Epidemiological patterns of animal bites in Abadeh district of central Iran from 2012 to 2018: A cross−sectional study

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ABSTRACT

Objectives: To investigate the epidemiology of animal bites and associated factors in Abadeh district (central Iran) from 2012 to 2018.

Methods: In this cross-sectional study, 1 407 individuals with animal bites who were referred to the Abadeh Rabies Treatment Center were investigated by using the census method from 2012 to 2018. The variables included the victim's demographic information (age, gender, occupation), the type of biting animals (dog, cat, and other animals), the domesticated and wild animals, the time of biting based on year and month, the residence location (urban or rural), the treatment status, and the anatomical location of the wounds.

Results: The annual incidence rate of animal bites was 189.62 per 100 000 population. Totally 83.4% of the victims were male. The average age was (33.66±18.97) years and individuals in the age range of 36-50 years were greater at risk. Most of the animal bites were from dogs (77.8%). About two thirds (62.1%) of the bites were from household animals. A total of 57.1% of individuals lived in urban areas. Most victims were engaged in farming and animal husbandry. The highest prevalence of animal bites (37.4%) happened in the summer. None of the patients had any clinical signs of rabies.

Conclusions: To reduce the incidence of animal bites, high-risk groups including farmers and ranchers should be educated about bite prevention, and it should be ensured that they are managed correctly.

1. Introduction

Rabies is a fatal disease which can be prevented by the timely implementation of vaccination after exposure[1-3]. This disease can transmit to humans through bites of infected animal such as dogs, cats[4]. The domestic animals such as cats and dogs are responsible for over 90% of all animal bites worldwide[5]. Over 95% of human cases of rabies are caused by bites of rabies-infected dog. Animal bites and the associated injuries can create several problems including loss of work, and increased medical expenses[6]. More than 20 million individuals receive post-exposure prophylaxis

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annually due to animal bites[7]. Rabies kills nearly 60 000 people in the world annually[8,9]. Despite the availability of effective prevention facilities, rabies to be a major public health challenge in many countries[10-12]. Rabies has been reported in all parts of the world, but most cases of rabies-induced deaths have been reported in some developing countries of Asian and African[13,14], and approximately nearly half of the deaths occurred in Asia[15]. This disease is not controlled in Iran and other Middle Eastern countries[16,17]. In the past few decades, some countries in Asian such as Japan, Singapore, Malaysia, Qatar, Bahrain, and the United Arab Emirates are free from rabies[18]. Iran has been affected by rabies and many people are bitten annually[19]. Due to the lack of an effective vaccination program for the domestic animals, it is impossible to eliminate the disease among the animals[20]. To our knowledge, there are not sufficient data about the epidemiological features of rabies and animal bites in Abadeh district (Fars province) of Iran, therefore, this study targeted at investigating animal bites epidemiology and its associated factors.

2. Materials and methods

In this cross-sectional study, 1 407 individuals with animal bites who referred to the Abadeh Rabies Treatment Center were investigated by using the census method from 2012 to 2018.

The city of Abadeh with a population of about 106 000 is located in the north of Fars province in the center of Iran. The residents of this city are mainly farmers and animal husbandry. The studied variables in this research included: the victim's demographic information (age, gender, occupation), the type of biting animals (dog, cat, and other animals), the domesticated and wild animals, the time of biting based on year and month, the residence location (urban or rural), the treatment status, and the anatomical location of the wound.

The data were analyzed by descriptive statistics models (frequency and percent) using Excel 2013 software and SPSS version 21 (IBM Corp., Armonk, NY, USA).

This study was approved by the Ethics Committee of Shiraz University of Medical Sciences and Health Services (code of ethics: IR.SUMS.MED.REC.1397.044).

3. Results

In this study, 1 407 animal-bitten individuals, who referred to the Rabies Treatment Center of Abadeh city from 2012 to 2018, were investigated. The mean incidence rate of animal bites was 189.62 per 100 000 population. The incidence rate of animal bites per 100 000 population from 2012-2018 is shown in Figure 1. As the findings showed, 83.4% of the victims were male. The average age of animal-bitten individuals was (33.66±18.97) years and individuals in the age range of 36-50 years were at more risk. Most of the animal bites were from dogs (*n*=1 095, 77.8%). About two thirds (*n*=874, 62.1%) of the bites were from household animals. Based on the findings, 57.1% of individuals lived in urban areas. Most victims were engaged in farming

and animal husbandry occupations (*n*=389, 27.6%). The highest prevalence of animal bites (*n*=526) happened in the summer with a frequency of 37.4%, whereas, the lowest number of bites (*n*=199) was in the winter with a frequency of 14.1% (Table 1). Most cases of animal bites were seen in September (*n*=214, 15.2%), August (*n*=186, 13.2%), and October (*n*=152, 10.8%), respectively (Figure 2). According to the results, 123 victims (8.7%) did not have desirable cooperation following the anti-rabies treatment and left their treatment incomplete after the first visit while 91.3% of victims had received complete vaccination. None patient had any clinical signs of rabies.

Table 1. Variables of animal bites in Abadeh district, central Iran (2012-2018).

Variables	*n* (%)
Gender	
Male	1 173 (83.4)
Female	234 (16.6)
Education	
Academic	236 (16.8)
Diploma and lower	1 103 (78.4)
Pre-school child	68 (4.8)
Types of residency	
Urban	804 (57.1)
Rural	603 (42.9)
Jobs	
Clerk	98 (7.0)
Worker	196 (13.9)
Animal Husbandry/farmer	389 (27.6)
Student	236 (16.8)
Housewife	160 (11.4)
Self-employment	260 (18.5)
Child (Pre-school)	68 (4.8)
Age, years	
≤10	121 (8.6)
11-20	191 (13.6)
21-35	432 (30.7)
36-50	474 (33.7)
51-65	135 (9.6)
≥66	54 (3.8)
*Seasons	
Spring	350 (24.9)
Summer	526 (37.4)
Autumn	332 (23.6)
Winter	199 (14.1)
Types of animal	
Wild	43 (3.1)
Stray	490 (34.8)
Pet	874 (62.1)
Animals	
Dog	1 095 (77.8)
Cat	251 (17.8)
Wolf/fox	21 (1.5)
Sheep/cow/horse	15 (1.1)
Others**	25 (1.8)
Bite sites	
Face & head	27 (1.9)
Trunk	167 (11.9)
Leg	626 (44.5)
Hand	587 (41.7)

*: Spring (April, May, June), Summer (July, August, Sept.), Autumn (Oct., Nov., Dec.), Winter (Jan., Feb., March); **: Other animals contains rats, squirrel, rabbit, and hamster.
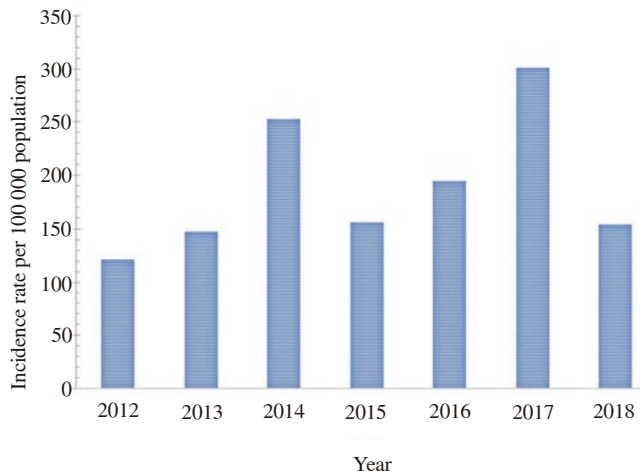
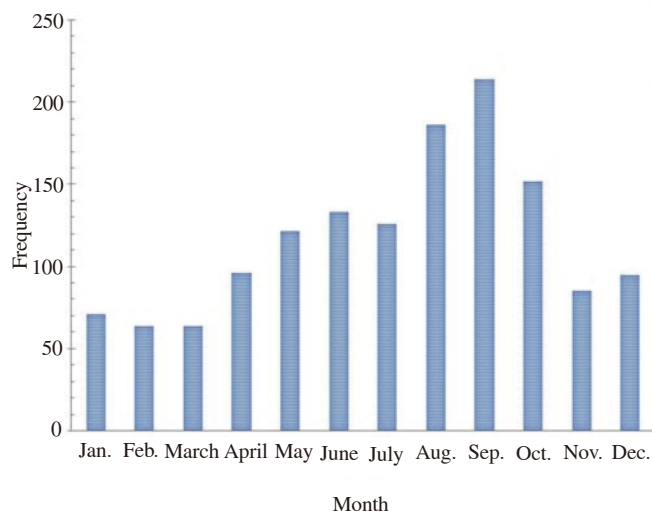**Figure 1.** Incidence rate of animal bites in Abadeh district from 2012 to 2018.

Figure 2. Frequency of the number of animal bites according to the month in Abadeh district from 2012 to 2018.

4. Discussion

Animal bites are considered as a serious public health problem. In this study, 1 407 victims suffered animal bites in Abadeh district from 2012 to 2018. Our data showed a general rising trend in the incidence of animal bites during the study period. The highest prevalence can be explained by several factors such as growth of dog population, expansion of employment in livestock breeding and agriculture.

The findings showed that the majority of animal bites occurred in males, which is consistent with the results of studies conducted by Joseph *et al.* and Dehghani *et al.*[5,8]. The fact that the majority of the animal bites occurred among men can be due to their employment in occupations such as animal husbandry and agriculture, where they are prone to be exposed aggressive animals such as dogs. Furthermore, men spend more hours out of the home, which is considered as another reason for being bitten more frequently.

The results of our study showed that among the individuals, the more bites occurred in urban areas than in rural areas. The reason could be rapid urbanization with a lack or low level of basic facilities in the region and the result of dog displacement from rural areas to the urban areas. There are still many agricultural areas in the urban area in Abadeh district, where dogs are kept in stables and farms, and they are more likely to attack foreigners than domestics dogs. This finding is inconsistent with the results of other studies[16].

The present study showed that the farmers and ranchers were bitten more frequently comparing to people engaged in other occupations. The reason seems to be that farmers as well as the ranchers who work in fields are at a higher risk of being exposed to animal bites.

Among the invading animals, dogs accounted for the highest portion (77.8%), of which 93.7% of injuries were caused by domestic dogs and only 6.3% by stray dogs. Similarly, dog bites constituted the most prevalent animal bites in other studies[8,16], so immunizing domestic dogs would be the start of intervention actions for rabies control.

Our study results showed that people in the age group of 36-50 years were more prone to animal bites (33.7%). This could be owing to that individuals in these age groups have more occupational exposure, which increases the risk of being bitten. Contrary to the results of our study, some studies which were performed in Iran showed individuals in 10-19 years old age group constituted the majority of victims[20,21], and in a study conducted by Hoseini *et al.*[22], the maximum cases observed in the age group of 31-45 years.

Anatomically, most individuals (44.5%) were bitten in feet. Similar with our study, other studies showed that legs were much more bitten, whereas upper limbs were rarely bitten[23,24].

The majority of animal bites in the study occurred in summer. The reason for this issue can be the high exposure to animals owing to the abundance of jobs in agriculture and animal husbandry during the summer; As well, the breeding season for dogs is from June to September. Other researchers in this field have come up with similar findings[25,26].

During the study, no case of rabies has occurred among the included individuals. This can be due to the effectiveness of control actions.

In our study, the highest prevalence of animal bites was seen in people with a lower level of education. The reason could be that people with lower education are more likely to be engaged in jobs related to livestock.

Some victims of animal bites did not cooperate well and did not refer to the rabies treatment centers. The researchers tried to contact these victims by calling or referring to their houses to vaccinate them.

To reduce the number of animal bites, high-risk groups including farmers and ranchers should be educated about bite prevention.

Rabies education must be an integral part of the public health and it is needful to ensure that they are managed correctly. In addition to the currently recommended strategy of controlling the dog population, vaccinating domesticated animals, immunizing veterinary personnel (pre-exposure prophylaxis), better surveillance for suspected animal bites populations by timely and perfect immunization (post-exposure prophylaxis) are also recommended. To increase the effectiveness of these strategies, their results must be evaluated during the operation.

Conflict of interest statement

The authors report no conflict of interest.

Acknowledgment

Authors' contribution

N.T. developed the theoretical formalism. F.M. and F.S. performed the analytic calculations and performed the numerical simulations. Both A.K.F. and B.K performed Data Acquisition. Authors A.Kasraei. and M.Y. contributed to the final version of the manuscript. A.K. supervised the project.

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