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Scorpion envenomation study in Behbahan County, Southwest Iran

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PEER REVIEW

Peer reviewer

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Comments

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ABSTRACT

Objective: To study the incidence and epidemiology of scorpion sting cases that were referred to the health services centers of Behbahan County, Khuzistan Province, southwestern Iran, during the two year (2007–2008).

Methods: In this descriptive retrospective research, the data has come from files of scorpion–stung patients referring to the health services centers of Behbahan during study period. A special scorpion sting sheet was prepared and completed for every case of scorpion sting. Analysis of 3441 case sheets received during this period was carried out. The frequencies of medical and entomologic parameters were turned to the percentage position.

Results: A total of 3441 cases of scorpion stings were reported during the two–year period from 2007 to 2008. The average incidence of scorpion stings was 8.8‰ in the two years. The frequency of cases was higher during August, September, June and July that 2056 cases of scorpion stings were reported. Most stings were occurred during summer. Nearly 51.3% of the cases were men. All cases had received antivenin. Majority of scorpion sting cases (56.5%) lived in the rural areas. The most common sting site was the hand. About 74.4% have received the antivenin 0–6 h after the sting. The early injection of the antivenin is very important. The most of the cases of scorpion stings (59%) were occurred by yellow scorpions.

Conclusions: Surveillance for cases of scorpion stings must begin at all regions of Behbahan County. Treatment of cases of scorpion stings is conducted according to a protocol set by the Ministry of Health, Treatment and Medical Education. This protocol included directions for lines of treatment and the dose of antivenin recommended. Thereafter all cases are referred to hospital for further observation and management.

KEYWORDS

Epidemiology, Scorpion sting, Incidence rate, Iran

1. Introduction

Events caused by scorpion stings are a relatively prevalent incident in many countries and can cause fatal envenoming in people, in particular pediatric[1]. Among 1500 species of scorpions that have been reported all over the globe, the venoms of fifty species are serious for human. Most of them belong to genus *Hemiscorpius* from Hemiscorpiidae and

genera *Buthus*, *Parabuthus*, *Mesobuthus*, *Tityus*, *Leiurus*, *Androctonus* from Buthidae[2]. More than 1 200 000 scorpion stings happen every year while the number of deaths could overpass 3 250. Mean case fatality rate is 0.27%. The stings occur in summer, mostly at home and during the night. The hazard also exists in urban areas, even if it happens more often in villages. Climatic situations, heat and dryness, are also significant risk factors[3].

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Scorpion stings in Khuzistan Province, a province of south–west Iran, are a fundamental public risk. They are responsible for many deaths annually, mostly among the children, in the rural areas during the hot seasons[4]. In the southern half of Iran (Khuzistan, Sistan–Baluchistan, Hormozgan and Kerman Provinces), about 75% annual mortalities of scorpion stings has been reported. However, most of the deaths and cases of scorpion stings have occurred in Khuzistan Province[5,6].

Iranian scorpion fauna consists of 44 named species from 23 genera in 3 families, Buthidae, Scorpionidae and Hemiscorpiidae. Khuzistan Province has 19 of these species. Scorpion species occurring in Khuzistan Province include: *Hemiscorpius lepturus* (*H. lepturus*), *Scorpio maurus townsendi*, *Vachoniolus iranus*, *Razianus zarudnyi*, *Orthochirus farzanpayi*, *Orthochirus iranus*, *Orthochirus stockwelli*, *Odontobuthus bidentatus*, *Mesobuthus eupeus phillipsii*, *Hottentotta saulcyi*, *Hottentotta schach*, *Hottentotta zagrosensis*, *Hottentotta khoozestanus*, *Compsobuthus garyi*, *Compsobuthus jakesi*, *Compsobuthus matthiesseni*, *Buthacus macrocentrus*, *Androctonus crassicauda* (*A. crassicauda*) and *Apistobuthus susanae*[7].

H. lepturus (Hemiscorpiidae), is the most medically important scorpion in Iran (Figure 1)[8]. The toxicity happening from *H. lepturus* sting varies considerably in both period and intensity. So, *H. lepturus* envenoming is noticed as a medical emergency that needs urgent and considerable attention. *A. crassicauda* (Figure 2) is noted as the other being of important medical significance, but less hazardous species[9–11]. Distribution of *H. lepturus* in Iran is given in Figure 3. Behbahan County is one of the most important foci of scorpion sting in Khuzistan Province, Southwestern Iran. This research was conducted to study the incidence and epidemiology of scorpion sting cases that were referred to the health services centers of Behbahan County during the two years (2007–2008).



Figure 1. Photo of a male *H. lepturus* (Hemiscorpiidae) in Khuzistan Province, SW Iran.



Figure 2. Photo of *A. crassicauda* (Buthidae) in Khuzistan Province, SW Iran.

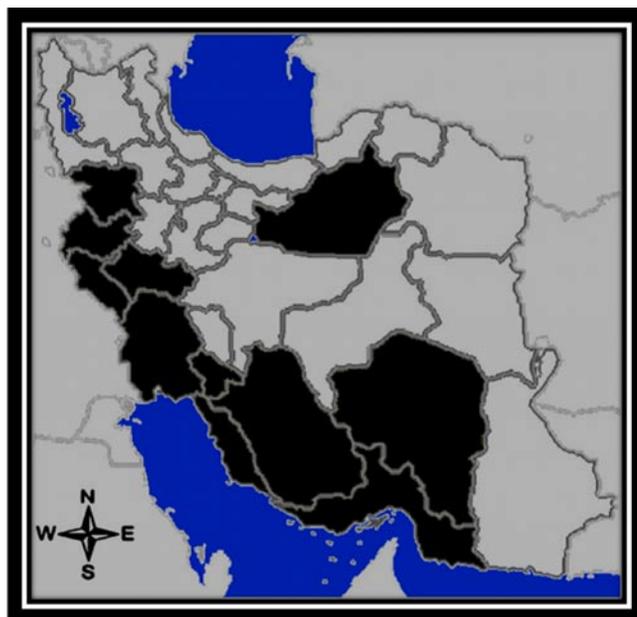


Figure 3. Distribution of *H. lepturus* (Hemiscorpiidae) in Iran (Dehghani R, 2012).

2. Materials and methods

Khuzistan Province has an area of 63 633.6 km² and it is located in the southwest of Iran (47°40' to 50°33' E longitude and 29°57' to 33° N latitude). Behbahan (30°35'45" N to 50°14'30" E) is located in the southeast of Khuzistan Province. In this descriptive retrospective study, the data has come from files of scorpion–stung patients referring to the health services centers of Behbahan during the two years (2007–2008). The victims who referred to the health services centers of Behbahan completed a questionnaire by asking gender, month of scorpion sting, residence of patients, scorpion–stung part of body, color of scorpion that stung, scorpion sting history, the interval time from scorpion sting to injection of scorpion antivenin, history of receiving the antivenin and death because of the sting. The frequencies of medical and epidemiological parameters were turned to the percentage position.

3. Results

Totally, 3441 patients presented to the health services centers of Behbahan were monitored during the two-year period from 2007 to 2008. Among these, 1620 cases was related to 2007 and the remainings in 2008. Just decisive scorpion stings, identified by trained health services centers personnel, were included in this research. The average incidence of scorpion bites was 8.8‰ during the two years. However, the lowest and the highest affected cases were observed in 2007 and 2008 with incidences of 8.3 and 9.3 per 1000 people, respectively.

The males with 51.3% were the most affected sex (Table 1). Among 3441 cases of scorpion stung, 646 (18.8%) were found on head and trunk, 1435 (41.7%) on hand and 1360 (39.5%) on leg areas (Table 2). The time passed from sting to injection of antivenin were less than 6 h for 74.4% of scorpion stung persons, 6–12 h for 10% of patients, more than 12 h for 15.6% of cases (Table 3). All cases were treated by scorpion antivenin serum. Also, 1944 scorpion stung cases (56.5%) were from rural regions of Behbahan and the rest of 1497 cases (43.5%) were from the urban areas of Behbahan (Table 4). No deaths were recorded during the present study.

Table 1

Distribution of scorpion sting cases by sex in Behbahan County, SW Iran (during 2007–2008).

Gender	2006 [n(%)]	2007 [n(%)]	Total [n(%)]
Female	826 (51.0)	851 (46.7)	1677 (48.7)
Male	794 (49.0)	970 (53.3)	1764 (51.3)
Total	1620 (100.0)	1821 (100.0)	3441 (100.0)

Table 2

Distribution of scorpion sting cases by site of sting in Behbahan County, SW Iran (during 2007–2008).

Site of sting	2007 [n(%)]	2008 [n(%)]	Total [n(%)]
Head and trunk	327 (20.2)	319 (17.5)	646 (18.8)
Hand	683 (42.2)	752 (41.3)	1435 (41.7)
Foot	610 (37.6)	750 (41.2)	1360 (39.5)
Total	1620 (100.0)	1821 (100.0)	3441 (100.0)

Table 3

Distribution of scorpion sting cases by interval time between sting and antivenin injection in Behbahan County, SW Iran (during 2007–2008).

Interval between sting and antivenin injection (h)	2007 [n(%)]	2008 [n(%)]	Total [n(%)]
<6	1215 (75.0)	1345 (73.9)	2560 (74.4)
6–12	157 (9.7)	187 (10.3)	344 (10.0)
>12	248 (15.3)	289 (15.8)	537 (15.6)
Total	1620(100.0)	1821(100.0)	3441(100.0)

Table 4

Distribution of scorpion sting cases by stung location in Behbahan County, SW Iran (during 2007–2008).

Year	City [n(%)]	Village [n(%)]	Total [n(%)]
2007	713 (44.0)	907 (56.0)	1620 (100.0)
2008	784 (43.0)	1037 (57.0)	1821 (100.0)
Total	1497 (43.5)	1944 (56.5)	3441 (100.0)

Patients reported 2030 (59%) yellow scorpions and 832 (24.2%) black scorpions. The rest did not distinguish their color (Table 5). Data collected in this research revealed that the most frequent scorpion sting cases pertained to the months of August (15.8%), September (15%) and June (14.6%), and the lowest to the December (1.1%), January (1.1%) and February (1.1%) (Table 6). Furthermore, the highest incidence of scorpion sting patients taken place in summer (45.1%), spring(35%), fall (16.2%) and winter (3.7%), respectively. During the present study, out of 3441 scorpion sting cases, 778 cases (22.6%) had sting scorpion history (Table 7). Results of the study based on history of receiving the antivenin showed that 12.4% of the patients had received the antivenin (Table 8).

Table 5

Distribution of scorpion sting cases by scorpion body color in Behbahan County, SW Iran (during 2007–2008).

Scorpion color	2007 [n(%)]	2008 [n(%)]	Total [n(%)]
Black	388 (70.6)	444(24.4)	832 (24.2)
Yellow	950 (22.0)	1080 (59.3)	2030 (59.0)
Others	282 (7.4)	297 (16.3)	579 (16.8)
Total	1620 (100.0)	1821 (100.0)	3441 (100.0)

Table 6

Distribution of scorpion sting cases by month in Behbahan County, SW Iran (during 2007–2008).

Month	2007 [n(%)]	2008 [n(%)]	Total [n(%)]
April	93 (5.7)	200 (11.0)	293 (8.5)
May	217 (13.4)	194 (10.6)	411 (11.9)
June	257 (15.9)	246 (13.5)	503 (14.6)
July	227 (14.0)	266 (14.6)	493 (14.3)
August	273 (16.9)	272 (14.9)	545 (15.8)
September	233 (14.4)	282 (15.5)	515 (15.0)
October	146 (9.0)	152 (8.3)	298 (8.7)
November	96 (5.9)	125 (6.9)	221 (6.4)
December	0 (0.0)	38 (2.1)	38 (1.1)
January	16 (1.0)	21 (1.2)	37 (1.1)
February	11 (0.6)	25 (1.4)	36 (1.1)
March	51 (3.2)	0 (0.0)	51 (1.5)
Total	1620 (100.0)	1821 (100.0)	3441(100.0)

Table 7

Distribution of scorpion sting cases by sting scorpion history in Behbahan County, SW Iran (during 2007–2008).

Sting scorpion history	2007 [n(%)]	2008 [n(%)]	Total [n(%)]
Yes	343 (21.2)	435 (23.8)	778 (22.6)
No	1277 (78.8)	1386 (76.2)	2663 (77.4)
Total	1620 (100.0)	1821 (100.0)	3441 (100.0)

Table 8

Distribution of scorpion sting cases by history of receiving antivenin in Behbahan County, SW Iran (during 2007–2008).

History of Receiving Antivenin	2007 [n(%)]	2008 [n(%)]	Total [n(%)]
Yes	178 (11.0)	248 (13.6)	426 (12.4)
No	1442 (89.0)	1573 (86.4)	3015 (77.6)
Total	1620 (100.0)	1821 (100.0)	3441 (100.0)

4. Discussion

This research is the case series to describe the epidemiological features of scorpionism in Behbahan

County, Khuzistan Province, Iran. Of the 3441 patients in the study, no one died. An average incidence of 8.8 per 1000 individuals had been reported from the study area. In a study during 2006–2007, about 991 scorpion stings were found in Baghmalek County, Khuzistan Province, Iran. There were approximately 0.96 stings/year per 100 people in the study area^[12]. During 2006–2010, a total of 20902 scorpion stings referred to the Ramhormoz health centers, Khuzistan Province, Southwestern Iran^[5]. According to the data collected by the Department of Violence and Injury, Ministry of Health and Medical Education of Iran, 44366 cases of scorpionism were recorded during 2009 in Iran. In this year, the mean incidence of scorpion sting was determined 59.5 per 100000. The maximum and the minimum affected cases were found in Khuzistan and Mazandaran Provinces with incidences of 541 and 0 per 100000 individuals, respectively. Other four provinces including Hormozghan, Sistan–Baluchistan, Boshahr and Ilam with incidences of 153.9, 136.1, 127 and 123 per 100000 individuals were the next major scorpionism priority within the country, respectively^[1].

In this study, the percent of scorpion stung men and women were 51.3% and 48.7%, respectively. In Rafizadeh's research, the males with 51.8 % were the most affected gender^[1]. In Karami's investigation, the number and percent of stung women and men of scorpion–stung patients were 10912 (52.2%) and 9990 (47.8%), respectively^[5]. The results of Gheshlaghi's study between 2007 and 2009 in Isfahan Province, Central Iran, showed that 74.8% of scorpion–stung patients were males^[13]. In Isbister's research in Australia, of the 95 subjects with definite stings, there were 33 males (35%) and 62 females (65%)^[14]. It is noteworthy that there are differences in stings among the sexes.

Results of this study revealed that the most prevalence of scorpion stings occurred on hands (41.7%) and feet (39.5%). In a study in Australia, scorpion stings occurred to all parts of the body, with 60% distal (hand or foot)^[14]. In Karami's study, legs were targeted by scorpion stings more than the other parts (39%) followed by hands with 36% and head and trunk with 25%^[5]. In Saghafipour's research in Qom Province, hands (45%) and feet (43.8%) were the most common location of scorpion stings^[15]. These findings may be explained on the basis that the exposed hands and feet are usually used in most manual activities and farm activities. In the present research, 56.5% of scorpion sting cases were found from rural regions. In Saghafipour's study, 74.4% of scorpion sting cases were found from rural areas^[15]. In Ramhormoz County, 56.3% of scorpion sting cases occurred in the rural area^[5]. Our results, do not agree with the results of Pipelzadeh *et al.* of entire Khuzistan Province, who reported 60% of scorpion

stings in the urban areas^[9].

Hot months of the year with mild or sunny weather are the period that leads to most envenomation accidents. Data collected in the current study revealed that the highest incidence of scorpion sting cases during 2007–2008 occurred in summer (45.1%) and spring (35%) in the Behbahan region. In Australia, the majority of stings occurred in the warmer months^[14]. In Qom Province, the most cases observed during spring (24.5%) and summer (62.8%)^[15]. Data collected in the Lordegan study revealed that the highest incidence of scorpion sting cases in 2006 took place in spring (49.72%)^[2]. In Baghmalek research, the scorpion stings occurred in spring, summer, autumn and winter were 41.2%, 40.5%, 14.9% and 3.4%, respectively^[12].

Scorpion stung patients reported 2030 (59%) yellow scorpions and 832 (24.2%) black scorpions. In Qom's research, 79% and 18.7% of envenomed cases were due to yellow and black scorpions, respectively^[15]. In Ramhormoz's research, most of the cases were stung by yellow (52.7%) and black (19.7%) scorpions^[5]. In our study, in 74.4% of victims scorpion antivenin serum was injected 0–6 h after stung. In Karami's research, in 70.3% of cases the interval hours after stings and injections were recorded 0–6 h^[5].

According to these results, scorpion stings are considered a common health challenge in Behbahan County and the high incidence of stings directs consideration to the urgent requirement for beginning preventive programs to decrease the incidence of this issue.

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgements

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Comments

Background

Scorpion stings are mainly due to unexpected contact with

a scorpion. Significant scorpions threatening public health in Iran are *H. lepturus*, *A. crassicauda*, *Odontobuthus* spp., *Hottentotta* spp., *Mesobuthus eupeus*, *Compsobuthus* spp., and *Apsitobuthus* spp. This problem is an emergency in many regions of the world. Species-specific antivenom therapy is a largely major method for scorpion envenomation. This antivenin made in Razi Research Vaccine and Serum Institute Iran, is a 5 mL polyvalent ampoule against 6 species including *H. lepturus*, *A. crassicauda*, *Mesobuthus eupeus*, *Odonthobuthus doriae*, *Hottentotta saulcyi* and *Hottentotta zagrozensis*. The aim of this descriptive study was to describe the epidemiological characteristics in the county of Behbahan, Iran.

Research frontiers

The purpose was to explain the demographic and epidemiologic profile in patients with scorpion envenomation in Behbahan County. Continuous care and reporting are necessary to monitor this issue and for the efficacy of control programs.

Related reports

Almost the most cases occurred in the summer and spring (80.1%) and extremities represented the most frequent sting sites (81.2%). These are in consistent to the studies of Saudi Arabia (Al-Sadoon and Jarrar, 2003; Jarrar and Al-Rowaily, 2008) and Abourazzak S, 2009. Yellow species were the most commonly reported scorpions (59%). This result is in accordance with the results of in Morocco (Abourazzak S, 2009). But, In Kashan County, Central Iran, black species were the most commonly reported scorpions (34.9%).

Innovations and breakthroughs

This is the first study of scorpion stings in Behbahan County, southwestern Iran. This research displayed that scorpion sting is an important health problem for this region.

Applications

It is important to know the epidemiology of scorpion stings in each region. The results of the present study are useful for sanitary training and prevention of scorpion stings. So, it is essential to monitor the epidemiology of stings.

Peer review

It is a good investigation in which the researchers detected some features of epidemiologic and demography of scorpion stings in Behbahan County. The findings are considerable and planned that this disease is widespread in Behbahan County.

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