

Epidemiological aspects of scorpion stings in Al-Jouf Province, Saudi Arabia

Bashir M. Jarrar, Meshref A. Al-Rowaily

From Clinical Laboratory Sciences, Al-Jouf University, Al-Jouf, Saudi Arabia

Correspondence and reprints: Dr. Bashir Mahmoud Jarrar · Al-Jouf University-Clinical Laboratory Sciences · PO Box 2014, Al-Jouf Sakaka 2014, Saudi Arabia · T: +966-503-229854 F: +966-4-925-7328 · bjarrar@ksu.edu.sa · Accepted for publication February 2008

Ann Saudi Med 2008; 28(3): 183-187

BACKGROUND: Information on scorpion stings is available for many parts of Saudi Arabia, but not for Al-Jouf Province.

METHODS: We reviewed and analyzed 1449 cases of scorpion stings that presented to the emergency department of the hospitals and medical centers in Al-Jouf Province during a 2-year period (2005-2006).

RESULTS: The majority of patients (92.7%) manifested class I envenomation with local pain at the sting site as the primary complaint. Systemic toxicity was noticed in 7.3% of cases but no deaths were reported. Scorpion stings were recorded throughout the year with the highest seasonal incidence in the summer (64.3%) and the lowest during the winter (10.6%). The highest monthly incidence was in June (21.5%) and the lowest in December (1.5%). Most of the patients were male (77.3%) and the age of 44.2% of victims ranged between 15 to 30 years. Diurnal stings exceeded the nocturnal ones with a ratio of 3:2, and most of the stings were located mainly on the exposed limbs (88.6%), especially the lower limbs (51.7%). *Leiurus quinquestriatus* and *Androctonus crassicauda* were incriminated in most recorded cases.

CONCLUSIONS: Our findings indicate that scorpion stings are common in Al-Jouf Province, especially during the summer. The overall threat to human health was found to be low.

Scorpion sting syndrome is a medical problem that represents a real threat in many parts of the world including Saudi Arabia.¹⁻⁵ Annually, thousands are stung by scorpions in Saudi Arabia with an average of 14 500 stings per year.³ While considerable information is available about scorpion sting syndrome in most districts of Saudi Arabia, little is known about scorpionism in Al-Jouf province.⁴ The present study aims to assess the risk of scorpion stings together with the efficacy of scorpion antivenom therapy, and to clarify the epidemiological features of scorpion stings in this province.

METHODS

This study was based on 1449 cases of scorpion stings submitted to the emergency department at the hospitals and medical centers of cities and towns of Al-Jouf province, Saudi Arabia (Skaka, Domat Al-Jandal, Tabarjal and Qorayat) (latitude, 29°47' N, longitude 40°06' W) over a period of 2 years (January 2005-December 2006). The victims belonged to ten nationalities (Saudi and non-Saudi). The data were extracted from the victim records and analyzed by age, sex, time of sting and

submission (month and time of day), sting location on body, scorpion species, presenting complaint, systemic symptoms, received treatment, period of observation and outcome of each sting. The clinical severity of each case was assessed according to Abroug's classification,⁶ where the envenomation cases were sorted into class I: local symptoms at the site of sting; class II (symptomatic): thrill, sedation, nausea, vomiting, diarrhea and hypertension; class III (systemic): cardiovascular, respiratory, and/or neurological disorders.

RESULTS

The total number of scorpion stings reviewed in Al-Jouf province over the period (2005-2006) was 1449 (Table 1). The total number of sting cases by city was 381 in Skaka, 149 in Domat Al-Jandal, 575 in Tabarjal, and 344 in Qorayat. The notification records indicated that the elapsed time between the sting and patient admission ranged between 30 to 90 minutes. Treatment protocols included sensitivity tests and injection of 5 mL of polyvalent antiscorpion venom vaccine. Most of the stung patients received the antiscorpion venom vaccine within 45 to 120 minutes after the sting. In addition,

Table 1. Characteristics and disposition of patients stung by scorpions in Al-Jouf province (January 2005-December 2006).

	Percent	
Patient age (years)	1-5	4.2
	6-15	17.6
	16-20	7.9
	20-29	36.3
	30-39	11.6
	40-49	10.9
	50-59	5.9
	<60	0.88
Sex	Male	77.3
	Female	22.7
Nationality	Saudi	79.6
	Non-Saudi	21.4
Stung patients	Refused treatment	5.3
	Received treatment	94.7
	Treated and discharged home	43.7
	Observed after treatment	31.6
	Hospitalized	19.4
	Abandoned hospitalization	1.9
Envenomation severity	Class I envenomation	92.3
	Class II envenomation	7.3
	Class III envenomation	0.4
Outcome	Recovery	100
	Lethality	0.0
Time of sting	Diurnal	53
	Nocturnal	41
Sting site	Lower limbs	51.7
	Upper limbs	36.9
	Other body parts	9.1
	Neck and head	2.3

some of the admitted patients received local anesthetics and analgesics. The period of observation ranged from 25 minutes to 6 hours with an average of 90 minutes. No patient was exposed to multiple stings.

The analysis showed that 64.3% of the stings were recorded in the summer months (June-September), while the 5-month period from October through February accounted for 10.6% of emergency visits. In

the spring months (March and April) there was a relatively moderate rate of scorpion envenomation (14.1%). The highest rate of scorpion stings was in June (21.5%) followed by July (15.1%), while the lowest one was in December (1.5%). The peak incidence occurred from May to October (Figure 1).

The gender distribution was 77.3% male and 22.7% female. The male incidence exceeded the female one during all months of the 2-year study period, for a male-female sting ratio of 3.4:1. Non-Saudi female victims represented 6.7% of the total stung females and all were housemaids. The non-Saudi male victims constituted 20.4% of stung males; most were farm workers.

The highest incidence of stings (45.1%) was recorded for the 15-30 year age group. Sting incidence for patients younger than 6 years old was 4.2%, while those 6-15 years old had an incidence of 17.6%, and 66% of the victims were younger than 30 years of age. Only 6.8% of the sting cases were seen in patients older than 50 years of age, with a considerable number of stings (22.5%) recorded in the age category of 30-50 years old.

Nocturnal and diurnal stings accounted for 41% and 53% of stings, respectively, while the incidence of undecided time cases was 6%. The majority of stings occurred in the early morning and in the first half of the night. The incidence of sting sites was as follows: lower limbs (51.7%), upper limbs mainly in the right hand (36.9%), neck and head (2.3%) while the rest of stings were on other parts of the body.

The data showed that 94.7% of the stung persons received treatment, 5.3% refused treatment, 43.7% were treated and discharged home, 31.6% were observed after treatment, 19.4% were hospitalized and 1.9% abandoned hospitalization against medical advice and were lost to follow-up. No deaths were recorded.

According to Abroug's classification (1994), the clinical severity was mainly class I where local pain was the primary presenting complaint (92.3%). Swelling, redness and tenderness were also noted at the sting site. Systemic toxicity (class II envenomation) was seen in 7.3% of the admitted patients. Signs of systemic envenomation included mainly hypertension, restlessness and to a lesser extent anxiety, vomiting and tachycardia. Systemic envenomation was encountered mainly in patients having a history of hypertension or diabetes. Six patients (0.4%) manifested evidence of severe envenomation.

In the medical reports, the scorpions were described as black and yellow. Fifty-six percent identified the color as yellow, and 34.5% as black. The incidence of undecided scorpion color was 9.1% of the stings. The scorpions brought to the medical centers by the patients or their

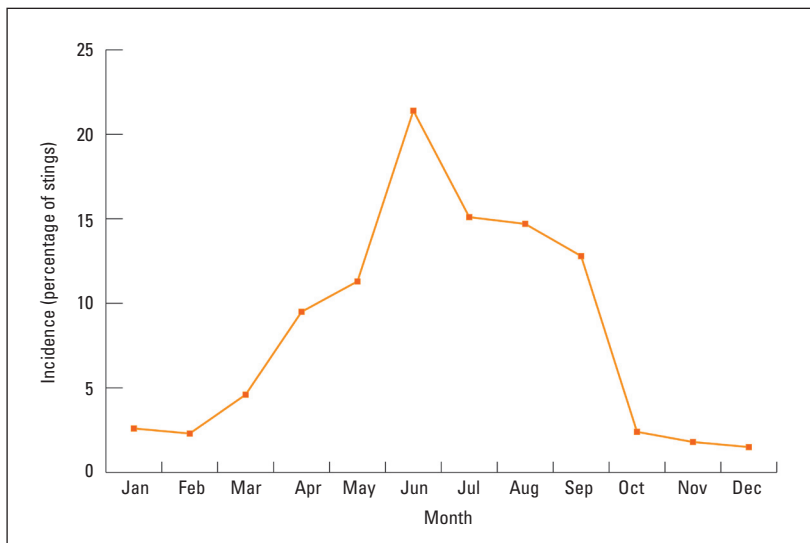


Figure 1. Distribution of scorpion stings in Al-Jouf province throughout the year (average of data for 2 years).

relatives were classified as *Leiurus quinquestriatus* and *Androctonus crassicauda*. A lack of experience in scorpion taxonomy was noticed among health professionals at the emergency department of the hospitals and medical centers in the province under study.

DISCUSSION

Al-Jouf Province is located in the north of Saudi Arabia, bordering Jordan, with an average elevation of 689 meters above sea level and a tropical desert climate, with an average humidity of 36.5%. This province includes four small cities (Skaka, Domat Al-Jandl, Tabarjal and Qorayat) together with many small villages. It has an area of 139 000 km² and a population of 362 000 in 2006, according to Saudi National Department of Statistics, corresponding to 13 inhabitants/5 km².

Scorpions are widely distributed in Saudi Arabia and the Arabian Peninsula in general. Fourteen species have been identified in Saudi Arabia, with six of these recorded in Al-Jouf province.^{2,4,7-8} The results of the present study indicate that 1449 scorpion stings were recorded in Al-Jouf province during two years (2005-2006) with an average of 4 cases/1000 inhabitants annually. No deaths were recorded in spite of the high incidence of stings. This finding is in agreement with the results of some investigations in other regions of Saudi Arabia,^{5,9-10} but not with others that reported deaths following scorpion stings in some areas of the Kingdom.^{3,11-15} Some studies reported that the mortality rate due to scorpion stings in Saudi Arabia was 3% between 1985 and 1993,^{10,16} but was less than 0.05% in 1997.³ Similar

studies in Jordan and Morocco have shown a high rate of scorpion sting envenomation with several deaths.¹⁷⁻¹⁹ In some countries, such as Brazil, Mexico and Venezuela, scorpion envenomation is considered a real public health issue.²⁰⁻²¹ In the city of Durango in Mexico, 1608 deaths were recorded in a 30-year period, with an average of 800 to 1000 deaths per year in all Mexico²¹⁻²² while in the past 20 years, there have been no reported fatalities in the US due to scorpion stings.

The present study shows that scorpion stings are frequent during the summer months (May through September), with a maximum frequency in June, which suggests that support for emergency departments should be increased during summer months. This result is in agreement with that of previous studies concerning the seasonal variations of scorpion stings in Riyadh city² and in Saudi Arabia in general.³ The seasonal scorpion sting cycle in Al-Jouf district may reflect the annual climate variations in this area, activities of inhabitants, and the ontological behavior of scorpions. The peak incidence of stings in the summer months and the lowest incidence in winter could be attributed to the fact that scorpions become less active in the winter season. The periods with the highest incidence of scorpion stings in other countries were April to July in Mexico and July to September in Tunisia and Morocco, with a maximum frequency during July and August in Tunisia and Morocco, respectively. In Brazil, stings occur regularly throughout the year, with a slight increase in August.^{19,23-25} These variations may reflect differences in environmental conditions, especially a rainy or dry

summer.

Stings among males outnumbered females in our study, which is in agreement with the results of previous studies focusing on the epidemiology of scorpion stings in Saudi Arabia^{2,3,9} and also in other countries such as Brazil.²⁵ However, the present results contradict the findings in other countries such as Tunisia and Morocco where males and females are almost equally affected.^{19,24} The male predominance in Saudi Arabia may be related to the lifestyle where women spend most of their times indoors with their families.

Presently, the high rate of scorpion stings among victims younger than 30 years old may be explained by the fact that most stings occur during work. It is obvious that this age category is associated with most outdoors activities. The current results point to a high rate of stings in the lower limbs, with the upper limbs next. This finding is similar to that reported in Brazil where stings are mainly encountered in the hands.²⁵ These observations may be explained on the basis that the exposed limbs are usually used in most manual activities. Stings in other parts of the body such as the neck and head take place while lying down for rest or sleep. These findings suggest that using proper shoes and gloves during farm work would help prevent stings.

Of 14 species belonging to *Buthidae* and *Scorpionidae* that have been identified in Saudi Arabia,^{8,26} only six species have been identified in Al-Jouf province.⁴ The present study incriminates *Leiurus quinquestriatus* and *Androctonus crassicauda* in Al-Jouf scorpionism. These two species are also the most common species accounting for human stings throughout Saudi Arabia, the Arabian Peninsula and the Middle East.^{2-4,14,27-29} The

predominance of stings by *L. quinquestriatus* is in agreement with the finding of Dittrich et al,¹⁰ but contrary to the results by Al-Sadoon,⁴ who concluded that stings by *A. crassicauda* occurred more often than those of *L. quinquestriatus*. Other deadly species have been reported in Saudi Arabia such as *Nebo hierochonticus*.¹⁵ Globally, there are dangerous species such as *Tityus stigmurus*, *T. serrulatus* and *T. braziliae* in Brazil,^{20,25,30} *Centruroides suffusus* in Mexico,¹⁶ *Hemiscorpion lepturus* in Iran,³¹ *Centruroides sculpturotus* in the United States, *Mesobuthus tamulus* in India³² and *Androctonus mauretanicus* in North African countries.^{18-19,33}

Local pain was the primary presenting complaint in our study. This finding is in agreement with the results of other reports from Saudi Arabia.^{2-4,10} The incidence of systemic envenomation in Al-Jouf province is less than that reported by similar investigations in other districts of Saudi Arabia,^{2-5,10} a point that remains to be investigated.

In conclusion, the high rate of scorpion stings in Al-Jouf province does not imply a real medical threat. This may be due to the excellent medical facilities and antivenom employment in recent years in different regions of Saudi Arabia including Al-Jouf province. Also, the present findings indicate the success of the Saudi national strategy against scorpion stings as a consequence of the establishment of national records and hospitalization files on scorpionism by the Ministry of Health.

Acknowledgements

We are grateful to the emergency departments at the hospitals and medical centers in Al-Jouf province, Saudi Arabia for giving us access to their medical records.

REFERENCES

1. Brennan R, Kumar E, Jaggaro N. Scorpion stings in the Al-Baha Region. *Saudi Med J* 1989;10(1):25-27
2. Al-Sadoon MK, Jarrar BA. Study of the frequency and incidence of scorpion stings and snakebites in Riyadh city. *J King Saudi Univ Science* 1994;6(2):217-266.
3. Al-Sadoon MK, Jarrar BA. Epidemiological study of scorpion stings in Saudi Arabia between 1993 and 1997. *J Venomous Animals and Toxins* 2003;9(1):1-8
4. Al-Sadoon MK. Scorpions and snake species of Al-Jouf Province. Al-Rahmaniya Establishment, Skaka, Saudi Arabia, (Book) 2004
5. Al-Asmari, AK, Al-Saif AA. Scorpion sting syndrome in a general hospital in Saudi Arabia. *Saudi Med J* 2004;25(1):64-70
6. Abroug F, Nouira S, Saguiga H. Envenimations scorpioniques: avancees chimiques, physiopathologiques et therapeutiques [Monograph], 1994;1-68.
7. Vachon M. Arachnids of Saudi Arabia Scorpions. In: Fauna of Saudi Arabia. eds. Wittmer W, Buttiker W; Basle, Ciba Gegy, (Book) 1979; :30-65.
8. Al-Sadoon MK, Al-Faraj S. Scorpions of Saudi Arabia. Al-Mehmas press, Riyadh, (Book) 2001.
9. Neale JR. Scorpion Sting syndrome in Eastern Riyadh. *Ann Saudi Med* 1990;10(4):383.
10. Dittrich K, Power AP, Smith NA. Scorpion sting syndrome- a ten year experience. *Ann Saudi Med* 1995;15(2):148-155.
11. Santhanakrishnan BR, Balagopal-Raju V. Management of scorpion sting in children. *J. Trop. Med. Hyg* 1974;77:133-135
12. Fatani AJ. Some pharmacological studies of the cardiovascular and related effects of scorpion envenomation: the setting up as an experimental treatment protocol. M.Sc. thesis, King Saud University, 1987.
13. El-Amin EO, Din-Khan MD. Haematological and biochemical findings in scorpion stung children *Ann Saudi Med* 1991;11:625-627.
14. Gajre G, Dammas A. Scorpion envenomation in children: Should all stings be given antivenom? *Ann Saudi Med* 1999;19:444-446
15. Annobil SH. Scorpion stings in children in the Asir Province of Saudi Arabia. *J Wilderness Medicine* 1993; 4(3):241-251
16. Reeves JJ. Scorpion envenomation. *Clin Tox Rev* 1998;20(6):1-6.
17. Amr Z, Al-Oran R, Amr S. Scorpion and scorpion stings in Jordan. *Bull Soc Pathol Exot Filiales* 1988;81(3):369-79
18. Touloun O, Slimani T, Boumezzouh A. Epidemiological survey of scorpion envenomation in Southwestern Morocco. *J Venom Anim Toxin* 2001;7(2):199-218
19. Soulaymani R, Idrissi M, Tamim O, Semlali I, Mokhtari A, Tayebi M, Soulaymani A. Scorpion stings in one province of Morocco: epidemiological, clinical and prognosis aspects. *J Venom Anim Toxins incl Trop Dis* 2007;13(2):36-40
20. Lourenco WR, Cuellar O. Scorpions, scorpionism, life history strategies and parthenogenesis. *J venom Anim Toxin* 1995;1(2):50-64.
21. De Sousa L, Parrilla-Alvarez P, Quiroga M. An epidemiological review of scorpion stings in Venezuela: the Northeastern region. *J Venom Anim Toxins* 2000;6(2):199-218
22. Velasco-Castrejon O, Lara-Aguilera R, Al-acuterrre H. Aspectos epidemiologicos elfiacuteticos del la picadura de alacran en una area hiperendemic. *Rev. Inv Salud Pfuacuteblica (Mexico)* 1976;36: 93-103.
23. Mazzotti L, Bravo-Becherelle MA. Scorpionism in the Mexico Republic. In: *Venomous and poisonous animals and noxious plants of the Pacific Region*. Pergamon Press, Oxford, (Book) 1963.
24. Goyfflon M, Vachon M, Broglio N. Epidemiological and clinical characteristics of the scorpion envenomation in Tunisia. *Toxicon* 1982; 20(1):337-344.
25. Lira-da-Silva RM, Moutinho S, Carvalho FM, Amorim AM, Brazil TK. Scorpions of medical importance in Bahia, Brazil. *J Venom Anim Toxins* 2001;7(2):155-164.
26. El-Hennawy HK. A catalogue of the scorpions described from the Arab countries (1758-1990). *Serket* 1990;2(4):95-153.
27. Polis GA. *The Biology of Scorpions*. Stanford University Press, California, (Book) 1990.
28. Amr Z, Al-Oran R, Amr S. Scorpion stings in Jordan. *Annals of Tropical Medicine and Parasitology* 1994;88(1):99-101
29. Mahaba MH, El-Sayed S. Scorpion sting, is it a health problem in Saudi Arabia? Evaluation and management of 820 cases. *Saudi Med J* 1996;17(3):315-321.
30. Eickstedt VD, Ribeiro LA, Candido DM, Albuquerque MJ, Jorge MT. Evolution of scorpionism by *Tityus bahiensis* (Perty) and *Tityus serrulatus* (Lutz and Mello) and geographical distribution of two species in the state of Sao Paulo-Brazil. *J Venom Anim Toxins* 1996;2(2):92-105
31. Radmanesh M. Clinical study of *Hemiscorpion lepturus* in Iran. *J Trop Med Hyg* 1990; 93:327-332
32. Warrell D. *Animal poisons. Manson's tropical diseases*. 19th edition 1987;889-890.
33. Balozet L. Scorpionism in the old world. PP 344-371. In: *Venomous animals and their venous Venomous Invertebrates*, New York, Academic express, (Book) 1971.