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Geographical Distribution, Time Trend, and Epidemiological Characteristics of Animal-Bite Cases in Bardsir, 2010-2014

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ABSTRACT

Introduction: Animal bites are one of the serious threats to human health, leading to numerous consequences such as fatal disease of rabies. Due to the importance of animal bite throughout the country, the purpose of the present study was to investigate the geographical distribution, time trend and epidemiological characteristics of animal-bite cases in Bardsir County, Iran.

Methods: This cross-sectional study was conducted on the records of people suffering from animal bite from April 2010 to March 2014 in Bardsir County. Data were analyzed in SPSS v.20 software using descriptive statistics including frequency and percentage, log-linear model and time series model. Arc GIS software was employed to plot the geographical distribution of animal-bite cases.

Results: The findings of this study indicated that 1500 cases of animal bite had occurred during the study period in totall. Mashiz district (with 695 cases of bite) had the most animal bites. In terms of time, animal-bite cases had no particular trend. The results showed that the incidence rate of bite in men was 2.12 times more than in women ($p<0.001$). In the age group of 31- 45 years compared to the reference age group (0-6 years), the rate of bite was 5.98 times greater ($p<0.001$). The incidence rate of animal bite in homemakers was 4.96 times greater ($p<0.001$) than the reference group (children). Among the biting animals, dogs were responsible for the most bites (76.9%). In terms of bitten organs, limbs were bitten frequently (52.8%). The majority of victims had received the vaccine in accordance with the three-dose immunization schedule (91%).

Conclusion: It seems that the determinants regarding high incidence of animal bite in Bardsir County are the type of activities and occupations. Therefore, special and preventive educational programs might be useful in high-risk groups.

Keywords: Animal Bite, Time Trend, Bardsir, Iran

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Introduction

Animal bites are one of the factors threatening human health [1]. The majority of bites occur in exposure to domestic animals such as dogs and cats and wild animals such as foxes, wolves, raccoons, minks and jackals. Animal bites might be as a result of self-defense, the animals' instinctive behavior or their attempt to obtain food [2]. Animal bite also increases following natural disasters such as hurricanes, floods and droughts [3]. In addition to rabies, animal bites may cause other diseases. For example, dog bites causes tularemia, tetanus and bacterial infections. Cat bites can cause cat-scratch disease (CSD) and tularemia [4].

Animal-bite cases are of health and also economic importance. This disease causes loss of 1.74 million healthy life years in children less than 15 years. In Asian developing countries, 560 million dollars are spent on prevention and treatment of this disease [5].

Animal bite is raised as a problem in the majority of countries around the world. Annually, more than 10 million cases of animal bite all over the world visit the health centers for prevention and treatment [6]. Of course, this is less important in Australia, New Zealand, Taiwan, Singapore, Japan, Great Britain, Hawaii and the Nordic countries that are free of diseases [7].

According to the Center for Disease Control, the incidence status of animal bite in Iran has increased in recent years. The highest incidence rate of animal bite was reported in the Golestan and Ardabil provinces (398-503 a hundred thousand people), and then Northern Khorasan and Chaharmahal-Bakhtiari provinces (292-397 a hundred thousand people). Other provinces have declared the moderate and mild incidence rates. Human rabies and deaths were also found in the northern and north- west provinces (Mazandaran and Golestan), central and southern provinces (Kerman, Fars and Hormozgan) and western provinces (Kordestan, Hamedan, Lorestan and Kermanshah) [8]. Kerman province with an area of more than eleven percent of the territory of Iran, as one of the widest provinces of the country and various climates, is one of the provinces with a significant number of animal bites and endemic rabies. Bardsir is one of the cities of Kerman province that has a high incident of animal bite due to climatic conditions and the development of agriculture and animal husbandry.

Due to the importance of the disease throughout the country, the increase in animal-bite cases, the drought of the past few years, the respective economic burden and high incidence of animal bite in this city [9, 7], the purpose of the present study was to investigate the geographical distribution, time trend and epidemiological characteristics of animal-bite cases in Bardsir County.

Methods

This cross-sectional study was conducted on the records of people suffering from animal bite from April 2010 to March 2014 in Bardsir County. Information was obtained from the offices of rabies centers, patient records and data recorded in the disease centers of the province. Basic information included the type of invasive animal, age, gender, place of living, bite site, type of injury and history of vaccination. Data were analyzed in SPSS v.20 software using descriptive statistics including frequency and percentage, log-linear model and time series model. The significance level was set at less than 0.05. Arc GIS software was employed to plot the geographical distribution of animal-bite cases.

Results

1- Epidemiological characteristics

During the period of study, 1500 cases of animal bite had occurred totally in Bardsir County. The incidence rate of the disease in the study period was respectively 449.9, 364, 401.8, 454.7 and 495 per a hundred thousand people. In this study, based on literature review and opinions of the research team, variables including gender, age and occupation were inserted into log-linear model. The results showed that the incidence rate of bite in men was 2.12 times more than in womenwhich is statistically significant ($p < 0.001$). In this investigation, the most bites in school age were

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related to the age of 7-14 years (IRR = 4.43, p < 0.001). The maximum cases in working age were observed in the age group of 31- 45 years (IRR = 5.98, p < 0.001). By occupation, homemakers (IRR = 4.96, p < 0.001) were accounted for the majority of animal bite. Detailed results for other classes of variables are shown in Table 1.

In most cases, the dog (76.9%) and then the cat (14.1%) were invasive animals in the event of animal bites. During treatment in the centers of rabies, most cases had received the vaccine in accordance with incomplete or the three-dose immunization schedule (91%). Most wounds were related to the lower extremities (52.8%) and minor wounds (93.9%).

1- Time trend

The best model to analyse the data was selected using the Expert Modeler toolbar in the SPSS software. Exponential smoothing models were considered as the best models; and among them, the simple seasonal model was better fit to the data. The coefficient of determination was 0.107 for the model, which indicates that only 10% of the variance observed in animal-bite cases is justified by the model. In the exponential smoothing method with the simple seasonal model, it is assumed that most animal-bite cases occur in the same months in different years and this assumption is inconsistent with the study data (as can be seen in Figure 1, the majority of cases are shown in different months and in different years). Therefore, it is concluded that the model chosen by the software is not the ideal model for the animal bite data. In fact, the cases of animal bite during this period in Bardsir County indicated no particular trend.

2- Geographical distribution

Map 1 shows the geographical distribution of animal-bite cases in the years from 2010 to 2014. In this study, the highest percentage (46.3%) of animal bite was related to Mashiz district and the lowest percentage (4.6%) was found in Kuh Pang district.

Table 1. Results of log-linear model based on gender, age and occupation

Variable		n	%	IRR* (CI)**	P
Gender	Female	481	32.1	1	< 0.001
	Male	1019	67.9	2.12 (1.90 – 2.36)	
Age (years)	0 – 6	53	3.5	1	-
	7 – 14	235	15.7	4.43 (3.52 – 9.97)	< 0.001
	15 – 20	131	8.7	2.47 (1.80 – 3.41)	< 0.001
	21 – 30	302	20.1	5.70 (4.25 – 7.63)	< 0.001
	31 – 45	317	21.1	5.98 (4.47 – 7.99)	< 0.001
	46 – 60	294	19.6	5.55 (4.14 – 7.43)	< 0.001
	> 60	168	11.2	3.17 (2.33 – 4.31)	< 0.001
occupation	Child	79	5.3	1	-
	Student	263	17.5	3.33 (2.45 – 9.28)	< 0.001
	Employee	52	3.5	0.66 (0.04 – 6.93)	0.02
	Rancher	174	11.6	2.20 (1.26 – 9.87)	< 0.001
	Farmer	237	15.8	3 (2.33 – 2.87)	< 0.001
	Homemaker	392	26.1	4.96 (3.68 – 9.32)	< 0.001
	Worker	143	9.1	1.81 (1.23 – 7.38)	< 0.001
	Driver	57	3.8	0.72 (0.15 – 1.01)	0.06
	Others	103	6.9	1.30 (0.19 – 7.75)	0.07

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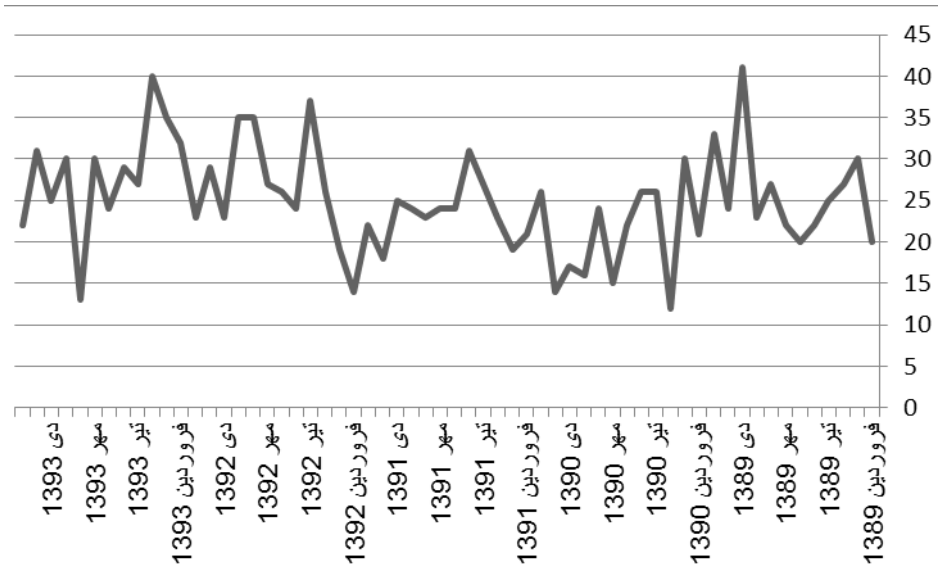
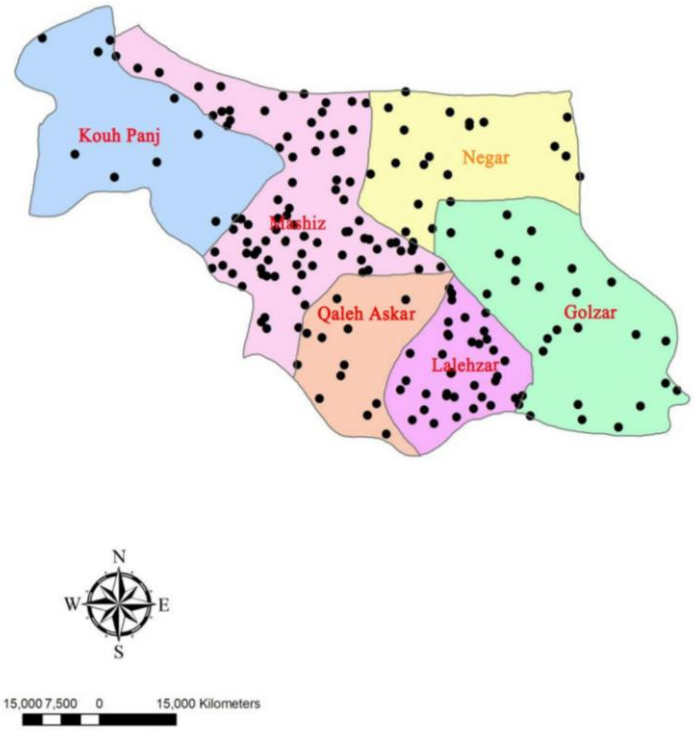


Figure 1. Time trend of Animal bites cases in Bardsir, 2010 – 2014



Map 1. Geographical distribution of Animal bites cases in Bardsir, 2010 – 2014

Discussion

During the period of study, 1500 cases of animal bite had occurred in this region. In a study by Bahonar et al. in Kerman province, the animal bite cases was 22860 in this province; the most incidence rate (per a hundred thousand people) was in the city of Baft (n = 166) and the lowest rate was in the city of Zarand (n = 63) [10]. In the present study, the incidence rate during the study period was an average of 433.08 cases a hundred thousand people, which is among the regions with a high incident of animal bite based on the classification of Tabatabai et al [11]. According to the Center for Disease Control, the national and provincial rates were in the category of moderate animal bite (133-220 a hundred thousand people)

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[12]. As a result, it appears that the incidence rate of cases recorded in this city has remarkable difference with the national and provincial average. In a study of Thaghafi PourPour et al., the incidence rate on average over a period of 6 years in Kerman province was reported as 109.4 per a hundred thousand people [13]. Amiri et al. in 2008 in the city of Shahrood, Iran, reported that the incidence rate of animal bite was 246 per a hundred thousand people [14] .Dadi PourPour et al. stated the rate of 773 per a hundred thousand people in the city of Kalaleh, Iran [15]. In another study, the incidence of animal bite was 325 per a hundred thousand people in Switzerland in 1998 and 324 per a hundred thousand people in Pennsylvania in 2000 [7].

In this study, the majority of animal-bite cases were observed among the males. According to the regression model, the gender was considered as a risk factor (males with the incidence rate of 2.12 times more than females). This result has been confirmed in most of the studies on the animal bite. In a study by Bahonar, the males (76%) suffered from the animal bite more than females [10]. In the studies by Thaghi PourPour in Qom, Majid PourPour in Ardabil and Bahonar in Ilam, the percentage of men in the event of animal bite was 89.6, 75 and 73.2 respectively [12]. In Iran, the results are consistent with internal studies and the most animal-bite cases were seen among the males. In a study in Spain, men found to be 62.2% of bitten people. The male to female sex ratio was also higher in France [16]. In a study in India, also the men were often involved [17]. The reason of this can be related to the occupational exposure to animals in men and also the men's longer presence outside the house. . In addition, the men are more aggressive toward animals compared to women. Moreover, annoying animals at the time of eating, pulling their tail and chasing them among the males is the cause of animal attack. In this investigation, the most bites in school age were related to the age of 7-14 years. The maximum cases in working age was observed in the age group of 31- 45 years. Based on the results, it seems that the risk of animal bite is higher during primary and secondary schools and almost in all working ages (21- 60 years old) compared to other age groups. In similar studies, the age of the most people that were bitten was below 30 years.

In the study of Bahonar in Kerman, people aged 10 to 19 years were the most exposed group [10]. In the study of Thaghafi PourPour, 36% of bites were in the age group of 29- 20 years [13]. In previous studies, the bite rate was 49.3% in the age group of 29- 10 years in Ilam [7], 52.8% in the age group of 10-29 years in Kalaleh [15] and 67% among those aged under 20 years in the Caspian littoral provinces [2]. In the study in Switzerland in 1998, most of bitten people were younger than 20 years. In a study in Virginia, investigators reported that the bite occurred in people under 18 years old more than adults [7]. In studies by Svdrashan in India [17], Bonnie in Texas [18] and Dao in Mali [19], the rate of bite was also further in younger people.

Homemakers, students and farmers accounted for the most cases of animal bite. In other studies in different regions of the country, the rate of bite in these occupations is also higher. Amiri, Thaghafi Pour and Dadi PourPour emphasized these results in their studies [14, 12]. The important point worth mentioning in this study is the high percentage of bite rate among homemakers.

In terms of time trend, the animal-bite cases had no significant difference in different seasons and the bite cases were non-significantly higher only in summer. In a study by Amiri et al., there was also no specific time trend for bites [13]. In the studies of Thaghafi Pour and Dadi Pour, the incidence of animal bite cases was relatively frequent in the spring [13, 15]. In a study by Bahonar et al., the bite rate was higher in winter [10]. Bonnie et al. in Texas showed that the bite rate was higher in summer and autumn [18]. Besides, a study conducted in India showed the animal bite was more common in spring and summer [20]. In conclusion, there is a risk of bites in all seasons for people living in this region. The reason of this in Bardsir County can be due to excessive exposure to animals owing to the abundance of jobs in agriculture and animal husbandry as well as living in villages and also women's participation in the

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work outside the house.

In most cases, dogs and cats were invasive animals in the event of animal bite. Farm animals were collectively more involved in the cases of bites compared to wild animals. This result was consistent with the researches by Amiri, Thaghafi Pour, Dadi Pour and Bahonar [10, 13, 15]. International studies have also shown that the dogs and cats were more involved in bites [16, 20]. The reason for this issue could be due to the larger number of these animals at private residences. Additionally, dogs are widely used in occupations such as animal husbandry, which in turn is a factor for more bites.

During treatment in the centers of rabies, most cases had received the vaccine in accordance with incomplete or the three-dose immunization schedule. Most wounds were related to the lower extremities as minor wounds. This finding is consistent with the majority of researches in different regions of the country, including Ilam, Aq Qala, northern provinces as well as other countries s [2, 3, 7,1 4, 17, 20]. Only in one study in Qom, the majority of bites were found on the hands [13].

Conclusion

Animal bite is among the wounds associated with the animals which can cause adverse consequences. However, it can be prevented with prompt management. During the study period, the incidence of animal bite was relatively high in Bardsir County. It seems that the type of activities and occupations are the determinants in this regard. Therefore, special and preventive educational programs might be useful in high-risk groups.

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Conflict of interest

None

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