillance of animal bites and rabies prophylaxis is critical in combating this disease. This study aimed to determine the frequency and characteristics of wounds due to animals and rabies prophylaxis at the emergency department of Ege University Faculty of Medicine.

Materials and Methods: In this descriptive and retrospective study, the medical records of patients admitted to the Emergency Department of Ege University Faculty of Medicine between 01.03.2016 and 01.12.2018 with wounds due to animals were reviewed. Of the 427 cases reviewed, four cases (0.9%) due to rats and two patients (0.5%) wounded by bats were not included in the analysis.

Results: Of the 421 applicants, 266 were males (63.2%), and 155 were females (36.8%). Forty-five patients (10.6%) were aged ≤ 10 (10.6%). Adults aged 18-59 years constituted 78.8% (n=332) of the applications. Most commonly, the wounds were in the lower extremities (220, 53.3%). The attacks were made commonly by dogs (n=312, 74.1%). Immunoglobulins were administered to patients who had injuries extending to the subcutaneous tissues (n=23, 5.5%). The majority of the patients were wounded by stray animals (288, 68.4%). All these patients received the rabies vaccine. On the other hand, the majority of patients wounded by owned animals (n=69, 16.4%) got a rabies vaccine as well (n=59, 85.5%).

Conclusion: Our findings indicate that the most significant risks were due to stray animals. It can be concluded that controls and vaccination of owned animals are insufficient, requiring immunization after the injuries. Additionally, to reduce animal bites and prevent rabies, public education about animal bites will be useful as well.

Keywords: Animals, wounds and injuries, bites and stings, rabies, vaccination.

Öz

Amaç: Hayvan kaynaklı yaralanmalar, kuduz virüsü bulaşma riski ve sebep olduğu enfeksiyon nedeni ile önemli bir halk sağlığı problemidir. Türkiye'de halen kuduz vakaları saptanmaktadır. Kuduzla mücadelede hayvan ısırıklarının epidemiyolojisi ve sürveyansının bilinmesi ile ısırılma sonrası kuduz profilaksisi uygulanmaları kritik öneme sahiptir. Bu çalışmamızda, Ege Üniversitesi Tıp Fakültesi acil servisine hayvan yaralanmaları ile başvuru sıklığını, yaralanmaların özelliklerini ve kuduz profilaksi uygulamalarını belirlemeyi amaçladık.

Gereç ve Yöntem: Bu tanımlayıcı ve retrospektif çalışmada hayvan yaralanması nedeniyle 01.03.2016-01.12.2018 tarihleri arasında Ege Üniversitesi Acil Servise başvuran olguların dosyaları incelenmiş ve analiz edilmiştir. Belirlenen 427 vakadan fare (n=4; 0,9%) ve yarasa (n=2; 0,5%) ısırıkları analize dahil edilmemiştir.

Bulgular: Başvuran 421 hastanın dosyası incelendiğinde; 266'sının erkek (%63,2), 155'inin kadın (%36,8) olduğu bulunmuştur. On yaş ve altındaki başvuran sayısı 45 kişi (%10,6) olarak saptanmıştır. En sık ısırılan bölge alt ekstremitedir (n=220, %52,2). Daha çok köpek tarafından ısırılma mevcuttur (n=312, %74,1). Erişkinlerde 18-59 yaş arasında yaralanma oranı %78,8 (n=332) olarak bulunmuştur. Hastaların 23'üne (%5,5) immünglobulin yapılmış olup, bu hastaların deri altına uzanan kesileri mevcuttur. Isırılan hastaların çoğu sahihsiz hayvanlar olup (n=288, %68,4) bu hayvanlar tarafından ısırılan hastaların hepsine kuduz aşısı yapılmışken, sahipli hayvanlar tarafından (n=69, %16,4) ısırılanların da büyük çoğunluğuna kuduz aşısı yapılmıştır (n=59, %85,5).

Sonuç: Bu çalışmaya göre hayvansal kökenli yaralanmalar açısından en büyük riski sahihsiz hayvanlar taşımaktadır. Sahipli hayvanların kontrollerinin ve aşılamalarının yetersiz yapıldığı, bu nedenle de sahipli hayvan ısırması sonrası aşılama yapılmak zorunda kalındığı düşünülebilir. Ek olarak, evcil hayvanların aşılarının ve kontrollerinin yapılmasının yanında hayvan ısırıklarının azaltılmasında ve kuduzun önlenmesi için topluma hayvan ısırıklarından korunma konusunda eğitim vermek etkili olacaktır.

Anahtar Sözcükler: Hayvanlar, yaralar ve yaralanmalar, ısırık ve sokmalar, kuduz, aşı.

Introduction

"Wound by animals" is defined as owned, farm or wild animal bites or scratches. This situation is a significant public health concern in endemic areas because of the risk of rabies infection (1, 2). Throughout life, the percentage of an animal bite is 50% for human beings, and about 80-90% of these are dog bites (3). Cat bites and scratches devise 5-10% of the cases (4, 5).

Children and teenagers are at increased risk of animal injuries, especially dog bites. While in children, dog bites are more common on the head and neck, extremity bites are more prevalent among adults (6-8).

Animal bites are seen more frequently in men, and these are mostly dog bites. In women, animal-related injuries are usually in the upper extremities and are mostly cat bites (5, 6).

The most common result of animal bites is wound infections. Infections due to cat bites are more prevalent than dog bites. While disease develops in 15-20% of dog bites, in cat bites, this rate is 30-50%. Anaerobic microorganisms are the most common cause of these infections. In some studies, it was determined that the reason for wound infections is anaerobic microorganisms due to animal or human bites, which constitute about two-thirds of the infections, and found especially responsible for abscess formation. Wound infections may vary from a simple infection to a life-threatening sepsis (5-9).

The most essential health problem after animal bites is the risk of rabies. While wild animals such as skunks, bats, and raccoons lead to 90% of animal rabies, domestic animal bites such as cats and dogs make up less than 10% of the cases (5). Worldwide the annual mortality because of

this disease is about 60,000, and 99% of the cases are from Asia and Africa, where vaccination programs and post-exposure prophylaxis fail. Dogs are the primary host responsible for most human rabies deaths (10-12).

Despite mandatory notification and precautions, still, rabies cases are encountered throughout Turkey. According to statistical data of the Ministry of Health, every year, some 250,000 contacts are reported, and annually 1-2 rabies cases are seen. For this reason, animal bites are still a health care issue in Turkey (13). It is not possible to eradicate rabies without knowing the risk factors, vaccinating all stray animals, and providing post-exposure prophylaxis.

This study aimed to determine the frequency and characteristics of wounds due to animals' and rabies prophylaxis at the emergency department of Ege University Faculty of Medicine.

Materials and Methods

Study design

A descriptive study was conducted based on a retrospective file review.

Setting

The study was approved by Ege University Faculty of Medicine and conducted at the Department of Emergency. This tertiary health care center annually serves around 200 000 patients in Izmir, Turkey.

Participants

Data collection was performed using the hospital's electronic medical records. The registry

was searched between 01.03.2016 and 01.12.2018 for the ICD-10 codes W54 (Dog bite and injury) and Z24.2 (Immunity for rabies). During the study period, a total of 566 651 patients were admitted to the emergency department. Of the applications, 427 cases were registered with the above ICD codes. Due to the low number of cases, patients with rat (n=4; 0.9%) and bat (n=2; 0.5%) bites were not included in the analysis.

Variables

The primary study variable was the presence of animal-induced wounds. The definition of "wound by animals" in this study is described as bites or scratches caused by a domestic, farm, or wild animal. Other variables studied were sex, age, admission time (within/after 24 hours), animal species (dog, cat, mice, or bat), ownership type (domestic/stray), number of wounds (single/multiple), localization of the injury, depth of the wound(s) (limited to the superficial skin/including the subcutis), contamination status (clean/contaminated), x-ray result (healthy/bony fracture), antibiotic prescription (yes/no), rabies vaccine administration (yes/no), anti-rabies immunoglobulin application (yes/no), suturing of the wound, surgical intervention (yes/no), and hospitalization (yes/no). The patients were grouped according to their age as <10, 10-17, 18-59, and ≥ 60 years.

Statistical Analysis

Statistical analyses were performed using the SPSS software version 25. For demographic data, descriptive statistics were administered. Descriptive analyses for normally distributed variables were presented as means and standard deviations. Categorical variables were compared using the Chi-square test with exact option. The comparison of age between the groups was made with the independent samples t-test. A p-value of <0.05 was considered statistically significant.

Results

Participants

Data for 421 patients were analyzed. Of the participants, 266 (63.2%) were males, while 155 (n=36.8) were females. The mean age was 29.70±16.02 years (min. 2, max. 84). Forty-five patients (10.6%) were at or below age 10, 34 (8.0%) were between ages 10 and 17, and 321

(76.2%) were between 18 and 59 (76.3%); 21 patients (4.9%) were at or above 60.

Descriptive data

Of the 566 651 patients admitted to the emergency department between March 2016 and December 2018, 427 (0.07%) were injured by animals. The number of patients admitted within the first 24 hours was 407 (96.6%). The majority of the cases were caused by dogs 312 (73.1%), followed by cats (n=109; 25.5%). From the 421 patients included in the analysis, 288 (68.4%) were wounded by stray animals, almost all patients applied to the emergency department within the first 24 hours of the event (95.2%, n=401), and had single injuries (96.0%, n=404) (Table-1). The most frequent wound sites were the lower extremities (n=220, 52.3%), and in the majority of the cases (n=395, 93.8%), the wound was superficial. In 15 patients (3.6%), the wounds were sutured, and only two patients (0.5%) required major surgical intervention (Table-1).

Outcome data

Patients wounded by a dog (31.54±15.92 years) were significantly older than those injured by a cat (24.42±15.14 years) (t=4.066; p<0.001). On the other hand, there was no age difference between patients receiving rabies vaccination (29.61±15.96 years) and those not vaccinated (32.73±18.49 years) (t=0.636; p=0.525).

There was no significant difference in the vaccination status of the participants except for stray animals; all patients wounded by stray animals were vaccinated (Table-2).

As age was increasing, the proportion of patients injured by a dog was rising too. Cat scratch or bites were more frequent in the younger age group (Table-3).

While cat-related wounds were more common in the upper extremities, dogs caused somewhat lower extremity injuries (Table-3). On the other hand, while dogs attacked males predominantly, cats were more involved in females injuries. The 20 plain x-rays requested were all cases of dog bites (Table-3).

Anti-rabies immunoglobulins were applied to 23 patients (5.5%). All patients receiving immunoglobulins had injuries involving the subcutis (Chi-square=369.616, p<0.001).

Table-1. Patient and animal characteristics.

		n	%
Sex	Male	266	63.2
	Female	155	36.8
Time of admission	Within 24 hours	401	95.2
	24 hours or later	20	4.8
Animal species	Dog	312	74.1
	Cat	109	25.9
Stray animal	No	69	16.4
	Yes	288	68.4
	Not known	64	15.2
Number of bites	Single	404	96.0
	Multiple	17	4.0
Area of injury	Head and neck	25	5.9
	Upper extremities	171	40.6
	Lower extremities	220	52.3
	Trunk	2	0.5
	Buttocks or genital area	3	0.7
Wound depth	Superficial	395	93.8
	Including subcutis	26	6.2
Number of wounds	Single	404	96.0
	Multiple	17	4.0
Area of injury	Head and neck	25	5.9
	Upper extremities	171	40.6
	Lower extremities	220	52.3
	Trunk	2	0.5
	Buttocks or genital area	3	0.7
Wound depth	Superficial	395	93.8
	Including subcutis	26	6.2
Antibiotic administration	Yes	183	43.5
	No	157	37.3
	Not known	81	19.2
Rabies vaccination	Yes	410	97.4
	No	11	2.6
Anti-rabies IgG administration	Yes	23	5.5
	No	398	94.5
Suture application	Yes	15	3.6
	No	406	96.4
Surgical intervention	Yes	2	0.5
	No	419	99.5
Hospitalization	Yes	2	0.5
	No	419	99.5
Wound cleanness	Clean	420	99.8
	Dirty	1	0.2

Table-2. Comparison of the immunization status between different characteristics.

		Rabies vaccination				χ^2	p*
		Yes		No			
		n	%	n	%		
Sex	Male	260	97.7	6	2.3	0.362	0.753
	Female	150	96.8	5	3.2		
Time of admission	Within 24 hours	391	97.5	10	2.5	0.470	1.000
	24 hours or later	19	95.0	1	5.0		
Animal species	Dog	305	97.8	7	2.2	0.646	0.486
	Cat	105	96.3	4	3.7		
Stray animal	No	59	85.5	10	14.5	46.275	<0.001
	Yes	288	100.0	0	0.0		
	Not known	63	98.4	1	1.6		
Number of bites	Single	393	97.3	11	2.7	0.475	1.000
	Multiple	17	100.0	0	0.0		
Area of injury	Head and neck	24	96.0	1	4.0	0.488	0.922
	Upper extremities	166	97.1	5	2.9		
	Lower extremities	215	97.7	5	2.3		
	Trunk	2	100.0	0	0.0		
	Buttocks or genital area	3	100.0	0	0.0		
Wound depth	Superficial	384	97.2	11	2.8	0.743	0.635
	Including subcutis	26	100.0	0	0.0		

*Chi-square with exact test option

Table-3. Comparison of different variables between patients wounded by cats and dogs.

		Animal species				χ^2	p
		Dog		Cat			
		n	%	n	%		
Age group	<=10	23	51.1	22	48.9	20.201	<0001
	10-17	22	64.7	12	35.3		
	18-59	247	76.9	74	23.1		
	>=60	20	95.2	1	4.8		
Sex	Male	217	81.6	49	18.4	21.010	<0.001
	Female	95	61.3	60	38.7		
Area of injury	Head and neck	20	80.0	5	20.0	46.350	<0.001
	Upper extremities	97	56.7	74	43.3		
	Lower extremities	190	86.4	30	13.6		
	Trunk	2	100.0	0	0.0		
	Buttocks or genital area	3	100.0	0	0.0		
Stray animal	No	54	78.3	15	21.7	1.176	0.575
	Yes	209	72.6	79	27.4		
	Not known	49	76.6	15	23.4		
Fracture in plain X-ray	No	19	100.0	0	100.0	NA	NA
	Yes	1	100.0	0	100.0		

*Chi-square with exact test option

The proportion of patients who had wounds including the subcutis [domestic: 38.5% (n=69), stray: 53.8% (n=288), not known: 7.7% (n=2)] had been caused more by domestic animals compared to the superficial injuries [domestic: 14.9% (n=59), stray: 69.4% (n=274), not known: 15.7% (n=62)] (Chi-square=10.124, p=0.006).

Although most of the wounds were superficial, the proportion of superficial wounds was higher in cases due to stray animals (95.1%, n=274 vs. 4.9%, n=14) compared to domestic (85.5%, n=59 vs. 14.5%, n=10) animals (Chi-square=10.124, p=0.006). As to the subgroup analysis, dog wounds due to domestic animals (superficial: 81.5%, n=44, including subcutis: 28.5%, n=10), as well as stray animals (superficial: 93.3%, n=195, including subcutis: 6.7%, n=14) were mostly superficial. The difference between these groups was significant (Chi-square=9.224, p=0.010).

Of the two major dog bite injuries requiring surgical intervention, one was caused by a Pit Bull breed, and the other was a Rottweiler injury. These two categories are in the same subspecies. In one case, the Rottweiler bites led to intraabdominal injury and pulmonary contusion, while in the other, the Pit bull bite led to an occipital defect of 1.3 cm in diameter with an open fracture, which was repaired by neurosurgery.

Discussion

Animal bites are a critical health care problem, not only because of secondary infections but also because of lethal rabies contamination risk when undiagnosed or untreated. For the prevention of rabies due to animal bite, planning of controlling and collecting the epidemiological data is crucial. This study provides data about the frequency of animal wounds, the animal species involved, and factors related to the exposure. On the other hand, this study demonstrates the significance of animal-related injuries as a reason for morbidity and admission to the emergency department.

During the study period, 427 of the 566 651 emergency admissions were due to animal-related wounds (75.4/100 000). Almost all applications (95.3%) were within the first 24 hours. This may be due to the fear of rabies. As in other studies, most of the admissions were due to dogs, and males were predominating (14-16). In this study, dog-related wounds were more common in men compared to women. In a report from a touristic

region in Nepal, animal bites with suspected rabies were more in females (17). Another study from the United States indicates that animal bites are more common among women compared to men (18). There might be cultural and behavioral differences in the studied populations.

Children below 18 were considered as a significant risk group by other studies (14, 20, 21). The explanation of this may be the central location of the study hospital, decreasing the possibility of children encountering dogs. On the other hand, cultural variations in different countries may affect the distribution of the cases according to age. Below 18 years of age, cat bites are more frequent. A possible explanation of this situation might be sympathy for small animals at this age group. Above the age of 18 years, dog bites were more prevalent.

As in many other studies (21-23), lower extremity injuries were more common in our research (51.5%). Upper extremity wounds were more commonly due to cats, while dogs were more common reasons for lower extremity injuries. The reason might be that one tends to reach down to pet the cats, while dogs attack directly without permitting to reach down.

When the dog-related trauma was classified according to age, upper extremity, and head and neck dominated in children. According to the report of Carmen A. Pfortmueller (24), above 18 years of age, people may play with dogs and try separating dog fights. During these activities, they remain defenseless, which can lead to lower extremity injuries.

After exposure to suspected animal injuries, the decision of rabies vaccination and immunoglobulin administration depends on animal species, the vaccination status of the causative animal, and the site and the depth of the wound. In India, the rate of rabies vaccination after an animal bite is 86% (25). However, in our study, this rate was 97.4%. In an investigation by Bülent Kılıç and associates (20), the vaccination rate was reported as 68%. The most essential reason for this difference in the vaccination rates may be the proportion of domestic animals in our study (16.4%), of which the majority (85.7%) were not vaccinated. The low number of animals with full vaccination suggests the insufficiency of animal control in the studied population.

Although in our study, 23 patients received anti-rabies immunoglobulin, in the Bülent Kılıç et al.'s

study, no immunoglobulins were administered (20).

Both Pit bull and Rottweiler subspecies are responsible for the majority of deaths due to dog bites (8, 26). Our study confirmed the risk of life-threatening injuries due to these species. Both Rottweiler and Pit bull injuries required surgical interventions.

Among some limitations of this study are issues related to coding and the completeness of the records. This study bears the limitations of retrospective studies. On the other hand, information on the treatments and patient outcomes were not included in this study.

Conclusion

In Turkey, animal-related bites and wounds are still an urgent healthcare issue. Many of the animals are domesticated, and usually in contact

with the victims. Thus, families and children must be educated for the prevention of such injuries. On the other hand, sufficient training of animals and close relationships with children at puppy age might lessen the attacks. Domestic animals should have periodical veterinary controls, and their vaccination cards must be kept properly. Unfortunately, many domestic animals have incomplete vaccination lack of information. Besides, stray animals should be controlled by authorities and must be kept in animal shelters. The control and supervision of the population of stray animals are of critical importance from the point of prophylaxis in the pre and post-exposure period for the prevention of rabies. To prevent animal injuries and rabies, appropriate planning and precautions must be made.

Conflict of interest: The authors have not declared any conflict of interest in this study.

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