



## Snake bite in Northwest Iran: A retrospective study

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### Abstract

**Introduction:** bite affects about 2 million people every year, with more than 100000 mortalities annually. A person bitten by a snake represents a variety of symptoms. Snake bite might be asymptomatic or with mild local symptoms or even could lead to tissue damage and rapid death. This study aimed to investigate characteristics of snake bite in Northwest Iran.

**Methods:** In this retrospective study, medical records of all patients with final diagnosis of snake bite who were admitted to Sina Clinical-Educational Center, the referral center for envenomation in Northwest Iran were investigated from 2002 to 2012. Demographic information and laboratory findings were collected using a checklist.

**Results:** During a 10 year period, 160 individuals with snake bite were admitted, of which 128 (77.6%) were male. With regard to occupation, farmers accounted for the largest portion ( $n = 57$ , 34.6%). The most prevalent sites bitten by snakes were right hand (25.5%) and left leg (24.8%). Fifty-seven patients (34.5%) had leukocytosis and four (2.4%) had coagulopathy. Pain and swelling were two main complaints, with vomiting, dizziness, and tingling in extremities coming afterwards.

**Conclusion:** Because snake bite is one of the most important emergencies presenting to emergency department and Iran's geographic status bears wide spectrum of poisonous snakes, this study was performed to further explore the clinical and epidemiologic details of snake bite.

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### Introduction

Snake bite is a common devastating environmental and occupational disease and is one of the most important and complicated medical emergencies with high rate of morbidity and mortality.<sup>1</sup> Most cases of snake

bites occur during spring and summer (April to September) all over the world.<sup>1-3</sup> Prevalence is especially high in countryside and areas with warm and dry weather. Different species could be identified based on epidemiologic characteristics of a specific

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area. Iran has a wide variety of climates including deserts and mountains build up at least three-quarters of the country. Most snakes could be found living in such areas.

A person bitten by a snake could present with a variety of symptoms, from being asymptomatic or having mild local symptoms to tissue damage and rapid death. Moreover, infection with oral flora of the snake can occur and lead to secondary infection and multi-organ dysfunction in body.<sup>4-6</sup> Annually 8000 individuals suffer from snake bites which leads to 4-6 cases of death in America. The most morbidity and mortality occur in elderly and children due to delay or failure to receive anti-venom.<sup>7-9</sup> In Mahshahr, Iran, a report showed 900-1000 cases of snake bites with 1-2 annual deaths.<sup>10</sup> Different reports of mortality and morbidity are being published every year depending on geographic factors, system characteristics and other factors.<sup>11-15</sup>

A common manifestation of severe envenomation is venom-induced consumption coagulopathy. Coagulopathy is perhaps the most significant clinical syndrome subsequent to snake envenomation worldwide and can be complicated by major hemorrhage that is often fatal.<sup>16-19</sup> Unfortunately, our understanding of the core mechanisms, risks of complications, and recovery is limited.

The underlying mechanism of coagulopathy is not clearly understood, therefore investigating coagulopathy pattern among patients suffering snake bite might lead to a better understanding of this mechanism. In this study, we aimed to investigate characteristics of snake bite in Northwest Iran in order to reveal the mentioned ambiguous results of previous studies and focus on importance of timely and appropriate treatment/medical management to prevent complications, morbidity, and mortality.

### Methods

In this retrospective study, medical records of all patients with final diagnosis of snake bite who were admitted to Sina Clinical-

Educational Center, the referral center for envenomation of Northwest Iran, were investigated in a 10-year period from 2002 to 2012.

Inclusion criteria included patients between 15 to 65 years of age who were admitted to hospital with confirmed diagnosis of snake bite. Patients with any underlying condition which could have compromised coagulation process were excluded from the study (e.g. hepatic dysfunction, hematological malignancies, etc.).

In this study demographic information such as age, sex, occupation, date and place of bite, site of bite on the body, arrival time, signs and symptoms, laboratory results, complications, management such as antibiotics, supportive therapy, antivenom, need for intubation, dialysis, surgical debridement and fasciotomy were collected by researchers using a checklist. Antivenom administration is indicated in presence of hemostatic abnormalities, neurotoxic signs, cardiovascular abnormalities, acute kidney injury, hemoglobinuria, laboratory evidence of systemic envenomation, and local swelling of bitten area spreading more than half of limb.<sup>1</sup>

The main parameters to evaluate coagulation were complete blood count (CBC), international normalized ratio (INR), and partial thromboplastin time (PTT). Renal and liver function tests and urine analysis were performed to detect hemoglobinuria and hematuria. In this study coagulopathy was defined as having one or more of the following: platelet count below 50000, prolonged PTT, high level of INR, and hemoglobin below 8.

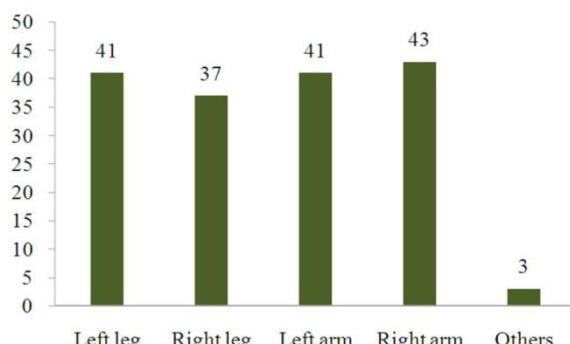
Statistical analysis was performed using SPSS for Windows (version 16, SPSS Inc., Chicago, IL, USA). Quantitative data are presented as mean  $\pm$  standard deviation, while qualitative data are demonstrated as frequency and percent (%). The study protocol was approved by the Ethics Committee of Tabriz University of Medical Sciences, which was in compliance with Helsinki Declaration. P value less than 0.05 was considered statistically significant.

## Results

This study was performed to investigate coagulopathy associated with snake bite among patients admitted to the referral center of envenomation in Northwest Iran in a 10 year period.

A total of 160 patients were included of which 128 (77.6%) were male. With regard to occupation, farmers accounted for the largest portion ( $n = 57$ , 34.6%). The mean time between occurrence of snake bite and reaching medical center was  $5.33 \pm 1.54$  hours.

Distribution of snake bite site is shown in figure 1. Only 3 patients were bitten in uncommon areas (buttock, left flank and lower back). None of the snake bites led to death.



**Figure 1.** Snake bite site among patients

Frequency of most common symptoms and signs among patients are shown in table 1.

**Table 1.** Frequency of most common symptoms and signs among patients

Symptoms	n (%)	Signs	n (%)
Pain	143 (87.1)	Edema	103 (62.5)
Edema	144 (87.7)	Tenderness	65 (39.4)
Nausea	37 (22.7)	Envenomation site	64 (38.8)
Dizziness	22 (13.5)	Tachycardia	8 (5.0)
Tingling	23 (14.1)	Tachypnea	2 (1.3)
Dyspnea	2 (1.2)	Ecchymosis	83 (50.6)
Bullae	8 (5.0)	Hypertension	7 (4.4)
Fever	4 (2.5)		

With regard to management options, 2 patients (1.2%) underwent surgical debridement and 8 patients (4.9%) underwent fasciotomy. One hundred and ten (66.9%) patients were administered Clostridium tetani

vaccine, 69 patients (42.3%) were administered human tetanus immunoglobulin, 155 patients (94.2%) received antivenom and 148 patients (90.2%) received antibiotics.

Regarding laboratory results, 57 patients (34.5%) had leukocytosis (white blood cells  $> 12000$  cell/ml) and 4 patients (2.4%) had coagulopathy.

## Discussion

Snake bite affects about 2 million people every year, with more than 100000 mortalities annually. Among sign and symptoms of Elapidae snake bites are paralysis, respiratory failure, dizziness, nausea and vomiting.<sup>20-22</sup> The symptoms for Viperidae snake bites include hemorrhage, disseminated intravascular coagulation (DIC), edema, necrosis, gangrene and bullae.<sup>4,23,24</sup> Crotalidae snake bites cause local tissue destruction<sup>25,26</sup> and Hydrophiidae snake bites cause muscular pain, intramuscular hemorrhage, dysphagia, myoglobinuria, and acute renal failure.<sup>27,28</sup>

In this study which included information obtained during 10 years, 77.6% of patients were male and most of the victims were farmers and housekeepers. In a study by Habib et al., it was reported that most of the victims were farmers and shepherds, because working outside and exposure to environment increases the probability of encountering snakes.

In a study by Alirol et al. about snake bite in Southeast Asia, it was concluded that there was a significant 2:1 male predominance over female among victims and that lower extremities were the most prevalent sites of snake bites. Mean time between snake bite occurrence and reaching first medical center was about six hours.<sup>29</sup> These findings are mostly similar to results of current study; although in our study, no significant gender predominance was found and right hand was the most prevalent bitten site. In current study, the most prevalent sites bitten by snakes were right hand (25.5%) and left leg (24.8%), which might be due to dominance of these extremities in daily work.

Coagulopathy is a significant cause of both morbidity and mortality in these patients, either directly, or indirectly. In current study, coagulopathy (2.4%), leukocytosis (34.5%) and renal failure (0.6%) were some of the complications seen among victims while 58.2% had no significant complication and they just suffered from mild itching and localized inflammation. There was no statistically significant association between snake bite and coagulopathy ( $P = 0.61$ ). In a study by Ireland et al. investigating serial laboratory findings among patients with snake bite, normal coagulation profile was observed in primary samples of only 13% of patients.<sup>30</sup> This is obviously in contrast with the results of current study and might be due to different snake species in these two studies.

In another study, 91 patients with snake bite with mean age of 21 years were observed for developing coagulopathy i.e. prolongation of prothrombin time (PT), PTT and decreased platelet count from admission to 72 hours after antivenom administration. It was reported that 78.5% of patients showed prolongation of PT and PTT while only one patient had decrease in platelet count. Spontaneous bleeding was the most important hematologic finding reported in 20.0% of patients.<sup>31</sup>

In present study, pain and swelling were two main complaints, while vomiting, dizziness and tingling in extremities were some other less prevalent complaints. Edema (62.5%) and ecchymosis (50.6%) were the most prevalent signs observed among victims. In a study by Suleman et al. investigating epidemiological details of snake bite in Thar desert, it was seen that swelling was the most common symptom and hypotension was the most prevalent sign detected among patients with snake bite.<sup>32</sup> This was similar to findings of present study although hypotension was not prevalent among patients with snake bite. In another study by Alirol et al. conducted in Eastern Terai, Nepal, neurologic manifestations were the most prevalent findings among victims of snake bite.<sup>29</sup>

#### Limitations

One of the main limitations of this study was lack of information about snake species. Recognition of snake species in snake bites might lead to more precise conclusions. This study only focused on Northwest of Iran. Studies with larger population including people from different geographic areas could lead to a more precise conclusion.

#### Conclusion

Because snake bite is one of the most important emergencies presented to emergency department and because Iran is a habitat for various species of poisonous snakes due to its geographical features, this study was performed to further explore the clinical and epidemiologic details of snake bite. Considering findings of this study, physicians and other healthcare providers can approach patients more oriented and get ready for the worst scenarios.

Also it is recommended that further studies focus on differentiating clinical findings which might be different snake species bite and involving more population, so more precise conclusions can be extracted from.

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#### Authors' Contribution

Zhinous Bayat makoo & Leila Eslamian contributed to design of the study, Haede Mobayen contributed to drafting of the article, Reza Piri & Ronak Benisi & Mohammad Nagavi-Behzad contributed to analysis and interpretation of data.

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#### Conflict of Interest

Authors have no conflict of interest.

**Ethic approval**

The study protocol was approved by the Ethics Committee of Tabriz University of Medical Sciences (Date: 15 Feb 2012,

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