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Research Article

**EPIDEMIOLOGICAL, CLINICAL CHARACTERISTICS
AND OUTCOME OF SCORPION ENVENOMATION IN
ABDANAN COUNTY, WESTERN IRAN: AN ANALYSIS OF
780 CASES**Hamid Kassiri^{1,*}, Masoud Lotfi², Atefe Ebrahimi³¹ School of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran² Abdanan Health Center, Ilam University of Medical Sciences, Ilam, Iran. School of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran³ Student Research Committee, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran**Abstract:**

Objective: Scorpion envenomation is an important health challenge in southern part of Iran with 75% yearly mortalities of scorpion sting in Iran. The aim of this descriptive-analytical study was to describe the epidemiological characteristics and outcomes among humans in Abdanan County, western Iran during 2009-2013.

Methods: In this study, all patients with scorpion sting reviewed and our needed data recorded. A questionnaire including demographic and epidemiologic data was completed for the patients. The frequencies of entomo-epidemiological parameters were converted to the percentage rank.

Results: There were 780 scorpion victims. Scorpion stings were more prevalent in July [19.4%]. The most relative frequency of scorpion stings were in rural areas [58.1%]. The most stung organs were hands, with 50%. Most of the cases were females [55%] in the 21-30 age groups [25.2%]. About 73.7% of the sufferers slept indoors and on the ground. Nearly 74.1 % of envenomed cases were due to yellow scorpions. The majority of cases [43%] were housewives. The stings mainly occurred between 12-18 [28%].

Conclusion: Due to serious signs of scorpionism, it is offered that members of families be instructed about observing safety plans, taking care people and applying appropriate shoes and clothes all day long.

Key Words: Scorpion Sting, Epidemiology, Iran

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INTRODUCTION:

Scorpion envenomation is a major health problem in underdeveloped countries with tropical and subtropical climates, imposing relatively heavy economic costs and causing emotional-psychological distress on society. An approximate 1500 scorpion species have so far been identified in the world, which are distributed across all continents [1].

Scorpions are usually found in outdoor environments between rock gaps, underneath barks, between firewood, and in indoor environments such as the bathroom, lavatory, kitchen, and other moist locations. They hide and remain still during day and go about hunting at night by injecting venom from their stinger – located at the end of their tail – to their prey [2].

Restlessness, convulsion, unsteady gait, disrupted speech [stuttering], drooling, severe skin sensitivity to touch, muscle contractions, abdominal pain, diminished respiratory system functionality, high radial pulse, hypertension, hyperventilation, cold sweats, urinary retention, mydriasis, horripilation, pale/flushed facial skin, salivation, rhinorrhea, epiphora and such gastrointestinal symptoms as nausea, emesis, abdominal pain, and diarrhea are among symptoms of scorpion envenomation [3].

The rate of scorpion envenomation differs across geographical regions depending on people's lifestyle, socio-economic and housing conditions, scorpion species and manner of health service provision [4]. Scorpion envenomation 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 South and Central American countries including Brazil, Mexico, Argentina, Venezuela, and Trinidad and Tobago. However, it is a less significant issue in Zaire, Nigeria, Chad, Tanzania, Kenya, Uganda [Africa], Thailand, Indonesia, India [Asia], and Colombia [South America]. The highest rate of mortality from scorpion envenomation belongs to Mexico, in North America, where 124 scorpion species have been reported, 8 of which are of medical significance [5-6].

Considering its climatic features, Iran is a very rich country in term of arthropods, in particular, scorpions [7], with numerous species of scorpion, especially poisonous ones, reported therein [8]. Mortality from scorpion stings can be seen all across the country; however, almost 75% of all deaths take place in Khuzestan, Sistan - Baluchestan, Kerman, and Hormozgan Provinces [9].

Considering the absence of studies on the epidemiological aspects of scorpion envenomation in Abdanan County, Ilam Province, this study was designed to meet the urgent therapeutic needs of the aforementioned city regarding scorpion

envenomation by collecting data about its status and providing it to the health officials in charge.

MATERIALS AND METHODS:

This was a descriptive-analytical study in which the medical records of all patients suffering from scorpion stings admitted to two therapeutic service centers, i.e. Rasool Akram Hospital and Murmuri Health Center, between 2009 and 2013 were reviewed. The demographic and epidemiological information of the patients were extracted using a checklist. Data were entered into and analyzed by SPSS using descriptive [mean scores and standard deviation] and analytical [chi-square test] statistics.

RESULTS:

The largest of scorpion stings data were happened in 2013 [34.6%], and the least were happened in 2009 [14.5%]. Data collected in this study revealed that 780 cases of scorpion stings were reported and recorded in Abdanan health centers between 2009 and 2013, giving an estimate incidence rate of 2.9/1000 person considering the population of Abdanan [Figure 1].

In terms of gender, women were more frequently stung than men [55% vs. 45%] [Figure 2]. The mean age and standard deviation of the patients were 33.04 +/- 17.7 years. The youngest patient was a one-year-old child and the oldest was an 82-year-old man. The patients fell more frequently [25.2%] into the 21-30 age range [Table 1]. There was a significant difference between scorpion sting cases among age groups [P=0.000].

In terms of occupation, the highest frequency belonged to self-employed occupations with 18.5% and followed by the youth population, i.e. students with 13.5%. The lowest frequency belonged to office workers with 1.8%. Out of the 429 female patients, 335 were housewives . [Table 2].

In terms of geographical distribution and place of residence, most scorpion stings occurred in rural areas with 453 [58.1%] cases, followed by 327 [41.9%] cases in urban areas [Figure 3]; 575 [73.7%] and 205 [26.3%] individuals were stung in indoor and outdoor environments, respectively [table 3].

July and August represented the highest frequency of scorpion stings with 151[19.4%] and 124 cases [15.9%], while no such case was reported during January. The seasonal distribution of scorpion stings revealed that 36.0, 49.8, 10.9, and 2.3% of the incidents occurred during spring, summer, autumn, and winter, respectively [Table 4]. Results from the non-parametric chi-square test suggested a significant difference between months in terms of the incidence of stings, with July marking the highest difference with 151 cases, making it a statistically significant difference with P value <000.1.

In terms of anatomic location, the most frequent stings were from the hands with 390 cases [50.0%], feet with 273 cases [35.0%], head and neck with 33 cases [4.2%], and trunk with 84 cases [10.8%] [Table 5].

The interval hours after scorpion stings and arrival time to Rasool Akram Hospital and Murmuri Health Center was, for the most part [77.1%], less than three hours [Table 6].

Most of the patients [92.1%] had not a history of scorpion sting in the past [Table 7]. Meanwhile, majority of cases [90.5%] had not a history of receiving antivenin [Table 8]. Totally, 133 cases [17% of victims] recovered using convenience

treatments without scorpion antivenin serum. However, the rest treated by scorpion antivenin serum including intra-venin [9%] and intramuscular [74%] injections and convenience treatments [Table 9].

The highest and lowest number of cases of sting occurred between 12:00-18:00 and 18:00-24:00 with 28.0 and 20.5%, respectively [Table 10]. The objectives of the study did not require the phenotypic traits of the scorpions to be investigated. However, in terms of color, yellow and black scorpions accounted for 578 and 103 sting cases, respectively, with 99 cases remaining unidentified [Table 11].

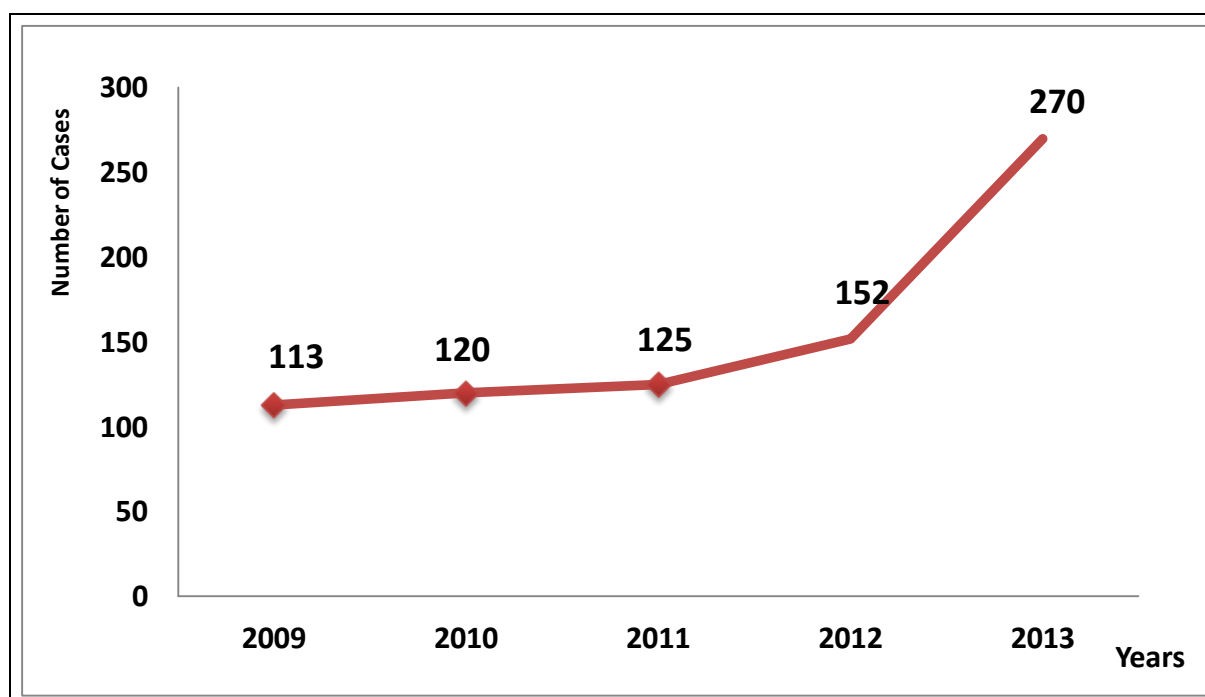


Fig 1: Trend of scorpion sting cases, Abdanan County, western Iran (2009-2013).

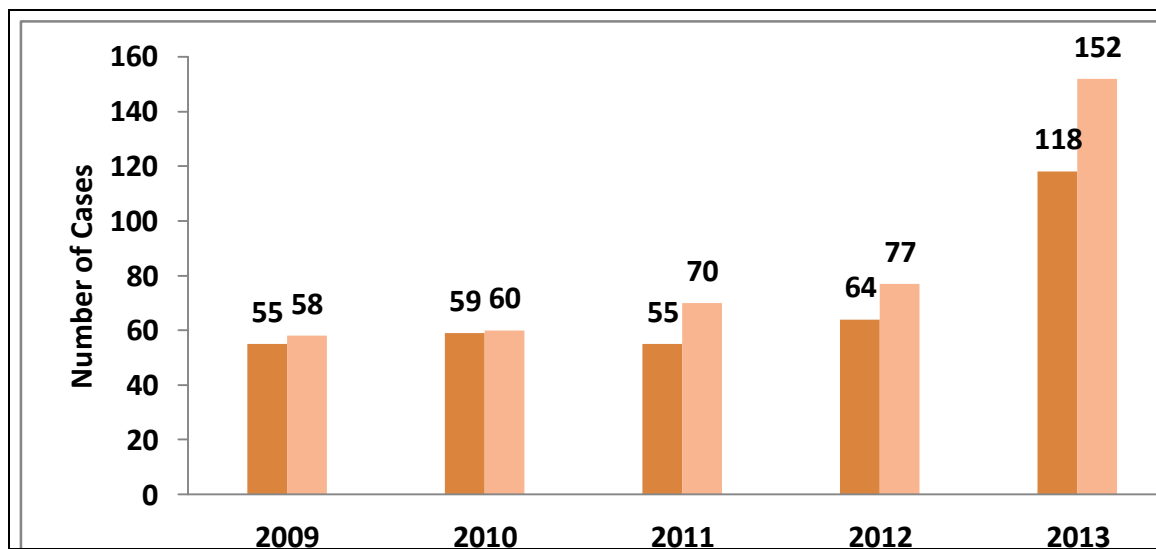


Fig 2: Distribution of the scorpion sting cases according to the sex, Abdanan County, western Iran (2009-2013).

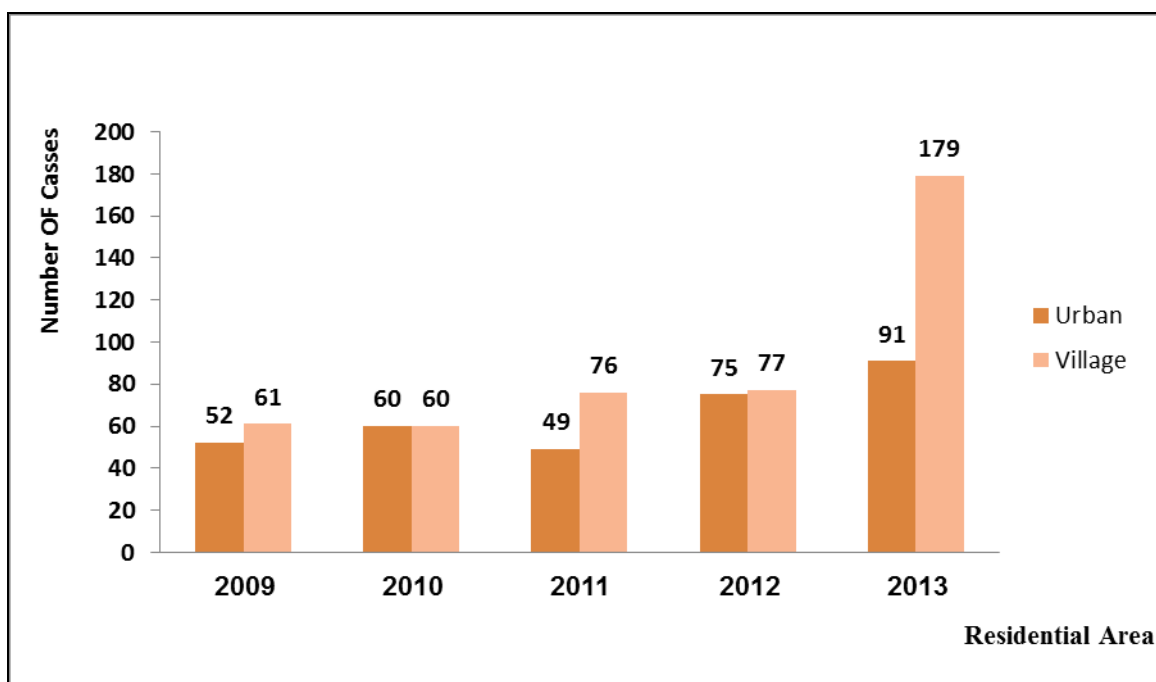


Fig 3: Distribution of the scorpion sting cases according to the geographical location, Abdanan County, western Iran (2009-2013).

Table 1: Distribution of the scorpion sting cases according to the age groups, Abdanan County, Western Iran (2009-2013)

| Years | 2009 | 2010 | 2011 | 2012 | 2013 | Total |
|-----------|-------------|-------------|-------------|-------------|-------------|------------|
| Age group | No. (%) | No. (%) | No. (%) | No. (%) | No. (%) | No. (%) |
| >10 | 10 (8.8) | 5 (4.2) | 8 (6.4) | 15 (9.9) | 32 (11.8) | 70 (9.0) |
| 11-20 | 15 (13.3) | 15 (12.5) | 11 (8.8) | 17 (11.2) | 35 (13.0) | 93 (11.9) |
| 21-30 | 30 (26.6) | 36 (30.0) | 33 (26.4) | 36 (23.7) | 62 (23.0) | 197 (25.2) |
| 31-40 | 26 (23.0) | 23 (19.2) | 21 (16.8) | 33 (21.7) | 53 (19.6) | 156 (20.0) |
| 41-50 | 13 (11.5) | 21 (17.5) | 19 (15.2) | 17 (11.2) | 29 (10.7) | 99 (12.7) |
| 51-60 | 10 (8.8) | 9 (7.5) | 15 (12.0) | 20 (13.1) | 27 (10.0) | 81(10.4) |
| 61-70 | 9 (8.0) | 11 (9.1) | 18 (14.4) | 14 (9.2) | 32 (11.9) | 84 (10.8) |
| Total | 113 (100.0) | 120 (100.0) | 125 (100.0) | 152 (100.0) | 270 (100.0) | 780 (100) |

Table 2: Distribution of the scorpion sting cases according to the job groups, Abdanan County, western Iran (2009-2013).

| Years | 2009 | 2010 | 2011 | 2012 | 2013 | Total |
|-----------------|-------------|-------------|-------------|-------------|------------|------------|
| Job groups | No. (%) | No. (%) | No. (%) | No. (%) | No. (%) | No. (%) |
| Ranch | 6 (5.3) | 3 (2.5) | 5 (4.0) | 7 (4.6) | 12 (4.4) | 33 (4.2) |
| Farmer | 7 (6.2) | 8 (6.7) | 2 (1.6) | 5 (3.3) | 1 (0.4) | 23 (2.9) |
| Employee | 2 (1.8) | 3 (2.5) | 1 (0.8) | 4 (2.6) | 4 (1.5) | 14 (1.8) |
| Self employment | 24 (21.2) | 19 (15.9) | 21 (16.8) | 15 (9.9) | 65 (24.1) | 144 (18.5) |
| Worker | 3 (2.6) | 10 (8.3) | 3 (2.4) | 0 (0.0) | 2 (0.7) | 18 (2.3) |
| Housewife | 42 (37.2) | 49 (40.8) | 56 (44.8) | 71 (46.7) | 117 (43.3) | 335 (43.0) |
| Student | 15 (13.3) | 12 (10.0) | 17 (13.6) | 23 (15.1) | 38 (14.1) | 105 (13.5) |
| Others | 7 (6.2) | 12 (10.0) | 16 (12.8) | 15 (9.9) | 4 (1.5) | 54 (6.9) |
| Baby | 7 (6.2) | 4 (3.3) | 4 (3.2) | 12 (7.9) | 27 (10.0) | 54 (6.9) |
| Total | 113 (100.0) | 120 (100.0) | 125 (100.0) | 152 (100.0) | 270 (4.2) | 780 (100) |

Table 3: Distribution of the scorpion sting cases according to the stung location, Abdanan County, western Iran (2009-2013).

| Location | Outside | Inside | Total |
|----------|------------|------------|-----------|
| Years | No. (%) | No. (%) | No. (%) |
| 2009 | 36 (31.9) | 77(68.1) | 113 (100) |
| 2010 | 27 (22.5) | 93 (77.5) | 120 (100) |
| 2011 | 23 (18.4) | 102 (81.6) | 125 (100) |
| 2012 | 48 (31.6) | 104 (68.4) | 152 (100) |
| 2013 | 71 (26.7) | 199 (77.3) | 270 (100) |
| Total | 205 (26.3) | 575 (73.7) | 780 (100) |

Table 4: Distribution of the scorpion sting cases according to the months, Abdanan County, western Iran (2009-2013).

| Years Months | 2009 No. (%) | 2010 No. (%) | 2011 No. (%) | 2012 No. (%) | 2013 No. (%) | Total No. (%) |
|-----------------|------------------|------------------|------------------|------------------|------------------|------------------|
| April | 6 (5.3) | 5 (4.2) | 10 (8.0) | 42 (27.6) | 2 (0.7) | 65 (8.3) |
| May | 29 (25.7) | 8 (6.7) | 27 (21.6) | 16 (10.5) | 24 (8.9) | 104 (13.3) |
| June | 34 (30.1) | 6 (5.0) | 17 (13.6) | 19 (12.5) | 44 (16.3) | 120 (15.4) |
| July | 10 (8.8) | 28 (23.3) | 29 (23.2) | 25 (16.5) | 59 (21.9) | 151 (19.4) |
| August | 17 (15.0) | 48 (40.0) | 13 (10.4) | 9 (5.9) | 37 (13.7) | 124 (15.9) |
| September | 16 (14.2) | 10 (8.3) | 22 (17.6) | 26 (17.1) | 39 (14.4) | 113 (14.5) |
| October | 0 (0.0) | 3 (2.5) | 6 (4.8) | 0 (0.0) | 44 (16.3) | 53 (6.8) |
| November | 0 (0.0) | 3 (2.5) | 0 (0.0) | 2 (1.3) | 21 (7.8) | 26 (3.3) |
| December | 0 (0.0) | 1 (0.8) | 0 (0.0) | 5 (3.3) | 0 (0.0) | 6 (0.8) |
| January | 0 (0.0) | 0 (0.0) | 0(0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| February | 0 (0.0) | 1(0.8) | 1 (0.8) | 1(0.7) | 0.0 (0.0) | 3 (0.4) |
| March | 1(0.9) | 7 (5.9) | 0 (0.0) | 7 (4.6) | 0 (0.0) | 15 (1.9) |
| Total | 113 (100) | 120 (100) | 125 (100) | 152 (100) | 270 (100) | 780 (100) |

Table 5: Distribution of the scorpion sting cases according to the site of sting on the body , Abdanan County, western Iran (2009-2013).

| Site of sting Years | Hands No. (%) | Feet No. (%) | Trunks No (%) | Head No. (%) | Total No. (%) |
|------------------------|-------------------|-------------------|------------------|-----------------|------------------|
| 2009 | 57 (50.4) | 43 (38.1) | 8 (7.1) | 5 (4.4) | 113 (100) |
| 2010 | 49 (40.8) | 57 (47.5) | 11 (9.2) | 3 (2.5) | 120 (100) |
| 2011 | 67 (53.6) | 41 (32.8) | 10 (8.0) | 7 (5.6) | 125 (100) |
| 2012 | 77 (50.7) | 52 (34.2) | 15 (9.9) | 8 (5.3) | 152 (100) |
| 2013 | 140 (51.9) | 80 (29.6) | 40 (14.8) | 10 (3.7) | 270 (100) |
| Total | 390 (50.0) | 273 (35.0) | 84 (10.8) | 33 (4.2) | 780 (100) |

Table 6: Distribution of the scorpion sting cases according to the interval time between sting and antivenin injection in Abdanan County, Western Iran (2009-2013)

| Interval time between sting and antivenin injection(h) | <3 No. (%) | 3-6 No. (%) | >6 No. (%) | Total No. (%) |
|--|-------------------|-----------------|-------------------|------------------|
| 2009 | 89 (78.7) | 15 (13.3) | 9 (8.0) | 113 (100) |
| 2010 | 91 (75.8) | 19 (15.8) | 10 (8.4) | 120 (100) |
| 2011 | 111 (88.8) | 7 (5.6) | 7 (5.6) | 125 (100) |
| 2012 | 110 (72.4) | 16 (10.5) | 26 (17.1) | 152 (100) |
| 2013 | 231 (85.6) | 24 (8.9) | 15 (5.6) | 270 (100) |
| Total | 632 (77.1) | 81 (9.9) | 107 (13.0) | 780 (100) |

Table 7: Distribution of the scorpion sting cases according to the sting scorpion history in Abdanan County, Western Iran (2009-2013)

| Sting scorpion history Years | Yes No. (%) | No No. (%) | Total No. (%) |
|---------------------------------|-----------------|-------------------|------------------|
| 2009 | 8 (7.1) | 105 (92.9) | 113 (100) |
| 2010 | 10 (8.3) | 110 (91.7) | 120 (100) |
| 2011 | 9 (7.2) | 116 (92.8) | 125 (100) |
| 2012 | 13 (8.6) | 139 (91.4) | 152 (100) |
| 2013 | 22 (8.1) | 248 (91.9) | 270 (100) |
| Total | 62 (7.9) | 718 (92.1) | 780 (100) |

Table 8: Distribution of the scorpion sting cases according to the history of receiving antivenin in Abdanan County, Western Iran (2009-2013)

| History of Receiving Antivenin Years | Yes No. (%) | NO No. (%) | Total No. (%) |
|---|------------------|-------------------|------------------|
| 2009 | 6 (5.3) | 107 (94.7) | 113 (100) |
| 2010 | 7 (5.8) | 113 (94.2) | 120 (100) |
| 2011 | 8 (6.4) | 117 (93.6) | 125 (100) |
| 2012 | 20 (13.2) | 132 (86.8) | 152 (100) |
| 2013 | 33 (12.2) | 237 (87.8) | 270 (100) |
| Total | 74 (9.5) | 706 (90.5) | 780 (100) |

Table 9: Distribution of the scorpion sting cases according to the antiserum injection method in Abdanan County, Western Iran (2009-2013)

| Method of Injection Years | Vein No. (%) | Muscle No. (%) | No Injection No (%) | Total No. (%) |
|------------------------------|------------------|-------------------|------------------------|------------------|
| 2009 | 17 (15.0) | 82 (72.6) | 14 (12.4) | 113 (100) |
| 2010 | 36 (30.0) | 74 (51.7) | 10 (8.3) | 120 (100) |
| 2011 | 2 (1.6) | 93 (74.4) | 30 (24.0) | 125 (100) |
| 2012 | 8 (5.3) | 126 (82.9) | 18 (11.8) | 152 (100) |
| 2013 | 7 (2.6) | 202 (74.8) | 61 (22.6) | 270 (100) |
| Total | 70 (9.0) | 577 (74.0) | 133 (17.0) | 780 (100) |

Table 10: Distribution of the scorpion sting cases according to the sting time in Abdanan County, Western Iran (2009-2013)

| Sting time | 0-6 | 6-12 | 12-18 | 18-24 | Total |
|--------------|-------------------|------------------|-------------------|------------------|------------------|
| Years | No. (%) | No. (%) | | No. (%) | No. (%) |
| 2009 | 37 (32.7) | 30 (26.6) | 21 (18.6) | 25 (22.1) | 113 (100) |
| 2010 | 40 (33.3) | 25 (20.9) | 36 (30.0) | 19 (15.8) | 120 (100) |
| 2011 | 9 (7.2) | 30 (24.0) | 61 (48.8) | 25 (20.0) | 125 (100) |
| 2012 | 24 (15.8) | 58 (38.2) | 43 (28.2) | 27 (17.8) | 152 (100) |
| 2013 | 82 (30.4) | 67 (24.8) | 57 (21.1) | 64 (23.7) | 270 (100) |
| Total | 192 (24.6) | 210(26.9) | 218 (28.0) | 160(20.5) | 780 (100) |

Table 11: Distribution of the scorpion sting cases according to the scorpion color in Abdanan County, Western Iran (2009-2013)

| Scorpion Color | Black | Yellow | Others | Total |
|----------------|-------------------|-------------------|------------------|------------------|
| Years | No. (%) | No. (%) | No (%) | No. (%) |
| 2009 | 16 (14.2) | 79 (69.9) | 18 (15.9) | 113 (100) |
| 2010 | 21 (17.5) | 77 (64.2) | 22 (18.3) | 120 (100) |
| 2011 | 19 (15.2) | 91 (72.8) | 15 (12.0) | 125 (100) |
| 2012 | 18 (11.8) | 118 (77.6) | 16 (10.6) | 152 (100) |
| 2013 | 29 (10.7) | 212 (78.6) | 29 (10.7) | 270 (100) |
| Total | 103 (13.2) | 578 (74.1) | 99 (12.7) | 780 (100) |

DISCUSSION:

Scorpion envenomation is a kind of injury of which the general public is utterly afraid. The sting-induced pain and the fear instilled by anecdotes and hearsays create considerable anxiety in patients. Given its climatic features, Ilam Province has a high incidence of scorpion stings in the country. A total of 780 cases of scorpion stings were reported and recorded in Abdanan health centers between 2009 and 2013, giving an estimate incidence rate of 2.9/1000 person considering the population of Abdanan. The results point to a growing trend in the incidence of scorpion stings, rising from 113 cases in 2009 to 270 in 2013.

In terms of age, the patients fell more frequently [25.2%] into the 21-30 age range. Combining the statistics, 78.8% of patients were in the less-than-50-year age group. In the study by Ozkan & Kat, the highest incidence [36.2%] belonged to the 15-29 age range [10]. In the study by Al-Sadoon and Jarrar, 65.46% of scorpion stung patients were more than 15 years of age, which is somewhat consistent with the findings of this study [11]. The study by Jarrar & Al-Rowaily demonstrated that 36.3% of scorpion stung patients in Saudi Arabia fell in the 20-29 age range, which was similar to the present study [12]. In the study by

Vazirianzadeh et al. in Khuzestan, Iran, 22.3% of scorpion stung patients were in the 20-30 age range [13].

The results of the present study demonstrated that women were more frequently stung than men [55% vs. 45%]. This is not consistent with two separate studies in Saudi Arabia which arrived at 73 and 77% frequency distributions of scorpion stings for men [10-12]. However, these results are consistent with those obtained by Vazirianzadeh et al. [13] and Chitnis et al. [14], which may be accounted for by the active participation of the male population in the national affairs.

In this study, the most frequent scorpion stung patients in terms of occupation were housewives. In the study by Ozkan and Kat in Turkey, the scorpion stung patients were equally distributed in terms of gender [10]. In our research, 42.9% of all patients were housewives, which is consistent with the study of Vazirianzadeh et al. in which housewives accounted for 30% of all the scorpion sting cases [13].

In this study, 65% of patients were stung at the upper part [limbs, trunk, head and neck] and the rest [35%] at the lower part of the body [feet]. In the study by Ozkat & Kat, 58.9% of patients were stung by the *Mesobuthus eupeus* species at the

lower parts of the body which is almost inconsistent with the present study [10]. In the studies by Al-Rowaily and Sadoon, 48.5 and 51.5% of scorpion stings were associated with upper and lower parts of the body, respectively [11, 12].

The highest incidence of stings [19.4%] occurred in July, which is probably due to the increased scorpion activity during hot months of the year. Other studies point to a similar conclusion [15-17]. The least frequency of stings was reported during winter. In other studies, the highest frequencies of stings are as follows: from May to August in Tunisia [18], from May to September in Mexico [19], during summer in Turkey [16], in May-June in Saudi Arabia [11], and in July-August in Brazil [20].

Considering the late arrival of the patients to the emergency room, about 77.1% of all patients were treated with anti-scorpion venom serums in the first three hours after sting. A similar delay has been reported between sting time and the administration of anti-scorpion venom serums in other studies [21-22]. In a study conducted in 1991 in Mexico, this delay was less than 30 minutes in 48% of cases [19], which could be accounted for by a lack of awareness of the significance of receiving treatment at the earliest possible opportunity or an inability to refer to health centers due to financial difficulties or geographical obstacles. It is probable that training programs prove to be effective in raising the awareness of people about the significance of receiving treatment following scorpion stings in diminishing this delay and its outcomes.

CONCLUSION:

Rational methods of combating scorpion envenomation are dependent upon environmental protection, promoting personal care, environmental matters, and enhancing housing quality in developing residential complexes. Since the highest incidence of scorpion stings is associated with housewives, they should be at the receiving end of the highest share of training programs by health centers in the prevention of scorpion stings. This matter gains more significance considering the fact that mothers can contribute significantly to the prevention of scorpion stings among students.

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