



CODEN [USA]: IAJPBB

ISSN: 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.884451>Available online at: <http://www.iajps.com>

Research Article

**SCORPION STING IN SHUSHTAR COUNTY,
SOUTHWESTERN IRAN: AN EPIDEMIOLOGICAL STUDY
DURING 2009-2013**Hamid Kassiri^{1*} and Parvaneh Farajifard ²¹ School of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran² Student Research Committee, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran**Abstract:**

Objective: To achieve people and authorities to prevent from being stung, information regarding scorpionism is essential. According to the high prevalence of scorpionism in Shushtar County, southwestern Iran, this survey was conducted to give us basic information about scorpion sting in this region.

Methods: This research was a descriptive cross-sectional study. The data of the present research has come from hospitalized persons referring to the health center and hospital of county of Shushtar during 2009-2013. Scorpion-stung patient filled out a questioner requesting age, month, season, gender and residence of victim, stung part of body, color of stinging scorpion, treatment with or without antivenin injection, the way how antivenin applied. The frequencies of entomo-epidemiological and medical parameters were converted to the percentage rank.

Results: During 2009-2013, a total of 4318 scorpion stung patients referred to the above-mentioned centers. The largest of scorpion stings data were happened in 2012 [23.2%]. Data collected in this study revealed that the highest incidence of scorpion sting cases was taken place in summer [35.4%]. The most victims of scorpion stung people were in rural areas [50.4%]. The greatest rate of scorpion stings victims belonged to the 15-24 and 25-34 year old persons [25.8% and 25.8%]. The percent of stung women and men of scorpion-stung patients were 40.8% and 59.2%, respectively.

Conclusion: According to the results of the current study it is concluded that the scorpion stings in Shushtar County is epidemiologically similar to the other parts of Khuzestan Province, with reference to age, sex, site of stings, stung part of body, month and season frequency. Training ways of prevention and decreasing the scorpion stings to the Shushtar residences can be an effective role in reducing the incidence of this occurrence in the future.

Key Words: Epidemiology, Scorpionism, Iran

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Please cite this article in press as Hamid Kassiri and Parvaneh Farajifard, *Scorpion Sting in Shushtar County, Southwestern Iran: An Epidemiological Study during 2009-2013*, *Indo Am. J. P. Sci.*, 2017; 4[08].

INTRODUCTION:

Scorpion stings are one of the main health problems in underdeveloped countries of tropical and subtropical regions, and cause a broad spectrum of complications from severe local skin reactions to neural, cardiovascular and respiratory problems and sometimes death. This health problem imposes relatively high economic costs and inflicts mental-psychological damages on communities. So far, about 1500 scorpion species have been identified that are scattered in all continents, but are more frequently observed in tropical and subtropical regions. About fifty species of them have a special health and medical significance [1]. Scorpions usually spend the day motionless in safe locations such as cracks in walls, under rocks, among shavings, under mats and wood particles, between leaves or under bark of trees such as eucalyptus, in holes in the trunks of palm trees, among construction waste, and even in shoes, boots, and front closed slippers tree, and come out of their safe places at night to hunt their prey [2]. Many scorpion species are harmless and their stings only cause severe pain or allergic reactions and a burning sensation, there is local swelling at the sting site followed by a tingling feeling, and the stung person recovers after a few hours without any complications. The venom in some dangerous scorpion species lyses red blood cells, and some scorpions have more lethal venoms that trigger symptoms in the nervous system [3]. Factors such as age and weight of the stung person, the sting site, the time the individual is stung, and the type of the scorpion influence the severity of poisoning. Scorpions are more dangerous for old people and children. The lower the body weight of the stung person is, the higher the ratio of the quantity of venom to body weight and the greater the danger posed for the individual will be [4].

The situation regarding scorpion stings in different regions and countries varies based on life style, socioeconomic conditions, housing, healthcare provision, and the species of scorpions living in the related area [5]. Nowadays, scorpions are widely distributed and their greatest species diversity is observed in tropical and subtropical regions [latitudes of 23-38°] [6]. Scorpion stings are considered a major medical problem in countries in the Middle East and Africa including Algeria, Egypt, Iraq, Jordan, Morocco, Sudan, South Africa, Turkey, and in South and Central American countries such as Brazil, Mexico, Argentina, Venezuela, Guyana, and Trinidad and Tobago. However, they are of less importance in African countries including Zaire, Nigeria, Chad, Tanzania, Kenya, Uganda, and Asian countries including Thailand, Indonesia, and India are less vulnerable to scorpion sting [7].

Considering the geographical location of Iran [latitude of 25-40° N], species diversity and distribution of scorpions are relatively considerable [8, 9]. Because of its type of climate and weather conditions, Iran is very rich in arthropods, especially scorpions [10], and is among countries from which many species of scorpions, especially the dangerous ones, have been reported [11]. Cases of death caused by scorpion stings are reported from all regions of the country but about 75% of them happen in the Provinces of Khuzestan, Sistan - Baluchestan, Kerman, and Hormozgan [12]. Considering the high prevalence of scorpion stings in the cities of Khuzestan Province including Shushtar, this comprehensive research was conducted for the epidemiological study and analysis of scorpion stings so as to develop strategies for preventing scorpion stings and for treating them in time so as to prevent loss of human lives.

MATERIALS AND METHODS:

This descriptive cross-sectional study was carried out in Shushtar with an area of 2,436 square kilometers located in northern Khuzestan Province. This city has a longitude from 48°35' to 49°12' E and latitude from 31°36' to 32°26' N and a population of 191,000 [based on 2011 census]. It is the 57th most populated city in Iran and the fourth largest city in Khuzestan Province after Ahvaz, Dezful, and Abadan. Shushtar is situated in the center of Khuzestan Province and extends towards its north, and the terminal slopes of the Zagros Mountains and the Dez River form its eastern and western borders, respectively. Its mean altitude is 150 meters, and its central part has an altitude of 65 meters.

All files related to cases of scorpion stings during the five years from 2009-2013 were studied at the treatment and health centers in the city, the demographic characteristics of the patients [age, gender, etc.] and the epidemiological features [type of scorpion, sting site, etc.] were extracted using checklists, and the data was entered into SPSS and analyzed using descriptive statistics [averages, standard deviations].

RESULTS:

From 2009 to 2013, a total of 4,318 people with scorpion stings visited the health and treatment centers of Shushtar that, considering the population of the city [which was an average of 200,000 during this period] and the incidence rate of scorpion stings, was an average of 4.3 stings per 1000 population. Results indicated that the number of scorpion stings fluctuated during these five years. The frequency of sting cases was higher during 2012 [23.2%] and 2009 [20.8%]

In relation to gender, 59.2% of the people stung by scorpions were males and 40.8% females [Table 1]. The maximum number of stings happened to people in the 15-24 [25.8%] and 25-34 [25.8%] age ranges, and more than half of the stung persons [2227 or 51.6% of the total] were from 15 to 34 years old. Table 2 lists frequency distribution of scorpion stings for the various age groups.

The maximum number of scorpion stings [14.0%] happened during June and the minimum [1.7%] during January [Table 3]. In relation to seasons, 1521, 1529, 881, and 387 scorpion stings [accounting for 35.2, 35.4, 20.4, and 9.0% of the total] happened in spring, summer, autumn, and winter, respectively. Table 4 presents the number of scorpion bites for the various seasons.

As for places of residence, 2141, or 49.6%, of the scorpion stings happened to people living in the

city and 2177, or 50.4%, to those who lived in the rural regions [Table 5]. In relation to the anatomic sites of the stings, 39.7% were on the hands, 41.6% on the feet, and 18.7% on the trunk and head [Table 6].

Most of the patients [3395 or 78.6% of the total] reached the health centers in Shushtar less than six hours after they were stung by scorpions [Table 7]. The phenotypes of the scorpions were not determined in the present research but 2923 people were stung by yellow scorpions, 571 by black scorpions, and 99 by scorpions whose color was not recorded [Table 8]. The majority of cases [86.9%] had not a history of receiving antivenin [Table 9]. All cases recovered treated using convenience treatments with intra-muscular injection of scorpion antivenin serum.

Table 1: Distribution of the scorpion sting cases according to the gender, Shushtar County, Southwestern Iran (2009-2013).

Gender Years	Male	Female	Total
	No. (%)	No. (%)	No. (%)
2009	455 (50.7)	442(49.3)	897 (100)
2010	437 (53.6)	379(46.4)	816(100)
2011	423 (52.6)	381 (47.4)	804 (100)
2012	502 (50.0)	501 (50.0)	1003 (100)
2013	387 (48.5)	411 (51.5)	798 (100)
Total	2555 (59.2)	1763(40.8)	4318 (100)

Table 2: Distribution of the scorpion sting cases according to the age groups, Shushtar County, Southwestern Iran (2009-2013).

Years	2009	2010	2011	2012	2013	Total
Age group	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
0-4	41 (4.6)	39 (4.8)	33 (4.1)	43 (4.3)	31 (3.9)	187 (4.3)
5-9	40 (4.5)	40 (4.9)	39 (4.8)	51 (5.1)	53 (6.6)	223 (5.1)
10-14	57 (6.3)	56 (6.9)	45 (5.6)	65 (6.5)	43 (5.4)	266(6.2)
15-24	240(26.7)	223 (27.3)	204 (25.4)	258 (25.7)	188 (23.6)	1113 (25.8)
25-34	233 (26.0)	209 (25.6)	212(26.4)	257(25.6)	203(25.4)	1114 (25.8)
35-44	144 (16.1)	116 (14.2)	119(14.8)	138(13.7)	130(16.3)	647(15.0)
45-54	73 (8.1)	71 (8.7)	74(9.2)	100(10.0)	72(9.0)	390 (9.0)
55-64	43 (4.8)	41 (5.0)	56(7.0)	48(4.8)	44(5.5)	232 (5.4)
+65	26 (2.9)	21 (2.6)	22(2.7)	43(4.3)	34(4.3)	146 (3.4)
Total	897 (100.0)	816 (100.0)	804 (100.0)	1003 (100.0)	798 (100.0)	4318 (100)

Table 3: Distribution of the scorpion sting cases according to the month, Shushtar County, Southwestern Iran (2009-2013).

Years Months	2009 No. (%)	2010 No. (%)	2011 No. (%)	2012 No. (%)	2013 No. (%)	Total No. (%)
April	65 (7.2)	85 (10.4)	83 (10.3)	93 (9.3)	88 (11.1)	414 (9.6)
May	111 (12.4)	111 (13.6)	102 (12.7)	88 (8.8)	92 (11.5)	504 (11.7)
June	138(15.4)	122 (15.0)	93(11.6)	134 (13.3)	116 (14.5)	603 (14.0)
July	109 (12.2)	92 (11.3)	99 (12.3)	122(12.2)	138 (17.3)	560 (13.0)
August	106 (11.8)	90 (11.0)	112 (14.0)	144(14.4)	79 (9.9)	531 (12.3)
September	109(12.2)	79 (9.7)	81(10.1)	86(8.6)	83 (10.4)	438 (10.1)
October	75(8.4)	63 (7.7)	84(10.4)	101(10.1)	57 (7.1)	380 (8.8)
November	80(8.9)	71 (8.7)	63(7.8)	81(8.0)	58 (7.3)	353(8.2)
December	30 (3.3)	32 (3.9)	25(3.1)	30 (3.0)	31(3.9)	148(3.4)
January	16 (1.8)	20 (2.4)	14(1.7)	19(1.9)	5 (0.6)	74 (1.7)
February	19 (2.1)	13(1.6)	13 (1.6)	34(3.4)	14 (1.8)	93 (2.1)
March	39(4.3)	38 (4.7)	35(4.4)	71(7.0)	37 (4.6)	220 (5.1)
Total	897 (100)	816(100)	804 (100)	1003(100)	798(100)	4318 (100)

Table 4: Distribution of the scorpion sting cases according to the gender, Shushtar County, Southwestern Iran (2009-2013).

Years Seasons	2009 No. (%)	2010 No. (%)	2011 No. (%)	2012 No. (%)	2013 No. (%)	Total No. (%)
Spring	314 (35.0)	318 (39.0)	278 (34.6)	315 (31.4)	296 (37.1)	1521(35.2)
Summer	324 (36.1)	261 (32.0)	292(36.3)	352 (35.1)	300 (37.6)	1529(35.4)
Autumn	185(20.6)	166(20.3)	172 (21.4)	212 (21.1)	146 (18.3)	881(20.4)
Winter	74(8.3)	71(8.7)	62 (7.7)	124(12.4)	56 (7.0)	387 (9.0)
Total	897 (100)	816 (100)	804 (100)	1003 (100)	798(100)	4318 (100)

Table 5: Distribution of the scorpion sting cases according to the geographical location, Shushtar County, Southwestern Iran (2009-2013).

Residential Area	Urban	Village	Total
Years	No. (%)	No. (%)	No. (%)
2009	437 (48.7)	460(51.3)	897 (100)
2010	379 (46.4)	437(53.6)	816(100)
2011	414 (51.5)	390 (48.5)	804 (100)
2012	514 (51.2)	489 (48.8)	1003 (100)
2013	397 (49.7)	401 (50.3)	798 (100)
Total	2141 (49.6)	2177 (50.4)	4318 (100)

Table 6: Distribution of the scorpion sting cases according to the site of sting on the body, Shushtar County, Southwestern Iran (2009-2013).

Site of sting	Hands	Feet	Trunks and head	Total
Years	No. (%)	No. (%)	No (%)	No. (%)
2009	332 (37.0)	427(47.6)	138(15.4)	897 (100)
2010	311 (38.1)	323 (39.6)	182(22.3)	816 (100)
2011	340 (42.3)	305 (37.9)	159 (19.8)	804 (100)
2012	407 (40.6)	398 (39.7)	198(19.7)	1003 (100)
2013	326 (40.9)	341 (42.7)	131 (16.4)	798 (100)
Total	1716(39.7)	1794(41.6)	808 (18.7)	4318 (100)

Table 7: Distribution of the scorpion sting cases according to the interval time between sting and antivenin injection, Shushtar County, Southwestern Iran (2009-2013).

Interval time between sting and antivenin injection(h)	<6	6-12	>12	Total
	No. (%)	No. (%)	No. (%)	No. (%)
2009	679 (75.7)	144 (16.1)	74 (8.2)	897 (100)
2010	637 (78.1)	108 (13.2)	71 (8.7)	816 (100)
2011	663 (82.5)	93 (11.6)	48 (5.9)	804 (100)
2012	764 (76.2)	177 (17.6)	62 (6.2)	1003 (100)
2013	652 (81.7)	120(15.0)	26(3.3)	798(100)
Total	3395(78.6)	642 (14.9)	281 (6.5)	4318(100)

Table 8: Distribution of the scorpion sting cases according to the scorpion color, Shushtar County, Southwestern Iran (2009-2013).

Color	Black	Yellow	Others	Total
Years	No. (%)	No. (%)	No (%)	No. (%)
2009	120 (13.4)	570 (63.5)	207 (23.1)	897(100)
2010	99 (12.1)	550(67.4)	167(20.5)	816 (100)
2011	102 (12.7)	525(65.3)	177(22.0)	804 (100)
2012	147 (14.7)	686 (68.4)	170 (16.9)	1003 (100)
2013	103 (12.9)	592 (78.6)	103 (12.9)	798 (100)
Total	571 (13.2)	2923 (67.7)	824 (19.1)	4318 (100)

Table 9: Distribution of the scorpion sting cases according to the history of receiving antivenin , Shushtar County, Southwestern Iran (2009-2013).

History of Receiving Antivenin	Yes	N0	Total
Years	No. (%)	No. (%)	No. (%)
2009	81 (9.0)	816 (91.0)	897 (100)
2010	92 (11.3)	724 (88.7)	816 (100)
2011	106 (13.2)	698 (86.8)	804 (100)
2012	133 (13.2)	870 (86.8)	1003 (100)
2013	152 (19.0)	646 (81.0)	798 (100)
Total	564 (13.1)	3754 (86.9)	4318 (100)

DISCUSSION:

Scorpion stings are one of the things people are very scared of, and those stung by scorpions become greatly worried by the pain resulting from the stings and by the fear arising from what they have heard about scorpion stings. Khuzestan Province has a high incidence of scorpion stings in Iran because of its climate and weather conditions. Despite the relatively high prevalence of scorpion stings in this Province, no thorough and comprehensive study has been conducted on cases of scorpion stings where anti-scorpion serum must be prescribed. Lack of sufficient serum at all health centers and the uncertainty about cases where serum prescription in necessary cause confusion in this regard for the personnel at the health centers on the one hand and lead to insistence on the part of those accompanying the victims to these centers on receiving the serum on the other hand.

There were 4318 recorded cases of scorpion stings in Shushtar during 2009-2013 that, taking the population of the city into consideration, amounted

to 4.3 scorpion stings per 1000 population. Findings of the present research show that the number of scorpion stings fluctuated during these five years, and the maximum number of cases referring to the health centers after being stung by scorpions was that of the year 2012 with 1003 cases of scorpion stings.

Analysis of the data revealed that 25.8% and 25.8% the people stung by scorpions in the present research were in the 15-24 and 25-34 age ranges. In the study by Ozkan and Kat, the highest percentage of scorpion stings [36.2%] happened to 15 - 29 year old people [13]. In research conducted in Saudi Arabia, Al-Sadoon and Jarrar reported that 65.46% of scorpion stings occurred to people older than fifteen [14]. Research by Jarrar and Al-Rowaily in Saudi Arabia indicated 36.3% of those stung by scorpions were in the 20-29 age range [15], which is similar to results found in the present research. Vazirianzadeh et al. reported that most scorpion stings in Khuzestan Province [22.3% of

the total] happened to people from 20 - 30 years of age [16], and their results are similar to what was found in the present research in Shushtar [16]. In the study carried out by Kassiri in Behbahan [in Khuzestan Province], it was found that 56.1% of the reported scorpion stings happened to people in the 21-50 age range [17]. In another study, Kassiri carried out in the city of Masjed- Soleyman, 77.4% of the scorpion stings occurred in people older than 15 years of age [18].

Results of the present research revealed that 59.8% of the people stung by scorpions were males and 40.20% females. These results are similar to those found in two separate studies carried out in two different regions in Saudi Arabia in which it was reported, respectively, that 73 and 77% of the scorpion stings happened to males and the rest to females [13, 15], but differed from those found by Vazirianzadeh et al. [16] and Chitnis et al. [19]. These differences can be attributed to active areas of participation by men in Iran. However, in the study by Ozkan and Kat in Turkey equal numbers of males and females were stung by scorpions [13]. As for the anatomical sites of the stings, 39.7% of the stings were on the hands, 41.6% on the feet, and 18.7% on the trunk and head. In the study Ozkan and Kat carried out, 58.9% of the people were stung in the lower part of their bodies by *Mesobuthus eupeus* [13]. Al-Rowaily and Al-Sadoon reported that 48.5 and 51.5% of scorpion stings happened in the upper and lower body organs, respectively [12, 15].

In the present research, the minimum number of stings was reported in winter and the maximum in spring and summer, probably because scorpions are more active during these two seasons. Other studies also confirmed this finding [20-22]. The maximum number of stings reported in other studies were as follows: from late May to late August in Tunis [23], from late May to late September in Mexico[24], in summer in Turkey [21], from late May to late June in Saudi Arabia, and from late July to late August in Brazil [25].

Since about 78.6% of the people visited the emergency department six hours after they were stung by scorpions, they were treated with anti-scorpion serum. Other studies have also reported similar delays in visiting health centers by people who were stung by scorpions [26,27]. In a study conducted in Mexico in 1991, this delay was less than 30 minutes in 48% of the cases where scorpion stings happened to people. The delay in visiting the health centers in our study was probably due to unawareness of people regarding the importance of being treated as soon as possible, or caused by financial problems or lack of geographical access to these centers. Therefore, a training program aimed at educating people regarding the importance of receiving rapid treatment for scorpion stings can probably be

effective in reducing this delay and the consequences resulting from it.

Phenotypes of scorpions were not studied in the present research but, based on color, 2923 of the stings were caused by yellow scorpions, 571 by black scorpions, and in 99 cases of stings the color of the scorpions was not reported. In the study conducted by Dehghani et al. in Kashan in 1998, there were 200 cases of stings. About 30% of which were caused by black scorpions, 62% by yellow scorpions, and in 8% cases the color of the scorpions was not reported [28].

CONCLUSION:

Logical solutions for controlling scorpion stings must involve environment protection that includes promotion of personal steps taken by people to protect themselves, increased attention to environmental issues, and improved housing quality in the expansion of towns. Considering the highest percentage of scorpion stings in women happen to housewives, the major share of educational programs for preventing scorpion stings offered by health centers must be devoted to these women because they can be a major contributor in transferring information related to prevention of scorpion stings to school children.

ACKNOWLEDGEMENTS:

Authors wish to express their sincere thanks to all staffs of the Health Centers of Shushtar County, Shushtar College of Medical Sciences, who helped sincerely for data collecting. This project has been financially supported by Student Research Committee , Chancellor for Research Affairs of Ahvaz Jundishapur University of Medical Sciences with project number 93S.40 .

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