

Incidence and Epidemiological Profile of Snakebites and Scorpion Stings in Northern Khuzestan Province, Southwestern Iran: A Descriptive, Analytical Study

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Abstract

Aim: The aim of this study was an epidemiological study of scorpion sting and snakebite in Dezful, Shush, and Gotvand Counties, located in the southwestern part of Iran. **Materials and Methods:** This research was a descriptive and analytical study. The information was gathered and recorded in questionnaires. Data were collected from 1756 to 89 scorpion sting and snakebite cases, respectively, during 2013. Data were analyzed by the descriptive statistical method and the Chi-square test using SPSS version 18. $P < 0.05$ is considered as significant difference in this study. **Results and Discussion:** The age distribution of cases showed that the largest rate of scorpion stings and snakebites occurred among the 15–24 (22.4%) and 25–34 (44.9%) years old groups, respectively. The most frequent of scorpion stung people was female (51.3%). However, a total of 92.1% of snakebites were male. The most frequent scorpion stings (18.2%) and snakebites (21.3%) were happened in June. The highest incidence of scorpion sting (59%) and snakebite (51.7%) cases in above-mentioned counties during 2013 was taken place in villages. Legs were more at risk of sting by scorpions (39.7%) and snakes (59.6%). Most of the scorpion sting (41.5%) and snakebite (42.7%) cases occurred in spring. A statistical significant correlation was observed between scorpion sting and age, month, season, and sting site on the body ($P < 0.05$). Statistical analysis showed a non-significant difference between history of sting, gender, and residence place. Scorpion stings and snakebites are the important health challenges in the tropical and subtropical areas. They are significant medical emergencies, particularly in children. Scorpionism and snakebite are considerable health hazards in Iran, especially in the rural area of south and Southwest of Iran. **Conclusion:** The results of this study indicated that most of the cases happened in June, spring, rural areas, and legs.

Key words: Epidemiology, snakebite, scorpion sting, iran.

INTRODUCTION

Scorpion sting and snakebite are of health problems in many countries of the world, and result in hurt, discomfort, and death of people. Bites and stings from these animals are of special importance in people's health due to their harmful effects.^[1] Scorpion sting is a major medical problem in African and Middle Eastern countries such as Algeria, Egypt, Iraq, Jordan, Morocco, Sudan, South Africa, and Turkey, as well as in Central American countries such as Brazil, Mexico, Argentina, Venezuela, and Trinidad.^[2,3]

People in Iran have always been exposed to bites and stings of various animals, and scorpion sting is a major issue. Each year, injuries caused by the bite of this poisonous animal are reported from different parts of Iran. Scorpion

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sting has always been one of the medical problems in Iran. This problem is correlated with the diversity of scorpion species and identification of 51 scorpion species belonging to 18 genera and four families in the vast area of Iran from the southern islands in the Persian Gulf to the northernmost regions.^[4-12] According to reports, 40–50 thousand cases of scorpion stings and many cases of deaths from scorpion stings occur every year, especially in the southern and southwestern tropical regions of Iran. It is noteworthy that scorpion sting cases are estimated to exceed the above statistics.^[2] In Iran, Khuzestan and Hormozgan Provinces are among the most important scorpion sting foci where thousands of stings and dozens of deaths are reported annually.^[13]

Snakes are found in large parts of Iran, especially in desert areas. In Iran, 69 species of snakes have been identified, including 36 non-venomous species, 25 venomous species and 8 semi-venomous species.^[14,15] The incidence of snakebite, regardless of the species involved, varies from country to country, and even between different regions of a country, and depends on various factors such as climate, environmental parameters, biodiversity, distribution of venomous snakes, human population density, economic activities, and types of residential units.^[16] Annually, between 1.2 and 5.5 million cases of snakebites occur in the world with a morbidity rate of 421–1841 thousand and a mortality rate of 20–94 thousand cases.^[17-20] The highest mortality rate from snakebites in the world is seen in India with 35,000–50,000 people a year, according to the World Health Organization.^[21] In Iran, according to the Ministry of Health and Medical Education, approximately 4500–7000 snakebites were reported annually from 2001 to 2010,

with 3–9 deaths. The mean annual incidence of snakebite was estimated to be 6.9/100,000 people.^[14,19,22] Snakebite imposes many complications and years of life lost on humans.^[19] Only about half of people bitten by snakes in the world ask for medical care, and probably more than 100,000 people suffer from severe and chronic complications.^[23] Given the high prevalence of scorpion sting and snakebite in Shush, Gotvand, and Dezful Counties, the present study aimed at investigating the prevalence of scorpion sting and snakebite and their epidemiologic factors in these cities in 2013. The results of this study can be used in the prevention and control programs for scorpion sting and snakebite, and hence can reduce their incidence in the region.

MATERIALS AND METHODS

This cross-sectional descriptive-analytical study was conducted in 2013. The college research review committee revised the proposal according to the rule and regulation. Accordingly, the study was approved by the Ethics Committees of Ahvaz Jundishapur University of Medical Sciences. Administrative authorities were informed about the study, and their consent was obtained with the letter.

Participation was fully voluntary and informed written consent was obtained from directors and each study participants. The data were recorded in a questionnaire using interviews with the those referring the disease control and prevention units at the health centers of Shush, Dezful, and Gotvand Counties. Scorpion sting and snakebite data included gender, age, place of occurrence (city and village), sting or bite site on the body, time of being stung or bitten, history of being stung or bitten, injection route of anti-scorpion-venom or anti-snake-venom serum (intramuscular and intravenous), month, and season.

Data were analyzed using descriptive statistics and the Chi-square test in SPSS version 18. For all the analyses, $P < 0.05$ was taken as significant.

RESULTS

In 2013, a total of 1756 cases of scorpion sting occurred in the three northern cities of Khuzestan Province (southwestern Iran) with 764 cases in Dezful, 303 cases in Gotvand, and 689 cases in Shush. The total number of scorpion stings in these cities included 855 men (48.7%) and 901 women (51.3%). A total of 328 men (42.9%) and 436 women (57.1%) in Dezful, 373 men (54.1%) and 316 women (45.9%) in Shush, and 154 men (50.8%) and 149 women (49.2%) in Gotvand were stung by scorpions [Table 1]. No statistically significant difference was observed between the two genders.

In terms of age, the highest frequency of scorpion stings in the three northern cities of Khuzestan Province was observed in the age group of 15–24 years with 394 cases (22.4%). According to the results, the highest scorpion sting frequency in Dezful and Shush was seen in the age group of 15–24 years with 215 cases (28.2%) and 135 cases (19.6%), respectively, and in the age group of 25–34 years with 81 cases (26.7%) in Gotvand [Table 2]. Statistical analysis showed a significant difference between the age groups ($P < 0.05$).

Regarding the effect of place residence on the rate of a scorpion sting, the recorded cases were separated based on place of residence. In total, 721 cases (41%) were in urban areas and 1035 cases (59%) were in rural areas. In Dezful, 381 cases (49.9%) were in urban areas and 383 cases (50.1%) were in rural areas; in Shush, 224 cases (32.5%) were in urban areas and 465 cases (67.5%) were in rural areas; and in Gotvand, 116 cases (38.2%) were in urban areas and 187 cases (61.8%) were in rural areas [Table 1]. The results showed no significant difference in the frequency of scorpion sting between urban and rural areas.

In terms of month, the highest number of scorpion stings occurred in June with 320 cases (18.2%) and the lowest cases in February with 25 cases (1.4%) [Table 3]. The seasonal distribution of cases showed that 729 cases (41.5%) were in the spring, 575 (32.7%) in the summer, 328 (18.7%) in the autumn, and 124 (7.1%) in the winter [Table 1]. Analyses

Table 1: Frequency distribution of scorpion sting cases based on type of injection, interval time between sting and reaching the hospital, site of sting on the body, gender, interval time between sting and antivenin injection, residential area, sting clock and history of receiving antivenin and history of sting in Dezful, Shush, and Gotvand Counties, Northern Khuzestan Province, Southwestern Iran during 2013

Counties	Injection <i>n</i> (%)				Interval time between sting and reaching the hospital (hours) <i>n</i> (%)			
	Vein	Muscle	No	Total	<1.5	1.5–3	>3	Total
Dezful	0 (0.0)	734 (96.0)	30 (4.0)	764 (100)	466 (61.0)	127 (16.6)	171 (22.4)	764 (100)
Shush	0 (0.0)	689 (100)	0 (0.0)	689 (100)	688 (99.9)	1 (0.1)	0 (0.0)	689 (100)
Gotvand	5 (1.6)	289 (42.0)	9 (1.4)	303 (100)	121 (39.9)	77 (25.4)	105 (34.7)	303 (100)
Total	5 (0.3)	1712 (97.5)	39 (2.2)	1756 (100)	1275 (72.6)	205 (11.7)	276 (15.7)	1756 (100)
Counties	Site of sting <i>n</i> (%)					Gender		
	Hands	Feet	Trunks	Head	Total	Male	Female	Total
Dezful	288 (37.6)	312 (40.8)	116 (15.1)	48 (6.2)	764 (100)	328 (43)	436 (57.0)	764 (100)
Shush	237 (34.5)	262 (38.0)	120 (17.5)	0 (0.0)	689 (100)	373 (54.1)	316 (45.9)	689 (100)
Gotvand	118 (39.0)	124 (41.0)	48 (16.0)	13 (4.0)	303 (100)	154 (50.8)	149 (49.2)	303 (100)
Total	643 (36.6)	698 (39.7)	284 (16.2)	131 (7.5)	1756 (100)	855 (48.7)	901 (51.3)	1756 (100)
Counties	Interval time between sting and antivenin injection (hours) <i>n</i> (%)					Residential area		
	<6	6–12	>12	No injection	Total	Urban	Village	Total
Dezful	728 (95.3)	0 (0.0)	6 (0.8)	30 (3.9)	764 (100)	381 (49.9)	383 (50.1)	764 (100)
Shush	665 (96.5)	23 (3.3)	0 (0.0)	0 (0.0)	689 (100)	224 (32.5)	465 (67.5)	689 (100)
Gotvand	246 (81.2)	20 (6.6)	28 (9.2)	9 (3.0)	303 (100)	116 (38.0)	187 (62.0)	303 (100)
Total	1639 (93.4)	43 (2.5)	34 (1.9)	39 (2.2)	1756 (100)	721 (41.0)	1035 (59.0)	1756 (100)
Counties	Sting time <i>n</i> (%)					History of receiving antivenin		
	0–6	6–12	12–18	18–24	Total	Yes	No	Total
Dezful	244 (31.9)	194 (35.3)	153 (20.0)	173 (22.6)	764 (100)	4 (0.5)	762 (99.5)	764 (100)
Shush	146 (21.0)	187 (27.0)	281 (40.7)	75 (10.8)	689 (100)	0 (0.0)	689 (100)	689 (100)
Gotvand	113 (37.0)	67 (22.0)	60 (19.8)	63 (20.7)	303 (100)	20 (6.6)	283 (93.4)	303 (100)
Total	503 (28.6)	448 (25.6)	494 (28.1)	311 (17.7)	1756 (100)	24 (1.4)	1732 (98.6)	1756 (100)
Counties	Season <i>n</i> (%)					History of sting		
	Spring	Summer	Autumn	Winter	Total	Yes	No	Total
Dezful	259 (31.9)	280 (35.3)	181 (23.7)	44 (5.8)	764 (100)	4 (0.5)	760 (99.5)	764 (100)
Shush	315 (45.7)	231 (33.5)	81 (11.7)	62 (8.1)	689 (100)	0 (0.0)	689 (100)	689 (100)
Gotvand	155 (51.1)	64 (21.1)	66 (21.8)	18 (5.9)	303 (100)	20 (6.6)	283 (93.4)	303 (100)
Total	729 (41.5)	575 (32.7)	328 (18.7)	124 (7.1)	1756 (100)	24 (1.4)	1732 (98.6)	1756 (100)

showed a significant difference between the frequency of scorpion sting cases and different seasons and months of the year ($P < 0.05$).

In terms of scorpion sting site on the body, the feet with 698 cases (39.7%) and the hands with 634 cases (36.6%) were stung more than other organs, respectively [Table 1]. Analyses showed a significant difference between the frequency of scorpion sting cases and sting site on the body ($P < 0.05$).

In terms of the previous history being stung by scorpions, 1732 individuals (98.6%) had no history, while 24 individuals (1.4%) had a history of being stung. According to the counties

studied, 760 cases (99.5%) had no history and 4 cases (0.5%) had a history of being stung by scorpions. In Shush, none of the cases had a history of being stung by scorpions. In Gotvand, 283 cases (93.4%) had no history and 20 cases (6.6%) had a history of being stung by scorpions [Table 1]. No significant difference was observed between scorpion sting cases and the history of being stung by scorpions.

The interval time between sting and reaching the hospital or health centers located in the studied counties was less than an hour and a half in most cases (72.6%). Regarding receiving anti-scorpion-venom serum, 1734 cases (98.7%) had no history of receiving anti-scorpion-venom serum [Table 1].

Table 2: Frequency distribution of scorpion sting cases based on age group in Dezful, Shush, and Gotvand Counties, Northern Khuzestan Province, Southwestern Iran during 2013

Counties	Dezful n (%)	Shush n (%)	Gotvand n (%)	Total n (%)
Age group				
0–4	42 (5.5)	15 (2.2)	13 (4.3)	70 (4.0)
5–9	35 (4.6)	43 (6.2)	18 (5.9)	96 (5.5)
10–14	51 (6.7)	95 (13.8)	25 (8.3)	171 (9.7)
15–24	215 (28.2)	135 (19.6)	44 (14.5)	394 (22.4)
25–34	195 (25.5)	109 (15.8)	81 (26.7)	385 (21.9)
35–44	106 (13.9)	123 (17.9)	54 (17.9)	283 (16.1)
45–54	63 (8.2)	86 (12.5)	38 (12.5)	187 (10.7)
55–64	32 (4.1)	60 (8.7)	17 (5.6)	109 (6.2)
<64	25 (3.3)	23 (3.3)	13 (4.3)	61 (3.5)
Total	764 (100)	689 (100)	303 (100)	1756 (100)

Table 3: Frequency distribution of scorpion sting cases based on the month in Dezful, Shush, and Gotvand Counties, Northern Khuzestan Province, Southwestern Iran during 2013

Counties	Dezful n (%)	Shush n (%)	Gotvand n (%)	Total n (%)
Months				
April	63 (8.2)	15 (2.1)	46 (15.2)	124 (7.1)
May	91 (11.9)	130 (18.9)	64 (21.1)	285 (16.2)
June	105 (13.7)	170 (24.7)	45 (14.9)	320 (18.2)
July	100 (13.1)	151 (21.9)	26 (8.6)	277 (15.8)
August	85 (11.1)	40 (5.8)	22 (7.2)	147 (8.4)
September	95 (12.4)	40 (5.8)	16 (5.3)	151 (8.6)
October	74 (9.7)	29 (4.2)	27 (8.9)	130 (7.4)
November	78 (10.2)	34 (4.9)	29 (9.6)	141 (8.0)
December	29 (3.8)	18 (2.6)	10 (3.3)	57 (3.2)
January	7 (1.0)	19 (2.8)	7 (2.3)	33 (1.9)
February	9 (1.2)	13 (1.9)	3 (1.0)	25 (1.4)
March	28 (3.7)	30 (4.4)	8 (2.6)	66 (3.8)
Total	764 (100)	689 (100)	303 (100)	1756 (100)

Most scorpion stings (503 cases, 28.6%) occurred from midnight to 6 AM and the least stings (311 cases (17.7%) occurred from 6 PM to midnight [Table 1].

A total of 89 people bitten by snakes visited health centers and received health-care services in Shush ($n = 16$), Dezful ($n = 70$), and Gotvand ($n = 3$) in 2013. In terms of gender, 82 people were men (92.1%) and 7 people were women (7.9%) in these counties; 64 men (91.4%) and 6 women (8.6%) in Dezful, 15 men (93.8%) and one woman (0.7%) in Shush, and 3 men in Gotvand [Table 4].

According to the age range of snakebite cases in the three counties, the highest frequency was seen in the age group 25–34 years with 40 cases (44.9%) followed by the age group 15–24 years with 17 cases (19.2%). No case was reported in the age group under 5 years. In Dezful, the highest number of cases was seen in the age group 25–34 years (23 cases, 32.8%), in Shush, all cases (100%) were in the age group 15–34 years, and in Gotvand, there was one case in the age groups 10–14, 55–64, and 10–14 years [Table 5].

Of the total number of snakebite cases, 46 people (51.7%) lived in rural areas and 43 people (48.3%) in urban areas. In Dezful, 27 people (38.6%) lived in urban areas and 43 people (61.4%) in rural areas; in Shush, all 16 cases lived in the urban areas and in Gotvand all 3 cases lived in rural areas [Table 4].

In terms of month, the highest number of snakebite cases was recorded in June (19 cases, 21.3%) and September (17 cases, 19.1%), respectively. No cases were recorded in January and February [Table 6]. Seasonal distribution of snakebites showed that 38 cases (42.7%) occurred in the spring, 35 cases (39.3%) in the summer, 12 cases (13.5%) in the autumn, and 4 cases (4.5%) in the winter [Table 4].

In terms of the site of snakebite on the body, the legs with 53 cases (59.6%) were bitten more than the other organs, followed by the hands with 33 cases (37%) and the trunk with 3 cases (3.4%) [Table 4]. None of the people had a history of snakebite, and hence had no history of receiving the antivenin [Table 4].

DISCUSSION

Scorpion sting is one of the most important health problems in Khuzestan Province, which, unfortunately, causes significant injuries each year.^[24,25] The event that has resulted in the phenomenon of scorpionism in Khuzestan was the beginning of the imposed war of Iraq against the Iranian people and direct involvement of Khuzestan Province, which had led to the displacement of people from villages and border towns. War displacements have also caused military forces to be more exposed to scorpion nests and shelters, which has increased the incidence of scorpion stings.^[24-26] The scorpionism is not limited to Khuzestan, and other provinces of Iran are also affected, especially the southern provinces. In addition, the variety of scorpion species in the province of Khuzestan is increasing. Various types of scorpions have different types of venom and can cause different clinical complications in different individuals.^[7,24]

In 2013, a total of 1756 scorpion stings were recorded in three northern counties of Khuzestan Province (Shush, Gotvand, and Dezful). In this study, the highest (22.4%) and the lowest (4%) number of cases occurred in the age groups 15–24 years and under 4 years, respectively. Children under the age of

Table 4: Frequency distribution of snakebite cases based on type of injection, interval time between sting and reaching the hospital, site of sting on the body, gender, interval time between sting and antivenin injection, residential area, season, history of sting in Dezful, Shush, and Gotvand Counties, Northern Khuzestan Province, Southwestern Iran during 2013

Counties	Interval time between sting and antivenin injection (hours) <i>n</i> (%)				Gender <i>n</i> (%)			
	<6	6–12	>12	Total	Male	Female	Total	
Dezful	54 (77.1)	12 (17.1)	4 (5.8)	70 (100)	64 (91.4)	6 (8.6)	70 (100)	
Shush	0 (0.0)	3 (18.75)	13 (81.25)	16 (100)	15 (93.75)	1 (6.25)	16 (100)	
Gotvand	3 (100)	0 (0.0)	0 (0.0)	3 (100)	3 (100)	0 (0.0)	3 (100)	
Total	57 (64.0)	15 (16.9)	17 (19.1)	89 (100)	82 (92.1)	7 (7.9)	89 (100)	
Counties	Interval time between sting and reaching the hospital (hours) <i>n</i> (%)				Residential area <i>n</i> (%)			
	<1.5	1.5-3	>3	Total	Urban	Village	Total	
Dezful	57 (81.5)	8 (11.4)	5 (7.1)	70 (100)	27 (38.6)	43 (61.4)	70 (100)	
Shush	10 (62.5)	6 (37.5)	0 (0.0)	16 (100)	16 (100)	0 (0.0)	16 (100)	
Gotvand	2 (66.7)	0 (0.0)	1 (33.3)	3 (100)	0 (0.0)	3 (100)	3 (100)	
Total	69 (77.5)	14 (15.7)	6 (6.8)	89 (100)	43 (48.3)	46 (51.7)	89 (100)	
Counties	Site of sting <i>n</i> (%)					Injection <i>n</i> (%)		
	Hands	Feet	Trunks	Head	Total	Vein	Muscle	Total
Dezful	30 (42.9)	39 (55.7)	1 (1.4)	0 (0.0)	70 (100)	70 (100)	0 (0.0)	70 (100)
Shush	2 (12.5)	12 (75)	2 (12.5)	0 (0.0)	16 (100)	16 (100)	0 (0.0)	16 (100)
Gotvand	1 (33.3)	2 (66.7)	0 (0.0)	0 (0.0)	3 (100)	0 (0.0)	3 (100)	3 (100)
Total	33 (37.0)	53 (59.6)	3 (3.4)	0 (0.0)	89 (100)	86 (96.6)	3 (3.4)	89 (100)
Counties	Season <i>n</i> (%)					History of sting		
	Spring	Summer	Autumn	Winter	Total	No	Yes	Total
Dezful	31 (44.3)	27 (38.6)	9 (12.8)	3 (4.3)	70 (100)	70 (100)	0 (0.0)	70 (100)
Shush	7 (12.5)	6 (75)	3 (12.5)	0 (0.0)	16 (100)	16 (100)	0 (0.0)	16 (100)
Gotvand	0 (0.0)	2 (66.7)	0 (0.0)	1 (33.3)	3 (100)	3 (100)	0 (00)	3 (100)
Total	38 (42.7)	35 (39.3)	12 (13.5)	4 (4.5)	89 (100)	89 (100)	0 (0.0)	89 (100)

Table 5: Frequency distribution of snakebite cases based on age group in Dezful, Shush, and Gotvand Counties, Northern Khuzestan Province, Southwestern Iran during 2013

Age group	Dezful <i>n</i> (%)	Shush <i>n</i> (%)	Gotvand <i>n</i> (%)	Total <i>n</i> (%)
0–4	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
5–9	1 (100)	0 (0.0)	0 (0.0)	1 (1.1)
10–14	0 (0.0)	0 (0.0)	1 (100)	1 (1.1)
15–24	17 (100)	0 (0.0)	0 (0.0)	17 (19.1)
25–34	23 (58.0)	16 (40.0)	1 (2.5)	40 (44.9)
35–44	10 (100)	0 (0.0)	0 (0.0)	10 (11.2)
45–54	13 (100)	0 (0.0)	0 (0.0)	13 (14.6)
55–64	4 (80.0)	0 (0.0)	1 (20.0)	5 (5.6)
<64	2 (100)	0 (0.0)	0 (0.0)	2 (2.4)
Total	70 (78.6)	16 (18.0)	3 (3.4)	89 (100)

10 in this study accounted for 9.5% of scorpion stings. In a study by Daneshi *et al.* in Kerman, 15% of the scorpion stings cases,^[27] and in the study of Isazadehfahar *et al.* in the southwest of Iran, 14% of the scorpion stings cases were reported in the age group under 10 years.^[28] In a study by Attamo *et al.* in the pediatric ward of Agadez Hospital in Nigeria, 50% of scorpion stings cases occurred in the age group 6–15 years.^[29] Studies by Kassiri *et al.* in Abadan^[30] and Mahshahr^[31] showed that most scorpion stings occurred in the age group 20–29 years. The high prevalence of scorpion sting in younger age groups can result from their curiosity, risk-taking, and behaviors such as lifting rocks without using gloves and wearing clothes and shoes without checking them for scorpions.^[32]

In this study, the incidence of scorpion sting was almost the same in women (49.7%) and men (50.3%); which is similar to the results of studies by Vazirizadeh *et al.*^[33] and Chitnis *et al.*^[11] However, these results are different from studies conducted in

Table 6: Frequency distribution of snakebite cases based on the month in Dezful, Shush, and Gotvand Counties, Northern Khuzestan Province, Southwestern Iran during 2013

Counties	Dezful n (%)	Shush n (%)	Gotvand n (%)	Total n (%)
Months				
April	8 (100)	0 (0.0)	0 (0.0)	8 (9.0)
May	8 (72.7)	3 (28.3)	0 (0.0)	11 (12.4)
June	15 (79.0)	4 (21.0)	0 (0.0)	19 (21.4)
July	6 (66.7)	2 (22.2)	1 (11.1)	9 (10.1)
August	7 (77.8)	2 (22.2)	0 (0.0)	9 (10.1)
September	14 (82.3)	2 (11.8)	1 (5.9)	17 (19.1)
October	8 (80.0)	2 (20.0)	0 (0.0)	10 (11.2)
November	0 (0.0)	1 (100)	0 (0.0)	1 (1.1)
December	1 (100)	0 (0.0)	0 (0.0)	1 (1.1)
January	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
February	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
March	3 (75.0)	0 (0.0)	1 (25.0)	4 (4.5)
Total	70 (78.6)	16 (18.0)	3 (3.4)	89 (100)

Saudi Arabia. In two separate studies in two different regions of Saudi Arabia, the highest incidence of scorpion stings was found in men (73% and 77%) and the rest in women.^[34,35] This difference can be attributed to the difference in active participation by women and men in these countries. A study by Ozkan and Kat in Turkey showed that the number of people stung by scorpions was equal in both genders.^[36]

Based on the findings of this study, 39.7% of scorpion stings were in the legs, 36.6% in the hands, 16.2% in the trunk, and 7.5% in the head and neck. In a study by Talebian *et al.*, 64.3% of the patients were stung in the lower limbs, 27.8% in the upper limbs, 7.4% in the trunk, and 0.5% in head and neck.^[37] These findings may be due to the fact that legs and hands are more commonly used in manual and motor activities and, therefore, are more exposed to scorpion stings; other parts of the body, such as head and neck, are stung at rest during sleep.

The present study showed that the most frequent scorpion stings occurred in the warm months of the year, with the highest frequency in June. In the study by Talebian *et al.*, the highest number of scorpion stings was observed in July and August,^[37] probably due to the fact that scorpion activity increases during these hot months. This is also confirmed by the findings of other studies.^[32,38] Most stings occurred from June to September in Tunisia,^[39] from June to October in Mexico,^[40] in August in Mahshahr,^[31] in July in Abadan,^[30] in August in Behbahan,^[41] and in August in Brazil.^[42]

In the present study, about 72.6% of patients were treated with anti-scorpion-venom serum in <1.5 h after being stung. The time delay between scorpion sting and administration

of anti-scorpion-venom serum has also been reported in other studies.^[43] In a study in Mexico in 2006, 48% of cases received antisera in <30 min.^[40] Perhaps the reason for this delay is the lack of awareness about the importance of immediate treatment of scorpion sting, the inability to visit the emergency department due to financial problems, or lack of geographical access. Informing people about the importance of immediate treatment of scorpion sting is effective in reducing the delay in visiting treatment centers.

In the present study, snakebites were more reported in men than in women. Snakebites occurred in men ten times more than in women. In a study by Dehghani *et al.* in Kashan, 96% of snakebites occurred in men.^[14] In a study by Brunda *et al.*, the rate of snakebite in men was 3 times greater than that of women.^[43] In a study by Kassiri *et al.* in Mahshahr, 84.7% of snakebite cases occurred in men.^[44] In a study by Eslamian *et al.* on snakebites in the northern part of Iran for 10 years, 77.6% of cases were male.^[45] The high frequency of snakebites among men can be due to their working outdoor, which increases the risk of snakebites.

In this study, most of the snakebites occurred in the age group 25–34 years. In a study by Zamani *et al.*, the mean age of the snakebite cases was 28.3 years, and most victims were in the age group 20–30 years.^[46] In a study by Dehghani *et al.* in Kashan, the highest number of snake victims was observed in the age groups 15–24 years and 35–44 years.^[14] In a study by Brunda *et al.*, most snakebites occurred in the age group 20–50 years.^[43]

Several studies have shown that most bites occurred in rural areas and outside of cities.^[17,45-47] In this study, the number of cases reported in rural areas was slightly higher than in urban areas. In a study in Mahshahr County, 62.2% of snakebite cases occurred in rural areas.^[44]

The time of snakebite (day or night) is important, but it has been ignored in many studies. The results of studies are sometimes contradictory. In a study by Halesha *et al.*, most bites occurred during the day (70.5%).^[48] However, in a study by Rahman *et al.* in Bangladesh, most bites occurred at night.^[47] This difference may be due to people's different lifestyles and different species of snakes in the two areas. In the present study, most snakebites occurred in the morning and afternoon (from 6 to 12), possibly because rural activities occur at this time of day.

As an objective, the seasonal distribution of snakebites during the year was investigated in this study. In a study by Brunda *et al.*, most snakebites in India were reported in autumn and summer.^[43] In a research conducted by Dehghani *et al.*, most snakebites occurred from May to April.^[14] In the present study, most cases of snakebites occurred in June. In other papers, the most frequent snakebites were also in the spring and summer.^[44]

To reduce scorpion stings and snakebites and their consequences, people should be more informed about scorpion sting and snakebite. Anti-scorpion-venom and anti-snake-venom sera should be constantly available in health centers that are geographically more exposed to scorpion stings and snakebites. Health center staff should update their knowledge of various types of venomous and non-venomous snakes and scorpions, as well as scorpion stings and snakebites. It is also necessary to reduce children's risky behaviors, such as walking barefoot, lifting rocks and manipulating scorpions, and snakes' nests, which increase the risk of incidents in children. Useful information about scorpion stings and snakebites can be provided for people using educational tools such as posters, brochures, and speeches. Public media such as television, radio, and newspapers can also be used for providing further information. In addition, with proper urban management and house building, the birthplaces and shelters of scorpions and snakes can be reduced.

The present study has two limitations; the study did not include an active method to increase the chance to detect the more cases. In addition, field assessments were not conducted on scorpion and snake collection to detect their fauna to support of control strategies in the study area.

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REFERENCES

1. Heidari M, Sepehri G, Zahedi M, Tezerji RS. Evaluation the effects of bezoar on survival duration and attenuation of complications of *Echis carinatus* snake venom poisoning in mice. *J Rafsanjan Uni Med Sci* 2008;7:259-66.
2. Dehghani R, Valaei N. Scorpion bite in Iran: Review of the literature. *J Kashan Univ Med Sci* 2005;9:66-84.
3. Prophylaxis of snake and scorpion bite in Islamic republic of Iran. 2005-2006. Education CfdeMoHaM; 2006.
4. Dehghani R, Vazirianzadeh B, RahimiNasrabadi M, Moravej SA. Study of scorpionism in Kashan in central Iran. *Pak J Med Sci* 2010;26:955-58.
5. Zargan J, Tirgari S, Tahernejad K, Lotfi H, Farahmanzad AR. Study of scorpion in Abomosa, great and small Tonbs and Hengam Islands of the Persian Gulf. *Iran South Med J* 2003;6:20-4.
6. Shahi M, Azizi K, Ansarian N. Surveying of scorpion fauna in high endemic scorpion sting in Hormozgan Province during 2005-2007. *Med J Hormozgan Univ* 2008;12:207-14.
7. Radmanesh M. Clinical study of *Hemiscorpion lepturus* in Iran. *J Trop Med Hyg* 1990;93:327-32.
8. Radmanesh M. Cutaneous manifestations of the *Hemiscorpius lepturus* sting: A clinical study. *Int J Dermatol* 1998;37:500-7.
9. Mirshamsi O, Sari A, Hosseinie S. History of study and checklist of the scorpion fauna (*Arachnida: Scorpiones*) of Iran. *Prog Biol Sci* 2011;1:16-28.
10. Vazirianzadeh B, Samie M. Epidemiological study of scorpionism in the Khozestan. Proceedings of the 2nd Congress of Medical Entomology. Tehran, Iran 2006.
11. Chitnis PA, Maraghi S, Vazirianzadeh B. Epidemiological and laboratory study on scorpion stings in Khuzestan Province. *J Guilan Univ Med Sci* 1993;2:5-12.
12. Pipelzadeh MH, Jalali A, Taraz M, Pourabbas R, Zaremirkabadi A. An epidemiological and a clinical study on scorpionism by the Iranian scorpion *Hemiscorpius lepturus*. *Toxicon* 2007;50:984-92.
13. Labafgahsemi R. Status of scorpion stings in Iran and their prevention. *Behv J* 1999;2:32-5.
14. Dehghani R, Rabani D, Panje-Shahi M, Jazayeri M, Sabhi-Bidgoli M. Incidence of snake bites in Kashan, Iran during an eight year period 2004-2011. *Archives of trauma research*. 2012;1;67-71.
15. Dehghani R. Health pests and safe control methods of them. Tehran: Published by Farmanesh; 2011. p. 436-43.
16. Meenatchisundaram S, Michael A. Snake bite and therapeutic measures: Indian scenario. *Indian J Sci Tech* 2009;2;69-73.
17. Alirol E, Sharma SK, Bawaskar HS, Kuch U, Chappuis F. Snake bite in South Asia: A review. *PLoS Negl Trop Dis* 2010;4:e603.
18. Chippaux JP. Snake-bites: Appraisal of the global situation. *Bull World Health Organ* 1998;76:515-24.
19. Kasturiratne A, Wickremasinghe AR, de Silva N, Gunawardena NK, Pathmeswaran A, Premaratna R, *et al.* The global burden of snakebite: A literature analysis and modelling based on regional estimates of envenoming and deaths. *PLoS Med* 2008;5:e218.
20. Cheng AC, Danzl DF, Traub SJ, Wiley JF. Principles of Snake Bite Management Worldwide UpToDate. In: Basow, DS editor. Waltham (MA): UpToDate; 2009.
21. Isbister GK, Little M, Cull G, McCoubrie D, Lawton P, Szabo F, *et al.* Thrombotic microangiopathy from Australian brown snake (*Pseudonaja*) envenoming. *Intern Med J* 2007;37:523-8.
22. Dehghani R, Mehrpour O, Shahi MP, Jazayeri M, Karrari P, Keyler D, *et al.* Epidemiology of venomous and semi-venomous snakebites (*Ophidia: Viperidae, Colubridae*) in the Kashan city of the Isfahan province in central Iran. *J Res Med Sci* 2014;19:33-40.
23. Coulson JM, Cooper G, Krishna C, Thompson JP. Snakebite enquiries to the UK national poisons information service: 2004-2010. *Emerg Med J* 2013;30:932-4.

24. Farzanpay R. Scorpion Knowledge. Tehran, Iran: Academic press 1987. p. 284.
25. Kamali K. Scorpions of Khuzestan, treatment of scorpion sting and how to control them. Majalleh -e- elmi -e- Keshavarzi. Sci J Agric 1984;1:1-31.
26. Vazirianzadeh B. Taxonomy, morphology and comparative study of bio-ecology and night promenade of three species of scorpions (Khuzestan, Iran): *Androctonus crassicauda* (olivier), *Mesobuthus eupeus* (C.L. Koch), *Hemiscorpius lepturus* (Peters). MSPH Thesis Tehran Univ. Med Sci 1990;127.
27. Daneshi S, Rezabeigi S, Razzaghi A, Zeinali M, Arefi S. The epidemiological analysis of scorpion stings in Kerman 2012-14. Pejouhandeh 2016;21:35-39.
28. Isazadehfar KH, Eslami L, Entezariasl M. Epidemiology of scorpionism in southwest, Iran, 2008. Iran J Epidemiol 2013;8:54-60.
29. Attamo H, Diawara N, Garba A. Epidemiology of scorpion envenomations in the pediatric service of the agadez hospital center (Niger) in 1999. Bull Soc Pathol Exot 2002;95:209-11.
30. Kassiri H, Lotfi M, Ebrahimi A. Epidemiological, clinical characteristics and outcome of scorpion envenomation in Abdanan County, Western Iran: An analysis of 780 cases. Indo Am J P Sci 2017;4:2692-701.
31. Kassiri H, Kasiri A, Kasiri E, Abdian P, Matori F, Lotfi M. Epidemiological characteristics and incidence rate of definite scorpion stings in Mahshahr County, Iran: Multivariate analysis of 1635 cases. Asian Pac J Trop Dis 2015;5:80-4.
32. Jahan S, Mohammed Al Saigul A, Abdul Rahim Hamed S. Scorpion stings in Qassim, Saudi Arabia – a 5-year surveillance report. Toxicon 2007;50:302-5.
33. Vazirizadeh B, Samie M. Epidemiological study of scorpionism in the Khozestan. The 2nd Congress of Medical Entomology, 2005 Tehran Medical Sciences University, Tehran, Iran.
34. Jarrar BM, Al-Rowaily MA. Epidemiological aspects of scorpion stings in al-jouf province, Saudi Arabia. Ann Saudi Med 2008;28:183-7.
35. Al-Sadoon MK, Jarrar BM. Epidemiological study of scorpion stings in Saudi Arabia between 1993 and 1997. J Venom Anim Toxins Incl Trop Dis 2003;9:54-64.
36. Ozkan O, Kat I. *Mesobuthus eupeus* scorpionism in Sanliurfa region of Turkey. J Venom Anim Toxins Incl Trop Dis 2005;11:479-91.
37. Talebian A, Dourodgar A. The Epidemiologic study of scorpion sting referred to medical centers. Bimonthly Sci Res Shahed Univ 2005;13:37-44.
38. Adiguzel S, Ozkan O, Inceoglu B. Epidemiological and clinical characteristics of scorpionism in children in Sanliurfa, turkey. Toxicon 2007;49:875-80.
39. Bouaziz M, Bahloul M, Kallel H, Samet M, Ksibi H, Dammak H, *et al.* Epidemiological, clinical characteristics and outcome of severe scorpion envenomation in south Tunisia: Multivariate analysis of 951 cases. Toxicon 2008;52:918-26.
40. Chowell G, Díaz-Dueñas P, Bustos-Saldaña R, Mireles AA, Fet V. Epidemiological and clinical characteristics of scorpionism in Colima, Mexico 2000-2001. Toxicon 2006;47:753-8.
41. Kassiri H, Kassiri A, Sharifard M, Shojaee S, Lotfi M, Kasiri E. Scorpion envenomation study in Behbahan Country, Southwest Iran. J Coast Life Med 2014;2:416-20.
42. Lira-Dasilva RM, Amorim AM, Brazil TK. Envenenamento por *Tityus stigmurus* (Scorpiones, Buthidae) no estado da Bahia, Brazil. Rev Soc Bras Med Trop 2000;33:239-45.
43. Brunda G, Sashidhar RB. Epidemiological profile of snake-bite cases from Andhra Pradesh using immunoanalytical approach. Indian J Med Res 2007;125:661-8.
44. Kassiri H, Naghibzadeh R, Kavosi-Asl P. An epidemiological study of patients with snake biting in the health center of Bandar Mahshahr, SW Iran. Asian J Anim Vet Adv 2012;7:268-72.
45. Eslamian L, Mobaiyen H, Bayat-Makoo Z, Piri R, Benisi R, Naghavi-Behzad M. Snake bite in Northwest Iran: A retrospective study. J Anal Res Clin Med 2016;4:133-8.
46. Zamani F, Dehdari T, Ahmadi K, Taghi-Rahdari M, Ashrafi A, Babaei A. Investigation of temporal pattern of scorpion sting and snakebite incidence in patients referred to Masjed Soleiman main hospital, during 24 months from 21 March 2008 to 20 March 2009. J Saf Promot Inj Prev 2014;1:190-7.
47. Rahman R, Faiz MA, Selim S, Rahman B, Basher A, Jones A, *et al.* Annual incidence of snake bite in rural Bangladesh. PLoS Negl Trop Dis 2010;4:e860.
48. Halesha B, Harshavardhan L, Lokesh AJ, Channaveerappa P, Venkatesh K. A study on the clinic-epidemiological profile and the outcome of snake bite victims in a tertiary care center in southern India. J Clin Diagn Res 2013;7:122-6.

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