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ORIGINAL ARTICLE

Complications of Scorpion Stings in Patients Admitted in Afzalipour Hospital in Kerman

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Abstract

Background: Scorpion sting is one of the medical health problems in tropical and subtropical regions of Iran. This study deals with the frequency of complications of scorpion sting, in patients referred to Afzalipour Hospital in Kerman.
Methods: This retrospective descriptive-analytical study was performed using the census sampling method of patients, who referred to Afzalipour Hospital in Kerman following scorpion sting. The statistical population included all patients from 2016 to 2018. After collecting and extracting the data, the results were analyzed by SPSS software.
Results: A total of 111 stings were reported, 61 females (55%) and 49 males (45%). Local signs included pain (55), swelling (15.3), erythema (21.6), skin ecchymosis (18.9), tenderness (10.8), and bleeding (1.8%). Systemic symptoms included nausea and vomiting (9), pain (1.8), numbness and paresthesia (3.6), weakness (9) and (86.5) without systemic symptoms. The average number of hospitalization days was 1.77.
Conclusion: Clinical manifestations of patients show that species belonging to two families, Buthidae and Hemiscorpidae, are the cause of stings in this province. Stings has been more common in women and in the age group of 21 to 40 years old and more in July. Due to different species with neurotoxic and hemotoxic poison, the development of treatment protocols by trained physicians, who are familiar with clinical manifestations of these arthropods, are essential.

Keywords: Scorpion sting, pain, burning, swelling, clinical complications

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INTRODUCTION

More than 2230 species of scorpions have been described in the world, which are scattered on all continents; therefore, they are more abundant in tropical and subtropical regions [1-4]. In 1968, a list of 79 species was published that were medically important scorpions with serious stings and, in some cases, they would led to death [5]. Other researchers reported about 25 to 30 species of scorpions medically important [6,7]. Each year, 1.23 million people are affected by scorpion sting worldwide, of which 32,250 lead to death [8]. Various organs of the body are severely damaged by the venom caused by the toxin of these arthropods with various manifestations. Socio-economic condition, providing health services, and the typology of species in each geographical area are effective in the occurrence, treatment, and prevention of scorpion sting [2]. Iran is very rich in scorpions due to its climate. According to the latest articles, at least 68 species of scorpions have been described in Iran, which are scattered in all regions of Iran, but in the southern half of the country, more species diversity has been reported [9]. Scorpion stings are reported annually from different parts of Iran. And according to reports, every year about 40 to 50 thousand cases of scorpion sting are observed, which unfortunately, in many cases, mortality has been reported [10,11].

Species of *Androctonus crassicauda, Mesobuthus eupeus, Hemiscorpius lepturus, Compsobuthus matthiesseni* are the main agents, while *Orthochirus scrobiculosus, Buthotus (Hotentotta) saulcyi, Odontobuthus doriae, Buthotus (Hotentotta) schach, Olivierus caucasicus, Buthotus(Hotentotta) jayakari, Apistobuthus pterygocercus* are consider as less importance. Most deaths due to scorpion sting in Iran have occurred mainly due to *Hemiscorpius lepturus*, and the black scorpion *Androctonus crassicauda*, so it can be said that these two species are the most fatal scorpions in Iran [12-15]. These species are more active in hot provinces in the southwest and east, including Kerman province of Iran, and are responsible for the sting and, unfortunately, death of many people every year [16].

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The sting of *Hemiscorpius lepturus and Androctonus crassicauda,* in addition to mortality in different parts of Iran, in Kerman province are also very important and cause fatal and serious complications, especially in children [17-19]. Therefore, Kerman province can be considered as one of the most dangerous areas in this regard. These animals occupy a wide range of habitats inside and outside homes and on the outskirts of villages or cities. For this reason, their presence in various habitats, including residential homes, workplaces, and living provides the possibility of their collision and human injure would increase [16]. Scorpion sting is a health-threatening problem in tropical and subtropical countries. Scorpion venom is a complex structure that consists of proteins, salts, and organic compounds, which in addition to local side effects such as redness, pain, burning, and swelling has neurological, cardiovascular, hematological, and renal side effects [6,8,10]. Due to the fact that scorpions are dangerous animals in Iran and their toxin cause serious complications, especially in children and the fact that Kerman province is one of the relatively high risk areas for the bites of these animals, it is necessary to know the complications of the sting of these arthropods. This effort is made to treat such complications as soon as possible and reduce the venomous damages in poisoned patients by specialized physicians. Therefore, the main purpose of this study was to evaluate the complications of scorpion sting in patients, who referred to Afzalipour Hospital in Kerman from 2016 to 2018.

METHODS

This retrospective study was performed based on the data available in scorpion stings patients, who referred to Afzalipour Hospital in Kerman, from 2016 to 2018. The statistical population of the study includes all patients, who presented with a history of sting. Sampling was performed by counting the files of all patients with a sting report. History or clinical signs such as edema, pain, burning, redness, blistering, necrosis, gangrene at the site of the sting, and laboratory findings including thrombocytopenia, coagulation disorder, and other evidence in favor of scorpion sting were included in the study. The patients would be excluded if there were no scorpion sting or a history and clinical signs of other stings or bites such as bee, spider, and millipede. The checklist was standardized and approved by the Ministry of Health and Medical Education. The parameters included age, sex, occupation, season of poisoning, local symptoms including pain, edema, redness, blisters, necrosis, gangrene, systemic symptoms, laboratory findings, severity of sting, and complications of scorpion patients' files. Then the data obtained from the study were categorized and the codes of research ethics were observed for all the patients.

Data were extracted, categorized, and statistically analyzed using SPSS software. Quantitative data description was used using mean and standard deviation and qualitative data were used using data frequency tables.

RESULTS

The results of this study showed that during the years 2016 to 2018, the number of patients with complaints and symptoms of scorpion sting was 111 .Of these, 61 were female (55%) and 49 were male (45%). The highest frequency of stings in the age range was 21-40 years (38.7%). The rest are in the age group of less than 6 years (24.4%), 6 to 20 years old (23.4 %) and over 40 years old 13.5 percent. The mean and standard deviation were 21.89 and 8.36, respectively.

The highest frequency of sting was 60% in summer, followed by 27% in spring, 12% in autumn, and 1% in winter. The highest number of stings was from Kerman 56.8%, followed by Kahnooj 12.6, Baft 8.1, Golbaft 5.4, Bam 3.6, Jiroft 3.6, Zarand 2.7, Nikshahr 1.8, Zahedan 0.9, and unknown places 4.5%, respectively.

The study showed 42.3% of patients were admitted before 6 hours, (8.1%) 6 to 24 hours, and (9.9%) after 24 hours. In 39.6%, the time of referral after the sting was not recorded. Pre-hospital care included 11.7% sucking the site of sting, 1.8% close the tourniquet, 7.2% bandage. 79.3% of cases had no action. Local symptom were including pain 54.9%, swelling 15.3%, erythema 21.6%, skin ecchymosis 18.9%, tenderness 10.8%, and bleeding 1.8% (Figure 1). Figure 2 shows limited local skin necrosis in a female fallowing scorpion string. Systemic symptoms of the patients included weakness and lethargy (9), nausea and vomiting (9), pain (1.8), numbness and drowsiness (3.6) and (86.5) without systemic symptoms. Table 2 shows the frequency of local and systemic symptoms after scorpion sting. Table 1 shows the mean of vital signs and standard deviation on admission (Table 1). 55.9% of the patients were stable in vital sign and the remain of 44.1% were unstable after sting.

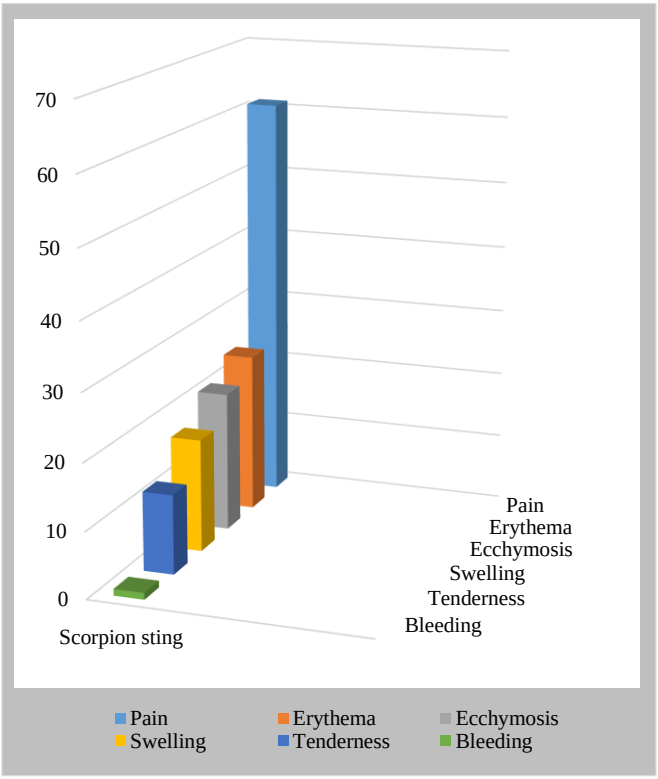

Figure 1. Frequency of local effects and complications in scorpion sting patients referred to the hospital

The results of the tests performed and the standard deviation between entry and discharge in scorpion patients are shown in Table 4 (Table 2).

The average number of days hospitalized in scorpion patients was 1.77 days. Out of 111 scorpion patients, rhabdomyolysis, hemolysis, and seizures were occurred in 3, 1, and 2 patients, respectively. The frequency of need for anti-scorpion was 47.7% and in 52.3% of cases, no anti-scorpion was required. The mortality rate among scorpion-infected patients was 3.6%. All the people, who died were under 6 years old.

Table 1. Mean and standard deviation of vital signs after scorpion sting

Vital Signs	Average	Standard deviation
SBP (mmHg)	105 mmHg	23/23
DBP (mmHg)	70 mmHg	15/49
PR	96/10	4/07
RR	25/24	8/58
T ©	37/07	0/90
Spo2 %	91/50	2/89

Table 2. Mean and standard deviation of test results at the time of arrival and discharge in scorpion sting patients

Laboratory data		Average	Standard deviation
admission	BUN mg/dl	29/42	2/76
	Cr mg/dl	0/94	1/05
	Na meq/l	139	4/53
	K meq/l	4/08	0/37
	AST IU/l	50	5/28
	ALT IU/l	32/20	6/54
	ALP IU/l	361	31/01
	PTT Sec	33/74	6/29
	PT Sec	13/03	1/18
	INR	1/04	0/13
	WBC 10*3/ul	10/70	6/02
	Hb g/dl	12/81	2/24
	Plt 10*3/ul	307/61	34/70
	PH	7/35	0/05
	PCO2 mmHg	35/15	4/62
	HCO3 mEq/l	21/95	2/48
	CPK ng/ml	170/30	44/38
	LDH ng/ml	485/85	64/96
discharge	BUN mg/dl	18/33	12/70
	Cr mg/dl	0/56	0/23
	Na meq/l	79	29/64
	K meq/l	70	30/05
	PTT Sec	53	20/62
	PT Sec	14/80	3/42
	INR	1/48	0/66
	WBC 10*3/ul	11/90	7/25
	Hb g/dl	11/57	1/14
	Plt 10*3/ul	267/25	99/80

Figure 2. Local necrosis in a scorpion sting patient (Photo by Dr. Zohreh Oghabian)

DISCUSSION

The results of this study showed that scorpion sting in patients, who referred to the hospital had caused a variety of clinical and local manifestations. Local effects and complications in scorpion patients included pain, swelling, erythema, skin ecchymosis, tenderness, and bleeding. Systemic symptoms in patients included weakness, lethargy, nausea, vomiting, pain, numbness and drowsiness, and in some cases without systemic symptoms. Since, in this study, none of the patients had a scorpion with them and none of the scorpions in Kerman province was introduced as the cause of the sting in this study, the patients' case concluded that the species of both Buthidae and Hemiscorpidae families are responsible for the sting in Kerman province. In these two families, dangerous and deadly species such as *Hemiscorpius lepturus* and *Androctonus crassicauda* have been reported from this region [16]. The sting of the Buthidae species are painful. After the sting of these scorpions, the main symptoms that appear are swelling and numbness at the site of the sting and then pain, which is felt more at night.

The species of this family are considered in many parts of the world due to their medical importance. The most dangerous and deadly species of the Buthidae family is *Androctonus crassicauda* [20,21]. Therefore, it can be stated

that the 3.6% mortality due to crooked tail sting in Kerman province is related to two species of *Hemiscorpius lepturus and Androctonus crassicauda* that belong to the families of Hemiscorpidae and butyde, respectively. The sting of these two species causes severe complications and death, especially in children [22-25]. *Hemiscorpius lepturus* venom has hemotoxic and cytotoxic properties. Numerous complications such as severe and fatal hemolysis, deep necrotic wounds, coagulation problems, and mortality are among the problems that can be seen following Gadim sting. This scorpion is one of the most important and dangerous scorpions in Iran from a medical point of view, which annually endangers the lives of a number of children and adults in the western and southwestern regions of the country [26-28] . The black scorpion, *Androctonus crassicauda*, is one of the most dangerous scorpions in the world and in Iran, which is widespread in Iran and has a higher abundance in tropical and arid regions. This scorpion has a neurotoxic venom and can affect most of the vital organs of the body and have fatal consequences [29-33]. The results showed that 55% of women and 45% of men suffered from this scorpion sting. The highest sting was in the age group of 21 to 40 years and the lowest sting was in the age group over 40. It can be said that due to the lower presence of women in the workplace and activities, they are probably more likely to be stung by scorpions indoors. Therefore, it can be concluded that different species of scorpions live in Kerman province, which live in earthen habitats in the wild or around houses or in people's habitats [34-37].

LIMITATIONS

The main limitation of this study was that the patient files are incomplete.

CONCLUSION

Local and systemic symptoms of patients indicate species of both families; Buthidae and Hemiscorpidae, are responsible for the scorpion sting in Kerman province. Scorpion sting is more common in women and in the age group of socially active people and more in summer. Given the lower presence of women in the workplace, they are more likely to be stung by scorpions indoors. It can be said that the species that are able to live inside residential houses are more likely to cause sting. Regarding the cases of death among children under 6 years old, educational programs should be prepared and presented with emphasis on educating families in high-risk areas. In addition, physicians in the poisoning and pediatric wards should be prepared to treat local and systemic complications of these injured.

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REFERENCES

1. Prendini L, Order Scorpiones CL Koch, 1850. InAnimal Biodiversity: An Outline of Higher-Level Classification and Survey of Taxonomic Richness; Zhang, Z.Q., Ed.; Zootaxa: Auckland, New Zealand, 2011; 3148: 115–177.
2. Santibáñez-López CE, Francke OF, Ureta C, Possani LD. Scorpions from Mexico: From species diversity to venom complexity. Toxins. 2016 Dec 24;8(1):2.
3. Rein-Ove J. Scorpion Files. Tronheim. Norwegian University of Science and Technology, 2014. Available online: http://www.ntnu.no/ub/scorpion-files (accessed on 21 March 2017)
4. Dupre G. Repartition Continentale Des Scorpions. Arachnides, Bulletin De Terrariophilie Et De Recherches De L'A.P.C.I. (Association Pour la Connaissance des Invertébrés), 2012. pp 8-32.
5. Keegan, HL. Scorpion of Medical importance .University Press of Mississipi;vol 1980. 1:1-140.
6. Bawaskar HS and Bawaskar PH. Scorpion Sting: Update. 2012;60:46-55.
7. Angsanakul J, Sitprija V. Scorpion venoms, kidney and potassium,Toxicon 73 .2013; 81–87.
8. Chippaux JP and Goyffon M. Epidemiology of scorpionism: a global appraisal. Acta Trop 2008;107:71-9.
9. Barahoei H, Navidpour Sh, Aliabadian M, Siahsarvie R & Mirshamsi, O.(2020)Scorpions of Iran (Arachnida: Scorpiones): Annotated checklist, DELTA database and identification key.JournalofInsectBiodiversityandSystematics,2020;.6(4),375–474.
10. Dehghani R, Kamiabi F, Mohammadi M. Scorpionism by Hemiscorpius spp. in Iran: a review. J Venom Anim Toxins Incl Trop Dis .2018;24, 8. https://doi.org/10.1186/s40409-018-0145-z.
11. Shahi M, Sanaei-Zadeh H. Clinical Manifestations of Compsobuthus Persicus Scorpion Envenomation in Southern Iran. Iranian Journal of Toxicology. 2020; 14(3):171-178.
12. Kassiri H, Kasiri A, Kasiri E, Safarpor S, Lotfi M. A hospital-based study on scorpionism in Khorram-Shahr County Southwestern Iran. Asian J Epidemiol. 2014; 7(2):28-35.
13. Nazari M, Hajizadeh MA. Faunistic study on scorpions and the epidemiology of scorpionism in bam, southeast of Iran. Glob J Health Sci. 2017; 9(2):177–83.
14. Kassiri H, Kassiri A, Sharififard M, Shojaee S, Lotfi M, Kasiri E. Scorpion envenomation study in Behbahan County, Southwestern Iran. J Coast Life Med. 2014; 2(5):416-20.
15. Nejati J, Mozafari E, Saghafipour A, Kiyani M. Scorpion fauna and epidemiological aspects of scorpionism in Southeastern Iran. Asian Pac J Trop Biomed. 2014; 4(Suppl 1):S217-S21.
16. Dehghani R, Moabed S, Kamyabi F, Haghdoost AA, Mashayekhi M, Soltani H. Scorpions Fauna of Kerman Province-IRAN. Journal of Kerman University of Medical Sciences. 2008; 2 (15): 172-81.
17. Kassiri H, Mohammadzadeh Mahijan N, Hasanvand Z, Shemshad M, Shemshad K. Epidemiological survey on scorpion sting envenomation in South-West, Iran. Zahedan J Res Med Sci (ZJRMS) 2012; 14(8): 80 -83.
18. Pipelzade MH, Jalali A, Taraz M, Pourabbas R, Zaremirakabadi A. 2007 .An Epidemiological and a clinical study on scorpionism by the Iranian scorpion Hemiscorpius lepturus. Toxicon 50 (9), 84 – 92.
19. Mahdi Sagheb MM, Sharifian M, Moini M, Sharifian AH. Scorpion bite prevalence and complications: report from a referral centre in southern Iran, Trop Doct April 2012; 42: 90-91.

20. Abd El FE, El Shehaby DM, Elghazally SA, Hetta HF. Toxicological and epidemiological studies of scorpion sting cases and morphological characterization of scorpions (Leiurusquin questriatus and Androctonus crassicauda) in Luxor, Egypt. Toxicology reports. 2019 Jan 1;6:329-35.
21. Dehghani R, Fathi B. Scorpion sting in Iran: a review. Toxicon. 2012 Oct 1;60(5):919-33.
22. Hedayat B, Rahmani AH, Matinrad M, Nazari P. An Epidemiologic and Clinical Study on Hemiscorpius lepturus (gadim) Envenomation with Focus on Clinical Manifestations, Prognosis Factors, and Outcomes. Asia Pacific Journal of Medical Toxicology. 2018 Dec 1;7(4)
23. Mohseni A, Vazirianzadeh B, Hossienzadeh M, Salehcheh M, Moradi A, Moravvej SA. The roles of some scorpions, Hemiscorpius lepturus and An-droctonus crassicauda, in a scorpionism focus in Ramhormorz, southwestern Iran. Journal of Insect Science. 2013 Jan 1;13(1):89.
24. Seyedian R, Jalali A, Babaee MH, Pipelzadeh MH, Rezaee S. A biodistribution study of Hemiscorpius lepturus scorpion venom and available polyclonal antivenom in rats. Journal of Venomous Animals and Toxins including Tropical Diseases. 2012;18:375-83.
25. Mohseni A, Vazirianzadeh B, Hossienzadeh M, Salehcheh M, Moradi A, Moravvej SA, Goodacre S. The roles of some scorpions, Hemiscorpius lepturus and An-droctonus crassicauda, in a scorpionism focus in Ramhormorz, southwestern Iran. Journal of insect science. 2013 Jan 1;13(1).
26. Jalali A, Pipelzadeh MH, Sayedian R, Rowan EG. A review of epidemiological, clinical and in vitro physiological studies of envenomation by the scorpion Hemiscorpius lepturus (Hemiscorpiidae) in Iran. Toxicon. 2010;55(2-3):173-9.
27. Heidarpour M, Ennaifer E, Ahari H, Srairi-Abid N, Borchani L, Khalili G, et al. Histopathological changes induced by Hemiscorpius lepturus scorpion venom in mice. Toxicon. 2012 Mar 1;59(3):373-8.
28. Rahmani AH, Jalali A. Symptom patterns in adult patients stung by scorpions with emphasis on coagulopathy and hemoglubinuria. Journal of Venomous Animals and Toxins including Tropical Diseases. 2012;18(4):427-31.
29. Boghozian A, Nazem H, Fazilati M, Hejazi SH, Sheikh Sajjadieh M. Toxicity and protein composition of venoms of Hottentotta saulcyi, Hottentotta schach and Androctonus crassicauda, three scorpion species collected in Iran. Veterinary Medicine and Science. 2021 Nov;7(6):2418-26.
30. Bavani MM, Rafinejad J, Hanafi-Bojd AA, Oshaghi MA, Navidpour S, Dabiri F, et al. Spatial distribution of medically important scorpions in north west of Iran. Journal of arthropod-borne diseases. 2017 Sep;11(3):371.
31. Mozaffari E, Sedaghat MM, Dehkordi AS, Akbarzadeh K. Bidiversity and species composition of scorpions (Arachnida, Scorpiones) in Ilam County, Iran. Journal of Applied Sciences Research. 2013;9(9):5412-8.
32. Firooziyan S, Sadaghianifar A, Rafinejad J, Vatandoost H, Bavani MM. Epidemiological Characteristics of Scorpionism in West Azerbaijan Province, Northwest of Iran. Journal of Arthropod-Borne Diseases. 2020 Jun;14(2):193.
33. Mohseni A, Vazirianzadeh B, Hossienzadeh M, Salehcheh M, Moradi A, Moravvej SA. The roles of some scorpions, Hemiscorpius lepturus and An-droctonus crassicauda, in a scorpionism focus in Ramhormorz, southwestern Iran. Journal of Insect Science. 2013 Jan 1;13(1):89.
34. Shahi M, Habibi-Masour R, Salehi M, Ghasemi-Nang M, Rafizad E, Abbasi M, Hanafi-Bojd AA. Scorpions and scorpionism in Roudan County, southern Iran. Journal of arthropod-borne diseases. 2019 Dec;13(4):353.
35. Dehghani R, Taji K, Mahmoudi A, Varzandeh M.Compsobuthus matthiesseni sting from Bazoft: A case report. Journalof Emergency Practice and Trauma 2022; 8(1): 83-85. doi: 10.34172/jept.2021.37
36. Shahi M, Moosavy SH, Hanafi-Bojd AA, Akbari M, Rafinejad J. Species composition and distribution of dangerous scorpions of Hemiscorpius genus and clinical symptoms due to envenomation in high-risk regions of southern Iran. Biodiversitas Journal of Biological Diversity. 2021 Jul 3;22(7).
37. Jenkins TP, Ahmadi S, Bittenbinder MA, Stewart TK, Akgun DE, Hale M, et al. Terrestrial venomous animals, the envenomings they cause, and treatment perspectives in the Middle East and North Africa. PLoS neglected tropical diseases. 2021 Dec 2;15(12):e0009880.