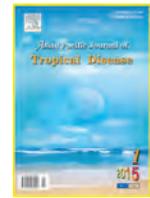




Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

Asian Pacific Journal of Tropical Disease

journal homepage: www.elsevier.com/locate/apjtd



Document heading

doi: 10.1016/S2222-1808(14)60632-0

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Epidemiological characteristics and incidence rate of definite scorpion stings in Mahshahr County, Iran: multivariate analysis of 1 635 cases

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PEER REVIEW

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Comments

This study shows that scorpion sting is an important public health concern in the southwestern region of Iran where it should have a preference in the performance of precautionary measures. The methods and discussion are well designed. Also, results are valuable.

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ABSTRACT

Objective: To study the epidemiology of scorpion stings in Mahshahr County during 1997–2001.

Methods: This descriptive study was based on 1 635 subjects from Mahshahr County who were admitted to the health services centers in Mahshahr with definite scorpion stings during the 5-year period between 1997 to 2001. A questionnaire was distributed to physicians to gather patient information. Data taken from the questionnaires about these cases were analyzed with SPSS software.

Results: The frequency of cases was higher during 1998 (24.6%) and 1999 (23.1%). The average incidence was calculated 1.62 per 1000 population for the mentioned years. A total of 1 034 (63.2%) cases were reported from urban areas. Frequency distribution of cases of scorpion stings by seasons included: spring (26.6%), summer (50.9%), autumn (19.9%) and winter (2.6%). The incidence of scorpion stings was found to be higher among males (63.6%). The most common sting site was foot (54.8%). With respect to the age, it was shown that the 21–30 and 31–40 age groups presented more scorpion stings 24.8% and 22.1%, respectively.

Conclusions: A well-being training schedule might be beneficial in protecting scorpion stings by utilization of shoes, gloves, clothes, care in handling stones and other objects. The higher incidence of injuries among those over 11 years of age conducts the consideration to outdoor sting. This is mostly due to their job and their custom of pleasure leisure time. This is also observed from increasing frequency of stings during summer (50.9%), spring (26.6%), autumn (19.9%) rather than winter (2.6%).

KEYWORDS

Scorpion Sting, Epidemiology, Incidence Rate, Iran

1. Introduction

Scorpions are venomous arthropods, their lengths limit from 13 to 220 mm, and they are easily recognizable because of their morphological structures. The abdomen consists of 12 distinct segments, with the last five forming the metasoma (tail). At the end of the tail, it is a structure comprising the venom glands and a pointed stinger to inject venom. Fossil

scorpions detected in Paleozoic strata 430 million years old seem very similar to nowadays species. It is thought that they are desert animals, however, they are found in lots other habitats. Scorpions have many adaptations for desert living. Scorpions have additional layers of lipids on their integument that minimizes loss of water. Scorpions exist frequently beneath stones and ruins in day hours and become active at night to protect themselves from

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Foundation Project: Supported by Chancellor for Research Affairs of Ahvaz Jundishapur University of Medical Sciences (Grant No. 88S10).

Article history:

Received 5 Apr 2014

Received in revised form 12 Apr, 2nd revised form 7 May, 3rd revised form 17 May 2014

Accepted 26 Jun 2014

Available online 11 Jul 2014

high temperatures since they have no endurance to high temperatures in warm seasons^[1,2].

Scorpion stings syndrome is a medical problem and a menace in many countries of the world, such as Iran. Thousands of people are stung each year by these arachnids with a disturbing enhancement in different arid and semi-arid regions with great rural populations^[3,4]. Various surveys on scorpionism patients confirmed that several clinical symptoms were observed, including positional signs to acute central and autonomic nervous system indications, and dying because of respiratory failure and heart attack, particularly in children^[5]. Numerous demographic and epidemiologic investigations on stings have been done in many countries, such as Saudi Arabia, Turkey, Morocco, Egypt, Australia, Brazil, Argentina, Mexico and Iran^[2–11]. Data on scorpionism are accessible for several regions of Iran, but not for Mahshahr County, Iran. The current research aims to clarify the epidemiologic aspects of scorpion stings in this county during a 5-year period (1997–2001).

2. Materials and methods

Mahshahr County also known as Bandar-e-Mahshahr County (30°33'32" N, 49°11'53" E, altitude ca. 5 m above sea level), is a county in Khuzestan Province, Southwestern Iran. In this research the frequency and incidence of scorpion stings in Mahshahr County were reviewed. Surveillance for cases of scorpionism started in 1997. This descriptive cross-sectional study was done on the cases with complaint of scorpion stings. A special scorpion sting questionnaire was catered. This was completed by physicians for each case of scorpionism. This sheet included epidemiologic and demographic data on the following basis: geographical area, age, sex, time of sting (month and year) and sting sites.

The study involved all cases of scorpion stings that were admitted to all Mahshahr health services centers during the 5-year period. All victims received the antivenin after allergy testing by intravenous route. Then, all patients were cared for additional seeing and management. Ancillary medications for treatment of signs and symptoms of envenoming were included. Data were analyzed by using SPSS software.

3. Results

A total of 1635 cases of scorpion stings were reported during the 5-year period between 1997 to 2001. The distribution of the scorpionism cases based on month of sting, season, sex of the patient, age group, stung location (city or village), sting site, number of cases per year, incidence rate per year and is given in Tables 1–6 and

Figures 1–3. The frequency of sting cases was higher during 1998 (24.6%) and 1999 (23.1%) (Figure 1). The average incidence was calculated as 1.62 per one thousand population for the mentioned years. Trend of incidence rate, during 1997 to 2001, is given in Figure 2. The time (monthly) distribution of cases of scorpion stings differed during the study period. The frequency was higher during August (19.7%), September (16%) and July (15.2%). In the mentioned months 832 cases (50.9%) of scorpion stings were reported (Table 1). It is clear that most of these cases are reported in summer (50.9%) and spring (26.6%) (Table 2).

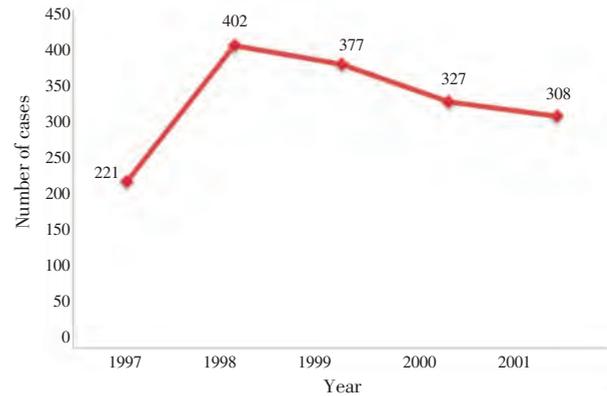


Figure 1. Trend of scorpion sting cases, Mahshahr County, Southwestern Iran (1997–2001).

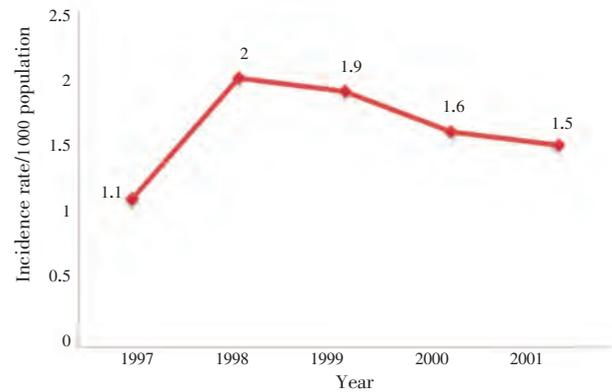


Figure 2. Trend of incidence rate of scorpion sting cases, Mahshahr County, Southwestern Iran (1997–2001).

Table 1

Distribution of the scorpion sting cases according to the month, Mahshahr County, Southwestern Iran (1997–2001).

Months	1997 No. (%)	1998 No. (%)	1999 No. (%)	2000 No. (%)	2001 No. (%)	Total No. (%)
April	0 (0.0)	32 (8.0)	21 (5.6)	42 (12.8)	19 (6.2)	114 (7.0)
May	0 (0.0)	18 (4.5)	49 (13.0)	22 (6.7)	22 (7.2)	111 (6.8)
June	0 (0.0)	58 (14.4)	55 (14.6)	46 (14.1)	51 (16.6)	210 (13.0)
July	54 (24.4)	49 (12.2)	43 (11.4)	54 (16.5)	48 (15.6)	248 (15.2)
August	47 (21.3)	69 (17.2)	69 (18.3)	43 (13.2)	95 (30.9)	323 (19.7)
September	55 (24.9)	72 (17.9)	59 (15.6)	49 (15.0)	26 (8.4)	261 (16.0)
October	39 (17.7)	61 (15.2)	39 (10.3)	35 (10.7)	18 (5.8)	192 (11.7)
November	11 (5.0)	19 (4.7)	30 (8.0)	20 (6.1)	9 (2.9)	89 (5.4)
December	12 (5.4)	9 (2.2)	6 (1.6)	7 (2.2)	10 (3.2)	44 (2.7)
January	0 (0.0)	5 (1.2)	5 (1.3)	1 (0.3)	2 (0.6)	13 (0.8)
February	0 (0.0)	6 (1.5)	0 (0.0)	4 (1.2)	4 (1.3)	14 (0.9)
March	3 (1.3)	4 (1.0)	1 (0.3)	4 (1.2)	4 (1.3)	16 (1.0)
Total	221 (100.0)	402 (100.0)	377 (100.0)	327 (100.0)	308 (100.0)	1635 (100.0)

Table 2

Distribution of the scorpion sting cases according to the season, Mahshahr County, Southwestern Iran (1997–2001).

Seasons	1997 No. (%)	1998 No. (%)	1999 No. (%)	2000 No. (%)	2001 No. (%)	Total No. (%)
Spring	0 (0.0)	108 (27.2)	125 (33.2)	110 (33.6)	92 (30.0)	435 (26.6)
Summer	156 (70.6)	192 (47.0)	171 (45.3)	146 (44.7)	169 (54.9)	832 (50.9)
Autumn	62 (28.1)	89 (22.1)	75 (19.9)	62 (19.0)	37 (11.9)	325 (19.9)
Winter	3 (1.3)	15 (3.7)	6 (1.6)	9 (2.7)	10 (3.2)	43 (2.6)
Total	221 (100.0)	402 (100.0)	377 (100.0)	327 (100.0)	308 (100.0)	1635 (100.0)

The incidence of scorpion stings differed between the male and female population. As shown in Table 3, males were more disposed to sting than women, 63.6% cases ($n=1040$) were reported for men and 36.4% ($n=595$) for women. By the way, the higher incidence was found at the age groups 21–30 years (24.8%) and 31–40 years (22.1%). Highest incidence of 87% during the five years was detected among scorpion stings aged more than 11 years (Table 4). Also, urban population had a higher frequency of patients (63.2%) (Table 5). Difference was found between cases regarding the site of sting on the body. The distribution of scorpion sting sites in the body indicated in Table 6 were 54.8% ($n=896$) for lower extremities and 37.7% ($n=616$) for upper extremities. The highest stings in the feet and hands occurred in the years of 1998 and 1999, respectively.

Table 3

Distribution of the scorpion sting cases according to the sex, Mahshahr County, Southwestern Iran (1997–2001).

Years	Female No. (%)	Male No. (%)	Total No. (%)
1997	67 (30.3)	154 (69.7)	221 (100)
1998	157 (39.1)	245 (60.9)	402 (100)
1999	130 (34.5)	247 (65.5)	377 (100)
2000	120 (36.7)	207 (63.3)	327 (100)
2001	121 (39.3)	187 (60.7)	308 (100)
Total	595 (36.4)	1040 (63.6)	1635 (100)

Table 4

Distribution of the scorpion sting cases according to the age group, Mahshahr County, Southwestern Iran (1997–2001).

Age groups	1997 No. (%)	1998 No. (%)	1999 No. (%)	2000 No. (%)	2001 No. (%)	Total No. (%)
0–4	3 (1.3)	11 (2.7)	12 (3.2)	12 (3.7)	6 (1.9)	44 (2.7)
5–10	21 (9.5)	40 (9.5)	37 (9.8)	41 (12.5)	29 (9.4)	168 (10.3)
11–20	49 (22.2)	62 (15.4)	66 (17.5)	60 (18.3)	45 (14.6)	282 (17.2)
21–30	57 (25.8)	89 (22.1)	92 (24.4)	80 (24.5)	87 (28.2)	405 (24.8)
31–40	44 (19.9)	79 (19.7)	79 (21.0)	75 (22.9)	84 (27.2)	361 (22.1)
41–50	26 (11.8)	61 (15.2)	60 (15.9)	54 (16.5)	49 (15.9)	250 (15.3)
51–60	12 (5.4)	43 (10.7)	29 (7.7)	4 (1.2)	5 (1.6)	93 (5.7)
>60	9 (4.1)	17 (4.2)	2 (0.5)	1 (0.3)	3 (1.0)	32 (2.0)
Total	221 (100.0)	402 (100.0)	377 (100.0)	327 (100.0)	308 (100.0)	1635 (100.0)

Table 5

Distribution of the scorpion sting cases according to the stung location, Mahshahr County, Southwestern Iran (1997–2001).

Years	City No. (%)	Village No. (%)	Total No. (%)
1997	167 (75.6)	54 (24.4)	221 (100)
1998	246 (61.2)	156 (38.8)	402 (100)
1999	244 (64.7)	133 (25.3)	377 (100)
2000	194 (59.3)	133 (40.7)	327 (100)
2001	183 (59.4)	125 (40.6)	308 (100)
Total	1034 (63.2)	601 (36.8)	1635 (100)

Table 6

Distribution of the scorpion sting cases according to the site of sting, Mahshahr County, Southwestern Iran (1997–2001).

Years	Hand	Foot	Head and trunk	Total
1997	70 (31.7)	140 (63.3)	11 (5.0)	221 (100)
1998	138 (34.3)	228 (56.7)	36 (9.0)	402 (100)
1999	150 (39.8)	197 (52.2)	30 (8.0)	377 (100)
2000	129 (39.4)	174 (53.3)	24 (7.3)	327 (100)
2001	129 (41.9)	157 (51.0)	22 (7.1)	308 (100)
Total	616 (37.7)	896 (54.8)	123 (7.5)	1635 (100)

4. Discussion

Sting by arachnid arthropods causes important medical emergency in the globe, therefore causing adult morbidity and child mortality[12,13]. Study of Shahbazzadeh *et al.* reported that the highest incidence rate of scorpionism fell in warm months and in the group aged 6–45 years in Khuzestan Province. Also, he observed that there were no significant differences between sexes of envenomated individuals (52.3% female, 47.7% male). The clinical signs were found in 44.8% of the patients and housewives and students were under great risk for scorpion sting (63.3%)[14].

This epidemiologic research considers 1635 cases that had stung by scorpions in Mahshahr County during five-year period with an average incidence rate of 1.62 cases/1000 inhabitants annually. This survey indicates that stings were dominant in the summer months of July–September, with the peak in August. Most scorpions sting cases occurring in the summer is due to greater activity of scorpions in hot months and that the residents use open environments for relaxation. This complies with many studies on the incidence of scorpion stings. Based on these studies, the most and the low frequency of scorpion stings incidence were seen in summer and in winter, respectively[5,9–14]. Limited cases of scorpion stings in the winter could be ascribed to the fact that this animal does not overwinter but become less active in winter months.

Our study indicates that maximum stung patients were men (63.6%). This may be because the truth that women in Mahshahr County, unlike men, spend most of their time in the houses with their families. This result is in accordance with the findings of other epidemiological researches on stings[15,16]. Many researches illustrated that maximum cases were seen in males, but in Ozkan's investigations in Turkey this finding was different[2,5]. In this research, 1512 of the cases had scorpion stings in their feet and hands (92.5%). This is similar to Brazil where maximum scorpion stings were in the extremities[17]. Meantime, many other researches have proved that the great ratio of cases affected in the upper and lower limbs[5,8–11,16]. Scorpion stings in spots of the body, such as head, trunk and neck, frequently occurred at relaxation or sleeping times due to not inspection of

bed mattress and pillow and wearing clothing without searching. The cause for the large number of stings in lower and upper extremities is considered to be putting on sandals in hot months in outdoors, shaking hands or feet to remove them, working in agricultural fields, walking with bare feet, wearing shoes without pre-wiggling, hand searching for these venomous arachnids in outdoors and indoors, picking up the stones without the use of gloves and carelessly.

The data of our study showed that stings were observed mostly in urban areas. It is thought that urban residents in Mahshahr County have a high percentage of stings when compared with rural residents in population. Besides, high frequencies of the scorpion stings in urban areas in this study are probably due to lack of proper building, old buildings, the accumulation of construction debris, and lack of proper disposal of waste, the abundance of wastelands, increasing marginalization of the urban edge and no asphalt of suburban streets. In study by Kassiri *et al.* in Behbahan County, Southwestern Iran, the most of stung patients (56.5%) lived in the villages^[18]. The current results point to a high rate of scorpion stings in the age category of 21–50 years (62.1%). The great amount of stings in people less than 51 years old could be because of their occupation that the mentioned age group is associated with maximum outdoor activities. In the study of Jarrar and Al-Rowaily in Saudi Arabia, the incidence rate of scorpion sting was recorded 58.8% for the 21–50 age group which is in accordance with the finding of this study^[6]. In Turkey, the 15–30 age group has faced more stings (34.1%) than the other age categories^[2]. In Qom Province, Central Iran, most of the scorpion sting cases were in the 10–24 (30.6%), 25–34 (29.1%) and 35–44 (12.7%) age groups^[19]. In a study on scorpionism in Masjed Soleyman County, Southwestern Iran, stings have been mostly seen in individuals of the age of 15 and over (77.4%)^[20].

The sanitary significance of stings in Mahshahr County is ascribed to the hard consequence of this problem, such as its relationship to all age categories and also both genders and the large number of stung patients. Also, it inflicts a large burden on health services and need emergency services. But this matter is not quite realized by people and several health care presenters. Since it is hard for stung patients present in the referral hospitals, it is suggested that treatment and management at primary health care centers can be prospering by the antivenin injection.

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgements

We would like to thank the staffs of Mahshahr health services centers, especially to Mr. Tofigh Anafcheh for his cooperation. This project has been financially supported by Chancellor for Research Affairs of Ahvaz Jundishapour University of Medical Sciences with project number 88S10.

Comments

Background

Scorpions are venomous arthropods in the class Arachnida. Approximately 1500 species of scorpions are described. About thirty of them are recognized as potentially dangerous for humans. All scorpions have venom and can sting, but their natural propensities are to run away and ensconce. Scorpions can control the venom flow, so some sting accidents are venom less or mild envenomation. Scorpion venoms are complex mixtures of neurotoxins and other matters. Each scorpion specie has an unmatched mixture. The effects of the stings depend on the transfer dose of the scorpion, the age, the season and the size of injured person. Scorpion envenomation cases are common in Iran, especially in south of the country. Hence, there is need of new studies on scorpion sting in the globe.

Research frontiers

This work explains the epidemiology of scorpionism in the Mahshahr County, Southwest of Iran.

Related reports

The present study showed that scorpion stings were frequent during the summer months, with the highest frequency in August and September. This result is in agreement with that of previous studies concerning the seasonal variations of scorpion stings (Ulg *et al.*, 2012). Also, in the present research, most of the stings were seen in feet and hands of victims. Epidemiological studies invariably have shown that the afflicted body parts are mostly the extremities (Pipehzadeh *et al.*, 2007). Furthermore, majority of cases lived in urban areas of

Mahshahr County. This finding is similar to that reported in the studies of Vazirianzadeh *et al.* (2008) and Pipelzadeh *et al.* (2007) who reported 60% of scorpion stings in the urban area of Khuzestan Province.

Innovations & breakthroughs

Regarding the abundant spreading of scorpion sting disease in Mahshahr region and the absence of an overall study with epidemiological aspects of this problem, this study was conducted in Mahshahr.

Applications

Such study enables the local authority to make the plans to eliminate scorpion stings among the residents of the region.

Peer review

This study shows that scorpion sting is an important public health concern in the southwestern region of Iran where it should have a preference in the performance of precautionary measures. The methods and discussion are well designed. Also, results are valuable.

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