Scorpion fauna in Hamadan county, west of Iran (2013)

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Abstract

Background: Unfortunately, accurate statistics on scorpion fauna in all regions especially in non-tropical areas are not available. The present study focused a faunistic study of scorpions in Hamadan county.

Methods: This was cross-sectional study and performed during May - September, 2013 when scorpion stings were at a peak. To identify the scorpion fauna, specimens were collected at night using UV light and they were stored in 70% ethanol. Morphological studies were conducted under a stereomicroscope using diagnostic keys.

Results: The total number of scorpion captured in Hamadan province over the study period was 98 (55.1% were males and 44.9% were females). Most scorpion captured in the mid of summer period, with the monthly distributions being June (18.4%), July (25.5%), August (32.7%) and September (14.3%). The most prevalent scorpion's species was Mesobuthus eupeus (89.8%), followed by Odontobuthus doriae (5.1%), Androctonus crassicauda (4.1%), and Razianus zarudnyi (1.0%). The most frequencies of scorpion species were revealed in the temperatures of 21 to 23°C (73.4%). Also, scorpion species was more prevalent in humidity of 43% (24.5%). There were no significant relationships between the frequency of scorpion species and two environmental parameters of temperature and humidity.

Conclusion: In our region, scorpion envenomation is more prevalent in male than in female individuals, frequently in children and adolescents. This event is mostly cause by the species of Mesobuthus eupeus, especially in summer, in region with moderate humidity and temperature.

Keywords: Scorpion, Fauna, Hamadan, Iran
Background

Scorpion stings are a major public health problem in many underdeveloped tropical and subtropical countries, especially Sahelian Africa, South India, the Middle East, Mexico, and South Latin America. The estimated annual number of scorpion stings is 1.2 million leading to 3250 deaths (0.27%) [1]. For every person killed by a poisonous snake, 10 are killed by a poisonous scorpion. Scorpions can be found outside their normal range of distribution, that is when they crawl into luggage, boxes, containers, or shoes and are unwittingly transported home via human travelers. Out of 1500 scorpion species, 50 are dangerous to humans [2]. Scorpion stings cause a wide range of conditions, from severe local skin reactions to neurologic, respiratory, and cardiovascular collapse. Envenomation from most scorpions results in a simple, painful, local reaction that can be treated with analgesics, antihistamines, and symptomatic/supportive care [3]. Scorpion stings occur in temperate and tropical regions, especially between the latitudes of 50°N and 50°S of the equator. Furthermore, stings predominantly occur during the summer and evening times. Addition, the majority of patients are stung outside their home. Many potentially dangerous scorpions inhabit the underdeveloped or developing world. Consequently, numerous envenomations go unreported, and true incidence is unknown. However, it has been estimated that there are 1.2 million scorpion stings per year [1]. A recent 5-year surveillance study in Saudi Arabia found 6465 scorpion sting cases with a mean patient age of 23 years, a male-to-female ratio of 1.9, and a higher incidence of stings in the months of May through October [6]. In Khuzestan province of Iran, 12,150 annual cases occurred, with nocturnal envenomations occurring 60.9% of the time, 39.3% stings occurring on the hands, and 37.3% stings occurring on the feet. June was the highest month for stings, at 16%, and February, the lowest at 0.6% [7]. Unfortunately, accurate statistics on scorpion envenomation in all regions especially in non-tropical areas are not available. The present study gaoled to evaluate scorpion stings in Hamadan. Faunistic study of scorpions in Hamadan city.

METHODS

The Hamadan province is a great province (33°59’ to 35°48’ N Latitude – 47°34’ to 49°36’ E longitude) in Iran and is located in the west of the country. It has an area of 19493 km². Our
study was conducted in Aliabbad, Darehmoradbeik, Solan, Ghanjnameh, Tarikdareh, Divine, Shahramadani, Abbasabbd (Figure 1).

This was a cross-sectional study performed during May-September, 2013 when scorpion stings were at a peak. To identify the scorpion fauna, specimens were collected at night using ultraviolet light; they were stored in 70% ethanol. Morphological studies were conducted under a stereomicroscope using diagnostic keys.

In our study, four species of scorpions which commonly described in different areas of the Hamadan County were considered in the study. The data of 98 cases for the present study were assessed including the species of scorpions, as well as the humidity and temperature of the area. Descriptive and frequency statistical analyses were performed by using the Statistical Package for the Social Sciences (SPSS) for Windows, version 20.0 software (SPSS, Chicago, IL, USA).

RESULTS

The total number of scorpion captured in Hamadan area over the study period were 98 (55.1% were males and 44.9% were females). Most scorpion captured in the mid of summer period, with the monthly distributions being June (18.4%), July (25.5%), August (32.7%) and September (14.3%) and smaller number of the cases was collected in May (9.2%) (Figure 2). The most prevalent scorpion's species was *Mesobuthus eupeus* (89.8%) (Figure 3), followed by *Odontobuthus doriae* (5.1%) (Figure 4), *Androctonus crassicauda* (4.1%) (Figure 5), and *Razianus zarudnyi* (1.0%). The mean of area temperature was 22.10 ± 1.30 ºC ranged 19 to 25ºC. Also, the average of humidity was 42.83 ± 1.99%, ranged 40 to 48% (Table 1). The most frequency of scorpion species was revealed in the temperatures of 21 to 23ºC (73.4%) (Figure 6). Specimens in the highest and the lowest temperatures were specified to *Odontobuthus doriae* and *Androctonus crassicauda* species (Figure 7). Also, scorpion species was more prevalent in humidity of 43% (24.5%) (Figure 8). Also, scorpion species in the highest and the lowest humidity was specified to *Razianus zarudnyi* and *Androctonus crassicauda*, respectively (Figure 9).

DISCUSSION

The true incidence of scorpion sting envenoming is not known because many cases do not seek medical attention. However, it has been estimated that there are approximately 1 million stings...
per year. In Mexico alone, 250,000 scorpion stings are reported yearly, but fatalities have
dropped from 2,000 to less than 50 per year following widespread distribution of antivenoms [8].
In Tunisia 40,000 stings, 1,000 hospital admissions and 100 deaths are reported each year. There
is a high incidence in other parts of Northern Africa, the Middle East (notably Iran), India and
Latin America [8].
In this study 98 scorpion species were registered between May 2013 and September 2013
showing its more frequency in mid time of summer, and in regions with moderate temperature
and humidity. Different studies have shown varied age distribution for scorpion stings. In
different studies, children from 9 to 15 years old were more frequently affected than other age
groups [9]. This result was the similar with our study. In the present study, male victims
predominated over females. Several authors assign similar results to more activity displayed by
boys than by girls [10]. However, there was no difference in severe cases between the sexes.
Other studies indicated that males, with their outdoor activities had more contact with scorpions
than females, while other reports indicated that females accounted for the majority of victims
[11,12]. Our study also showed that the majority of scorpion stings occur in July and August,
during the hot season of the year. This is in accordance with data from the medical literature [13-
15]. This result is in agreement with that of previous studies concerning the seasonal variations of
scorpion stings in our country [3,5,16-18]. The seasonal scorpion sting cycle in the Midyat
district reflects the annual climate variations in this area, activities of the inhabitants and the
ontological behavior of scorpions. The periods with the highest incidence of scorpion stings in
other countries were June to September in Morocco, May to September in Saudi Arabia and
April to October in Iran [19-23]. In Brazil, the greatest number of envenomations occurred
during hot and humid months, with the majority from September to December [24]. These
variations may reflect differences in environmental conditions, especially a rainy or dry summer.
The differences between countries are most likely related to the temperature. In almost all regions of the world, most scorpion
species are active only during the summer.

Conflict of interest statement
There is no conflict of interest to be declared

Authors’ contributions
MN carried out the study design, participated in data collection and drafted the manuscript. MN
participated in the design of the study and performed the statistical analysis. MN, DB, BD and
AS conceived of the study, and participated in its design and coordination. All authors read and approved the final version.

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References


Fig. 1: Map of study area in Hamadan County, Iran

Quality of the map not allow to see any names. I strongly suggest to change the map to a vector type (you can even use the one produced by Google), and need to add locality points were scorpions were collected.

Fig. 2: Frequency of scorpion envenomation in different months ($\chi^2=16.796$, df= 4, P=0.002)

I can't understand: In the text, you are talking about "collected scorpions", but here you speak about "scorpion envenomation". Please give all the details in the methodology and in the results. A bar graph is more convenient for this kind of information. You need to do some statistical test for differences between months. Would be more convenient to show results from Mesobuthus euepus separately, since is by far more abundant than other species.
For all scorpion pics, you need to provide the sex and collection-locality data. All the pictures appears to be taken from Internet sources. You need to reference the source, and provide permissions for the use of the photographs.

Fig. 3: Photo of *Mesobuthus eupeus*

Fig. 4: Photo of *Androctonus crassicauda*

Fig. 5: Photo of *Odontobuthus doriae*
Fig. 6: The status of temperature in study areas

This graphic does not have any purpose as is presented now.
**Fig. 7:** Mean of area temperature according to scorpion species

You need to provide temperature standard deviation at least for each species. The values for each species are independent, remove the line between.

**Fig. 8:** The status of humidity in study areas

In the present form, the information of this graphic is useless. Remove it.
Fig. 9: Mean of area humidity according to scorpion species

Same comments than in Fig. 7. Give SD for the humidity, and do not use lines between values.
Fig. 1: Map of study area in Hamadan County, Iran
Fig. 2: Frequency of scorpion envenomation in different months ($\chi^2=16.796$, df= 4, P=0.002)
Fig. 3: Photo of *Mesobuthus eupeus*
Fig. 4: Photo of *Androctonus crassicauda*
Fig. 5: Photo of *Odontobuthus doriae*
Fig. 6: The status of temperature in study areas
Fig. 7: Mean of area temperature according to scorpion species
Fig. 8: The status of humidity in study areas
Fig. 9: Mean of area humidity according to scorpion species
Additional files provided with this submission:

Additional file 1: Table 1.docx, 12K
http://www.biomedcentral.com/imedia/1518685059216993/supp1.docx