

# A Three-Year Epidemiological Study of Animal Bites and Rabies in Hamedan Province of Iran

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## Abstract

**Background:** Rabies is an almost invariably fatal disease that is associated with animal bites. Hence, gathering data about cases of animal bites can help in clarifying the relative status of the disease.

**Objectives:** This study was conducted to provide an epidemiological overview on animal bites and rabies occurred in Hamedan province, Iran, during 2011 - 2013.

**Methods:** This cross sectional descriptive study was conducted in Hamedan province, Iran. The information was retrieved from the vice-chancellor for health (Hamedan University of Medical Sciences) and veterinary directorate general of Hamedan province. The data were analyzed using the SPSS software. The Chi-square test was used to determine statistically significant differences with P values less than 0.05.

**Results:** There was just one report of rabies death during the mentioned period. The total number of reported animal bites was 14327 with the incidence of 2.69 cases/1000 individuals, which included 3287 (22.9%) women and 11040 (77.1%) men. Of these cases, 9868 (68.9%) resided in rural areas, while 4459 (31.3%) were urban residents. Most animal bites, 3516 (24.54%) cases, occurred in the 20 - 29 year-old age group. The lower limbs injuries were significantly higher than other sites with 7462 (52.08%) records. In addition, the majority of people were bitten by dogs (11040 cases, 77%).

**Conclusions:** This study indicated that the incidence of animal bites was increased during 2011 - 2013 in Hamedan province. Therefore, it seems necessary to take appropriate educational programs along with both pre-exposure immunization and postexposure prophylaxis to control this infection in the region.

**Keywords:** Rabies, Animal Bites, Hamedan

## 1. Background

Rabies is one of the oldest and most feared diseases of humans and animals, which occurs or has occurred throughout the world. However, certain regions have never reported domestic rabies (eg, Japan). The disease is caused by rabies virus, which can infect all mammals and its infection virtually always results in death (1). The virus is classified in Lyssavirus genus within the family Rhabdoviridae (2). Two epidemiological patterns including urban and sylvatic, which are transmitted by dogs and wild animals respectively, could contribute to rabies infection (3). Human infection is dominantly caused through either biting or skin erosions. Nevertheless, inhalation of aerosols, flaying of animals and contact with mucosa should be also brought to notice. Animal bite is conventionally occurred by dogs (80% - 85% of cases); however, cats as well as other animals such as bats, monkeys and rabbits are also important. Prevention of rabies in humans

includes pre-exposure immunization and post exposure prophylaxis (PEP), which is conducted through human rabies immunoglobulins (HRIG) (4, 5). Annually, this disease inflicts 33 000 casualties, the absolute majority (30 000 cases) occurs in India. The disease is distributed in all of the countries except for Antarctica. Nevertheless, the most of rabies deaths occur in Africa and Asia (95% of global deaths) (6). The disease constitutes a crucial dilemma in Iran, Turkey, Saudi Arabia, Yemen, and other Middle East countries. In Iran, this disease is reported in nearly all of the provinces. In 2008, Pasteur institute reported 131431 cases of animal bites of suspected exposure to rabies. These individuals were dominantly bitten by dogs (85.2%) (7). It seems that more people refer to PEP when public knowledge increases regarding animal bites and rabies casualties. Besides, there is an indispensable need for epidemiological investigation of rabies due to escalation of stray dogs, animal bites and extensive distribution of the disease (8). To our knowledge, there are not sufficient data

about the epidemiological features of rabies in Hamadan Province of Iran, which seems to be a zoonotic area for this disease.

## 2. Objectives

The present study aimed to evaluate three-year incidence of animal bites and rabies in humans in Hamedan province from 2011 to 2013.

## 3. Methods

The study population in the present study comprised the resident humans in Hamadan province, Iran, who were exposed to rabies infection and/or animal bites during 2011 - 2013. Factors including species of biting animals, demographic data of bitten individuals, occupations, living locations, bitten limbs, and those who manifested the disease were taken into account. However, only those bitten individuals were included who referred to outpatient clinics due to rabies phobia and received PEP. These data were retrieved from the vice-chancellery for health, Hamedan University of Medical Sciences and veterinary directorate general of Hamedan province. Finally, the chi-square test was used to analyze the relationship among variables and the data were analyzed using the SPSS software. Differences between groups were considered to be statistically significant when P values were less than 0.05.

## 4. Results

From 2011 to 2013, there was just one report of rabies death in a man who fed a rabid dog in Tuyserkan (Hamadan, Iran). This man passed away since he did not meet the need for PEP. Diagnosis of the disease was based on the patient's history and clinical signs. On the other hand, as 14327 cases of animal bites were totally reported, the mean prevalence was approximately 2.7 (cases) /1000 (individuals) (Table 1). The numbers of male and female cases were 11040 (77.1%) and 3278 (22.9%), respectively and based on the statistical analysis, animal bite was significantly associated with sex ( $P < 0.05$ ). Moreover, out of 14327 injured people, 4459 (31.3%) cases lived in urban areas, while 9868 (68.9%) settled in rural areas (Table 1). As shown in the Figure 1, bitten individuals were dominantly placed in a group contained people aged from 20 to 29 years (24.54%), whereas people with the age of more than 70 years were less frequently bitten (3.67% of the cases). In comparison with the other occupational groups, farmers were the most frequently bitten (21.40% of the cases), while veterinarians, butchers, as well as slaughterhouse workers

(0.07%) were equally and less frequently bitten (Table 2). Besides, legs and neck were the most and less bitten organs, respectively (52.1% and 0.3% of the cases) and out of 14327 cases of animal bites, 11040 cases were dog bites, which constituted 77% of the cases.

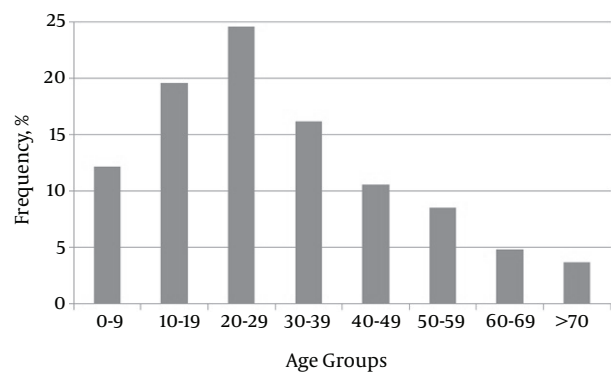


Figure 1. Frequency and Prevalence Rates of Animal Bite Cases Based on the Age Groups (Years)

## 5. Discussion

Animal bite is assumed as health dilemma when it jeopardizes human life due to rabies. This mortal and pandemic disease is under constant close surveillance. In fact, bitten individuals would be treated through vaccination protocol aiming PEP (9). The present study showed that animal bites increased from 2.48 (cases) /1000 (individuals) in 2011 to 2.849/1000 in 2013. However, several prevalence rates have been published from different regions. Kassiri et al. showed that the incidence of animal bites increased from 1.77 / 1000 to 1.88 / 1000 in Ahvaz (Iran) during 2004 - 2007 (10). In another study conducted in Kalaleh (Golestan, Iran), the rate of animal bites was very high and almost equal in the years 2003 (745/1000), 2004 (787/1000) and 2007 (788/1000) (11). There are also other epidemiological studies, which have reported increase in the incidence of animal rabies in Iran (12, 13).

The statistics revealed that 11040 out of 14327 animal bites occurred in males (77.1%), whereas females (3278 cases; 22.9%) were less frequently bitten and the Chi-square test showed that this difference was statistically significant ( $P < 0.05$ ), indicating an occupational nature of the disease. This is in agreement with other studies, which noted that males were significantly more bitten in comparison to females (9, 10).

On the other hand, statistical comparison of two rural and urban residents revealed that life location is a determinant factor and residents in rural areas were signif-

**Table 1.** Frequency and Prevalence Rates of Animal Bite Cases Based on the Gender, Residential Areas and Biting Animals

Year	Prevalence/1000	Sex		Residential areas		Biting animal		Total No. (%)
		Female No. (%)	Male No. (%)	Rural No. (%)	Urban No. (%)	Others No. (%)	Dog No. (%)	
2011	2.48	1035 (23.7)	3333 (76.3)	3019 (69.1)	1349 (30.9)	1035 (23.7)	3333 (76.3)	4368 (30.5)
2012	2.79	1195 (24.2)	3743 (75.8)	3391 (68.7)	1547 (31.3)	1195 (24.2)	3743 (75.8)	4938 (34.5)
2013	2.82	1057 (21)	3964 (79)	3458 (68.9)	1563 (31.1)	1057 (21.1)	3964 (78.9)	5021 (35)
<b>Total</b>	-	3287 (22.9)	11040 (77.1)	9868 (68.9)	4459 (31.1)	3287 (23)	11040 (77)	14327 (100)

**Table 2.** Frequency and Prevalence Rates of Animal Bite Cases by Occupations

Job Group	Year			Total No. (%)
	2011 No. (%)	2012 No. (%)	2013 No. (%)	
Children	258 (5.91)	368 (7.45)	309 (6.15)	935 (6.53)
Student	892 (20.42)	1035 (20.96)	973(19.38)	2900 (20.25)
Housewife	679 (15.54)	862 (17.46)	737 (14.68)	2275 (15.88)
Ranch or Farmer	916 (20.97)	1028 (20.66)	1129 (22.49)	3065 (21.40)
Worker	329 (7.53)	368 (7.45)	349 (6.95)	1046 (7.30)
Employee	102 (2.34)	109 (2.21)	125 (2.49)	336 (2.35)
Military	15 (0.34)	19 (0.38)	51 (1.02)	85 (0.59)
Veterinarian	2 (0.05)	1 (0.02)	7 (0.14)	10 (0.07)
Abattoir worker	2 (0.05)	5 (0.10)	3 (0.06)	10 (0.07)
Butcher	2 (0.05)	6 (0.12)	2 (0.04)	10 (0.07)
Self-employed	743 (17.01)	733 (14.84)	905 (18.02)	2381 (16.62)
Others	428 (9.80)	412 (8.34)	431 (8.58)	1271 (8.87)
<b>Total</b>	4368 (100)	4938 (100)	5021 (100)	14327 (100)

icantly ( $P < 0.001$ ) more bitten (9868 individuals; 68.9%) than urban inhabitants (4459 individuals; 31.1%). Indeed, due to their occupation and lifestyle, residents in rural area are often in contact with animals, which may lead to a higher risk of being bitten. In the case of the age groups, individuals aged from 20 to 29 years, and those with the age of more than 70 years formed the most and least bitten, respectively. Similar results were found in other studies conducted in Tehran (Iran) and Birjand (Southern Khorasan, Iran), where the frequencies of animal bites in a 20-29 year old age group were 30.1% and 23.9%, respectively (7, 14). However, in some studies which were performed in Kerman (Iran), Kalaleh (Lahijan, Iran), Ilam (Iran), and Ahvaz (Khouzestan, Iran), individuals in 10 - 19 years old age group constituted most dominantly bitten ones (25.76%, 32.3%, 26%, and 32.8%, respectively) (10, 11, 15, 16). Interestingly, in another study which was implemented in Boroujerd, most of the animal bites occurred in children less than 10 years of age (12). As rabies virus has a tissue tropism,

the site of the animal bite is extremely important and the infection is dependent on the location of the bite (4). In our study, 7462 (52.08%) out of 14327 cases had bites on the lower extremities. Lower extremities were also the most common sites for animal bites in other studies, which were conducted in Tehran, Ahvaz, Ilam and Khuzestan (in 38.11%, 61.4%, 71.8%, and 58.1% of the cases, respectively) (7, 10, 16, 17). In Boroujerd, which shares common border with the Hamadan Province, it was shown that legs (46.6%) and hands (41.8%) were much more bitten, whereas buttocks (4.6%) and heads (4%) were rarely bitten (12). It seems that the frequencies of animal bites in different sites are affected by human lifestyles. Indeed, wild animals mostly bite the legs whilst hands are much more bitten by pet animals.

In our study, farmers were the most frequently bitten by comparison. To elaborate, out of 14 327 animal bites, 3065 cases occurred in a ranch or farmer group (21.40%), followed by students (20.25%), self-employed (16.62%) and

**Table 3.** Frequency and Prevalence Rates of Animal Bite Cases Based on the Sites of the Bites

Years/ Bit Sites	2011 No. (%)	2012 No. (%)	2013 No. (%)	Total No. (%)
Heads	54 (1.24)	29 (0.59)	35 (0.70)	118 (0.82)
Faces	72 (1.65)	97 (1.96)	83 (1.65)	252 (1.76)
Necks	16 (0.37)	13 (0.26)	18 (0.36)	47 (0.33)
Trunks	173 (3.96)	110 (2.23)	75 (1.49)	358 (2.50)
Waist	100 (2.29)	176 (3.56)	175 (3.49)	451 (3.15)
Upper extremities	1662 (38.05)	1953 (39.55)	2024 (40.31)	5639 (39.36)
Lower extremities	2291 (52.45)	2560 (51.84)	2611 (52.00)	7462 (52.08)
<b>Total</b>	<b>4368 (100)</b>	<b>4938 (100)</b>	<b>5021 (100)</b>	<b>14327 (100)</b>

housewife (15.88%) groups. In a study performed by in Kerman (Iran), Rezaeinasab et al. showed that absolute majority (60%) of animal bites occurred in farmers and workers (15). In another study, which was carried out in Birjand, frequencies of animal bites in students, farmers, workers, and employees were 15.6%, 15%, 12.8%, and 8.1%, respectively (14). It seems that farmers as well as the students who work in fields are at a higher risk of being exposed to animal bites.

The present study showed that the majority (77%) of the animal bites occurred through dogs and dog bites were significantly higher than the others ( $P < 0.001$ ). Meanwhile, dog bites also constituted the most prevalent animal bites in other studies, which were implemented in Tehran (65.9%), Ilam (89.2%), Kerman (50%), and Ahvaz (91.3%) (7, 10, 15, 17). On one hand, dog bite is more crucial since there is more likelihood of infectious wounds due to the dog's teeth, which can cause deep tissue injuries. On the other hand, in the Asian countries, a rabies virus which is transmitted by dogs is the most common viral variant and it can cause rabies providing that the biting animal makes deep tissue injuries (18). It seems that the vast majority of dog bites may be caused due to more frequent human exposure to sheepdogs, stray dogs, and pets.

To conclude, since animal husbandry is a common occupation in Hamadan Province, more efficient strategies aiming prevention of rabies should be implemented in this region. To elaborate, primary health cares (PHCs) should promote public knowledge regarding "rabies is not only fatal but also a preventive illness which can be precluded through human and animal vaccination". In practice, oral vaccination strategies and more accurate vaccination programs, which aim stray dogs and sheepdogs respectively, should be considered.

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