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Epidemiological and demographic study of acute animal biting in Abdanan County, Ilam Province, Western Iran

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ABSTRACT

Objective: To determine the incidence, epidemiology and demography of acute animal bites referred to Abdanan health centers in the years 2009 to 2013. **Methods:** This study was a descriptive analytical research. Questionnaires for each case of acute animal bite was completed. Data about age, gender, kind of animal, residency, site of bite, etc taken from Abdanan health centers were analyzed. Data were analyzed in SPSS by using descriptive statistics. **Results:** Total number of exposed persons to acute animal bites was reported 67 in 2009 and 69 in 2013. The average incidence rate was 1.2 per 1 000 population. Bites were frequent among the age group of 20-30 years. Most of the cases were self-employment. Around 83.8% of cases were bitten by dogs. Of total 309 studied patients, 73.8% were male. Feet (71.5%) and hands (22.7%) were the most common body part affected. About 53.1% of cases were in rural population. **Conclusions:** Dogs seems to play a very important role in the epidemiology of rabies in Abdanan, Iran. No cases of human rabies were observed in our study. This may be because of increasing public awareness and the upgrading of health and treatment centers, all of which in study region provide post-exposure anti-rabies treatment including vaccination, immunoglobulin and wound washing.

1. Introduction

Acute animal bite is a major public health problem not only for the associated risk of acquiring secondary infections, but also for the possibility of contracting rabies. Annually 10 million cases acute animal bites are estimated to occur in the world. Acute dog bites make up 80%-85% of all reported incidents. Between 3 500 and 50 000 individuals worldwide die from rabies each year.

A considerable quantity of information has been obtained on diseases shared by humans and animals, and this has led to extensive advances in their diagnosis and treatment. Nevertheless, this group of diseases continues to affect large numbers of animals and a more limited number of humans. In this regard, diseases transmitted by acute animal bites are a health problem affecting all countries including Iran, and despite the considerable progress made in preventing and treating them, there is still an annual rise in the incidence of these diseases[1].

Rabies are usually transmitted following acute bites through

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animal saliva. However, transmission may take place in other ways such as mucous membranes, scratches by claws of rabbit-infected animals, skin scratches, breath of contaminated air and organ transplant (especially cornea transplant). Rabies is one of the very dangerous zoonotic viral diseases that may affect all mammals. The causal agent of rabies is a neurotropic virus belonging to the order Mononegavirales, the family Rhabdoviridae, and the genus Lyssaviruses. After transmission of the virus, the infected person must start treatment immediately. If no treatment measures are taken due to unawareness or negligence of the consequences of the disease, symptoms of the disease will appear once the incubation period ends. At this stage, there will be no treatment for the affected person who will be certainly doomed to die[2,3].

According to estimates of the World Health Organization, 40-70 thousand people die annually in rabies endemic countries, and 10 million are annually treated after being bitten[2,4]. Based on statistics, it is estimated that 3-6 million animal biting happen annually in the United States[5,6]. Due to lack of an advanced supportive care program for rabies patients, the actual figure of people affected by this disease is probably higher than the reported ones, and dogs play the main role in transmitting rabies to humans[7-9].

In addition to the importance rabies has for the health of people, its occurrence in livestock inflicts considerable economic losses[10]. The continent of Asia bears 96.5% of the burden of rabies and spend the equivalent of 560 million dollars every year mainly to prevent and treat this disease[11]. Wildlife management is also involved with this disease as an important health issue[12].

Considering the increasing awareness people have gained in recent years of the dangers caused by acute animal bites, and because of the daily increase in visits to health centers for receiving the required treatments, analysis of the data kept at responsible organizations can be effective in enhancing our knowledge of rabies epidemiology and in paving the way for the introduction of the necessary programs to teach health matters and reduce the burden of this disease for the Iranian health systems. Broad geographical expanse of Iran, diverse climates, dependence of the risk factors posed by rabies on wildlife species, differences between populations with respect to health levels and need for awareness in Iranians make it necessary to conduct separate studies in various parts of the country. Therefore, carrying out studies on the epidemiology of acute animal biting seems to be necessary to enable development of better plans for taking appropriate measures for the ever more effective control of rabies and for reducing losses of human lives and economic losses caused by rabies through studying frequency distribution of this disease in the country[5].

In general, various factors must be taken into account in plans for fighting and controlling acute animal biting, the first of which is supervision and epidemiological studies and data collection[13]. Considering the large rural and nomadic populations in the Abdanan city of Iran, who are mostly engaged in livestock keeping, and given the fact that the villages and the nomads are scattered on the slopes of two mountains (the Kabir Kooh and the Dinar Kooh), taking into account the importance of keeping dogs for protecting herds. And due to the increase in instances of acute animal biting in recent years, it was felt that an epidemiological study must be conducted on cases of acute animal biting because results of this research could offer suitable strategies for controlling rabies, for reducing the number of acute animal biting, and for decreasing treatment costs and workload of personnel at healthcare centers in Abdanan.

2. Materials and methods

2.1. Study preparations

This descriptive analytic study was conducted on all visitors to the anti-rabies unit at the health center in Abdanan County during 2009 to 2013. There were 309 cases of acute animal biting. The average incidence rate of animal biting during the above five years was approximately 1.2 per 1 000 population.

Data were collected by questionnaires including their age, gender, occupation, type of animal that had bitten them, place of residence, treatments received, and the bitten organ. The overall mean age and standard deviation of the bitten persons was (32.15±1.90) years, and the youngest and oldest individuals that suffered animal bites were 3 and 95 years old, respectively. Tables of frequency distributions were prepared separately for each year and also tables comparing the cases studied during these five years.

2.2. Statistical analysis

The collected data was coded, entered into SPSS, and analyzed using chi-square test. Statistical tables and diagrams were used in the section describing the collected information. Significance is considered at $P<0.5$.

3. Results

Figure 1 showed the trend of acute animal bites cases during the

study period. Men were more often bitten than women that 73.8% of persons bitten by animals were males and 26.2% were females (Table 1). *Chi*-square test indicated a significant relationship between the variables of gender and frequency of animal bites (P=0.00). Largest group of people bitten by animals during these five years (24.3%) was in the age group of 21-30 (Table 1). Based on the *chi*-square test, there was a significant relationship between the variables of age group and cases of acute animal bites (P=0.00).

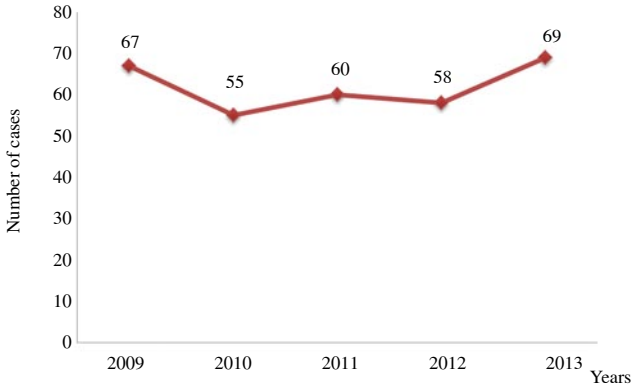

Figure 1. Trend of acute animal bites frequency in Abdanan County, western Iran (2009-2013).

As for the occupations of the bitten persons, the highest percentage of the animal bites occurred in self-employed persons (24.9%), followed by students (20.4%), while the lowest (2.3%) was in government employees. Forty eight of the 81 women bitten by animals were housewives, 17 were students, and 16 were employed (Table 2). The *chi*-square test indicated a significant relationship between the variables of employment and frequency of acute animal biting (P=0.00).

Regarding geographical distribution, the largest number of acute animal bites (164 cases or 53.1% of the total) happened among rural people, 111 cases (35.9%) among the urban population, and 34 cases (11.0%) among the nomads (Table 2).

The maximum number of acute animal biting (45 or 14.6% of the total) was recorded from late March to late April and the minimum (19 or 6.1% of the total) from late December to late January (Table 3). *Chi*-square test indicated a significant relationship between the variables of month and frequency of acute animal biting (P=0.025). Seasonal distribution of acute animal bites showed that 31.1% happened in spring, 23.6% in summer, 24.9% in autumn, and 20.4% in winter. *Chi*-square test revealed that there were no statistical significance between the variables of season and number of acute animal bites (Table 3).

As for the wounded sites on the body of acute animal bites, 221 cases (71.5%) were on the feet, 70 (22.7%) on the hands, 11 (3.5%) on the head and necks and 7 (2.3%) on the trunks (Table 4).

Table 1
Prevalence of animal bites cases classified by gender and age [*n*(%)].

Parameters	Gender			Age								
	Female	Male	Total	0-4	5-10	11-20	21-30	31-40	41-50	51-60	⩾60	Total
2009	43 (64.2)	24 (35.8)	67 (100)	1 (1.5)	5 (7.5)	13 (19.4)	13 (19.4)	11 (16.4)	9 (13.4)	9 (13.4)	6 (9.0)	67 (100.0)
2010	43 (78.2)	12 (21.8)	55 (100)	3 (5.5)	9 (16.4)	9 (16.4)	15 (27.3)	5 (19.1)	7 (12.7)	5 (9.1)	2 (3.6)	55 (100.0)
2011	45 (75.0)	15 (45.0)	60 (100)	1 (1.7)	12 (20.0)	8 (13.3)	17 (28.3)	4 (6.7)	6 (10.0)	10 (16.7)	2 (3.3)	60 (100.0)
2012	49 (84.5)	9 (15.5)	57 (100)	1 (1.7)	9 (15.5)	3 (5.2)	18 (31.0)	13 (22.4)	6 (10.3)	6 (10.3)	2 (3.4)	58 (100.0)
2013	48 (69.6)	21 (30.4)	69 (100)	0 (0.0)	6 (8.7)	14 (20.3)	12 (17.4)	11 (15.9)	9 (13.0)	9 (13.0)	8 (11.6)	69 (100.0)
Total	228 (73.8)	81 (26.2)	309 (100)	6 (1.9)	41 (12.3)	47 (15.2)	75 (24.3)	44 (14.2)	37 (12.0)	39 (12.6)	20 (6.5)	309 (100.0)

Table 2
Prevalence of acute animal bites cases classified by job amd residence [*n*(%)].

Parameters	Job								Residence			
	Rancher	Employee	Self employment	Worker	Housewife	Student	Others	Total	Urban	Rural	Nomad	Total
2009	14 (20.9)	4 (6.0)	13 (19.4)	4 (6.0)	14 (20.9)	15 (22.4)	3 (4.4)	67 (100)	13 (19.4)	52 (77.6)	2 (3.0)	67 (100)
2010	12 (21.8)	1 (1.8)	14 (25.6)	2 (3.6)	5 (9.1)	13 (23.6)	8 (14.5)	55 (100)	16 (29.1)	29 (52.7)	10 (18.2)	55 (100)
2011	6 (10.0)	1 (1.7)	16 (26.6)	5 (8.3)	10 (16.7)	14 (23.4)	8 (13.3)	60 (100)	27 (45.0)	26 (43.3)	7 (11.7)	60 (100)
2012	18 (31.0)	0 (0.0)	18 (31.0)	2 (3.5)	4 (6.9)	8 (13.8)	8 (13.8)	58 (100)	20 (34.5)	28 (48.3)	10 (17.2)	58 (100)
2013	11 (15.9)	2 (2.9)	16 (23.2)	1 (1.5)	14 (20.3)	21 (30.4)	4 (5.8)	69 (100)	35 (50.8)	29 (42.0)	5 (7.2)	69 (100)
Total	61 (19.7)	8 (2.6)	77 (24.9)	14 (4.5)	47 (15.2)	71 (23.0)	31 (10.1)	309 (100)	111(35.9)	164 (53.1)	34 (11.0)	309 (100)

Table 3
Prevalence of animal bites cases classified by season and month [*n*(%)].

Parameters	Spring			Summer			Autumn			Winter		
	April	May	June	July	August	September	October	November	December	January	February	March
2009	10 (14.9)	6 (9.0)	7 (10.4)	8 (11.9)	10 (14.9)	5 (7.5)	5 (7.5)	4 (6.0)	4 (6.0)	4 (6.0)	2 (3.0)	2 (3.0)
2010	10 (18.2)	10 (18.2)	2 (3.6)	4 (7.3)	3 (5.5)	5 (9.1)	6 (10.9)	4 (7.3)	0 (6.0)	0 (6.0)	6 (10.9)	5 (9.1)
2011	6 (10.0)	3 (5.0)	7 (11.7)	7 (11.7)	6 (10.0)	1 (1.7)	3 (5.0)	12 (20.0)	7 (11.7)	5 (8.3)	0 (0.0)	3 (5.0)
2012	8 (13.8)	5 (8.6)	1 (1.7)	3 (6.2)	2 (3.4)	7 (12.1)	6 (10.3)	1 (1.7)	7 (12.1)	5 (7.2)	6 (10.3)	7 (12.1)
2013	11 (15.9)	7 (10.1)	3 (4.3)	3 (4.3)	4 (5.8)	5 (7.2)	2 (2.9)	4 (5.8)	12 (17.4)	5 (7.2)	5 (7.2)	19 (6.1)
Total	45 (14.6)	31 (10.0)	20 (6.5)	25 (8.1)	25 (8.1)	23 (7.4)	22 (7.1)	25 (8.1)	30 (9.7)	19 (6.1)	8 (11.6)	25 (8.1)

Table 4
Prevalence of animal bites cases classified by biting site and number of bites [*n*(%)].

Parameters	Biting site					Number of bites				
	Hands	Feet	Head and neck	Trunk	Total	1	2	3	⩾4	Total
2009	11 (16.4)	51(76.1)	3 (4.5)	2 (3.0)	67 (100)	29 (43.3)	27 (40.3)	4 (6.0)	7 (10.4)	67 (100)
2010	11 (20.0)	39 (70.9)	3 (5.4)	2 (3.6)	55 (100)	27 (49.1)	18 (32.7)	7 (12.7)	3 (5.5)	55 (100)
2011	20 (33.3)	37 (61.7)	2 (3.3)	1 (4.7)	60 (100)	36 (60.0)	12 (20.0)	9 (15.0)	3 (3.0)	60 (100)
2012	15 (25.9)	40 (69.0)	2 (3.4)	1 (1.7)	58 (100)	37 (63.8)	15 (25.8)	3 (5.2)	3 (5.2)	58 (100)
2013	13 (18.8)	54 (78.3)	1 (1.4)	1 (1.4)	69 (100)	34 (49.3)	25 (36.3)	5 (7.2)	5 (7.2)	69 (100)
Total	70 (22.7)	221 (71.5)	11 (3.5)	7 (2.3)	309 (100)	163 (52.8)	97 (31.4)	28 (9.1)	21 (6.7)	309 (100)

The average number of bites in each of the studied people was around 2. Most bitten persons (163 cases or 52.8%) were bitten once, and the largest number of bites per individual was 8 (Table 4).

Findings indicated that 83.8% of the studied people were bitten by dogs, 12.6% by cats and 1.6% by boars, and 2 persons were bitten by donkeys, 2 by bears and 2 by wolves. In addition, 96.4% of the studied people were bitten by domestic animals, and in 3.6% of the cases the biting animals had escaped. Furthermore, results demonstrated that cat bites in urban areas were far more frequent compared to rural regions (Table 5). *Chi*-square test indicated a significant relationship between the variables of month and biting animals (P=0.00).

Table 5
Prevalence of acute animal bites cases classified by the biter animals [*n*(%)].

Index	Dog	Cat	Boar	Others	Total
2009	57 (85.1)	9 (13.4)	1 (1.5)	0 (0.0)	67 (100)
2010	45 (81.8)	8 (14.6)	1 (1.8)	1 (1.8)	55(100)
2011	50 (83.3)	8 (13.3)	0 (0.0)	2 (3.4)	60 (100)
2012	49 (84.5)	5 (8.6)	2 (3.4)	2 (3.4)	58 (100)
2013	58 (84.1)	9 (13.1)	1 (1.4)	1 (1.4)	69 (100)
Total	259 (83.8)	39 (12.6)	5 (1.6)	6 (1.8)	309 (100)

Regarding visits to healthcare center, 94.5% of the persons bitten by animals were treated with three doses of the rabies vaccine, and their treatment was discontinued after 10 d (incomplete vaccination). Five doses of this vaccine was used in 5.5% of the cases (complete vaccination) (Table 6).

Table 6
Prevalence of acute animal bites cases by type of vaccination regime [*n*(%)].

Index	Incomplete	Complete	Total
2009	64 (95.5)	3 (4.5)	67 (100)
2010	52 (94.5)	3 (5.5)	55 (100)
2011	54 (90.0)	6 (10.0)	60 (100)
2012	57 (98.3)	1 (1.7)	58 (100)
2013	65 (94.2)	4 (5.8)	69 (100)
Total	292 (94.5)	17 (5.5)	309 (100)

During these years, the highest incidence of sting (45%) happened at time period of 6-12 am (Table 7). The interval between acute animal bite and injection of anti-rabies vaccine was in most cases (46.3%) equal or less than 1 h (Table 8). About 23.6% of the studied persons received anti-tetanus vaccine (Table 9).

Table 7
Prevalence of acute animal bites cases classified by bite time [*n*(%)].

Parameters	0-6 am	6-12 am	12-18 pm	18-24 pm	Total
2009	3 (4.5)	31 (46.3)	22 (32.8)	11 (16.4)	67 (100)
2010	3 (5.5)	20 (36.4)	23 (41.8)	9 (16.4)	55 (100)
2011	4 (6.7)	25 (41.7)	19 (31.6)	12 (20.0)	60 (100)
2012	0 (0.0)	29 (50.0)	23 (39.7)	6 (10.3)	58 (100)
2013	3 (4.3)	34 (49.3)	21 (30.5)	11 (15.9)	69 (100)
Total	13 (4.1)	139 (45.0)	108 (34.0)	49 (15.9)	309 (100)

Table 8
Interval between animal bite and anti-rabies vaccination [*n*(%)].

Index	⩽1 h	2-4 h	5-8 h	9-12 h	⩾ 13 h	Total
2009	23 (34.3)	19 (28.4)	6 (9.0)	2 (3.0)	17 (25.4)	67 (100)
2010	30 (54.5)	10 (18.2)	7 (12.7)	4 (7.3)	4 (7.3)	55 (100)
2011	29 (48.3)	7 (11.7)	11 (18.3)	3 (5.0)	10 (16.7)	60 (100)
2012	25 (43.1)	14 (24.1)	10 (17.3)	1 (1.7)	8 (13.8)	58 (100)
2013	36 (52.2)	3 (4.3)	11 (15.9)	2 (2.9)	17 (24.7)	69 (100)
Total	143 (46.3)	53 (17.2)	45 (14.6)	12 (3.9)	56 (18.1)	309 (100)

Table 9
Prevalence of acute animal bites cases classified by tetanus vaccination injection [*n*(%)].

Index	Injection	No injection	Total
2009	8 (11.9)	59 (88.1)	67 (100)
2010	21 (38.2)	34 (61.8)	55 (100)
2011	18 (30.0)	42 (70.0)	60 (100)
2012	10 (17.2)	48 (82.8)	58 (100)
2013	16 (23.2)	53 (76.8)	69 (100)
Total	73 (23.6)	236 (76.4)	309 (100)

4. Discussion

The present research studied acute animal bites that happened during past 5 years (2009-2013) to those who visited the centers providing vaccination for people bitten by animals. Most of these cases (24.3%) were people in the age group of 20-30. Majidpour *et al*[14] reported that most victims were in the age group of 10-29 with 44.13% in Ardabil Province. Zeinali *et al*[15] found in their

research that half of those bitten by animals were 10-29 years old. In the study carried out by Tepsumethanon *et al*[16], 42.3% and 39.7% of the cases happened respectively in the 10-14 and 5-9 age ranges in Thailand on mammalian bites. Pandey *et al*[17] noticed in their study that children were at greater risk of being bitten on the head and face. While Singh *et al*[18] showed that persons in the 5-14 age ranges were bitten more frequently than other age ranges in India.

In the present research, acute animal bites in males were about three times more frequent than in females that were 228 cases (73.8%) in males and 81 cases (26.2%) in females. Except for the research done by Pandey *et al*[17] where more females than males tourists and expatriates were bitten by rabid animals in Nepal. Males were exposed to more acute animal bites than females in the other studies (results were similar to ours)[15,18].

In our study, dog bites constituted 259 cases (83.6%) of the total acute animal bites, and these results are similar to those reported in other studies[17,19-21]. In the study carried out by Majidpour *et al*[14], dog bites accounted for 96% of the total acute animal bites in Ardabil Province, which was about 10% higher than what we found in our research.

In the present research, most cases of acute animal bites (53.1%) happened to rural people. The study conducted by the Pasteur Institute in Iran on 136 cases of rabies in which the victims died showed that the highest percentage of the dead people (30%) was that of the 10-19 age group. Meanwhile, 77%, 83% and 68% of them were males, lived in villages and were bitten by dogs, respectively[22]. Sadeghi *et al*[23] carried out a study in West Azerbaijan Province and found that 63.4% of acute animal bites happened to males, 35.0% to those in the age group of 10-19 and 81.6% of them lived in villages. Moreover, 93.7% of the victims were bitten by dogs. Results of the present study were in undeniable agreement with those found by Sadeghi *et al*[23] and by the Pasteur Institute. Considering the high incidence of dog bites among rural populations in Abdanan, the necessity of controlling wild dogs becomes redoubled.

Tepsumethanon *et al*[16] showed in their study that the most common sites for animal bites (56.6%) were feet in Thailand. Also, other researchers have reported similar findings[15,20]. In children, a higher percentage of bites by domesticated and pet dogs have been reported on the face[17,19]. Majidpour *et al*[14] found that 3 078 (71.79%) cases of acute animal bites out of the total 4 331 in Ardabil Province happened on the feet. About 2 580 (66.7%) of the cases out of the total 3 867 animal bites occurred in the lower organs in West Azerbaijan Province[23].

It was found in the present research that 31.1% of acute animal bites happened in spring, 23.6% in summer, 24.9% in autumn and 20.4% in winter. While in the study done by Majidpour *et al*[14], a larger number of acute animal bites happened in summer. Sadeghi *et al*[23] reported the maximum percentage of acute animal bites (39.4%) occurred in spring and the minimum (16.4%) in autumn. The present research found that the largest percentage of acute animal bites took place during April (14.6%) and May (10.0%) and the smallest during January (6.1%) and February (6.1%). Of the total acute animal bites in West Azerbaijan Province in 2000, the highest percentage (24.4%) happened in May and the lowest (4.8%) in November[23]. While the largest number of acute animal bites in Ardabil Province in the year 2000 happened during August, November, December and September[14].

The highest percentage of acute animal bites in the present study happened to self-employed people (24.3%) and to students (20.4%). These results are consistent with those reported by Zeinali *et al*[15]. In the research carried out by Majidpour *et al*[14], 29.10% of those bitten by animals were students, 18.90% farmers, 12.71% housewives, 8.64% shepherds, 8.90% workers, and 4.00% government employees. Sadeghi *et al*[23] observed that 48% of the total number of acute animal bites happened to students.

Lack of a monitoring system and regular reporting of acute animal bites are among the main problems related to the prevention and control of this problem. These shortcomings have prevented collection of sufficient, correct and timely information on acute animal biting. Therefore, the ground must be prepared for participation and cooperation. Moreover, people's awareness concerning acute animal biting must be raised so that individuals bitten by animals make timely visits to healthcare centers. In addition, inter-sectoral coordination, as well as coordinating and planning meetings, must be increased to exterminate wild dogs and vaccinate domestic ones.

Conflict of interest statement

The authors declare that they have no conflict of interest.

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