



Animal Bites: Epidemiological Considerations in the East of Ahvaz County, Southwestern Iran (2011 - 2013)

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Abstract

Background: Animal bite is an emerging public health problem. Annually, in different parts of the world, more than 15 million people are treated for animal bites. Each year, 140 cases of animal bites per 100,000 population are estimated to occur in Iran, more than 85% of which are dog bites.

Objectives: The aim of this study was to investigate the epidemiology of animal bites during years 2011 and 2013 in the East of Ahvaz county.

Methods: This was a descriptive cross-sectional study performed on whole cases of animal bite registered at the health center of Eastern Ahvaz, Southwestern Iran. According to the current study, a "bitten person" is bitten by an animal, and refers to the rabies prevention centers due to animal bites and fear of rabies. During a three-year period, through a questionnaire-based study, 2493 bitten individuals were enrolled in the research. In this respect, for all cases, demographic and epidemiological data, such as treatment, biting animals, age, gender, occupation, place of residence, month of the year, season and biting site on the body were recorded. Descriptive statistics, including frequency distribution and percentage were used to analyze the data. The analysis was performed using the SPSS version 18 software.

Results: The highest number of bitten individuals were recorded during year 2012. Out of 2493 bitten individuals, 76.6% were male and 23.4% were female. Bites were most frequent among the age group of 21 to 30 years old. Most cases (24.7%) were self-employed. In total, 65% of animal-bite incidents were in the city and 35% were in rural areas. The cases were mostly related to dog bites (78.4%) and cat bites (17.3%), respectively. Moreover, 100% of cases were vaccinated within the first 24 hours, 61.4% had incomplete while 38.6% had complete vaccination. Lower extremities were the most frequent bite site (46.9%) followed by upper extremities (41.6%), head and neck (5.7%), and trunk (5.8%). Animal bites were more common during spring (26.7%) and autumn (25.2%). Maximum number of incidents were reported during the month of April (9.2%) and July (9%).

Conclusions: Dogs were the most common animals causing this problem. Control of stray dog population by animal birth control and domestic animal vaccination is needed. Meanwhile, training people at risk can play an important role in reducing the incidence of animal bites and rabies.

Keywords: Animals, Bites, Epidemiology, Prevalence, Rabies, Iran

1. Background

Today, a large amount of information is available concerning zoonotic diseases, which has resulted in substantial progress in their diagnosis and treatment. Nevertheless, a large number of animals and a more limited number of humans, continue to obtain such diseases (1). Transmitted diseases by animal bites have been regarded as a health issue throughout the world and Iran (2). In addition to their health significance to humans and livestock, such diseases impose a substantial economic burden on countries and are, therefore, of great significance (1). Every

year, increased incidence of animal bites incurs enormous costs on the purchase of vaccines and serums to prevent and treat associated diseases (3).

Rabies is a fatal viral disease, transmissible between humans and animals. The cause of rabies is a neurotropic virus that is transmitted through (direct) contact with infected saliva from animal scratches or bites, mucous tissue, respiration, placenta, contaminated equipment, and organ transplants. The mortality rate of rabies is 100% following the emergence of clinical symptoms. It is an acute fatal viral syndrome, often accompanied by stimulatory disorder or paralysis syndrome, which is specific to domestic

and wild carnivores. Rabies is transmitted to humans and other homoeothermic mammals, accidentally through infected bites. There are two epidemiological types of rabies: (a) urban rabies associated with dogs and, in a limited number of cases with cats, and (b) sylvatic rabies, whose natural reservoirs include wolves, foxes, weasels, raccoons, and bats (4, 5).

According to the World Health Organization (WHO) estimations, an annual 40 to 70 thousand people pass away due to catching rabies in endemic countries (6). An additional 10 million people receive post-exposure treatment following rabies-induced bites per year. According to estimations, three to six million cases of animal bites occur each year in the United States, with dog bites representing the majority of mammalian bites (7, 8).

Animal bites and diseases that are transmitted through it continue to remain a major economic-health issue in Iran, affecting almost all provinces to some degree. According to statistics reported by the Iranian Disease Management Center, the highest distribution of animal bites across the country belongs to the following provinces, respectively: Ardabil and Golestan with an incidence of over 450 cases per 100,000 people, Chaharmahal - Bakhtiari with 300 to 450 cases per 100,000 people, Bushehr, East Azerbaijan, Isfahan, Fars, Gilan, Kermanshah, Hamadan, Hormozgan, West Azerbaijan, Khorasan, Khuzestan, Kohgiluyeh - Boyer-Ahmad, Lorestan, Markazi, Mazandaran, Qazvin, Semnan and Zanzan with an average incidence of 100 to 300 cases per 100,000 people, and Tehran, Qom, Kurdistan, Ilam, Sistan - Baluchestan and Yazd with less than 100 cases per 100,000 people, exhibiting a low incidence (9).

Estimation of health and well-being indices of the society based on existing data is essential for the identification of health priorities and making relevant interventions, in a way that, the lack of epidemiological information is an inhibiting factor in disease prevention, control, and surveillance. In this regard, the identification of the epidemiology of animal bites and associated risk factors is of considerable significance. Numerous studies have recently been conducted on the epidemiology of rabies across Iran; however, due to extensive geographic scope, climatic variation and animal diversity in each region (some of these animals are natural reservoirs of rabies), along with demographic variations in terms of health level and knowledge of rabies prevention methods, it is necessary to conduct separate studies in each region of the country.

2. Objectives

Covering a large area, the city of Ahvaz (in southwestern Iran) is home to various wildlife species. An under-

standing of the epidemiology and prevalence of animal bites as well as the age groups at risk can provide health-care system planners with effective solutions to prevent this health issue. Therefore, this study was conducted to determine the epidemiologic condition of animal bites and its associated demographic factors in Eastern Ahvaz, during a three-year period (2011 to 2013).

3. Methods

In a descriptive cross-sectional study, all people bitten by animals between 2011 and 2013 were examined. Data was collected through interviews and review of statistics recorded in the Disease Prevention and Control Department of East Ahvaz Health Center. Informed consent was obtained from the respondents. They were made to understand that participation is voluntary and there was no consequence for non-participation. All obtained information was kept confidential. The college research review committee revised the paper, according to rules and regulations. Accordingly, the study was approved by the Ethics Committees of Ahvaz Jundishapur University of Medical Sciences. Eastern Ahvaz Health Services Center administrative authorities at the district level were informed about the study and their consent was obtained with a letter. The epidemiologic and demographic information included gender, age, occupation, season, place of occurrence (urban or rural), type of biting animal, site of wounds caused by bites, month and type of prophylaxis.

The East Ahvaz Health Center routinely collects data related to the incidence of animal bites (Disease Surveillance System). Incidents of animal bite are reported to the Center by regional units, such as hospitals and urban and rural health-medical centers via telephone for preventive measures to be taken, according to national instructions.

In the current study, two sources were used to report animal bites: (1) emergency departments of hospitals and (2) statistics reported to the center by other health-medical centers, such as urban and rural health-medical centers and health homes. However, the current study excluded cases not referring to health-medical centers, hospitals, etc. to receive prophylaxis.

4. Results

During the study, 2493 cases of animal bites undergoing medical intervention were recorded. The incidence of animal bites reported to the Center between 2011 and 2013 was 104, 142, and 124 per 100,000 people, respectively, indicating an upward-downward trend during this three-year period (Figure 1).

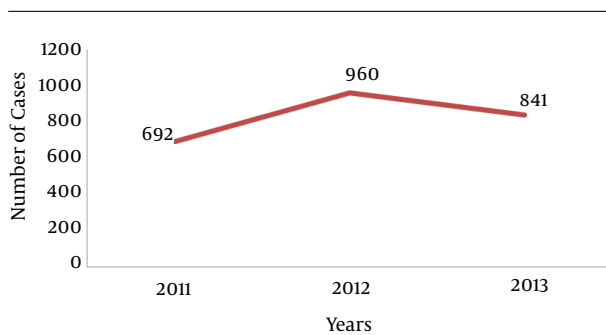


Figure 1. Trend of animal bite frequency during 2011 to 2013, in East of Ahvaz county, Southwestern Iran

With respect to gender, animal bites were more common among males than females, with 1910 male cases (76.6%) and 583 female cases (23.4%). The majority and minority of victims belonged to the 10 to 20 (20.2%) and above 60 (2.7%) age groups in 2011, 20 to 30 (22.8%) and above 60 (3.6%) age groups in 2012, and 20 to 30 (23.7%) and above 60 (4.4%) age groups in 2013, respectively. In general, the majority and minority of victims belonged to the 20 to 30 (21.8%) and above 60 (6.3%) age groups, respectively (Table 1).

In terms of the frequency of occupation, 616 cases (24.7%) were self-employed, 568 cases (22.8%) were students, 271 cases (10.9%) were housewives, 216 cases (8.7%) were employees, 183 cases (7.3%) were workers, 22 cases (0.9%) were livestock farmers, and a total of 617 cases (24.7%) were either retired, unemployed, children or engaged in other occupations (Table 1).

In terms of the frequency of bites, dogs and cats accounted for the majority of injuries with 566 (81.8%) and 82 (11.8%) cases in 2011, 752 (78.3%) and 168 (17.5%) cases in 2012, and 636 (75.6%) and 182 (21.7%) cases in 2013, respectively. In total, dogs accounted for the majority of animal bites with 1954 (78.4%) cases followed by cats with 432 (17.3%) cases, and other animals (fox, wild boar, etc.) with 107 (4.3%) cases (Tables 2 and 3).

In terms of place of residence, of the 2493 cases of animal bites reported in Eastern Ahvaz, 433 and 259 cases involved urbanites and villagers in 2011, 627 and 333 cases involved urbanites and villagers in 2012, and 560 and 281 cases involved urbanites and villagers in 2013, respectively. In total, 65% of cases occurred in urban areas and 35% in rural regions (Table 1).

In terms of anatomical sites, legs with 330 out of 692 cases (47.7%), were the most common site of injury in animal bite victims during year 2011. In 2012, legs with 466 out of 960 cases (48.5%) were the most common site of injury in animal bite victims. In 2013, legs with 372 out of

841 cases (44.2%) were the most common site of injury in animal bite victims. In total, the most frequently injured sites during this three-year period were legs with 1168 cases (46.9%), hands with 1036 cases (41.6%), trunk with 146 cases (5.8%), and neck-head with 143 cases (5.7%) (Table 2 and Figure 2).

In terms of month, the most and least frequent injuries occurred in April with 228 cases (9.2%) and August with 178 cases (7.1%), respectively. In terms of season, most injuries occurred in spring. Seasonal frequency of animal biting was as follows: 666 cases (26.7%) in spring, 586 (23.5%) in summer, 627 (25.2%) in fall, and 614 (24.6%) in winter (Table 3 and Figure 3).

Treatment in 61.4% of victims bitten by animals (dogs and cats), suspected of having rabies, who visited rabies treatment and prevention centers, was done with three doses of anti-rabies vaccine and stopped after ten days. Treatment with five doses of anti-rabies vaccine was conducted in 38.6% of cases per year (Table 2).

5. Discussion

The incidence of animal bites in Eastern Ahvaz had an upward-downward trend during the study period with 2493 victims in total. The incidence of animal bites increased from 104 cases in 2011 to 124 cases in 2013 per 100,000 individuals, placing Ahvaz among the moderate endemic regions based on Tabatabaai et al.'s classification with an incidence of 100 to 300 cases per 100,000 people (4). Moreover, different studies reported an increased incidence of animal bites in different regions of Iran from 35 cases in 1988 to 151 in 2001 per 100,000 people (10). In a similar study conducted by Sabouri Ghannad et al., the incidence of animal bites increased from 34 cases in 1999 to 98 in 2008 per 100,000 people (11). In a study conducted in Rafsanjan in Southern Iran, the incidence of animal bites increased from 180 cases in 2003 to 214 in 2004 per 100,000 people (12). This result is consistent with the findings of the current study. Although the reason behind this increased incidence in animal biting is unknown, it may be due to the increased number of health-medical centers covering a larger population and encouraging more people to visit such centers. Another reason can be an increase in the number of stray dogs (13).

A study conducted by Pandey et al. on tourists and foreign residents in Nepal showed higher prevalence of rabies-infected bites among females than males (14); however, the number of male animal bite victims was higher than females, which is consistent with the results of other studies in Iran concerning the gender distribution of animal bites. For example, males accounted for 76% of animal bite victims in Kerman (Bahonar et al. (15)), 75% in Ardabil

Table 1. Distribution of Animal Bite Cases in East of Ahvaz County, Southwestern Iran (2011 - 2013) Based on Age , Gender, Job and Residency^a

Variables	Years			Total
	2011	2012	2013	
Age group				
0 - 4	62 (9.0)	75 (7.8)	43 (5.1)	180 (7.2)
5 - 10	113 (16.3)	149 (15.5)	71 (8.5)	333 (13.4)
11 - 20	140 (20.2)	168 (17.5)	128 (15.2)	436 (17.5)
21 - 30	125 (18.1)	219 (22.8)	199 (23.7)	543 (21.8)
31 - 40	112 (16.2)	127 (13.2)	171 (20.3)	410 (16.4)
41 - 50	63 (9.1)	91 (9.5)	112 (13.3)	266 (10.7)
51 - 60	58 (8.4)	97 (10.1)	80 (9.5)	235 (9.4)
> 61	19 (2.7)	34 (3.6)	37 (4.4)	90 (3.6)
Total	692 (100)	960 (100)	841 (100)	2493 (100)
Gender				
Male	534 (77.2)	768 (80.0)	608 (72.3)	1910 (76.6)
Female	158 (22.8)	192 (20.0)	233 (27.7)	583 (23.4)
Total	692 (100)	960 (100)	841 (100)	2493 (100)
Job group				
Rancher	7 (1.0)	4 (0.4)	11 (1.3)	22 (0.9)
Employee	46 (6.7)	83 (8.7)	87 (10.3)	216 (8.7)
Self-employed	151 (21.8)	216 (22.5)	249 (29.6)	616 (24.7)
Worker	49 (7.1)	42 (4.4)	92 (10.9)	183 (7.3)
Housewife	66 (9.5)	81 (8.4)	124 (14.8)	271 (10.9)
Student	199 (28.8)	232 (24.2)	137 (16.3)	568 (22.8)
Others	174 (25.1)	302 (31.4)	141 (16.8)	617 (24.7)
Total	692 (100)	960 (100)	841 (100)	2493 (100)
Residence area				
Urban	433 (62.6)	627 (65.3)	560 (66.6)	1620 (65.0)
Rural	259 (37.4)	333 (34.7)	281 (33.4)	873 (35.0)
Total	692 (100)	960 (100)	841 (100)	2493 (100)

^aValues are expressed as No. (%).

(Majidpour et al. (16)), 73.2% in Ilam (Bahonar et al. (6)), 80% in Ahvaz (Kassiri et al. (17)), 77.6% in Shush (Kassiri et al. (18)), and 72.5% in Islamabad-Gharb (Kassiri et al. (19)). It seems that the greater exposure of males to animals, specifically in rural areas, is the reason behind this difference. On the other hand, a study conducted in the United States showed higher prevalence of animal bites among females (20), which is inconsistent with the current findings. This difference can be attributed to cultural differences between the two countries. For example, household pets, typically seen in American homes, are uncommon in Iran.

The majority of animal bite victims belonged to the 20 to 30 age range, which is consistent with the findings of

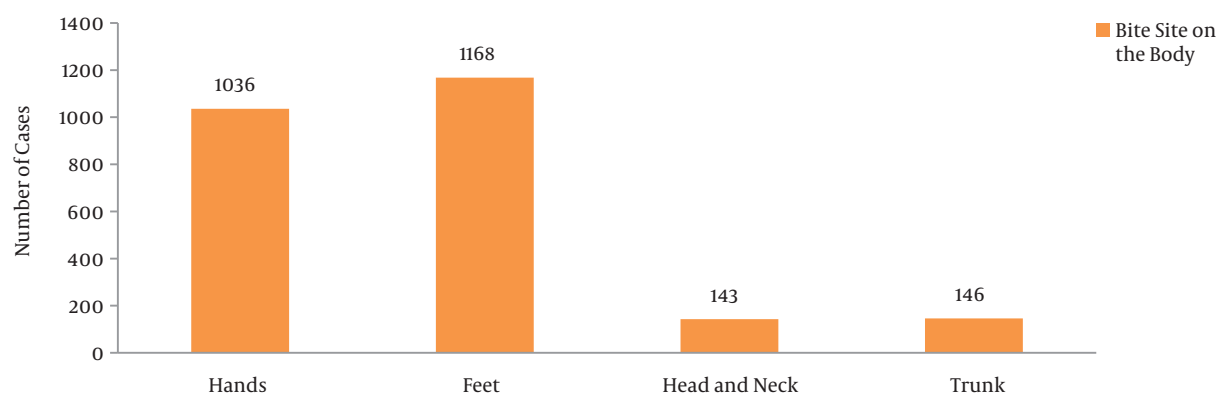
Naghibi et al. in Mazandaran (with the highest incidence in 20 to 30 age group) (21), Ramazani et al. (with the highest incidence in 11 to 30 age group) (22), and Dehghani et al. (with the highest incidence in 10 to 30 age group) (23). This can be accounted for by the active and adventurous personality of this age group, which may stimulate animals.

In terms of occupation, the majority of animal bite victims were self-employed (24.7%), followed by students (22.8%). Fayaz et al. (24), Naghibi et al. (21), Dadypour et al. (7), Kassiri in Ahvaz (17) and Kassiri in Shush (18) reported that the majority of animal bites occurred among students; however, in the study by Kassiri et al. in Islamabad-Gharb (19) and Amiri and Khosravi (25), employees made

Table 2. Distribution of Animal Bite Cases in East of Ahvaz County, Southwestern Iran (2011-2013) Based on Type of Biting Animal, Bite Site, Season and Type of Rabies Vaccination^a

Variables	Years			Total
	2011	2012	2013	
Type of biting animal				
Dog	566 (81.8)	752 (78.3)	636 (75.6)	1954 (78.4)
Cat	82 (11.8)	168 (17.5)	182 (21.7)	432 (17.3)
Others	44 (6.4)	40 (4.2)	23 (2.7)	107 (4.3)
Total	692 (100)	960 (100)	841 (100)	2493 (100)
Bite site				
Hands	283 (40.9)	381 (39.7)	372 (44.2)	1036 (41.6)
Feet	330 (47.7)	466 (48.5)	372 (44.2)	1168 (46.9)
Head and neck	40 (5.8)	52 (5.4)	51 (6.1)	143 (5.7)
Trunk	39 (5.6)	61 (6.4)	46 (5.5)	146 (5.8)
Total	692 (100)	960 (100)	841 (100)	2493 (100)
Season				
Spring	181 (26.2)	242 (25.2)	243 (28.9)	666 (26.7)
Summer	160 (23.1)	222 (23.1)	204 (24.3)	586 (23.5)
Autumn	178 (25.7)	235 (24.5)	214 (25.4)	627 (25.2)
Winter	173 (25.0)	261 (27.2)	180 (21.4)	614 (24.6)
Total	692 (100)	960 (100)	841 (100)	2493 (100)
Type of rabies vaccination				
Incomplete	428 (61.8)	574 (59.8)	529 (62.9)	1531 (61.4)
Complete	264 (38.2)	386 (40.2)	312 (37.1)	962 (38.6)
Total	692 (100)	960 (100)	841 (100)	2493 (100)

^aValues are expressed as No. (%).

**Figure 2.** Bite site distribution of the animal bite cases during 2011 to 2013, in East of Ahvaz county, Southwestern Iran

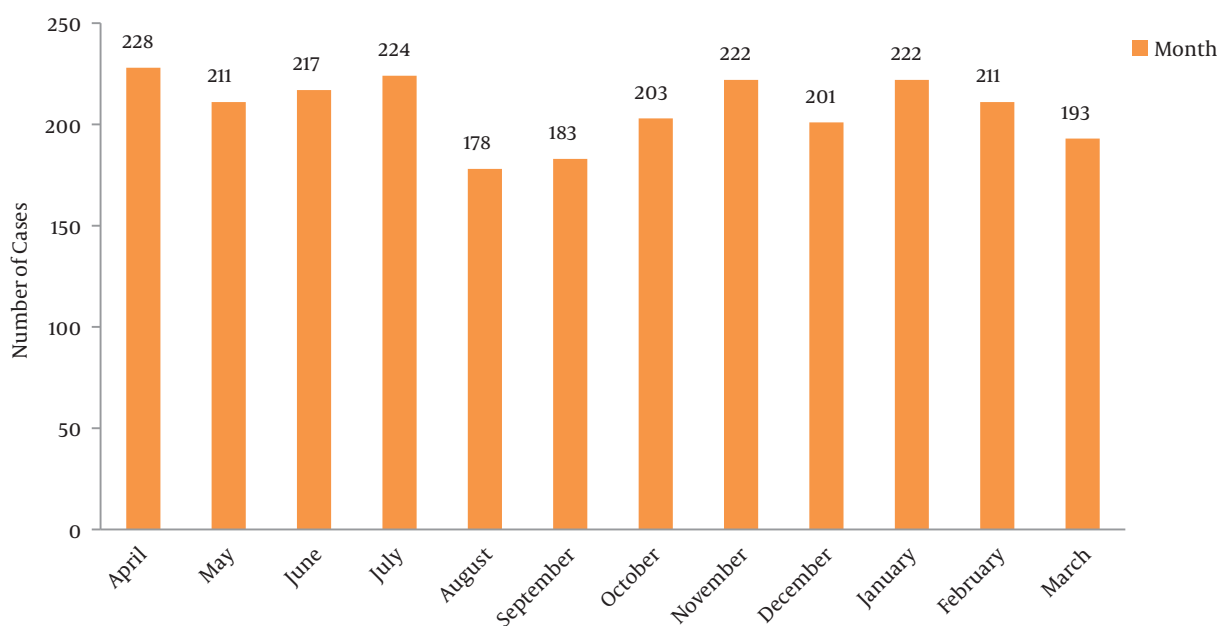
up the majority of animal bite victims. The high number of victims among self-employed individuals may be due to their job conditions, longer outdoor presence, and greater exposure to animals. In a study by Sriarsoon et al., two

waves of increased animal bites coinciding with school holidays time were identified, during which the probability of exposure to animals was higher due to naughty behavior and stimulation of animals, specifically dogs, by

Table 3. Distribution of Animal Bite Cases in East of Ahvaz County, Southwestern Iran (2011-2013) Based on Month^a

Months	Years			Total
	2011	2012	2013	
April	61 (8.8)	88 (9.2)	79 (9.4)	228 (9.2)
May	64 (9.3)	74 (7.7)	73 (8.7)	211 (8.5)
June	56 (8.2)	79 (8.2)	82 (9.8)	217 (8.7)
July	52 (7.5)	87 (9.0)	85 (10.1)	224 (9.0)
August	58 (8.4)	70 (7.3)	50 (6)	178 (7.1)
September	50 (7.2)	65 (6.8)	68 (8.1)	183 (7.3)
October	56 (8.1)	64 (6.7)	83 (9.7)	203 (8.1)
November	64 (9.2)	86 (8.9)	72 (8.7)	222 (8.9)
December	75 (8.2)	85 (8.9)	59 (7)	201 (8.1)
January	68 (9.8)	100 (10.4)	54 (6.4)	222 (8.9)
February	52 (7.5)	89 (9.3)	70 (8.3)	211 (8.5)
March	54 (7.8)	73 (7.6)	64 (7.8)	193 (7.7)
Total	692 (100)	960 (100)	841 (100)	2493 (100)

^aValues are expressed as No. (%).

**Figure 3.** Month distribution of the animal bite cases during 2011 to 2013, in East of Ahvaz county, Southwestern Iran

students (26). Given that the highest incidence of animal bites occurs among adolescents and students, paying greater attention to them to increase their knowledge about rabies, keeping their distance from stray dogs, and following protective instructions when facing these animals have a significant role in reducing the incidence of

animal bites.

Among injured organs, legs with incidence of 46.9% represented the most affected body organ, which can be attributed to adjacency and higher accessibility of legs to animals. According to a study conducted in the Caspian Sea and Persian Gulf coasts, 49.2% of injuries were on the legs

(27). Consistent results were also obtained from another study conducted in Ilam province (Western Iran) between 1994 and 2003 (6); whereas, Riahi et al. reported upper extremities, such as the hand, forearm, arm and shoulders, as the most injured areas (28), which is not consistent with the findings of this study. This difference can be attributed to the fact that in the Ahvaz region, dogs are used to guard the herds and homes; whereas, in Riahi' study, dogs were kept as pets, and thus hands were the most exposed area to bites.

Results of this study showed that dogs, followed by cats, were the major causes of bites in Eastern Ahvaz with 78.4% and 17.3% cases, respectively. In a three-year study (2004-2006), Eslamifar et al. showed that dogs (65.9%), followed by cats (25.4%), represented the highest number of animal bites in Tehran (10). These findings are consistent with those of the current study. Warrell reported that 80% to 85% of animal bites were associated with dogs and 10% with cats (29), which is consistent with the current study. Quiles Cosme et al. (30) and Takayama (31), along with three studies conducted by Kassiri et al. in Shush, Ahvaz, and Islamabad-Gharb (17-19) showed that dogs accounted for the majority of animal bite cases. In a study conducted by Kilic et al., 83.7% of cases of animal bites were associated with dogs, followed by monkeys and cats (32). In a similar study conducted in Southern Iran, the majority of animal bites were associated with dogs (74%) and cats (23%), with only 3% of cases attributable to other animals (monkeys, mice, foxes, and donkeys) (12). Moreover, in a study conducted in Western Iran, 3942 cases (82.2%) of animal bites were associated with dogs (11). This can be attributed to the use of dogs as a guard in these regions.

In the current study, animal bites were relatively more common in spring, which is consistent with the findings of Charkazi et al. and Dadypour et al. (7, 33); however, Bahonar et al. reported higher incidence of animal bites during winter (6). Researchers attribute higher prevalence of animal bites in spring to more active life in rural areas, greater agricultural activities, and the beginning of the grazing season. With respect to winter, it is attributed to higher activities of animals in search of food (10, 34).

With respect to diagnosis, treatment and prevention of rabies, vaccination without serum should be administered for domestic animal bites associated with slight scratch and non-bleeding wounds; however, vaccination with serum should be administered to bleeding wounds. If the aggressive animal (dog and cat) is quarantined and survives after 10 days, further vaccination after the third dose, i.e. the seventh day, is not necessary. In addition, any type of bite inflicted by wild animals requires serum injection containing anti-virus rabies antibody at the rate of 20 units per kilogram of body weight along with vaccina-

tion on days 0, 3, 7, 14, and 28, following bite (35). A study conducted in Yazd on 416 animal bite cases showed that 99.5% received vaccination; however, vaccination course was incomplete in 404 cases (97.1%), and only 12 cases (2.9%) received a complete vaccination course (1). In Qom, 81.5% of victims received incomplete vaccination course (three times), and the remaining received complete vaccination course (five times) (36). In the current study, 61.8%, 59.8%, and 62.9% cases received incomplete vaccination courses (less than five times) and 38.2%, 40.2%, and 37.1% of cases received complete vaccination courses in 2011, 2012, and 2013, respectively. The frequency of five-time vaccination course was higher in Eastern Ahvaz compared with other studies. This trend is indicative of the need for the implementation of control programs (vaccination and control of stray dogs and cats) to diminish the economic-health burden associated with animal bites. Results showed that there were some limitations for the study, including not referring all patients to health centers of the County and passive case finding. Also, the type of data gathering form used in the current study was unable to assess the patients' education level, married status and so on. A strong point of this study was the use of experienced staff to interview and fill in the questionnaire form.

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Footnotes

Conflict of Interests: The authors declare no conflict of interest.

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References

1. Hoboobati MM, Dehghani MH, Sarvat F. [A ten years record of animal bite cases of patients referred to nikoopour health center, Yazd, 1990-1999]. *J Shahid Sadoughi Univ Med Sci Health Serv.* 2002;9(4):117-2. Persian.
2. Rezaeinasab M, Rad I, Bahonar AR, Rashidi H, Fayaz A, Simani S. [The Prevalence of rabies and animal bites during 1994 to 2003 in Kerman province, southeast of Iran]. *Iran J Veter Res.* 2007;8(4):343-50. Persian.
3. Sharifeian J, Simani S, Shirzadi MR, Fayaz A, Hooshmand B. *Guideline state rabies disease.* Tehran: Seda Publication; 2003. 9 p. Persian.

4. Tabatabaai M, Zahraei M, Ahmadnia H, Ghotbi M, Rahimi F. *Principles of disease prevention and surveillance*. 2th ed. Tehran: Rooheghalam; 2006. p. 61-7. Persian.
5. Hatami H. Epidemiology and rabies control. In: Hatami H, editor. *Text book of public health*. Tehran: Shahid Beshti University of Mdical Sciences Publication; 2009. p. 1170-81. Persian.
6. Bahonar AR, Bokae S, Khodaverdi KH, Nikbakht-Broogeni GR, Rad MA. [Epidemiology of rabies and animal biting in province Ilam]. *Iran J Epidemiol*. 2008;**4**(1):47-51. Persian.
7. Dadypour M, Salahi R, Ghezelsoufa F. [Epidemiological survey of animal bites in Kalaleh district, North of Iran (2003-05)]. *Sci J Gorgan univ med sci*. 2009;**11**(1):76-9. Persian.
8. Fredrick M, Abrahamian J, Ellie J B. In: Gorbach S, Bartlett J, Black Low N, editors. *Infectious disease*. 3th ed. Philadelphia: Sunders; 2004. p. 1440-5.
9. Mazaheri V, Holakouie Naieni K, Simani S, Yunesian M, Biglari P, Mostafavi E. [Geographical distribution of animal bite and rabies in the Caspian Sea littoral provinces during 2002-2007]. *J Sch Public Health Inst Pub Health Res*. 2010;**8**(3):37-46. Persian.
10. Eslamifar A, Ramezani A, Razzaghi-Abyaneh M, Fallahian V, Mashayekhi P, Hazrati M, et al. Animal bites in Tehran, Iran. *Arch Iran Med*. 2008;**11**(2):200-2. [PubMed: 18298299].
11. Sabouri Ghannad M, Roshanaei G, Rostampour F, Fallahi A. An epidemiologic study of animal bites in Ilam Province, Iran. *Arch Iran Med*. 2012;**15**(6):356-60. [PubMed: 22642245].
12. Sheikholeslami NZ, Rezaeian M, Salem Z. Epidemiology of animal bites in Rafsanjan, southeast of Islamic Republic of Iran, 2003-05. *East Mediterr Health J*. 2009;**15**(2):455-7. doi: 10.26719/2009.15.2.455. [PubMed: 19554994].
13. Dhand NK, Gyeltshen T, Firestone S, Zangmo C, Dema C, Tenzin, et al. Dog bites in humans and estimating human rabies mortality in rabies endemic areas of Bhutan. *PLoS Negl Trop Dis*. 2011;**5**(11). e1391. doi: 10.1371/journal.pntd.0001391. [PubMed: 22132247]. [PubMed Central: PMC3222627].
14. Pandey P, Shlim DR, Cave W, Springer MF. Risk of possible exposure to rabies among tourists and foreign residents in Nepal. *J Travel Med*. 2002;**9**(3):127-31. doi: 10.2310/7060.2002.23219. [PubMed: 12088577].
15. Bahonar AR, Rashidi H, Simani S, Haghdoost AA, Rad MA. [Rabies prevalence and frequency of animal bites in Kerman Province, 1993-2003]. *Payesh J*. 2005;**5**(1):21-7. Persian.
16. Majidpour A, Arshi S, Sadeghi H. [Epidemiological survey of animal bites in Ardebil province, (2000)]. *J Ardebil Univ Med Sci*. 2003;**3**(10):39-43. Persian.
17. Kassiri H, Kassiri A, Mosavi R, Jashireh A, Lotfi M. Prevalence rate and epidemiological determinants of animal bite in Ahvaz County, Khuzestan Province, Southwestern Iran. *J Acute Dis*. 2014;**3**(1):51-5. doi: 10.1016/s2221-6189(14)60011-1.
18. Kassiri H, Kassiri A, Lotfi M, Shahkarami B, Hosseini SS. Animal bite incidence in the County of Shush, Iran. *J Acute Dis*. 2014;**3**(1):26-30. doi: 10.1016/s2221-6189(14)60006-8.
19. Kassiri H, Kassiri A, Pourpolad-Fard M, Lotfi M. The prevalence of animal bite during 2004-2008 in Islamabad-Gharb county, Kerman-shah province, Western Iran. *Asian Pac J Trop Med*. 2014;**4**:342-6. doi: 10.1016/s2222-1808(14)60468-0.
20. Freeman AJ, Senn DR, Arendt DM. Seven hundred seventy eight bite marks: analysis by anatomic location, victim and biter demographics, type of crime, and legal disposition. *J Forensic Sci*. 2005;**50**(6):1436-43. doi: 10.1520/JFS2005178. [PubMed: 16382842].
21. Naghibi A, Yazdani Charati J, Shojaie J. [Epidemiological characteristic of animal-bite cases in Mazandaran, 2004-2011]. *J Mazandaran Univ Med Sci*. 2014;**24**(117):218-24. Persian.
22. Ramazani A, Eslami Far A, Islami N, Nazguny F. [Epidemiology of animal rabies in Tehran (2002-2003)]. *Iran J Infect Dis*. 2004;**9**(25):30-5. Persian.
23. Dehghani R, Sharif MR, Sharif AR, Moghimi A, Ashaari A, Hosseini MA. [Epidemiology of animal bite in Samirom in 2008 to 2012]. *Iran J Infect Dis Trop Med*. 2013;**18**:45-8. Persian.
24. Fayaz A, Simani S, Janani AR, Farahtaj F, Esfandyari B, Eslami N. [Epidemiological survey of rabies in Mazandaran province during 1996-2006]. *J Babol Uni Med Sci*. 2009;**11**(5):70-5. Persian.
25. Amiri M, Khosravi A. [Animal bites epidemiology in Shahrud city]. *Knowledge Health*. 2009;**4**(3):41-3. Persian.
26. Sriaroon C, Sriaroon P, Daviratanasilpa S, Khawplod P, Wilde H. Retrospective: animal attacks and rabies exposures in Thai children. *Travel Med Infect Dis*. 2006;**4**(5):270-4. doi: 10.1016/j.tmaid.2005.06.001. [PubMed: 16905457].
27. Behzad E. Serodiagnosis evaluation of rabies and animal bites in North of Iran, 2010. *J Gen Mol Virol*. 2011;**3**(5):71-3. doi: 10.5897/jgmvi1.019.
28. Riahi M, Latifi M, Bakhtyari M, Yavari P, Khezeli M, Hatami H. [Epidemiologic survey of animal bites and causes of delay in getting preventive treatment in Tabbas during 2005-2010]. *J Toloo-e-Behdasht*. 2012;**11**(1):20-31. Persian.
29. Warrell DA. Rhabdoviruses: rabies and rabies-related viruses. In: Weatherall DJ, Ledingham JGG, Warrell DA, editors. *Oxford textbook of medicine*. 2nd ed. Oxford: Oxford Medical Publication; 1986.
30. Quiles Cosme GM, Perez-Cardona CM, Aponte Ortiz FI. [Descriptive study of animal attacks and bites in the municipality of San Juan, Puerto Rico, 1996-1998]. *P R Health Sci J*. 2000;**19**(1):39-47. Spanish. [PubMed: 10761204].
31. Takayama N. [Study on the subjects received postexposure rabies vaccination in our vaccine clinic]. *Kansenshogaku Zasshi*. 1995;**69**(1):73-8. Japanese. doi: 10.1150/kansenshogakuzasshi970.69.73. [PubMed: 7751739].
32. Kilic B, Unal B, Semin S, Konakci SK. An important public health problem: rabies suspected bites and post-exposure prophylaxis in a health district in Turkey. *Int J Infect Dis*. 2006;**10**(3):248-54. doi: 10.1016/j.ijid.2005.05.010. [PubMed: 16458565].
33. Charkazi A, Behnampour N, Fathi M, Esmaeili A, Shahnazi H, Heshmati H. Epidemiology of animal bite in Aq Qala city, northern of Iran. *J Educ Health Promot*. 2013;**2**:13. doi: 10.4103/2277-9531.112682. [PubMed: 24083263]. [PubMed Central: PMC3778582].
34. Pfukenyi DM, Pawandiwa D, Makaya PV, Ushewokunze-Obatolu U. A retrospective study of rabies in humans in Zimbabwe, between 1992 and 2003. *Acta Trop*. 2007;**102**(3):190-6. doi: 10.1016/j.actatropica.2007.04.013. [PubMed: 17543871].
35. Zeynali M, Fayaz A, Nadim A. Animal bites and rabies situation in Iran. *Arch Iranian Med*. 1999;**2**:120-4.
36. Saghafipour A, Noroozei M, Pahlevani S, Akbari Z. [Epidemiology of animal bites in Qom Province during 2007-2012, Iran]. *Qom Univ Med Sci J*. 2014;**8**(1):42-7. Persian.