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Original Article

Epidemiological patterns of animal bites in Northwest of Iran

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Abstract

***Background & Aims*:** Mortality and morbidity resulting from injuries caused by animals are increasing globally. Among these injuries, rabies, one of the oldest zoonosis viral diseases, remains one of the most important threats to public health in the 21st century. This study aims to investigate the epidemiology of animal bites and associated factors in Maku city.

***Materials & Methods*:** In this cross-sectional study, 1,401 cases with animal bites referred to the Maku Rabies Treatment Center were investigated using the census method from 2016 to 2019. The variables included the victims' demographic information (age, gender, occupation), the types of biting animals (dog, cat, and other animals), domesticated and wild animals, the time of biting based on year and month, the event area (urban or rural), the treatment status, and the anatomical location of the wounds.

***Results*:** The mean incidence rate of animal bites was 387.4 per 100,000 people. In total, 73.7% of the victims were male. Individuals in the age range of 36-50 and 11-20 years were at a greater risk. The majority of the animal bites were from dogs (90.8%), and (95.2%) were from household animals. A total of 82.7% of individuals lived in rural areas. Most victims were students and housewives. The highest prevalence of animal bites (36.2%) happened in the summer.

***Conclusion*:** These findings suggest a need for increased awareness and preventative measures to reduce the incidence of animal bites in the studied region.

***Keywords*:** Animal bites, Epidemiology, Iran, Rabies

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Introduction

Animal bites are a serious public health problem that results from animal attacks (1). Animal bites can cause damage to the skin and tissues. However, the most important consequence of animal bites, especially in indigenous countries, is rabies, which is transmitted to humans through inhalation and animal saliva (2). The severity of the wound can vary depending on several factors, such as the size and type of the animal and the location of the bite. Animal bites usually occur 90-85% by dogs, 10-5% by cats, and 3-2% by other animals (3). In case of a bite, it is crucial to clean the wound using soap and water, provide first aid, and seek medical attention if necessary (4). The incidence of animal bites globally is increasing; more than 2.5 billion individuals globally are in danger of contracting rabies (5). Despite being preventable with effective vaccines, the control of rabies has become a significant

health issue in several countries. Asian countries such as China, Pakistan, the Philippines, India, Thailand, and parts of Central America (Mexico) are particularly impacted, totaling seven countries (6). According to the World Health Organization (WHO) estimates, there are approximately 31,000 annual deaths from rabies in Asia, accounting for about 56% of global deaths from the disease. Additionally, rabies is the most common cause of human deaths related to animal-borne diseases, contributing to around 60% of total deaths and DALYs (disability-adjusted life years) lost in Asia (7).

In Iran, the incidence rate is 180 per 100,000 people, and the occurrence of rabies is less than 1 in a million people (8). The incidence and mortality rates in rural areas are higher due to less access to PEP, a shortage of disease diagnosis capacity, and a lack of awareness of the risks of animal bites (9). In other words, one death due to rabies occurs every 15 minutes in the world, of which 4 out of 10 cases are in children (10). In addition to public health concerns, rabies also causes significant economic losses in animals. Rabies has been present in Iran for a long time and affects endemic wildlife (11). The contamination incidence rate in domestic animals is increasing, leading to reports of the disease in various provinces of Iran every year. The incidence rate of animal bites in the year (2017-2018) was reported to be 4.168 and 7.97 cases per 100,000 populations in Yazd and Khorramshahr, respectively (12). The rise in stray dogs and animal bites, along with the spread of rabies in many provinces, resulted in annual costs associated with the preparation of vaccines, serums, and other preventive measures (13). It is necessary to focus more attention on controlling and researching various aspects of rabies in Iran. The wide geographical distribution, ecological diversity, and different risk factors associated with wildlife species suggest the need for separate investigations in different regions of the country. By understanding the epidemiology, prevalence, and at-risk age groups, officials can implement effective ways to prevent the spread of the disease in the healthcare system. This study aimed to evaluate the epidemiological patterns of animal bites and incidence in Maku City, located in northwest Iran, over 4 years from 2016 to 2019.

Materials & Methods

This study was conducted as a descriptive cross-sectional design of all animal bite cases in Maku City from April 2016 to March 2019. The information was collected by a whole number from the animal bite registration portal of the health department and recorded in the SPSS 23 software after coding. Descriptive analysis using frequency and percentage was conducted for qualitative data, while mean and standard deviation were used for quantitative data. To analyze the relationship between variables, the Chi-Square test was employed. Statistical significance between groups was considered when the p-values were less than 0.05. The variables under investigation included demographic information of individuals, time and location of the incident (city or village), type and species of the biting animal, cause of the bite, body part bitten, delay in seeking PEP treatment, post-bite care received (washing with soap and water, receiving antibiotics, rabies vaccine, and immunoglobulin), history of past animal bites, and receipt of concurrent vaccination. The study received ethical approval from the Urmia University of Medical Sciences ethics committee (code of ethics: IR.umsu.REC.1397.286).

Results

The study found that there were a total of 1,401 reported cases of animal bites in Maku city during the four-year study period, with a mean incidence rate of 387.4 per 100,000 people. The incidence of animal bites increased from 363.5 per 100,000 people in 2016 to 407.3 per 100,000 people in 2019, as shown in Figure 1.

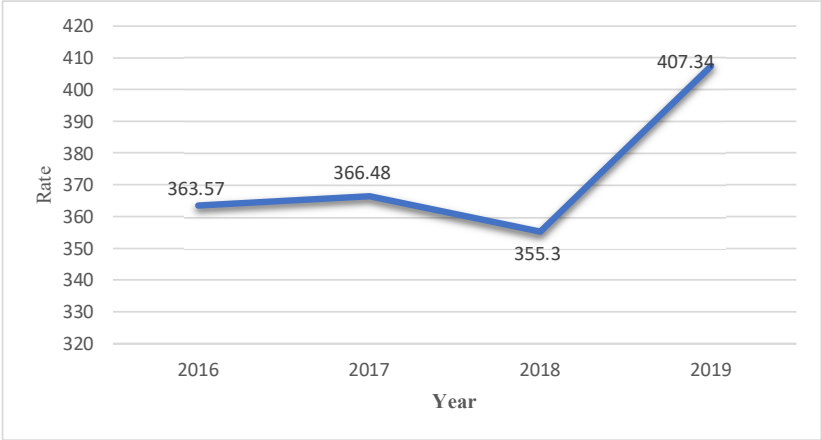

Fig. 1. Trends of the incidence rate of animal bites per 100,000 population in Maku City, Iran (2016-2019).

According to the results of cases, animal bites occurred more frequently in men .Most of the animal bites, (82.7%), occurred in rural areas, while (17.2%) occurred in urban areas. Among the occupational groups, students (31.2%), housewives (15.8%), and farmers/ranchers (14.2%) were the most affected by animal bites. The age groups of 36-45 years (26.9%) and 11-20 years (25.8%) had the highest number of animal bite victims. Through the application of the non-parametric Chi-Square test, a statistically significant relationship ($p < 0.05$) was found between the occurrence of animal bites and different occupations, different age groups, and event areas.

Also, the highest number of animal bites occurred during the summer, accounting for (36.2%) of all bites, followed by spring (25.7%), fall (22.6%), and winter (15.5%). The months of June, May, and December had the highest number of incidents. A significant difference in the frequency of animal bite cases was not observed using the Chi-Square test (p value >0.05).

Dogs were responsible for the majority of animal bites, accounting for (90.8%) of all cases, while cats accounted for only (6.9%). Domestic animals were found to be responsible for the majority of incidents (95.2%), while wild animals accounted for only a small percentage (1.2%). Stray animals were more likely to cause bites in urban areas than in rural areas. The Chi-Square test demonstrated a significant difference in the frequency of animal bite cases (p value < 0.05). The most common bite locations were legs (64.8%) and hands (25.7%), with the majority of cases receiving two bites per individual. A significant difference in the frequency of animal bites and their locations on the body was observed (p value < 0.05) (Table 1).

Table 1. Demographic and incident characteristics of animal bites in Maku City

Variable	N	%
Gender	Male	1033 (73.7)
	Female	368 (26.2)
Age, years	≤ 10	225 (16)
	11-20	362 (25.8)
	21-35	208 (14.8)
	36-50	377 (26.9)
	51-65	154 (10.9)
	≥ 66	75 (5.3)
Event area	Rural	1159 (82.7)

Variable	N	%
	Urban	242 (17.2)
Jobs	Clerk	82 (5.8)
	Worker	58 (4.1)
	Animal husbandry/farmer	199 (14.2)
	Student	438 (31.2)
	Housewife	222 (15.8)
	Child (preschool)	143 (10.2)
	Other	259 (18.4)
***Seasons**	Spring	360 (25.7)
	Summer	507 (36.2)
	Autumn	316 (22.6)
	Winter	218 (15.5)
Types of animals	Pet	1335 (95.2)
	Stray	49 (4.3)
	Wild	17 (1.2)
Animals	Dog	1273 (90.8)
	Cat	98 (6.9)
	Wolf/fox	5 (.3)
	Sheep/cow/horse	5 (.3)
	Others	20 (1.1)
Bite sites	Face & head	41 (2.9)
	Trunk	90 (6.4)
	Hand	361 (25.7)
	Leg	909 (64.8)

Most animals involved in the incidents (90%) were under supervision after the bite, and only (2.7%) were lost. Most cases sought immediate care (66.6%), while (33.3%) delayed seeking care for more than 24 hours after exposure to the animal. All cases washed the wound with soap and water, and 98% disinfected it. Antibiotics were administered to (5.4%) of cases, and (7.4%) received bandages over their wounds. Following exposure, all cases received the first dose of the vaccine, while (99.6%), (97.2%), (8.6%), and (8.2%) received the second, third, fourth, and fifth doses, respectively. The percentage of cases receiving anti-rabies immunoglobulin was (31.1%) and (88.6%) received the tetanus vaccine. Only (1%) of cases had a history of receiving the anti-rabies vaccine in the past.

Discussion

The results of the study on animal bites in Maku city are significant as they provide insights into the incidence and trends of animal bites over four years. The study found that there were 1,401 reported cases of animal bites in Maku city during the study period, equating to a mean incidence rate of 387.4 per 100,000 people. The average incidence rate in the Switz 325 and Lorestan 223.3 study was 100 per 100,000 people (14, 15). This suggests an upward trend in the incidence of animal bites over time, which could be due to various factors such as population growth, changes in animal behavior or management practices, or changes in reporting methods, thereby improving the registration and reporting system. Based on the findings, the age groups of 36-50 and 11-20 years old had the highest incidence of animal bites. The results of studies conducted in Oman and Kerman, Iran, were consistent with the present study (16, 17). The higher incidence of animal bites among young age groups may be due to their increased presence outside the home for work or education, putting them at greater

risk of animal bites. The incidence rate of dog bites on the lower extremities is significantly higher than on the upper extremities. A study conducted in Gilan Province, Iran, revealed that a majority of dog bite cases involved injuries on the lower extremities. This can be attributed to individuals being bitten while approaching or entering areas guarded by dogs (18).

According to the study results, animal bites are more common in men than women. These findings were consistent with the results of studies conducted in Iran and Ethiopia (19, 20). This could be due to differences in occupational or recreational activities that result in more exposure to animals. In most cases, the attacking animal has been a domestic or owned dog. These results are consistent with the findings of Ramos (20). One potential reason for the higher incidence of animal bites by dogs may be their key role in rural life and proximity to humans. In the villages of this region, pet dogs serve as guards and are mostly unrestrained, roaming freely around the house and alleyways day and night. The high incidence of bites in rural areas also suggests that people who work or live around animals are at a higher risk of being bitten. From an occupational perspective, the highest prevalence of distribution of zoonotic diseases in urban and rural areas was found among students, housewives, livestock farmers, and agricultural workers. Similar patterns were observed in studies conducted in Dandle and Moghadam where cases were more prevalent among students, housewives, and agricultural workers (2, 21). In the meta-analysis study conducted by Adedi, these three occupations (students, housewives and farmers) had the most cases of animal bites (22).

One of the likely reasons for the high incidence rate among students could be attributed to their frequent travels to high-risk areas and sometimes engaging in provocative activities while encountering animals. Additionally, women's work in rural homes and their increased contact with domestic animals may contribute to the higher incidence of zoonotic diseases among housewives. The seasonal variation in animal bites is also noteworthy, with the majority occurring during the summer months. One of the reasons for the high prevalence of zoonotic diseases in summer and spring seasons could be attributed to the increased traffic in rural areas, intensified agricultural activities, the start of the grazing season for livestock, and an increase in tourism.

During this study, it was found that 3.33% of cases had a delay of more than 24 hours in receiving post-bite care. In Kenya, the percentage was 43%, in Nigeria it was 47%, and in Isfahan, it was 30.8% (1, 23, 24). Delay in seeking medical attention can be interpreted as being due to the fact that most bites occurred in rural areas, where distance and lack of timely access may have played a role. Additionally, the belief that domestic animal bites do not require medical attention and will self-heal may also contribute to such delays. In most cases, wound washing with water and soap, as well as disinfection, had been performed. Also, most of the victims used the rabies vaccine, and the majority of them received at least one dose of the vaccine. Additionally, a small percentage of individuals had received a complete course of five doses of the vaccine. In the numerous studies conducted by Alavian and Kassiri, the majority of cases had received three doses of the vaccine (25, 26). Furthermore, 31.1% of individuals had also received anti-rabies serum along with the first dose of the vaccine. In the studies conducted in Yazd, and Sri Lanka, 15% and 37% of victims had received anti-rabies serum, respectively (12, 27).

Conclusion

The high prevalence of animal bites in the northwestern provinces of the country, especially in cities such as Maku, where livestock and agriculture industries are prevalent, requires attention and effective interventions. Therefore, due to the frequency of animal bites among young individuals and in specific occupations such as students, housewives, and farmers, efforts should be made to raise awareness about ways to prevent animal bites and the importance of timely prophylaxis in case of such incidents.

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Conflict of interest

The authors have no conflict of interest in this study.

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This article did not receive any funding.

Data availability

The raw data supporting the conclusions of this article are available from the authors upon reasonable request.

Ethical statement

The study received ethical approval from the Urmia University of Medical Sciences ethics committee (code of ethics: IR.UMSU.REC.1397.286).

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