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Epidemiological patterns of animal bites in Yazd Province (central Iran) between 2013 and 2017

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ABSTRACT

Objective: To investigate the epidemiological pattern of animal bites in Yazd Province, central Iran.

Methods: In this cross-sectional study, 8 545 individuals with animal bites who were referred to the Yazd Province Rabies Treatment Center were investigated using the census method from April 2013 to March 2017. The variables included: demographic information, household living condition, the type of biting animals, the domesticated and wild animals, the time of biting based on year, the residence location (urban or rural), and the treatment status. Data were analyzed by descriptive statistics using Excel 2013, SPSS version 25 and Arc GIS 14.1 Software.

Results: A total of 8 545 cases of animal bites were reported in Yazd province from 2013 to 2017. The most animal bites (with 4 253 case of bites) and the lowest animal bites (with 121 case of bites) occurred in Yazd and Bahabad district, respectively. The incidence of animal bites was 168.4 per 100 000 people during the five-year period. Most of cases (73.9%) occurred in urban areas. Dog and cat bites accounted for 47.6% and 47.4% of all cases, respectively. Most of animal bites were reported in the summer (29.4%). Sixty percent of the cases received incomplete treatments, while 40% of them received complete treatments. During this study, three positive cases of fatal rabies from dog bites were reported.

Conclusions: The incidence of animal bites is high in Yazd province, and more patients are bitten by dog and cat. Hence, educational, preventive, and informative programs are required to reduce the incidence of animal bites.

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1. Introduction

Mortality and morbidity of injuries caused by animals increase across the globe[1]. Among these injuries, rabies is a major public health problem, and lack of prevention after exposure, and usually leads to death[2]. However, incidence of rabies can be prevented completely by taking immediate and timely preventive measures such as post-exposure prophylaxis[3-5]. The most common transmission of the rabies infection virus is through contact with sick animals, for example, being bitten or scratched by rabies-prone animals[1,6]. Over 2.5 billion people are at the risk of rabies worldwide[7]. In Iran, incidence of rabies is also increasing due to the lack of control over domestic and wild animals[7-9]. The mortality and morbidity of rabies are very high, and can cause high economic costs[8]. The incidence rate of animal bites was reported as 250 cases per 1 000 people worldwide and as 180 per 100 000 people in Iran[10]. Each year, about 60 000 deaths occur due to rabies throughout the world, with 56% in Asia and 43.6% in Africa[11-13]. The high incidence rates of animal bites in Golestan, Ardabil, North Khorasan, as well as Chaharmahal and Bakhtiari provinces were 398, 503, 292, and 397 per 100 000 people, respectively. In a study by Hosseini *et al.* in Kerman, the average incidence rate of animal bites was 433.08 per 100 000 populations from 2010 to 2014[14]. According to an Iranian study in Babol city, the rate of animal bite increased from 130 to 214 per 100 000 populations from 2010 to 2014[7]. The increased number of animal bites increases treatment and prevention costs, and has negative effect on psychological and social aspects of the victims' lives[8]. Considering the increasing number of animal bites and rabies cases, the epidemiological incidence patterns of this disease should be investigated to evaluate and plan interventions for controlling and preventing rabies with regard to its geographical and ecological distribution in different regions. The purpose of this study was to investigate the incidence rate of animal biting in Yazd province during 2013-2017 to reduce the incidence of animal bites and to decrease the vital, financial, and mental burden of the disease.

2. Materials and methods

In this descriptive cross-sectional study, all animal bite cases in Yazd province from April 2013 to March 2017 were investigated using census. The data were collected based on the records of animal bites of individuals who were referred to the health centers of Yazd province for preventive measures and treatment. Questionnaires were carried out to patients of acute animal bite, including the number of animal bites, the year of bite, the month of bite, the residence location, the treatment status and the type of biting animal. The collected data were analyzed by descriptive statistics using Excel 2013 software and SPSS version 21. This study was ethically approved by the Shahid Sadoughi University of Medical Sciences ethics (code of ethics: IR.SSU.SPH.REC.1397.102) committee.

3. Results

The study showed that a total of 8 545 cases of animal bites in Yazd province during the study period. The mean incidence rate was 168.4 per 100 000 people. The incidence of animal bites increased from 136.4 per 100 000 people in 2013 to 229.8 per 100 000 in 2017 (Figure 1).

According to the results, 26.1% of animal bites occurred in rural areas and 73.9% of them occurred in urban areas (Table 1).

According to the findings, 23.9% ($n=2\ 043$) of the animal bites occurred in spring, 29.4% ($n=2\ 515$) in summer, 25% ($n=2\ 140$) in fall, and 21.6% ($n=1\ 847$) happened in winter. This shows that the highest and the lowest numbers of animal bites occurred in the summer and winter, respectively.

The more bites were due to dogs and cats with frequency rates of 47.6% and 47.4%, respectively. However, the lowest bites were due to wolves with a frequency of 0.1% (Table 2). Among all individuals who had animal bites, 40% ($n=3\ 412$) received comprehensive treatment, while 60% ($n=5\ 131$) had incomplete treatment.

In this study, the lowest incidence of animal bites was 142 cases per 100 000 (Meybod City) and the highest incidence of animal bites was 361.96 cases per 100 000 (Khatam city). The incidence of Taft city is 273.67 cases per 100 000, Mehriz city 243.73 cases per 100 000, Sadough city 238.64 cases per 100 000, and Yazd city 143.21 per 100 000 (Figure 2).

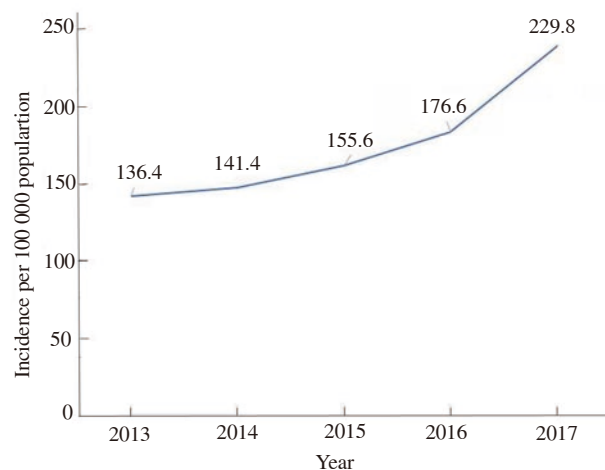


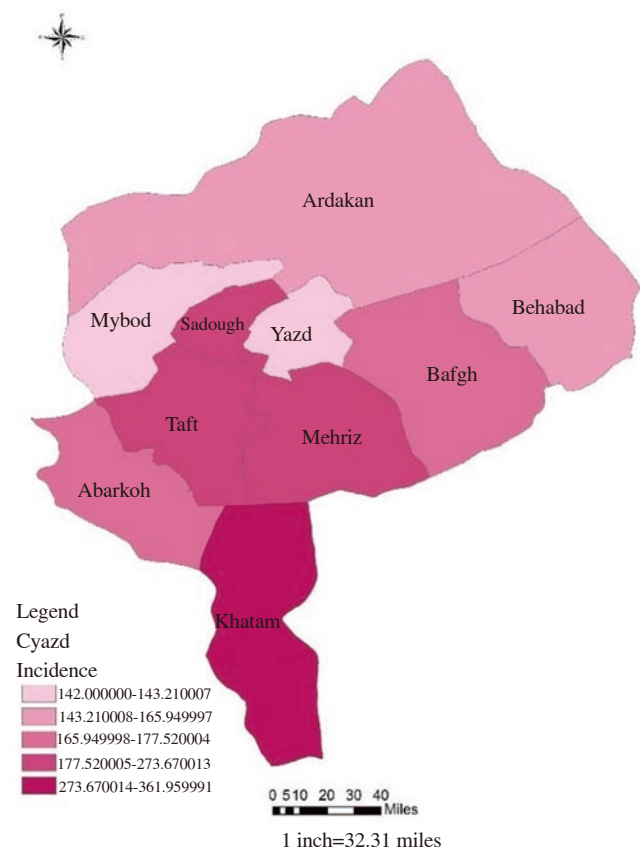
Figure 1. Trends of incidence rate of animal bites per 100 000 population in Yazd province, Iran (2013-2017).

Table 1. Frequency of animal bites according to residence location [$n(\%)$].

Year	Urban	Rural	Total
2013	1 056(79.2)	277(20.8)	1 333(15.6)
2014	1 068(76.4)	329(23.6)	1 397(16.3)
2015	1 161(73.7)	415(26.3)	1 576(18.4)
2016	1 344(73.2)	493(26.8)	1 837(21.5)
2017	1 689(70.3)	713(29.7)	2 402(28.1)
Total	6 318(73.9)	2 227(26.1)	8 545(100)

Table 2. Frequency of animal bites according types of biting animals.

Animal types	n	%
Dog	4 067	47.60
Cat	4 052	47.40
Fox	22	0.26
Jackal	18	0.22
Wolf	9	0.11
Other domestic animals	214	2.50
Other wild animals	162	1.90
Unknown	1	0.01
Total	8 545	100.00

**Figure 2.** Geographical distribution of animal bites.

4. Discussion

Mortality and morbidity of injuries caused by animals increase worldwide[1]. The present study examined the trends of animal bite cases in Yazd province during 2013-2017. In this study, the incidence rate of animal bites increased from 136.4 in 2013 to 229.8 in 2017 in Yazd province. This ascending trend is almost similar to the global average. Various studies were conducted on animal bites in the world and in Iran. Ghaffari carried out a study in Babol city in Iran and concluded that the incidence rate of animal bites over a five-year period was ascending, these findings are similar to those of the present study[7]. Hosseini *et al.* found that the average incidence rate of animal bites was 433.08 per 100 000 people, which is higher than the average incidence in the present

study[14]. Babazadeh *et al.* reported that the incidence rate of the animal bites was 541 per 100 000 people. In the same vein, Kasiri carried out a research in Shoosh city, Iran, and concluded that the mean incidence rate of animal bites in a five-year period was 2.82 per 1 000 people. Both of these studies showed an ascending trend in this regard. Although in the study by Kasiri, the incidence rate of animal bite was higher than the present study, the results of our research also represent an ascending trend in incidence of animal bites in a five-year period[8,15]. In the present study, 60% of the animal bite cases happened in urban areas, whereas, 40% of them occurred in rural regions, which is the same with the study of Dehghani *et al.*[16]. Kasiri *et al.* concluded that most cases of animal bites occurred in urban areas with the frequency rates of 85.6% and in rural areas with frequency rates 13.5%[15]. The study of Abbasi *et al.* in Golestan city showed that most cases of animal bites were in urban areas (82.27%) in comparison with the rural areas[17]. Mohammadzadeh also investigated the cases of animal bites in Hamadan city and reported that most of them occurred in urban areas (68.9%)[18]. However, Naghibi *et al.* carried out a study in Mazandaran and reported that most cases of animal bites occurred in rural (62.4%) than urban areas (37.93%), which contradict the results of our study[19]. In the present study, the number of animal bites increased with the growth of population. The high incidence rate of animal bites in urban areas can be due to the development of urbanization and destruction of natural environment. Furthermore, citizens have recently tended to the culture of keeping domestic or even wild animals. Individuals are also in more contact with animals considering new developing animal-related jobs.

In the present study, the incidence rates of animal bites were almost the same in different seasons, but most of the animal bites happened in summer and autumn, whereas, the lowest animal bites occurred in winter. In the study by Majidpour *et al.*, the highest rate of animal bite was in the summer, whereas, the lowest rate happened in the winter, which is similar to our findings. In confirmation of these findings, Bonnie *et al.* reported that the rate of animal bite was higher in summer and autumn[14]. In our study, the lowest rate of animal bite occurred in winter. In study Babazadeh *et al.* showed that the rate of animals bite was higher in summer with frequency rate 32.8% and the lowest rate occurred in winter with frequency rate 18.7%[8], which is similar to the findings of the present research. According to the findings of this study, the risk of animal bites exist in all seasons; however, in the warm weather of summer, the ecological conditions of animal habitats change to a large extent, and stray dogs and cats or other animals come to cities to find food. Moreover, families travel more frequently to the forest recreational areas in summer; as a result, exposure to stray animals increases.

In a study by Alavinia *et al.*, 88.1% of the animal biting cases did not receive complete treatment, while 11.9% had complete treatment. In Birjand, 81.9% of treatments were incomplete and 18.1% were complete[20]. Another study in Kerman and Ilam indicated that 79.36% of treatments were incomplete, whereas,

20.64% of them were complete. It was reported 85% of injured individuals received rabies vaccine in Rafsanjan city and 15% of injured individuals received both rabies vaccine and rabies immunoglobulin. and in Ilam 81.3% of injured individuals had incomplete treatment and 18.7% of injured individuals had completed treatment[21]. The cost of rabies vaccine was 11 665 dollars and 849 dollars for three and five doses, respectively. The total cost of rabies vaccine was calculated as 12 514 dollars in the studied period[8]. In confirmations of these findings, the results of our research showed that the incomplete treatment rate was 60%, while the complete treatment rate was 40%. Given the high cost of treating rabies, we need to use preventive programs to reduce the risk of animal bites.

In the current study, most cases were bitten by dogs (47.6%) and cats (47.4%), while the lowest by wolves (0.1%). In a study by Kasiri *et al.*, the most cases of animal bites were due to dogs (83.6%)[22]. In the studies conducted by Pattanayak and Sreenivas, the most cases of animal bites were due to dogs with frequency rates of 76.6% and 95.44%, respectively[23,24]. This may be caused by several reasons: the newly developing tendency of citizens to keep pets such as cats and dogs, the entry of stray and aggressive animals to urban environments to find foods due to the destruction of their habitats, animal-related occupations, or other ecological factors. During this study, three positive cases of fatal rabies caused by dog bites were reported.

This research had some limitations including lack of access to demographic information of victims bitten by animals, such as gender, age, and occupation. Moreover, the exact time of biting was not determined. Such information can be useful in designing programs to reduce animal bites.

Considering the increasing incidence rate of animal bites in Yazd province, it is urgent to establish preventive and educational programs to implement the related interventions, reduce the mortality rate, and decrease the economic costs imposed by animal bites.

Conflict of interest statement

The authors report no conflict of interest.

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