

An Epidemiologic and Clinical Study on *Hemiscorpius lepturus (gadim)* Envenomation with Focus on Clinical Manifestations, Prognosis Factors, and Outcomes

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Abstract

Background: *Hemiscorpius lepturus* envenomation is one of the most important medical issues in tropical regions of Iran, especially Khuzestan Province. Due to lack of reliable data about scorpion sting in Khuzestan Province, this investigation was performed to study the clinical presentation, prognosis factors, complications and mortality rates of *Hemiscorpius lepturus* sting.

Methods: this study was a cross-sectional study performed at Sina Hospital, Karoon, Iran during 2011-2013. Required data such as demographic data, complications and outcomes were collected from medical records of all admitted victims of envenomation in this period and then were registered in a proppriate checklist. Data were analyzed using SPSS version 16.

Results: a total of 311 victims were studied. The highest frequency of sting was in the age range of 15-24 years. Most areas of the sting were the lower extremity. Forty-two patients delayed more than 24 hours to refer to the emergency room. The most common initial symptom in victims was pain in the sting location. Complications such as hematuria, hemoglobinuria, and coagulation disorders were most morbidity occurred in patients. 6 cases died.

Conclusion: delay in referring to the hospital, the existence of hemoglobinuria, coagulation disorders and kidney failure were associated with poor prognosis in patients. It seems that patients who refer with delays and with symptoms such as hematuria, need for more medical health care.

Keywords: Clinical manifestations; Epidemiology; Karoon city; *Hemiscorpius lepturus*

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INTRODUCTION

Scorpion stings are one of the most common health problems in the tropical regions with relatively high morbidity and mortality rate. Although there are no detailed statistics of the prevalence of scorpion stings in Iran, some studies have shown annual occurrence of 40,000 to 50,000 scorpion stings in Iran leading to about 19 deaths (1). This is despite the fact that in America with a large size of population, only about 10,000 to 13,000 scorpion stings are reported per year that leads to only 3 deaths per 11 years (2). Therefore, Iran and especially southwestern Iran (Khuzestan province) is an endemic region for many species of dangerous types of scorpions, due to its climatic condition (3).

Scorpions belong to the order of arthropod invertebrate and 650 species have ever been identified (4); in general, however, in Khuzestan province most scorpion stings belong to three species including *Mesobuthus eupeus*, *Hemiscorpius lepturus (gadim)* and *Androctonus crassicauda* (large black scorpions) (4).

Based on the type of the scorpion, clinical symptoms in patients are relatively different. However, in most patients

the local symptoms are often pain, redness and inflammation in the location of the sting, and in most cases the systemic symptoms are absent (2, 4).

Hemiscorpius lepturus (gadim) is one of the world's deadliest scorpions, which is endemic in areas of southwestern Iran. The venom of *Hemiscorpius lepturus* includes several toxins, including neurotoxin, cardiotoxin, and nephrotoxin hemolytic toxin and enzymes (3-5).

Each of these toxins and enzymes can in turn cause devastating complications, including hemolysis, hemoglobinuria, acute kidney injury, coagulation disorders, respiratory failure and nervous disorders such as seizures and ultimately the death of the victim (3, 4).

Unfortunately, due to mild pain of the sting with *Hemiscorpius lepturus*, the majority of victims may not sense the pain of *gadim* stings. It may lead to delay in referring and seeking for receiving medical care until the presentation of severe side effects of the scorpion venom (1-5).

Hemiscorpius lepturus stings treatment is controversial and even prescription of polyvalent anti-venom in all cases of stings as a standard treatment has been subject to the conflict among the physicians (3, 6). It seems that due to Khuzestan

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Province being endemic for *Hemiscorpius lepturus*, and our insufficient knowledge of the disease due to its relatively low prevalence in the world, studies in this area will significantly lead to our better understanding of this health problem. Therefore, the researchers decided to design this study to gain a better understanding of the epidemiology, signs and symptoms, as well as treatment outcomes for such victims.

METHODS

In this case-series study, all patients with the complaint of *Hemiscorpius lepturus* stings referring to Sina Hospital in Karoon, south-west of Iran during May, 2011 until March 2013, were investigated epidemiologically. This study was approved by Ethics Committee of Ahvaz Jundishapur University of Medical Sciences. All persons with inclusion criteria were included into the study, and to participate in the study, voluntary and informed written consent was obtained from them. In cases where patients had their scorpion samples, type of scorpion species was identified by an entomologist using the Iranian key of scorpions in an entomology unit of school of public health, Ahvaz Jundishapur University of Medical Sciences. In cases where a person's complaint of *Hemiscorpius lepturus* stings did not have the scorpion, by showing our collections to the victims we identified the type of the scorpion. Other data related to patients were collected, including age, gender, location of the scorpion stings in the body, the time of a visit to the hospital, and the complication and the outcome of the patients. These data were prepared using the medical records of the patients during the time of hospitalization to the time of discharge or death of the patients. The data were analyzed using appropriate statistical tests and by SPSS version 16.

RESULTS

311 cases with scorpion *H. Lepturus* stings were reported in the study. Of these, 65.6% were female. Most patients were in an age range of 15-24 years with a prevalence of 25.7%. Most scorpion stings time was between the hours of 20 (8 p.m.) to 5 (39.9%). A quantity of 131 people of the victims (42.1%) referred to the hospital after 24 hours of sting. Most locations of the sting were lower extremities with 38.6%, the upper extremity (28.9%), and then the trunk (21.5%) (Table. 1).

Most of the main complaints of patients during a visit to our Hospital Emergency were the pain in the sting location (57.6%), and hematuria (23.5%) (Table. 2). The most significant side effects created for patients included

Table 1. Frequency of the sting location in victims with *H. lepturus* sting

Location of the sting	Frequency (percent)
Head and neck	34 (10.9)
Trunk	67 (21.5)
Upper limb	90 (28.9)
Lower limb	120 (38.6)
Total	311 (100.0)

hemoglobinuria (55%), coagulation disorders (19.3%), acute kidney injury (8.7%) and respiratory distress (1.9%), respectively. Finally, six individuals (1.9%) of the patients were expired (Table. 3).

Table 2. The clinical presentation of victims with *H. lepturus* sting

Clinical presentation	Frequency (percent)
Pain	179 (57.6)
Edema	2 (0.6)
Hypersensitivity reactin	48 (15.4)
Hematuria	73 (23.5)
Other signs	9 (2.9)
Total	311 (100.0)

DISCUSSION

H. Lepturus is one of the deadliest scorpions that are endemic in Khuzestan Province, Southwestern Iran, accounting for 10-15% of the victims of scorpion stings referred to medical centers, including those in Khuzestan province. The appearance of these scorpions is morphologically unique. The body color of the scorpion is yellow with longitudinal dimensions of 5.5-8 cm (7).

Of the factors involved in the deaths and side effects caused by this scorpion is the presence of toxins and enzymes contained in them. Witness for this occurrence is the greatest mortality rate caused by scorpion stings (95% of the total mortality rate for scorpion stings) in Khuzestan Province, despite its relatively low prevalence (15% of the total scorpion sting cases), and for this reason, it has been dubbed as the deadliest scorpion in the world. Numerous studies have ever been conducted on the venom of the scorpion and its impact on the human body. The scorpion venom contains cytotoxin components and some enzymes (gelatinolytic, caseinolytic, and hyaluronidase activities) (8) that cause countless signs and symptoms, from skin necrosis to fatal complications such as kidney failure and respiratory failure, hepatotoxicity and central nervous system disorders and even death (9).

In our study, the occurrence time of the scorpion sting was mostly between the hours of 8 p.m. to 5 a.m. This finding is important because the little pain of scorpion sting if it happens during sleep can cause failure to refer the patient for treatment in the golden time and since most stings happen on the outskirts of sleep the envenomation danger will be increased. In this study, 42.1% of the patients had referred to the hospital after 24 hours. These findings were consistent with the findings of the studies conducted by Maghsoodi *et al.* and Karami *et al.* (10, 11).

Based on our study and other similar studies, the most common symptoms of patients on admission were related to pain in the location of the sting and hematuria. Furthermore, patients with pain often (77%) referred less than 24 hours for health care, while only 64.38% of patients with mild pain or

Table 3. The characteristics of expired victims with *H. lepturus* sting

Complication/ Case number	Age	Gender	Site of sting	Onset of symptoms	Symptom	Coagulopathy	Acute kidney injury	Hemoglobinuria
1	5	female	upper limb	<6h	pain	yes	no	yes
2	16	female	trunk	6-24h	haematuria	yes	yes	yes
3	70	male	upper limb	≥24h	haematuria	yes	yes	yes
4	75	female	lower limb	≥24h	hypersensitivity reactions	yes	no	yes
5	58	female	upper limb	≥24h	hypersensitivity reactions	no	no	yes
6	65	female	head and neck	<6h	pain	yes	yes	yes

no pain referring just for hematuria, had referred to the emergency room after 24 hours. These findings could justify the higher mortality of patients with the presentation of hematuria in our study and similar studies, which appears to be due to not having pain or stings while sleeping. Victims refer only when they have experienced the obvious symptoms of disease and delays in treatment cause mortality in these victims (2, 4, 12, 13).

In vitro and *in vivo* studies have shown that when RBCs are faced with the Scorpion *H. Lepturus* venom, their osmotic fragility increases, probably due to phospholipase A2 like enzymes, which leads to lysis of RBCs, hematuria (14). The results of our study and other clinical studies have also stressed this issue (15, 16).

In our study, the prevalence of coagulopathy was 19.3%, while in a study of 66 patients with scorpion *H. Lepturus* sting, Imam *et al.* reported a coagulopathy prevalence of 72.7%. This is more than the amount reported in our study and the reason for it can be our different definition of the coagulopathy. Since we did not consider coagulopathies that were not clinically important and that more likely they have been resulted as laboratory error, we did not consider them as coagulopathies (16). Moreover, Rahmani *et al.* reported the frequency of coagulopathy as 8%; the cause of the difference between their results with the results of our study is different types of scorpions explored in the two studies. So, since the cause of coagulopathy is the stinging arising from *H. Lepturus* venom thrombin-like enzymes, it is expected that coagulopathy can be seen more in stings from this scorpion (18 and 17). According to the results of our study in five of six deaths occurred, coagulopathy was seen and as previously pointed out also by Rahmani *et al.*, coagulopathy is accompanied by weak prognosis of disease (17).

It is thought that due to a direct effect on the kidney tissue and reduction of localized blood flow to the kidney, the toxin coming from venomous scorpions can cause acute renal injury. The results of our study and studies conducted by Radmanesh *et al.*, Pipelzadeh *et al.*, and Jalali *et al.* confirm the subject (7, 18-20).

In accordance with our study and other studies, the predominant panel of the death of *H. Lepturus* sting victims is renal failure and coagulation disorders.

CONCLUSION

According to the results and other studies, it can be concluded that the incidence of coagulation disorders, hemoglobinuria and acute kidney injury, and especially if the patient is referred by a delay, can be accompanied by a poor prognosis. It seems that patients with signs and symptoms such as hematuria, who refer with a delay, are in need for more medical health care (15-20).

In further studies in the form of clinical trials, it is recommended that different treatment methods for patients with *H. Lepturus* stings be compared so that the most effective treatment method can be obtained.

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