

Scorpions and scorpionism in Iran's central desert



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ABSTRACT

Venomous scorpions have extreme importance in field of medicine and public health. This descriptive – analytic study was done to identify scorpion fauna, their ecological aspects as well as scorpionism for risk management and prevention of this health problem in Iran's central desert. Four urban and fifteen rural areas with various climates and topography locations were selected for monthly scorpion collection through a randomly cluster sampling in 2013. The clinical data was obtained from questionnaires provided in 2009–2014. Totally, 1481 scorpion sting cases were recorded. The majority were treated less than 6 h after the sting. Statistical tests showed significant difference between season, scorpion's color, living place of patients and scorpionism cases. Plain areas had the most occurrence of scorpionism followed by foothills. Moreover, 311 scorpion samples belonged to 7 species of Buthidae were collected. *Mesobuthus eupeus* was the dominant species in both rural and urban areas. Most of the collected samples were from indoors, yards and around the houses. The most scorpion activity was recorded in the summer. The studied areas had rich scorpion fauna due to various climates and topography locations. Scorpion stings can be important and fatal in this area, particularly in the plain regions with semi-desert climate. An investigation for assessment of peoples' awareness on prevention methods of scorpionism and also the determination and the assessment of effective factors on reducing the elapsed time between scorpion stings and receiving medical care are here recommended.

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1. Introduction

Scorpions are arthropods classified into the arachnids, with extreme importance in the field of medicine and public health (Rafizadeh et al., 2013). Although they cannot transmit specific pathogens to humans, some of them have venomous stings (Ozkan et al., 2006).

Approximately 1500 scorpion species have been identified in the world, of which approximately 30 of them present medical importance (Bawaskar and Bawaskar, 2012). Scorpionism is known as an important public health problem in developed tropical and subtropical countries, causing widespread complications, from severe local skin reactions to nervous, cardiovascular, and respiratory problems and sometimes death (Kassiri et al., 2012b; Pucca et al., 2015; Vahdati and Moradi, 2012b). At least 1 million scorpionism cases with more than 3250 deaths are estimated to

occur annually in the world (Nejati et al., 2014). In Iran, approximately 40 000–50 000 scorpionism cases with about 19 deaths were recorded annually (Kassiri et al., 2014). Iran has also the most number of dangerous scorpion species among the Middle Eastern countries (Dehghani and Fathi, 2012). At least 66 species and subspecies from 18 genera belonging to four families (Buthidae, Scorpionidae, Hemiscorpidae, and Diplocentridae) have been identified (Sari and Hosseini, 2011), of which about 10 species have a venomous sting (Dehghani and Fathi, 2012).

Qom province includes a large part of Iranian central desert with local and very old reports on the high prevalence of scorpionism in its urban and rural areas. The high reception of pilgrims from various countries increases the importance of this subject (Ebrahimzadeh et al., 2011). This comprehensive study was aimed to investigate scorpion fauna, their ecological aspects, and scorpionism for risk management and prevention of this health problem in the future.

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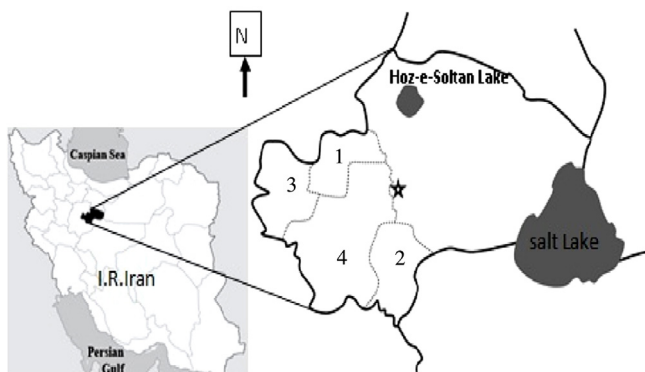


Fig. 1. Map of Qom Province, its location, district (★ Qom District) and towns: 1. Jafarabad, 2. Kahak, 3. Khalajestan, and 4. Salafchegan.

2. Materials and methods

2.1. Study area

Qom province has approximately 11240 km² area (0.68% of Iranian area) with hot regions suitable for scorpion growth and reproduction. Qom district is the provincial capital, located between 34° 09'–35° 11' N latitude and 50° 06'–51° 58' E longitude at almost 880 m above the sea level. This province includes one district (Qom) and four towns: Jafarabad, Kahak, Khalajestan, and Salafchegan (Fig. 1).

Qom district and Jafarabad town have warm and dry weather and desert with low rainfall, low humidity, and high temperature. Its soil type is clay, and vegetation includes tamarisk shrubs and thorns. Khalajestan town has cold and wet mountains with good vegetation and normal rainfall. A large part of Kahak is located in the mountainous areas and a few in the plains. It has moderate rainfall (Table 1).

2.2. Scorpion collection and identification

This descriptive – analytic study was conducted during four seasons in 2013. In total, 4 urban and 15 rural areas with various climates and topography were selected for monthly scorpion collection through a random cluster sampling.

Scorpions were explored in plains and mountains with a dense cover of weeds from sunset to 2 h after that. Scorpion nests were detected via semicircular opening and presence of soil near it.

To prompt the scorpions for leaving the nest, it was filled with water. Then, the fleeing scorpions were collected by the tail by long-handled tongs. In addition, the rocks were replaced with a metal lever to collect scorpions that may be sheltered beneath them. UV light was used for their collection.

In houses, the yards were sprayed with water 2 h before sunset, and then the corners of the yards were explored for scorpion collection. Pyrethroid spraying was done in warehouses for their stimulation and leaving of the shelter. In addition, under the carpets and behind the backrest and cupboards were explored.

The collected species were transferred to glasses containing 70% ethanol. Then, the collector name, location, and date of sampling were labeled.

In the laboratory, the scorpions were identified using a stereo microscope and scorpion species identification keys, besides information from the literature.

2.3. Clinical data collection

Clinical data were obtained from questionnaires belonging to 6 years, 2009–2014. These questionnaires were formerly prepared by the Iranian Centers for Disease Control (CDC) (Shahbazzadeh et al., 2009), had been registered by physicians and health staff in hospitals/health centers, and gathered in the province health center. Various data were derived from the questionnaires, including patient sex, age, residence, site of sting, and antivenom injection status.

3. Results

3.1. Scorpion fauna

A total of 311 samples were collected from urban and rural areas, among which seven species of Buthidae (C.L. Koch, 1837) were identified:

1. *Mesobuthus eupeus* (Rural: 107, 41% Urban: 31, 62%)
2. *Odontobuthus doriae* (Rural: 87, 33.3% Urban: 0, 0%)
3. *Androctonus crassicauda* (Rural: 47, 18% Urban: 18, 36%)
4. *Odontobuthus odontobotus* (Rural: 10, 3.8% Urban: 0, 0%)
5. *Orthochirus scrobiculosus* (Rural: 4, 1.5% Urban: 1, 2%)
6. *Compsobuthus matthiesseni* (Rural: 4, 1.5% Urban: 0, 0%)
7. *Hottentotta (Buthotus) saulcyi* (Rural: 2, 0.8% Urban: 0, 0%)

In rural areas, *Mesobuthus eupeus* (41%) was the dominant species, followed by *Odontobuthus doriae* (33.3%). Although the frequency of captured scorpions in the urban areas was very low, *M. eupeus* had the most frequency (62%), followed by *Androctonus crassicauda* (36%). Most of the collected samples belonged to indoors, yards, around the houses, and warehouses. Overall, the lowest population size was seen for *Hottentotta (Buthotus) saulcyi* in rural and urban areas.

Females and male scorpions comprised 60.77% and 39.23%, respectively.

Most of the scorpion activity was recorded in the summer (65%), followed by spring (28.5%), autumn (6%), and winter (0.5%). The ANOVA test showed significant difference between season and scorpionism cases ($p = 0.035$).

Distribution of scorpion species was different in various parts of Qom province. Most of the collected species belonged to the plain regions (Qom district and Jafarabad town). Khalajestan town with a mountainous topography had the lowest collection. All the species were found in the plain areas, whereas *M. eupeus*, *O. doriae*, and *A. crassicauda* were collected from the mountains (Fig. 2).

Some of scorpions were hunted and brought by patients to the health centers. The most of them had yellow color and some of samples were black. Unfortunately, only their color and not species had been reported by health workers (Table 2). There was significant difference between scorpion's color and scorpionism cases ($p = 0.042$).

3.2. Epidemiological data

During the 6 years (2009–2013), a total of 1481 scorpion sting cases were recorded. The scorpion sting cases were more reported from May to August as a month with the most incidences. Most of stings occurred in urban areas (Table 2). The Independent T-Test showed significant difference between living place of patients and scorpionism cases ($p < 0.05$).

Additionally, the most of victims were males (58.3%). The highest frequency of scorpionism belonged to the age group of 15–24 years

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