

# Epidemiologic Status of Scorpion Sting in Qom, Iran 2004-2013

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## A-R-T-I-C-L-E-I-N-F-O

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## A-B-S-T-R-A-C-T

**Background & Aims of the Study:** In the tropical regions of Iran, scorpionism is one of the important medical and public concerns. Poisoning with scorpion sting is one of the life threatening medical emergencies especially in individuals who are less than 6 years; knowing about its epidemiologic aspects might lead to exploit appropriate preventive methods. Therefore, for this purpose, the epidemiologic status of scorpion sting in Qom province of Iran was studied during 2004–2013.

**Materials & Methods:** This research is a descriptive-cross sectional study which has been done in all urban and rural areas of Qom province during 2004–2013 and all cases that referred to the one hospital, were assessed, examined, treated, followed and finally a questionnaire which is including demographic, epidemiologic and clinical data was completed for the patients. Data were analyzed by SPSS 17. Chi square and Fisher's exact test were used for the evaluation of the hypothesis.

**Results:** Totally, 395 cases of scorpion sting who were referred during the studied period. Most of them had 10–24 years. Most of them were male (60.25%). The most cases occurred during spring and summer. The stings mainly occurred at night between 22 p.m. and 4 a.m. Hands and feet were the most common organs of scorpion sting. 18.7 % of envenomed cases were due to black scorpion. 74.4 % of cases were from rural and 25.6 % from urban regions. 77.2% of the sufferers, sleep outdoor and on the floor. In 20.5% of cases, were surrounded by timber, dust and building materials. All cases have been received treatment and healed.

**Conclusions:** Based on findings, scorpion sting is considered a public health concerns in Qom province. So, it seems the programs of health education on personal protection to prevent possible damages with scorpions, especially students to be necessary. Also, the villager's should use the proper bed to sleep outdoor before wearing clothes or shoes and before entering the bed to ensure there are no scorpions. People should refuse to keep away timber, dust from residential environments for a long time.

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## Background

Scorpions are dangerous arthropods subsisting from late Silurian period (i.e about 330 million years ago). Scorpions are carnivorous and feed on insects, worms, arthropods, lizards or even small rodents. They are nocturnal and leave their hideouts with darkening of air searching for food and prey. Humans are stung by

scorpions accidentally. Scorpions hide inside clothes or shoes incidentally and sting individuals when putting them on (1). Scorpionism (being stung by scorpions) is one of the most important health problems in developing countries in tropical and subtropical regions that causes extensive side effects from severe local dermal reactions to neurological, cardiovascular, respiratory disorders and in some cases death. Today, Scorpionism is an

important health problem in some areas of world including countries which are located in southern parts of Africa and Middle East such as Algeria, Egypt, Iraq, Iran, Jordan, Morocco, Sudan, South Africa and Mexico, Brazil, Argentina, Venezuela, Guyana, Trinidad in South America (2,3,4). Based on statistical data, about 1.2 billion people live in areas having liability to be afflicted by scorpion sting and 1.2 million people are suffered by envenomation caused by scorpion venoms that causes mortality at a rate of 0.27% of stung cases annually (5). This health problem causes relatively high economic expanses and various psycho-mental disorders in societies (4). Scorpionism is occurred in many countries as in Morocco and Brazil, about 40,000 and 7,000 annual cases of scorpion sting are reported, respectively. From the total number of 40,000 annual cases of scorpion sting in Tunisia, about 1000 individuals are admitted in hospitals because of clinical manifestations of which 100 individuals are died (6,7,8). Until now, approximately 1500 scorpion species have been identified spreading throughout the world with more prevalence of occurrences in tropical and subtropical regions. About 50 species of scorpions need special health and medical importance (4). The situation of scorpionism varies in different regions and countries in terms of life style, socio-economical status, residency, the way of offering health care services and scorpion species of each geographical area (9). Iran is rich of arthropods especially scorpions because of weather and climate factors (10). 44 scorpion species of 23 genus have been identified and characterized in Iran; all of them belonging to two Buthidae and Scorpionidae families with 6 species of health importance including *Mesobuthus eupeus*, *Hemiscorpius lepturus*, *Buthotus (Hottentotta) saulcyi*, *Odonthobuthus doriae*, *Androctonus crassicauda* and *Buthotus (Hottentotta) schach*. These species are the most prevalent scorpions causing scorpionism in Iran in which *Buthotus (Hottentotta) schach* is determined as the most

dangerous scorpion species. The highest rate of scorpionism in of Iran especially in Khuzestan province is caused by this species (11-14). For many years, Iran's researchers such as Dr. Farzanpey and colleagues had directed numerous studies as in thesis and research projects to identify scorpion species of different regions in Iran in which faunistic studies of scorpions in Iilam, Sari, Yazd, Shiraz, some parts of Persian gulf islands and many other regions could be mentioned (14-18). So far, *Odonthobuthus doriae* and *Androctonus crassicauda* species have been reported from Qom province (19). Scorpionism is happened in many regions of Iran. More than 100,000 individuals are subjected to envenomation caused by scorpion sting annually in which only about 36,000 cases are reported by medical sciences universities that more than 75% of them are children. Among them, between 7 to 60 cases of scorpionism events lead to mortality (20). In addition to Khuzestan province with highest rate of scorpionism, some other cases have been reported from other provinces including Hormozgan, Sistan and Baluchestan, Fars, Ilam, Bushehr, Kerman, Kohkiluyeh and buyerahmad, Kermanshah, Isfahan, Khorasan, Western Azarbayjan, Kurdistan, Tehran, Qom, Eastern Azarbayjan, Ardebil, Markazi, Gilan, Lorestan, Semnan, Mazandaran and Golestan (11). Central and southern regions of Iran have special importance compared with other regions in terms of scorpion and snake sting because of socio-economical, geographical and cultural status. People in tropical rural areas, for instance, sleep outdoor in summers making possible the occurrence of scorpionism. Because of relatively high prevalence of scorpionism in rural and urban areas of Qom province and absence of a comprehensive study in this regard, applicable solutions in order to prevent this major health issue could be provided for health service programmers via knowing about epidemiological status,

prevalence, high-risk age groups and other indicators which are related to scorpionism.

### Aims of the study:

#### Materials & Methods

This study is a descriptive cross-sectional one with case studies which were obtained from scorpion-stung people profiles in urban and rural areas of Qom province during 2004 to 2013. The data of scorpionism cases were reported as non-urgent reports from hospital emergencies to non-contagious unit of public health center of Qom province. The data of only thoroughly recorded profiles were included in this study. Data were extracted from diseases control department which consist of variables including age, gender, sting-affected organ, seasonal and geographical status of the region, color of scorpion and so forth. Since all the cases are referred to hospital emergencies, it may be the best place for gathering relative data. Affected stung patients were divided into three categories based on clinical symptoms and manifestations as follow; Mild: including asymptomatic cases, local signs, pain and restlessness; Moderate: including severe restlessness, drowsiness, nausea-vomiting, tachycardia, sweating and hypertension; Severe: covering cases of acute pulmonary edema characterized by clinical radiological observations, electrocardiograms and laboratory test alterations such as hemoglobin reduction and haematuria (21). General symptoms of scorpion sting in terms of effects on nervous system were divided into several groups; sympathetic and parasympathetic simulations, central nervous symptoms and asymptomatic. The patients with mild clinical signs were taken under careful inspection for 6 hours and discharged after anti-pain therapies. Patients with moderate and severe symptoms received antivenom therapy and were discharged after ensuring of remedy following at least 24 hours being under medical inspection. After data compiling and checking its accuracy, they were

analyzed by computer. Relative frequency table and consensus table were used to describe classified variables. Chi-square test and Fischer exact test were used for analytical part of study. Obtained p-values which were less than 0.05 considered as a significance level. All mentioned statistical analyses were performed by SPSS v.17.

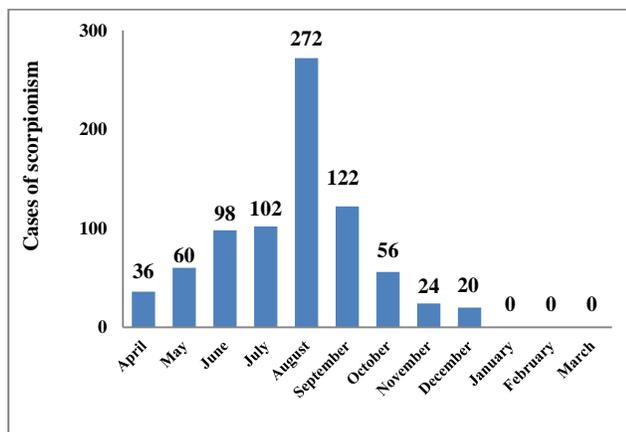
#### Results

From the total of 395 cases of scorpion sting during the study, 157 individuals (39.75%) were female and 238 of them (60.25%) were male. Groups who had the highest rate of stung were 10-24 years old (34% of total affected males) and 25-34 years (27.3% of total affected females) in males and females, respectively.

**Table 1) Distribution of scorpionism frequency according to age groups**

Age groups	No.	Percent (%)
0-9	21	5.3
10-24	121	30.6
25-34	115	29.1
35-44	50	12.7
45-54	48	12.2
55-64	21	5.3
65+	19	4.8
<b>total</b>	<b>395</b>	

74 cases of scorpion stings (18.7%) were caused by black scorpion (*Androctonus crassicauda*), 312 cases (79%) were caused by yellow scorpion and 9 cases were stung by other scorpion species. Results showed that 178 cases (45%), 173 cases (43.8%), 32 (8.2%) and 12 (3%) cases of scorpion stings had been taken place in hands, feet, trunk, head and neck, respectively. 97 (24.5%), 248 (62.8%) and 50 (12.7%) cases of scorpionisms were occurred in spring, summer and autumn, respectively. No cases of scorpion stings were recorded in winter. The most cases of scorpionism in summer were reported in August (136 individuals-54.8%) and September (61 individuals-24.6%) and as mentioned above, no cases of scorpionism were reported in winter months (Figure 1).



**Figure 1) Distribution of scorpionism frequency according to month.**

294 cases (74.4%) of stung people were inhabitants of rural areas and the remaining 101 cases (25.6%) were living in urban areas. Outdoor cases of scorpion stings were more than indoor cases (350 cases, 77.2% versus 90 cases, 22.8%). 81 cases (20.5%) of stung people were living in areas with lots of firewood and shavings around them. The time

of accessing to hospital (time interval between scorpion sting and serum injection) in most cases was less than three hours (362 cases, 91.6%). Clinical manifestations included local pain in suffered area (82%), redness (9%), numbness and paresthesia (12.5%) and severe muscular pain (0.7%). The most and the least cases of scorpionism occurred in 00:00 to 6:00 am and 12:00 to 6:00 pm, respectively (table 2).

**Table 2) Distribution of scorpionism frequency according to time of sting**

Time of sting	No.	Percent (%)
0-6	193	48.9
6-12	81	20.5
12-18	9	2.3
18-24	112	28.3
<b>total</b>	<b>395</b>	<b>100</b>

Most (20.5%) of individuals who suffered from severe clinical symptoms were stung in early morning and first hours of night (6:00 pm to 12:00 pm) (table 3).

**Table 3) Distribution of frequency of scorpionism symptom's severity during night**

time of sting	Mild symptoms		Moderate symptoms		Severe symptoms		Accumulative number	Accumulative percent (%)
	No.	%	No.	%	No.	%		
18-24	68	60.7	21	18.7	23	20.5	112	100
00-06	119	61.6	56	29	18	9.4	193	100

With respect to effects on nervous system, 2% of inflicted individuals presented stimulations and sympathetic signs; 0.5% showed parasympathetic signs, 0.2% of cases were indicated by central nervous system symptoms and 97% were asymptomatic. With respect to therapeutic procedures, 389 individuals (98.4%) of cases were subjected to muscular antivenom therapy and 6 cases underwent intravenous antivenom therapy. All the stung cases were healed and discharged. The most cases of injuries caused by scorpion sting in males (45%) were in hands and in females were in feet and lower extremity. By performing Fischer exact test, it was revealed that there was a significant statistical association between the residency area (urban or rural) and the place

(indoor or outdoor) of scorpion sting happening. Although, 25% of morbidity rate in urban regions occurred indoor (inside the living area), however, in rural regions, 6.5% of cases occurred indoor and the remaining (93.5%) happened in outdoors (p-value <0.05). 47 (11.9%) scorpionism cases were in spring that all caused by black scorpion. 338 (85.6%) of cases took place in summer in which 27 (6.8%) cases were stung by black scorpion and 311 (78.8%) cases were due to yellow scorpion; and 10 (2.5%) cases were reported in autumn including 1 (0.3%) and 9 (2.2%) cases were because of yellow scorpion and other scorpion species, respectively. Descriptive results also showed that 101 cases of scorpion stings (25.6%) were in urban areas in which 74

(18.7%) cases were caused by black scorpion and 27 (6.8%) cases were because of yellow scorpion. In rural regions, besides that, the number of cases were 294 (74.4%) consisting 285 (72.2%) cases because of yellow scorpion and 9 (2.2%) cases because of other scorpion species other than yellow and black scorpions. The most cases of scorpionism in urban and rural regions were due to black and yellow scorpions, respectively.

## Discussion

This study is an expansive research lasting for 10 years in which 395 cases of scorpionism referring to Qom province hospitals were studied in terms of demographic information, clinical manifestations and therapeutic results. Scorpionism cases were more in males compared with females (39.74% of females versus 60.25% of males). The reason may be due to occupational condition and higher exposure of males to high-risk places. In a study carried out by Talebian and Darrudgar in Kashan, similar results were obtained (22). With respect to different age groups, the stung cases were as follow: 2 individuals in 0-9 years, 121 cases in 10-24 years, 115 cases in 25-34 years, 50 cases in 35-44 years, 48 cases in 45-54 years, 21 cases in 55-64 years and finally 19 cases were above 65. Also, in a study conducted by Darrudgar *et al.* and another study by Hosseininasab *et al.* in southern regions of Kerman province, the least cases of scorpionism were above 65 (21,22). This research showed that clinical symptoms of envenomation in early night-stung patients were more severe than patients stung in other times (71% of early night-stung patients showed severe clinical symptoms). During the night, the scorpion may sting several more times that results in reduction in venom amount (23). Most of stings (72.2%) occurred along night between 6:00 p m and 6:00 a m. Scorpions usually stay immobile and inactive during daytime in secure places like wall

cracks, under stones, inside shavings, under woods or bushes, among leaves or under the soft skin of trees like Eulayptus, palm trunk openings, inside building's waste remnants or even inside shoes, boots and slippers, then leave their secure place at night in to get foods (24). The severity of clinical symptoms was more severe in 0-9 years group (42% of cases with severe symptoms). Factors like age, weight, place, time of sting and type of scorpion are effective in envenomation severity. Children and old people are more vulnerable to scorpion venom. To whatever extent, the weight of affected person be less, the ratio of venom to per kg of weight would be more and thereby the risk of envenomation would be elevated (25,26). Stings which taken place in head and neck were low (3%); it could be the reason for the lack of referrals to specialized hospitals and no cases of casualties. According to performed studies; stings in the head and neck areas are more dangerous than stings which taken place on hands and feet (21). Despite in this research, happily there were not any stung cases leading to death, since the rates of scorpionism in last 10 years in Qom province were more in spring and summer, physicians should pay more attention to stung cases in spring because scorpions have high amount of venoms in this reason compared with other seasons (27). In addition, the time for conveying stung person to hospital were less than three hours in most cases (91.6%) and with appropriate therapeutic procedures all the stung cases were healed, discharged and no cases of mortality caused by clinical symptoms of scorpion stings were reported. In a study carried out in Turkey, one case of mortality happened because of pulmonary edema (28). In another study in Khuzestan, three cases of mortality had been occurred because of severe symptoms of scorpionism (29). 18.7% of scorpionism cases was due to black scorpion, 79% of cases due to yellow scorpion and the rest 2.3% was because of other scorpion species. According to a study carried out by Dehghani *et al.* in Kashan, from

200 scorpionism cases in one year, 30% was because of black scorpion (*Androctonus crassicauda*), 62% was because of yellow scorpion (*Mesobuthus eupeus*) and in 8% of cases, the scorpion species were not identified (30). With respect to clinical symptoms, in most of the cases (82%) only local pain was reported. In addition, 3% of cases showed nervous symptoms while the rest 97% were asymptomatic. Many of scorpion species are harmless and their stings causes only severe pain or tenderness, burning feeling, often local inflation and consequent paresthesia is seen at the place of sting that usually is healed in some hours without any side effects. The venom of some dangerous scorpion species causes hemolysis and some other species posses more lethal venoms causing nervous system symptoms. The most cases of injuries with scorpion sting in males were in hands (45%) and females were in feet and lower extremity. In a study conducted by Hosseininasab *et al.* in southern Kerman, similar results were revealed (21). The reason for this observation may be because of diurnal hideout of scorpions in dark areas like inside shoes and clothes and consequent their nocturnal activity, therefore, it is expected that hands and feet be more vulnerable to stings, as many cases of scorpionism have been observed when putting on clothes and shoes (1). By performing Fischer exact test, a significant statistical association was seen between the residency (urban or rural areas) and place of scorpionism (indoor or outdoor). 25% of morbidity cases in urban regions were happened indoor while in rural regions, just 6.5% of cases were happened indoor and the rest of 93.5% was because of outdoor stings. The research carried out by Dehghani *et al.* also showed that more stung cases have been taken place outside of houses (3). The reason for this observation is clear to some extent; for instance, outside environments in rural areas are more suitable for scorpion living compared with urban areas. Large portion of families in rural areas keep woods,

construction materials and shavings around their living environments that could provide appropriate places for scorpions living. Besides, many people in rural areas sleep outdoor at nights without being in an enclosed room. Although, studied cases can not reflect 100% of scorpionism cases in Qom province that this is a defect of studies based on recorded data; however, it seems that achieved results of this study can to some extent reflect the epidemiological status of scorpionism in Qom province.

### Conclusion

The results of this study indicate that scorpionism is an important health concerns in Qom province. Therefore, it is necessary to provide educational health programs regarding to personal protection for preventing probable scorpion sting especially for students. In addition, people in rural areas should use appropriate beds for outdoor sleeping and be vigilant when putting on clothes and before going to bed. Stone, forage and woods should not be kept in living environments for a long period of time. Besides, fractures and cracks of buildings should be repaired to reduce cases of scorpion stings. It is also recommended to perform a study for determining the fauna of scorpions in Qom province in order to provide better therapies for scorpionism cases.

### Footnotes

#### Conflict of Interest:

The authors declared no conflict of interest.

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