

# Epidemiological Study of Scorpion-sting in Patients Referred to Medical Centers of Shiraz, South-west of Iran

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#### Abstract

**Background:** Scorpion sting is one of the serious and major medical problems in the world. Shiraz is a tourist city and one of the high-risk areas where a number of scorpion sting occurs annually. The present research aimed to conduct an epidemiological study of scorpion sting in Shiraz County.

**Methods:** This is a cross-sectional study performed using a checklist to collect data about scorpionism in Shiraz health center during 2014-2018.

**Results:** The results of the study showed that the total number of scorpion stings was 844 cases. Generally, 336 cases (39.8%) were female and 508 (59.3%) male. The results from the residential area revealed that 817 cases (96.8%) were urban and 27 (3.1%) were rural. The highest frequency of scorpionism happened in the 25-34 years old group (286, 33.8%) and after that 15-24 year old (165, 19.4%), 35-44 year old (157, 18.6%), 45-54 year old (108, 12.7%) groups, and the least frequency was seen in the 0-4 year old group. The time periods between the sting and injection of anti-venom were less than 6 hours for 822, (85.5%) of cases, 6-12 hours for 101, (11.9%) of cases and, more than 12 hours for 21 (2.4%) cases. A total of 844 cases were recovered; 690 (81.7%) of them recovered with anti-venom and 154 (18.2%) injured individuals recovered without any anti-venom, the sting site was 27.6% in the foot, 57% in the hand, and 20% in the head and trunk.

**Conclusion:** Shiraz is a major tourist city, and most cases of scorpion-sting occur in summer and spring, when the tourist population is high, so health care providers must carry out an integrated program in those months.

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**Keywords:** Scorpion, Stings, Epidemiology, Shiraz, Iran

## Introduction

Scorpion sting is a major and serious public health problem in many parts of Iran.<sup>1</sup> South and West south regions of Iran are important areas that have reported 95% species of scorpion.<sup>2</sup> The scorpion fauna in Iran consists of 51 species from 18 genera in 4 families, Buthidae 44 species, (86%), Hemiscorpiidae 5 species, (10%), Scorpionidae 1 species, (2%), and Diplocentridae 1 species (2%). These arthropods are in motionless and

hidden corners, and during the night, they start their activity and go after their prey and inject their venom into their prey.<sup>3</sup> Scorpion venom contains a mixture of toxin such as neurotoxin, hemotoxin, cardiotoxin and enzyme that facilitate the effects of the toxin including lecithinase, hyaluronidase, phospholipase, proteinase, and coagulation or anticoagulant enzymes.<sup>4,5</sup> The venom of most venomous scorpions lyses the blood cells and causes local discoloration and painful swelling at the site of the bite.<sup>6,7</sup> Although the parasitic venom of

some lethal types does not cause local symptoms and excessive swelling, it must be examined by a doctor and treated with an injection of anti-scorpion serum. In addition to damaging the red blood cells, scorpion venom also causes neurological symptoms that include restlessness, seizures, unbalanced gait, runny mouth, severe skin sensitivity to touch, muscle contractions, abdominal pain, and decreased respiratory function; in most cases, symptoms subside within 48 hours.<sup>8,9</sup> The scorpion sting has varied clinical symptoms that depend on such factors as species of scorpion, site of injected venom, age, season, time of the sting, and the person's immune system.<sup>10,11</sup> Children and the elderly are also more vulnerable to scorpion venom and need more attention.<sup>10</sup>

Annually, about 1.2-1.5 million scorpion sting cases with nearly 3000-5000 deaths are reported in the world.<sup>12,13</sup> Scorpion-sting is a very important health issue in the Mediterranean area and Africa.<sup>14,15</sup> The incidence of scorpion sting has been estimated 4000-5000 cases in Iran.<sup>16,17</sup> Although scorpion sting is reported in all provinces, most of scorpion sting and death occur in the south and west-south provinces such as Khuzestan, Hormozgan, Sistan-Baluchestan, Bushehr, Fars, and Kerman.<sup>2,18-21</sup> Fars province is one of the most important areas of scorpion sting in the southwestern region of Iran, and every year, there are numerous cases of scorpion stings and sometimes death cases are reported due to scorpion stings.<sup>9,22,23</sup> Shiraz County is one of the major foci of scorpion sting in Fars province. It has a varied climate and is a historical city with an ancient and new architectural texture. Therefore, it is one of the important foci for scorpion habitat, and many domestic and foreign travelers visit this province every year.<sup>1,23,24</sup> Recently, some researchers have conducted studies on the clinical signs of scorpion stings in the province.<sup>9</sup> The present study aimed to conduct an epidemiological study of scorpion sting in Shiraz city.

## Methods

### Study Area

Shiraz (known as the capital of Fars province) is located in (N 52°32'E/37°29'), the southwest of Iran (Figure 1); it is bounded on the north by Marvdasht and Ardakan, on the west by Mamasani and Kazerun, on the south by Farashband, Firoozabad, Jahrom and Fasa, and on the east by Estahban, Neyriz and Arsanjan. Shiraz covers an area of 178,191 square kilometers. Its length is 40km and its width 15 to 30 km; it has spread in an area of 1268 square kilometers. According to the latest census in 2019, the population of Shiraz is over 1,566,000. It has a moderate and relatively warm climate, and the average annual temperature is 18 degrees Celsius. The annual rainfall in Shiraz is 337.8 millimeters.

### Data Collection

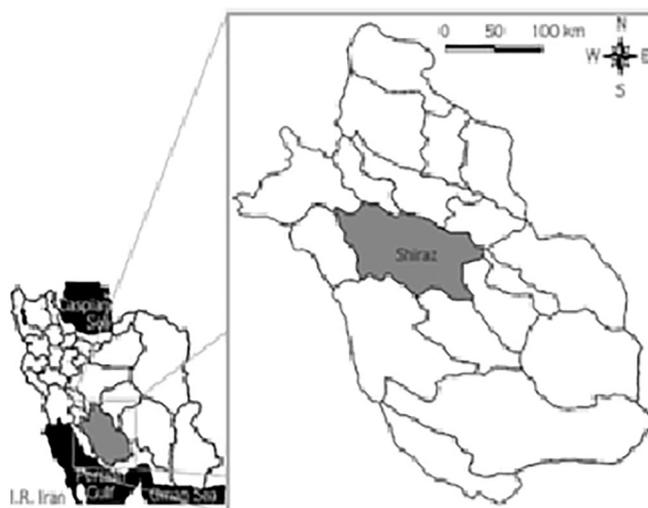
This is a descriptive cross-sectional study. Data were collected using a checklist that was completed for every patient, indicating age group, gender, the region of residence, month, season, site of sting on the body, sting time during night and day, interval time between sting and reaching the hospital (hours), interval time between sting and antivenin injection (hours), and injection method of antivenin.

### Statistical Analysis

In the next step, the data were analyzed using SPSS 20, as well as descriptive statistics and chi-square and t-tests.

## Results

Overall, 844 cases of scorpion-sting were recorded from Shiraz, during 2014-2018. Analysis of study results showed that the highest incidence of scorpion



**Figure 1:** Map of the study area, Shiraz city, Fars province, Southern Iran, 2014-2018

**Table 1:** Number and percentage of scorpion-sting in Shiraz during 2014-2018

Years	Number	Percentage
2014	29	3.43%
2015	154	18.25%
2016	150	17.80%
2017	266	31.51%
2018	245	29.02%
Total	844	100%

sting cases occurred in the year 2017 (31.4%), followed by 2018 (29.02), 2015 (18.2%), 2016 (17.7%), and 2014 (3.4%) (Table 1, Figure 2).

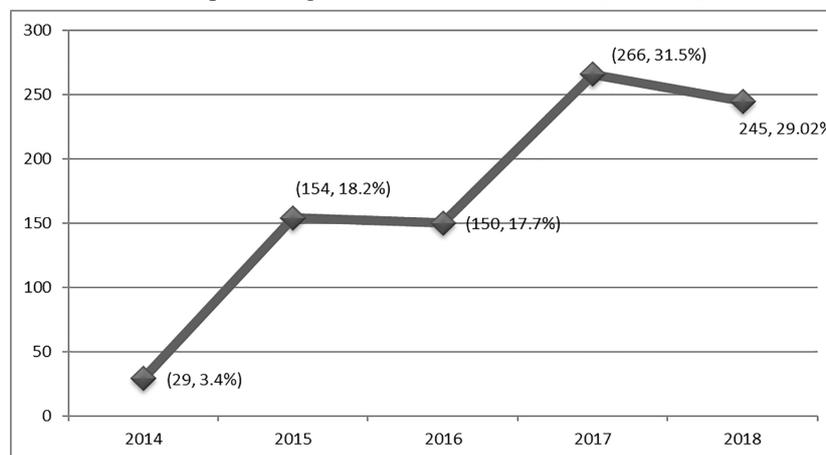
Most victims of scorpion stung were in the urban areas (817=95%) and rural areas (=283.2%).

The greatest rate of scorpion sting occurred in the 25-34 year old group (33.8%), followed by 15-24 year old (19.4%), 35-44 year old (18.6%), and 45-54 year old (12.7%) groups; and the least cases were the 0-4 year old group. The number of scorpion sting of the

females and males was 336 (39.8%) and 508 (59.9%), respectively. Of 844 scorpion stung cases, 68 (8.05%) were observed on the head and neck, 439 (52.1%) on the hands, 235 (27.8%) on the legs, and 102 (12.8%) on the trunk areas (Table 2). The times elapsed between the sting and injection of anti-venom were less than 6 hours for 822 cases (85.5%), 6-12 hours for 101 (11.9%) cases, more than 12 hours for 2.4% of them. A total of 844 cases were recovered (154=18.2% of cases), the rest of them had not received any anti-venom, and 690 cases (81.7%) recovered with anti-venom.

**Discussion**

Scorpion sting is one of the most important medical problems in Iran. Factors such as various species of scorpions, climatic conditions, building conditions of houses, and the occupations status of people (agriculture, animal husbandry, etc.) have made Iran a high risk area for scorpion stings and in some cases death due



**Figure 2:** Frequency of scorpion-sting in Shiraz during 2014-2018

**Table 2:** Frequency and percentage of scorpion stings according to age groups, gender, residential area, sit of the sting in Shiraz during 2014-2018

Year		2014 Number, (%)	2015 Number, (%)	2016 Number, (%)	2017 Number, (%)	2018 Number, (%)	Total Number, (%)
Age Group	0-4	0 (0.00)	1 (0.64)	2 (1.33)	0 (0.00)	1 (0.40)	4 (0.47)
	5-9	0 (0.00)	2 (1.29)	6 (0.4)	3 (1.12)	0 (0.00)	11 (1.30)
	10-14	0 (0.00)	3 (1.94)	3 (2)	3 (1.12)	6 (2.44)	15 (1.77)
	15-24	2 (6.89)	34 (22.00)	28 (18.66)	48 (18.04)	53 (21.63)	165 (19.54)
	25-34	15 (51.72)	59(38.00)	51(34.00)	81(30.45)	80(31.65)	286(33.88)
	35-44	6 (20.68)	20 (12.98)	28 (18.66)	55 (20.67)	48 (19.59)	157 (18.60)
	45-54	3 (10.34)	21 (13.63)	16 (10.66)	43 (16.16)	25 (10.20)	108 (12.79)
	55-64	2 (6.89)	9 (5.84)	9 (6.00)	19 (7.14)	17 (6.93)	56 (6.63)
	Upper 64	1 (3.44)	5 (3.24)	7 (4.66)	14 (5.26)	15 (6.12)	42 (4.97)
Gender	Total	29 (100)	154 (100)	150 (100)	266 (100)	245 (100)	844
	Femalemale	3 (10.34)	69 (44.80)	53 (35.33)	102 (38.34)	109 (44.48)	336 (39.81)
Residential area		26 (89.65)	85 (55.19)	97 (64.66)	164 (61.65)	136(55.51)	508 (60.18)
	Urban	20 (68.00)	154 (100)	150 (100)	248 (92.10)	245 (100)	817 (96.80%)
Site of sting	Rural	9 (31.00)	0 (0.00)	0 (0.00)	18 (6.76)	0 (0.0)	27 (3.19%)
	Head and neck	1 (3.44)	0 (0.00)	14 (9.33)	21 (7.89)	32 (13.06)	68 (8.05)
Total	Hand	10 (34.48)	132 (85.71)	81 (0.54)	99 (37.21)	117 (47.76)	439 (52.01%)
	Leg	18 (62.06)	19 (12.33)	54 (0.36)	87 (32.70)	57 (23.26)	235 (27.84%)
	trunk	0 (0.00)	3 (1.94)	1 (00.66)	59 (22.18)	39 (15.91)	102 (12.08)
	Total	29	154	150	266	245	844

to scorpion stings, but unfortunately little attention has sometimes been paid.<sup>25,26</sup>

In this epidemiological study, there were 844 identified cases of scorpion sting in Shiraz during 2014-2018; the highest incidence (245 cases) was in 2017 and the lowest cases (28 cases) were seen in 2014.

Results of this study showed that the rate of scorpion sting among males (59.9%) was more among females (39.8%); this study is in accordance with a recent study conducted by Saneizadeh et al. from July 2012 to 2016 on scorpion stings in Shiraz,<sup>9</sup> which reported the rate of scorpion stings in men (59%) and women (41%).<sup>9</sup> A recent study conducted by Firoozian et al. in West Azerbaijan Province revealed that the rate of scorpion stings in men was 53.6% and in women 46.4%, respectively.<sup>27</sup> In the study by Dehghani et al. in Kashan, the rate of scorpion sting was reported to be 53.04% for males and 46.95% for females.<sup>28</sup> Al-Sadoon and Jarrar reported that most victims were male (61.8%) in Saudi Arabia.<sup>28, 29</sup> In the study on scorpion stings by Fenik Sh. Hussien in Kurdistan region of Iraq, the rate of scorpion stings was reported 48.9% in men and 44.6% in women.<sup>30</sup> These results are different from those of Shahi et al. in Rudan County, which stated that the rate of scorpion stings in female was 59%.<sup>31,32</sup> However, in general, the rate of scorpion stings in men was higher due to more occupational activity (such as agriculture, animal husbandry, their greater presence in the desert, etc.).

Based on the distribution of residential area, the highest percentage (96.8%) of scorpion sting occurred in urban areas and 3.2% was seen in rural areas.<sup>33</sup> These results are consistent with those of Kassiri et al. in Masjed Soleyman and Mahshahr, and the rate of scorpion sting was 69.7% in urban areas (and 63.2% in rural areas, respectively).<sup>34,35</sup> In addition, the results of the study are consistent with the findings of Dehghani et al. in Kashan that reported that 73.5% of scorpion sting was seen in urban areas.<sup>28</sup> Vazirianizadeh et al. have reported 60% of scorpion sting cases in rural areas of southwestern Iran.<sup>28</sup> Our study results are not in the same line with the findings of Shahi et al. that have reported the highest percentage (71.1%) of sting in rural areas of Roudan.<sup>36</sup> The author has mentioned one of the most important reasons for this increase in sitting and standing on the ground, as well as walking barefoot and insufficient coverage on rural lands. The results of urban and rural classification of scorpion stings can be an important factor in the control and management of scorpion stings as well as the production of effective anti-venom due to the spread and dispersion of scorpion species in these areas.

In this study, the relationship between age group and rate of scorpion sting demonstrated that the highest rate of scorpion stings was shown to be among

the 25-34 year old group (33.8%), and after that 15-24 year old group (19.5%). This study is consistent with that conducted by Kassiri et al. in Abadan that have reported the highest rate of scorpion stings in the young age group of 15 to 25 years (25.9%).<sup>37</sup> Also, Firoozian in West Azerbaijan province has announced the highest number of scorpion victims in the age group of 24-45 years old.<sup>27</sup> The reasons for this increase can be attributed to the greater occupational and social activity of these two groups. Children under four years old were the least frequent group (0.4%). This finding was in agreement with the result of Shahi et al. in Roudan; they reported the highest percentage in 25-44 year old group.<sup>36</sup>

The most injured parts of the body were the hands (52.1%), legs (27.8%), trunk (12.08), head and neck (8.05%). In the study by Shahi et al., the hands (41.2%) were the most site of scorpion sting.<sup>31</sup> Talebian et al. reported that 64.3% of scorpion stings were in people who had been stung on the leg.<sup>38</sup> This result is in the same line with those of Kassiri et al. in Masjed-Soleiman.<sup>2</sup>

The extent and severity of the damage and symptoms of this scorpion sting depend on such factors as age, gender, area of residence, and location of the bite.<sup>10</sup> Due to the climatic conditions of Shiraz, vector-borne diseases such as leishmaniasis and myiasis are also common.<sup>39-41</sup> The result of this study showed that young males were a high-risk group in scorpionism; therefore, the results of this study can help us to plan and use effective control methods, such as awareness and education.<sup>42</sup> It can identify the risk factors of scorpion sting for planning the preventive ways of scorpion stings.

## Conclusions

In this study, it was shown that Shiraz was one of the most dangerous areas for scorpion stings in southwestern Iran; considering the importance of this issue, it is suggested that more phonetic studies should be conducted to determine the fauna and scorpions of the region. Also, appropriate training and control measures in the field of scorpion stings should be done in urban and rural areas.

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**Conflict of Interest:** None declared.

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