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Epidemiology of acute animal bite and the direct cost of rabies vaccination

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ABSTRACT

Objective: To describe the epidemiological aspects of animal bites and to calculate the financial burden resulting from rabies vaccination in Chalderan City.

Methods: In this cross-sectional study, records of all victims of animal bites was done in a seven-year period reviewed. Studied variables included demographic information of victims, biters' profile, time and place patterns, clinical aspects of the victims and the cost of vaccination.

Results: Most of bites were observed in men in the age group (10–19 years old), at rural areas and occupational group of farmers. The vast majority of animal bites happened by dogs and domestic animals. The average age of victims with head and neck injuries was lower than the lower extremities, shoulders and hands (P = 0.001). The cost of vaccination was 11 665 dollars with three doses of rabies vaccine and 849 dollars for five doses, and the 12 514 dollars cumulative frequency in the studied period. Based on the results of trend test, the incidence of animal bites was increased significantly during the study period (P = 0.02).

Conclusions: The results of this study showed that due to the increasing incidence of animal bites and the financial burden resulting from animal bite vaccination, it is necessary to design and implement preventive measures in order to reduce the animal bites.

1. Introduction

Rabies is recognized as the most important viral zoonoses nowadays, due to the global distribution, high incidence, human and veterinary costs, and its mortality, which imposes high economic costs annually in various countries[1,2]. Rabies is one of the consequences of a bite that has high virulence and case fatality rate[3,4]. It is an acute viral illness that causes encephalomyelitis in humans, all mammals and warm-blooded animals. The disease is common in domestic and wild animals in most provinces of Iran[5,6]. Dogs play the most important role in the transmission of rabies to humans[6]. By proper vaccination coverage for at least 70% of dogs and cats population, an effective barrier will be created for the transmission of the disease to humans[7].

The main sources of rabies in the northern regions of Iran are dogs and foxes, and in the western and northwestern regions of Iran are wolves[8,9]. In areas where rabies is endemic, children aged 5–15 years old are about 40% of people exposed to dog bites[10,11]. In the world, the death rate due to rabies in children under 15 years

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The study was performed according to the Helsinky Declaration. The study protocol was reviewed and approved by the Ethics Committee of Tabriz University of Medical Sciences. Identity of all bitten persons kept confidential.

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old result in the loss of about 1.74 million disability adjusted life years[12]. Asia carries 96.5% of the disease burden in developing countries, with annual expenditures of about 560 million dollar mainly for the treatment-prevention[13].

Increased annual incidence of animal bites results in increased costs for taking care of victims, such as the rabies vaccine and serum[14]. In Iran, billions of rials are annually spent to prevent human rabies, and there is no other contagious disease in the country that costs as much as rabies[15]. However, its global cost is estimated more than a billion dollars a year[15,16]. In addition to the financial costs of prevention and treatment of animal bites, the mental and social consequences caused by animal bites and scars can greatly affect the life of victims and their family[17]. Wide geographical distribution, ecological diversity and interdependence of the major risk factors of rabies with wildlife species, as well as differences in health-related behaviors and knowledge of the population, necessitate the need to conduct researches separately in different regions of the country[18].

There were some quotes about high incidence of animal bite in Chalderan County. So this study conducted with the aim of describing the epidemiology of animal bites, identifying people at risk, seasonal and temporal patterns of animal bites, and calculating the financial burden of vaccination of victims. Results of the study will help us to design the intervention programs in order to prevent and reduce cases of animal bites and reduce its burden on health care system.

2. Materials and methods

This cross-sectional study examined the patterns of animal bite in a seven-year period from March 21st, 2008 to March 20th, 2014 longitudinally in Chalderan City, West Azerbaijan province, Iran. The seven-year period of the study was selected due to the availability of data. The health center in this city had two units for the prevention of rabies, which provided health care and treatment services for all victims of animal bites. Data on the bitten subjects were extracted from rabies records.

2.1. Study site

In the study site, people usually did not keep pet dogs with them at the home. The dogs were typically used as guard at the house yard or with the sheep herds. No national vaccination program was run in the country for dogs and other pets. In urban areas, most people did not keep pet dogs and most dogs in these areas were stray dogs.

2.2. Target population

All cases of animal bites in all age and sex groups referred to the rabies prevention units and their data were fully recorded in the files.

2.3. Animal bitten subjects

The subjects of this study included person who referred to rabies units due to fear of contracting rabies and/or other diseases from animal bites.

All the cases of animal bites referred to the health centers in the study period were included in the study (census).

2.4. Studied variables

Age, gender, occupation, residential information in urban or rural and location of the injury in urban or rural, type of biting animal, biter's situation after 10 days of bite by domestic, wild or escaped ones, injury site, the extent of the wound (large or small), time patterns of injury (hour, month, season, year), patterns of health services provided for the victims: the number of vaccination, and vaccination costs in terms of the number of rabies vaccine were assessed.

2.5. Code of ethics

The study protocol was reviewed and approved by the Ethics Committee of Tabriz University of Medical Sciences. Identity information of all bitten persons kept confidential.

2.6. Data analysis

Data were analyzed by SPSS software version 20. Descriptive characteristics of the participants were presented with statistics such as mean ± SD. And in case of lack of normality, the median and inter-quartile range and qualitative variables were presented with the relative frequency.

2.7. Statistical analysis

To investigate the possible correlations between the qualitative variables, the *Chi*-square test was used. In case of low sample size, Fisher's exact test was used. To examine the equality of the means of quantitative variables, the independent samples *t*-test was applied with equal variances assumed. To examine the equality of means of categories of qualitative variables the One-way ANOVA test was used. The Cochran–Armitage test for trend was also used to examine the incidence trend of bites during the seven-year study period. In all statistical tests, the *P*-value less than 0.05 was considered as significant.

3. Results

3.1. Demographic characteristics of victims

In total, during the study period, 1 724 bitten subjects with an average age of (21.00 ± 14.56) were registered and there was a statistically significant difference between the mean age of men (20.52 ± 14.72) and women (22.20 ± 14.11) ($P = 0.03$). In terms of gender distribution, 1 241 (72%) cases of the victims were male. Male to female ratio was 2.56.

Most of the victims of animal bite in terms of occupation were farmers with 494 cases (28.7%), students with 435 cases (25.2%) and housewives with 332 cases (19.3%). The most involved age group for men was 10–19 years old and for women was 20–29 years old (Figure 1).

3.2. Spatial patterns

The residential status of 288 cases (16.6%) were living in urban areas and 1 437 (83.4%) in rural areas. In terms of the location of bites, 409 cases (23.7%) happened in urban areas and 1 234 cases (71.5%) in rural areas and the location of 81 bites