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ORIGINAL ARTICLE

An Epidemiologic and Clinical Study of Snake Bites during a Five-Year Period in Karoon, Iran

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Abstract

Background: Snakebite is one of the most common health problems in endemic regions such as Iran. Due to the potential life-threatening impact of snake envenomation and biodiversity of snakes, it seems that epidemiological studies are required, as the primary step to design standard and local therapeutic protocols, regarding the national and regional facilities and therapeutic needs.
Methods: This investigation was conducted with a retrospective design, by studying all the records of patients affected by snakebite and hospitalized in Sina Hospital during 2006 to 2011. Epidemiological data and also the outcomes of patients (including side effects and survivals) were collected. The data were analyzed by SPSS software version 18, using descriptive statistics and Chi-Square test. $P < 0.05$ was considered as significant.
Results: A total of 287 snakebite patients were studied. 73.5% of patients were men and most of them belonged to the age group of 15-34 years. Most common complaints of patients once admitted were pain (74.6%) and edema (43.9%). 96.5% of the patients received 5-10 vials of anti-venom. The most prevalent side effect observed was coagulopathy (70.7%). A significant relationship was found between the anti-venom onset after the bite and the rate of coagulopathy occurrence (p=0.035). Three deaths had occurred in general.
Conclusion: Early referral to medical centers and administration of anti-venom has been accompanied by significant improvement in outcomes, and would reduce the hematological side effects, need for administrating blood products, and probably the need for administration higher anti-venom doses.

Keywords: Manifestation; Outcome; Snakebite; Treatment

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INTRODUCTION

Snakebite is one of the most important health issues in rural regions of endemic countries such as Iran (1-3). Epidemiological studies show that snakebite by venomous snakes happens for 2.1 to 5.5 million people annually, among which 125 thousand people die, and also tens of thousands get affected by chronic disabilities (1, 4-6). In addition, statistics in Iran are demonstrative of 4500 to 6500 cases of snakebite per year, 3-9 of which die yearly (7-9).

Studies have indicated that 69 snake species have been identified in Iran, 25 being venomous and 8 species being semi-venomous (2). This biodiversity and also the unique properties of each snake, even in the similar species (regarding geographical variety, and difference in moisture and temperature), have led into a wide range of clinical signs for snakebite (1, 2, 10). Therefore, variable clinical manifestations are seen in patients including swelling, pain, and tenderness (in mild cases), and systemic complications such as shock, bradycardia, respiratory failure, and coagulopathies (in severe cases) (1, 2, 11).

Despite the advances in current treatments for snake envenomation, antivenin is still the main choice for treatment. Antivenin includes two monovalent and polyvalent forms. it is usually recommended for moderate to severe cases because of the potentially life-threatening side effects (2, 12). Management strategies for snakebite in Iran are mostly based on personal experiences and therapeutic protocols of other countries. Since biodiversity of the snakes and their venoms is completely unique, it seems that performing epidemiological studies is required as the fundamental and primary step toward compiling standard and local therapeutic protocols regarding the national and regional facilities and therapeutic needs (3, 13).

Thus, this study was performed with the aim of evaluating the epidemiological aspects, clinical signs, complications, treatments, and outcomes of patients with snakebite in southwest of Iran, Karoon city, during 2006 to 2011.

METHODS

This study was a retrospective study based on hospital data. This research was performed by using the medical records of patients with snake envenomation, who had been hospitalized from March, 2006 until March, 2011 in Sina Hospital of Karoon, Iran. Sina Hospital is located in Karoon city, southwest of Iran. Most of the patients in this hospital are the farmers of marginal and rural regions who are at high

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risk for snakebite envenomation. This study was approved in informed written consent was taken from all the samples who met the criteria for entering the study. Data were collected from medical records. The required data were registered in a checklist that had been prepared beforehand and consisted of items including age, sex, interval between bite and admission, bite time, symptoms at the time of admission, number of the anti-venom vials used, coagulopathy complications, blood products administered such as packed cell (PC) and fresh frozen plasma (FFP), anti-venom infusion onset after the bite, length of hospital stay, and the need for intensive care unit (ICU) admission and mortality.

Statistical analysis:

The collected data were analyzed and the variables were first described using descriptive statistical methods including tables and graphs, and the relationship between the variables were then investigated by Chi-Square test. $p<0.05$ was considered as significant. SPSS software version 18 was utilized for analyzing the data.

RESULTS

Demographic Data and Clinical Manifestations:

A total of 287 patients with snake envenomation were studied, among which 211 cases (73.5%) were men and the rest were women. Most of the patients were in age group of 15-34 years (57.5%). The most common complaint was pain in the bite area (74.6%). Other symptoms included swelling (42.2%), cellulite (43.9%), and hemorrhage in the bite area (31.4%). The most common bite area was the lower limb (49.8%) and the least was reported to be the trunk (4.2%). Most of the bites had happened in afternoons (51.6%). Two-hundred and eleven patients (73.5%) had referred to hospital in less than 24 hours and the rest within more than 24 hours after the bite (Table 1).

Management and Treatments:

All the patients went under treatment with anti-venom and most of them (66.2%) received 5-10 vials of anti-venom. Most of the patients (68.6%) received anti-venom in less than 24 hours after the snake envenomation. Our findings demonstrated that late referral of the patients was accompanied by need for more anti-venom administration ($p=0.00$) (Table 2). So that, 70.3% of the patients who had referred after 48 hours of the bite, needed more than 10 vials of anti-venom administration, while it was 22.8% for the patients who had referred in less than 24 hours (Table 2). Moreover, our results indicated that delay in anti-venom administration onset significantly correlated with the increase in coagulopathies ($p=0.035$), which had resulted in a significant increase in the need for blood products administration ($p<0.05$).

27 patients (9.4%) just received PC, 45 patients (15.6%) just FFP, 29 patients (10.1%) both PC and FFP, and 186 patients (64.8%) did not receive any blood product (Table 2). Our study indicated that there is a significant relationship between the time passed after the bite and the need for using blood products in patients, so that the patients who had referred sooner to the medical center, had a significant reduction in the need for administration of blood products such as FFP and PC ($p=0.005$).

Outcomes:

203 of the patients (70.7%) got affected by coagulopathies during the treatment process identified by abnormality in PT, PTT, and INR. 35.2% of the patients had serious hematologic disorders during the treatment, that required therapeutic intervention. Besides, 53 patients (18.5%) experienced cardiovascular sequels in hospital and 22 people (7.7%) showed neurologic disorders. 138 patients (48.1%) were hospitalized in the ICU. 3 cases of mortality were reported in this study (1%) (Table 2).

Table 1. Demographic data

Variables	Gender	76 F, 211M
	Age	30 (15-70)
Clinical Presentations	pain	214 (74.6)
	edema	121 (42.2)
	cellulites	126 (43.9)
	Bleeding from bite area	90 (31.4)
Time passed from bite to refer	less of 24 hours	211(73.5)
	24 to 48 hours	49 (17.1)
	up to 48 hours	27 (9.4)
Snakebite time	morning	42 (14.6)
	noon	148 (51.6)
	night	97 (33.8)
Bite location	upper limb	114 (39.7)
	lower limb	143 (49.8)
	trunk	12 (4.2)
	head & neck	18 (6.3)

Table 2. The treatment and outcome of snakebite victims admitted to Sina Hospital, Karoon, southwest of Iran, 2006-2011.

Variables			Frequency (%)
Hospitalized Unit	General ward		149 (51.9)
	ICU		138 (48.1)
Treatment	antivenom	5 - 10 vial	190 (66.2)
		11- 15 vial	58 (20.2)
		upper 16	29 (10.1)
		0	10 (3.5)
	FFP		74 (25.8)
	P.C		56 (19.5)
Time of starting the anti-venom infusion after bite	less of 24 hours		197 (68.6)
	24 to 48 hours		69 (24.0)
	up to 48 hours		21 (7.3)
Outcome	coagulopathy complication		203(70.7)
	cardiovascular complication		53(18.5)
	neurological disorder		22(7.7)
	death		3(1.0)

DISCUSSION

Snakebite is still one of the challenging issues in clinical medicine, especially in rural regions of developing countries, that unfortunately has remarkably been neglected by the reliable scientific references (1). Hence, clinical study on snakebite in Iran and its local regions could provide beneficial data sources for the initial steps toward compiling the therapeutic protocols and improving practice and management of this disease (3).

The purpose of this study was to assess the epidemiologic and clinical aspects of snakebite injuries with focus on clinical manifestations, prognosis factors, and outcomes.

Epidemiologic Aspects:

According to our study, most of the bite cases have been in men. These results are consistent with the results of studies in Iran and other countries (2, 12-16), and show that men have been in dangerous places (farms, deserts, and forests) more than women. In this study, patients were mostly from the age range of 15-34 years. Similarly, in other studies also most of the patients belonged to this age group, which might be because of snake bite being one of the occupational diseases mostly seen in farmers of developing regions and that most of the farmers are in this age range (14, 15, 17). In our study, the most common bite location was lower limbs (49.8%), which is completely similar to other studies (14, 15, 17). This point suggests the importance of covering the feet as a cost-beneficial pace in preventing snakebites. A successful example would be using light boots resistant to snake teeth and sting by Burmese farmers (1, 18).

Clinical Manifestations:

32 species of venomous and semi-venomous snakes have been identified in Iran, most of which belonging to Viperidae (Vipera lebetina obtusa, Echis carinatus sochureki, and Pseudocerastes persicus persicus) and Elapidae (Naja naja oxiana) (2, 3). Snake venom is a complex of proteins and peptide toxins with potential life-threatening impact on different tissues of the body. Various signs such as nervous system paralysis, functional disorder in platelets, inhibition of smooth muscles, coagulopathies, edema, and change in vascular permeability might occur based on the venom type, amount of the venom injected, and patient's immune response (1-3).

The major complaint in our study was pain (74.6%), followed by cellulitis around the bite area (43.9%), localized edema (42.2%), and hemorrhage (31.4%). Moreover, our evaluation regarding the systemic disorders demonstrated that the rate of coagulopathy occurrence in patients was 70.7%, nervous disorders as 7.7%, and cardiovascular disorders as 18.5%. All of them are consistent with the results of Albuquerque et al. (15) and Jamaiah (19). In the study performed by Besharat et al. (20), coagulopathies have been reported as 43%. Furthermore, in the study of Raina et al. (17) and Jarwani et al. (14), the rate of the nervous intoxication has been reported as 46% and 51.6%; and this difference in symptoms occurrence could be attributed to the geographical distribution of snake species.

Early anti-venom administration as an Independent Factor in Prognosis:

One of the interesting findings in our study was the correlation between the anti-venom administration onset and the disease prognosis. Our study indicated that earlier administration of anti-venom was accompanied by improved consequences such as reduced need for higher doses of anti-venom, coagulopathies, and diminished need for blood products (PC and FFP). These findings demonstrate that sooner initiation of anti-venom may be considered as an important prognostic factor. There is little evidence regarding the effect of anti-venom administration onset and consequences of snake envenomation (21). These findings have also been confirmed in the studies of Silveira and Nishioka on those bitten by rattlesnake. They concluded that there is a significant relationship between the time of anti-venom administration and renal side effects (22). Moreover, in a study on those bitten by the crotaline snake Bothrops lanceolatus, Thomas et al. found out that the lack of treatment or delay in anti-venom administration is accompanied by higher mortality (23). Additionally, a study in Brazil on children demonstrated that children bitten by the rattlesnake Crotalus durissus significantly had fewer side effects, when received early anti-venom, compared to the group that had received it by delay (24).

Unlike the results of our study, Gerardo et al. in a study, performed in the United States of America, on those by Copperhead-predominant envenomation, concluded that there is no correlation between the time to anti-venom administration and total anti-venom dose administered with the outcomes of snakebite. It seems that the main reason for the difference in our study results could be the different setting of these studies. In the study of Gerardo et al., only the patients were studied who did not have the chance for serious side effects (patients with local signs and without progression) (21). Furthermore, in a study on 176 Australian patients with venom-induced consumption coagulopathy (VICC), Isbister et al. indicated that neither the time nor the administered anti-venom affected the VICC improvement. However, our study was different from the results of this study and the reason could be attributed to the different cut-off points in these two studies; we had considered the early referral time as under 24 hours after the bite (versus 4 hours in the study of Isbister et al.) and most of our patients had received more than 5 vials of anti-venom (versus 2-5 vials in Isbister's study). The snakes of each region are also different (25). Rahmani et al. also showed in Iran (Ahvaz) that the best initiation dose in snakebite patients is 5 vials, and we guess that part of positive effects of early anti-venom administration is due to administrating the suitable dose of anti-venom in our study (26).

LIMITATION

Retrospective nature of the study and the existing defects in documents and the type of snake not being identified were the main limitations of our study.

CONCLUSION

Current study demonstrated that snakebite is still one of the most important occupational diseases, especially in

young people of rural regions in developing countries. Regarding the high prevalence of snakebite in lower limbs, covering them, as an important factor in snakebite prevention, is recommended. Early referral to therapeutic centers and early anti-venom administration are accompanied by a significant improvement in disease outcomes. They reduce the hematologic side effects and the need for blood products, and higher anti-venom doses in patients. It is recommended that the future studies be prospective and the snake types get identified, if possible.

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Conflict of Interest: None to be declared.

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