

Clinical aspects and frequency of scorpion stings in the Riyadh Region of Saudi Arabia

Abdulrahman K. Al Asmari, MSc, PhD, Adnan G. Al Zabrani, MD, FRCS C, Said Al Jowhary, MD, Mohammed Arshaduddin, MSc, PhD.

ABSTRACT

الأهداف: دراسة الجوانب السريرية وتكرار لدغات العقارب بمنطقة الرياض، المملكة العربية السعودية.

الطريقة: تمت دراسة الجوانب السريرية وتكرار حدوث لدغات العقارب بمستشفيات من المستشفيات المرجعية بمنطقة الرياض وذلك خلال الفترة من مايو 2006م إلى إبريل 2008م. واشتملت البيانات التي تم جمعها على الوضع الديموغرافي، وتاريخ ووقت اللدغة، وموضعها، ولون العقرب، والمظاهر السريرية، والعلاج المستخدم.

النتائج: تم تسجيل مجموع 391 حالة من حالات لدغات العقارب من خلال التقارير الإحصائية المقدمة من قبل اثنين من المستشفيات المرجعية بمنطقة الرياض، وبلغ عدد حالات المصابين 248 حالة (63.4%) بالنسبة للذكور، و143 حالة بالنسبة للإناث (36.6%). وكانت أسوأ الحالات تأثر بلدغات العقارب هي حالات الأشخاص الذين تتراوح أعمارهم ما بين 21-30 عاماً، يليها الأشخاص الذين تتراوح أعمارهم ما بين 31-40 عاماً، ثم الأشخاص الذين تتراوح أعمارهم ما بين 11-20 عاماً، وأخيراً الأشخاص من الفئة العمرية 10 سنوات أو أقل. حدثت لدغات العقارب بأعداد كبيرة خلال أشهر الصيف وفي أجزاء الجسم الطرفية ومعظم اللدغات أثناء الليل. كما وصل غالبية المرضى للمستشفى بعد ساعة واحدة من تعرضهم للدغات العقارب، وكان عدد الإصابات من العقارب الصفراء أكثر من الإصابات بلدغات العقارب السوداء. وقد ظهرت الأعراض الجهازية لدى 25% من المصابين، بينما ظهرت الأعراض الموضعية فحسب لدى 75% من المصابين، ومع ذلك فقد تم إعطاء الغالبية المصل المضاد.

خاتمة: أثبتت هذه الدراسة بأن هناك نسبة انتشار مرتفعة من لدغات العقارب مع علامات وأعراض طفيفة بدون حدوث وفيات وذلك بسبب فصائل العقارب ضعيفة السمية السائدة بمنطقة الرياض. إن نظام علاج المرضى المصابين بلدغات العقارب وعلاجهم بالمصل المضاد بغض النظر عن حدة الأعراض يتطلب إجراء مراجعة تفصيلية.

Objectives: To study the clinical aspects and frequency of scorpion stings in Riyadh region of Saudi Arabia.

Methods: Clinical aspects and frequency of scorpion sting cases reporting to 2 referral hospitals in the Riyadh region of Saudi Arabia were analyzed during May 2006 to April 2008. Data on demographic status, date and time of sting, sting site, scorpion color, clinical manifestations, and treatment were collected.

Results: A total of 391 cases of scorpion stings were recorded from the 2-referral hospitals, 248 (63.4%) of were men and 143 (36.6%) were women. The 21-30 years age group was the worst affected, followed by 31-40 years, 11-20 years, and <10 years age groups. Larger number of stings occurred during the summer months, at nights, and on distal limbs. Most of the patients reached the hospital within one hour of the sting. The yellow scorpions were responsible for a larger number of stings than the black scorpions. Seventy-five percent of the patients showed local signs and symptoms and 25% demonstrated systemic manifestations of poisoning. Most of the patients were treated with antivenom.

Conclusion: The high prevalence of scorpion stings largely with mild signs/symptoms and without any mortality suggests the predominance of weak venomous scorpion species in the Riyadh region. Therefore, the protocol of managing scorpion-sting patients with anti-venom irrespective of the intensity of manifestations warrants a detailed review.

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From the Research Center (Al Asmari, Arshaduddin), Department of Accidents & Emergency (Al Zabrani), Riyadh Military Hospital, and the Department of Pathology (Al Jowhary), Al-Iman Hospital, Riyadh, Kingdom of Saudi Arabia.

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Address correspondence and reprint request to: Dr. Abdulrahman K. Al Asmari, Research Center, Riyadh Military Hospital, Riyadh, Kingdom of Saudi Arabia. Tel. +966 506417236. Fax. +966 (1) 4786601. E-mail: abdulrahman.alasmari@gmail.com

Scorpion envenoming is an important public health problem in Saudi Arabia,¹⁻³ and other tropical and subtropical regions of the world.⁴⁻¹⁰ Species of scorpions capable of inflicting fatal stings are distributed in North and South Africa, Middle East, India, Americas, Trinidad, and Tobago.^{5,11} Although scorpionism, shows a scattered distribution geographically it concerns an at-risk population of almost 2.5 billion people with an annual number of scorpion stings exceeding 1.2 million and resulting in more than 3250 deaths.⁵ The epidemiology of scorpionism in the world is poorly known and the incidence is underestimated. There are considerable geographical variations at the level of both the incidence, severity, and treatment of scorpion poisoning.⁵

Scorpions are widely distributed in Saudi Arabia and more than 25 scorpion species have been identified including some of the most toxic species.¹¹ Scorpion stings are common in this country due to its climate, socioeconomic structure, and social habits. It is estimated that an average of 14,500 stings per year are recorded in the different regions of Saudi Arabia. A recent survey has revealed a wide diversity of scorpion populations in the Riyadh region, with 3 families and a minimum of 10 species and subspecies.¹¹ The most vulnerable people to scorpion stings include the shepherds who tend the livestock in the desert, farmers, and the people who spend their weekends in the desert for recreation. In most cases, the stings cause pain and local manifestations but sometimes they also result in serious complications.¹²

Scorpion venoms contain a group of toxins, (species-specific complex mixtures of short proteins), which have been shown to interact with ionic channels of the excitable membranes. The active components of the venoms of dangerous scorpions are neurotoxic peptides containing about 65 amino acids along with some peptides, enzymes, amines, and proteases that have selective activity upon mammals or invertebrates.^{13,14} Moreover, the quantity and toxicity of venom varies widely among species.¹⁵ Studies on scorpion sting cases have described various clinical signs and symptoms, ranging from local pain, burning and edema to serious autonomic and central nervous system symptoms, and also death especially in children.^{4,9,10,16-18} On the

other hand, there is no uniformity in the management of scorpion stings and it remains a subject of controversy.^{5,19-21} Different approaches including the use of symptomatic and adjuvant treatment and anti venom have been reported for the treatment of scorpion stings.^{3,8,17,19} Although scorpionism has been reported from different areas of Saudi Arabia,^{1-3,5,12} little is known about it from the Riyadh region. Therefore, the aim of the present investigation is to study the clinical aspects and frequency of scorpionism in the Riyadh region.

Methods. Scorpion sting cases reporting to 2 referral Ministry of Health (MOH) hospitals, Al-Iman General Hospital (IGH), and Prince Salman Hospital (PSH) in the Riyadh region during May 2006 to April 2008 were recorded using defined data sheets. These data sheets were distributed to the physicians of the Accident and Emergency (A/E) Departments in the above mentioned referral hospitals to record information on the patient demographics (name, age and gender), clinical manifestations (local and systemic signs and symptoms), and the treatment employed. Other data collected included the month, date, and time of sting, location of sting on the body, time elapsed between the sting and reporting for treatment, and information about the color of scorpions.

Inclusion and exclusion criteria. Data was collected only from patients with scorpion stings as confirmed by the victims or/and relatives of the patients. Cases with other poisonous bites such as spiders, wasps, bees and so forth were not included in the study.

On arrival at the A/E department, the patients were thoroughly assessed by the attending physicians. Patients were classified into 2 major groups based on observed symptoms. The local signs and symptoms group had symptoms including localized pain, redness, swelling, numbness, tingling sensation, and so forth or a combination of any of these, while the systemic signs and symptoms in addition to pain included tachycardia, hypertension, emesis, shivering, muscular extension, dysphoria, headache, dizziness, and abdominal pain.

The study was approved by the Research and Ethics Committee of Riyadh Military Hospital, Riyadh, Kingdom of Saudi Arabia.

Statistical analysis. Descriptive statistics (frequencies of different variables), was performed on the collected data using the Statistical Package for Social Studies (SPSS version 14).

Results. Frequency of stings in patient's gender, age range, time and month of sting, and color of the scorpion are shown in Table 1. A total of 391 patients with

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scorpion stings were reported to the 2 hospitals during 2006 to 2008. Two hundred and forty-eight (63.43%) were men and 143 (36.57%) were women with a male to female ratio of 1.73:1. The largest frequency of stings was recorded in 21-30 years age group, followed by 31-40 years, 11-20 years, and <10 years age groups. Scorpion stings were recorded in smaller numbers in 41-50 years, 51-60 years, 61-70 years and >70 years age groups with approximately 13% of the total stings being recorded in these age groups (Table 1). The frequency of scorpion stings was more during the night (74%) than during the day time (26%). Most of scorpion stings occurred between 18:00-24:00 hours and the least during 24:00-06:00 hours (Table 1).

A larger frequency of scorpion stings was recorded during the summer months (May-September) with 63.1%, followed by the spring months (March and

April) with 21%, and the winter months (October to February) (15.9%). The highest frequency of scorpion stings was recorded in August (17.7%), and the lowest in January (1.0%) (Table 1). Since the scorpions are identified mainly on the basis of color by the common man, a larger number of stings were attributed to the yellow scorpions than the black scorpions, and in some cases, the patients were unaware of the color of the scorpions (Table 1).

Anatomical distribution of the sting sites and clinical findings are shown in Table 2. The frequency of stings was recorded more on the lower limbs, than on the upper limbs, and other parts of the body (Table 2). Most of the patients showed local signs and symptoms. The predominant being pain and burning sensation, observed in 234 patients, redness was recorded in 178, and swelling in 100 patients. Other signs which were noted included pain with proximal radiation, tingling, tenderness, redness and swelling, and numbness (Table 2).

The systemic manifestations of poisoning were observed in a smaller number of patients and included

Table 1 - Characteristics of scorpion stung patients, and monthly distribution of scorpion-stings in Riyadh Region of Saudi Arabia.

Characteristics	Frequency (%)	
<i>Gender</i>		
Male	248	(63.4)
Female	143	(36.6)
Total	391	(100)
<i>Age range (years)</i>		
<10	60	(15.4)
11-20	86	(22)
21-30	105	(26.9)
31-40	91	(23.3)
41-50	30	(7.7)
51-60	8	(2.0)
61-70	7	(1.8)
>70	4	(1.0)
Total	391	(100)
<i>Sting time (hour)</i>		
06:00 - 12:00	47	(12.0)
12:00 - 18:00	55	(14.1)
18:00 - 24:00	251	(64.2)
24:00 - 06:00	38	(9.7)
Total	391	(100)
<i>Monthly frequency of scorpion stings</i>		
January	4	(1.0)
February	7	(1.8)
March	37	(9.5)
April	45	(11.5)
May	50	(12.8)
June	25	(6.4)
July	50	(12.8)
August	69	(17.7)
September	53	(13.6)
October	22	(5.6)
November	17	(4.4)
December	12	(3.1)
Total	391	(100)
<i>Color of the Scorpion</i>		
Yellow	162	(41.4)
Black	157	(40.2)
Unknown	72	(18.4)
Total	391	(100)

Table 2 - Anatomical sites and clinical signs and symptoms of scorpion-stung patients.

Clinical findings	Frequency (%)	
<i>Anatomical sites</i>		
Upper extremities	150	(38.4)
Lower extremities	201	(51.4)
Other parts of the body	40	(10.2)
Total	391	(100)
<i>Local signs and symptoms</i>		
Pain and burning	234	(59.9)
Redness	178	(45.5)
Swelling	100	(25.4)
Pain and proximal radiation	52	(13.3)
Tingling	42	(10.7)
Tenderness	39	(9.8)
Redness and swelling	28	(7.2)
Numbness	26	(6.7)
<i>Systemic signs & symptoms</i>		
Discomfort	21	(5.4)
Dysphoria	17	(4.4)
Headache	14	(3.6)
Tachycardia	13	(3.3)
Dizziness	8	(2.1)
Hypertension	6	(1.5)
Shivering	5	(1.3)
Emesis	5	(1.3)
Agitation	4	(1.0)
Muscular extension	3	(0.4)
Abdominal pain	1	(0.3)
Coma and cerebral edema	1	(0.3)
Total	98	(25.1)

Table 3 - Time elapsed until reporting to the hospital and the use and quantity of antivenom.

Time interval and antivenom administration	Frequency (%)
<i>Interval to hospital arrival</i>	
Within 0.5	130 (33.3)
Within 1	93 (23.8)
Within 2	70 (17.9)
Within 4	34 (8.69)
Within 8	34 (8.7)
>8	30 (7.7)
<i>Antivenom administration & volume</i>	
Not given	109 (27.9)
<5 ampoules	87 (22.3)
5 ampoules	195 (49.8)

discomfort which was recorded in 21 patients, dysphoria in 17, headache in 14, tachycardia in 13, and dizziness in 8 patients (Table 2). Other systemic manifestations included hypertension, emesis and shivering, agitation, muscular extension, and abdominal pain (Table 2).

Data sheets indicated that the elapsed time between the scorpion sting and arrival to the hospital ranged between less than 30 minutes to more than 8 hours. However, a large number of patients reached the hospital within 30 minutes (n=130) and within one hour (n=93), respectively. Seventy patients arrived at the hospital between 1-2 hours and 34 between 4-8 hours after the scorpion sting. Although, patients reported to the hospital even 8 hours after the scorpion stings their number was comparatively less (Table 3).

Out of the total 391 patients with scorpion stings, 282 (72.1%) were given antivenom and 109 (27.9%) were managed with symptomatic (supportive) treatment. Most of the patients were administered 5 ampoules of antivenom. However, no differences were observed in the outcome of those who were not given antivenom. No deaths were recorded in any of the sting patients (Table 3).

Discussion. This study reviews the frequency and clinical aspects of scorpionism in the Riyadh region. The Riyadh region encompasses the city of Riyadh which is the capital of Saudi Arabia and also the capital of the Riyadh province and is located on a plateau in the Arabian Peninsula. A recent survey has revealed a wide diversity of scorpion population with 3 families namely Buthidae, Hemiscorpidae, and Scorpionidae, and a minimum of 10 species and subspecies being distributed in this region.¹¹

A total of 391 scorpion stings were recorded during the 2 year (2006-2008) study period. The frequency observed in our study is more than an earlier report

from this region.¹ This may be due to referral bias since the earlier study reviewed cases that were reported to a specialized hospital that provides services to the Armed forces and their families, whereas in this study data was collected from hospitals which provide medical services to the general population. Comparatively, higher frequencies of scorpion poisonings have been reported from other regions of Saudi Arabia,^{3,13} which may be due to the regional differences in the degree of scorpion infestation and also due to differences in the degree of urbanization of these regions, since incidence of scorpionism is comparatively higher in rural areas.²⁰ Our study showed a higher frequency of stings in males (63.43%) than females which is in agreement with reports of scorpion stings from different regions of Saudi Arabia,^{2,3,12} and may be attributed to the culture, social structure, and preference of indoor activities by the female population in Saudi Arabia. Moreover, males often outnumber females as this gender is more prone to scorpion stings worldwide;^{5,22,23} however, some reports show a larger number of females being stung by scorpions than males,^{8,24,25} suggesting that male-female distribution shows differences according to region, culture, and social habits. The most vulnerable groups, based on age, were those of the young adults, adolescents and children and this is understandable, as they comprise the most active groups. Our findings of the largest number of victims in the 21-30 years age group is similar to studies from Turkey,⁸ Saudi Arabia,³ and Morocco.²³ This may probably be assigned to the increased outdoor activities of the population in this age group. With respect to children, their vulnerability could be attributed to their inquisitive nature with ignorance and lack of experience in dealing with strange creatures. Several workers^{4,5,10,20,25-27} showed that the risk of mortality and morbidity is much higher in children while occurrence of scorpion stings independent of age or gender has also been reported.²⁸ Our results showed a gradual decrease in sting cases, inversely proportional with age. This could be attributed to the limited movements, wisdom, and awareness of the older age adults. We observed that the maximum number of scorpion stings (64.2%) occurred during evening until midnight and this is in line with earlier reports,^{12,23,25} and contrary to the findings of Jarrar and Al Rowaily,³ who reported a larger number of stings during the day time. The increased incidence during the night indicates the natural tendency of the scorpions to be active during the night in search of food and mate. Scorpions become active at night and sting for their own protection against human intrusion into their niche. During day time, scorpions live mostly

under ruins and stones because they have no tolerance to high temperatures in hot seasons. On the other hand, activity such as agriculture and other labor which results in the incursion of their habitat also results in stings during day time. Most of scorpion sting cases were recorded in the summer months, rising from March, up to a maximum in August and then decreasing towards the winter season, which is in agreement with earlier literature from Saudi Arabia,^{2,3,12} and other countries such as Iran,^{7,29} Turkey,^{8,20} Tunisia,⁴ Morocco,^{23,30} and Mexico,²² and many other countries of the world.⁵ In warm climates, scorpions become more active, other reasons are the scorpions breed during this season and also flowering during these months provides ample amounts of insects and scorpions get easy food. The hyperactivity of scorpions in warm climates and reduced activity during the winter is in parallel with the findings of the maximum and minimum frequency of scorpion stings during the hot and cold months respectively and emphasizes the necessity for collaboration of the health authorities to reinforce their efforts for the prevention and/or management of scorpion stings during the summer season as suggested earlier.^{23,26}

Our study showed that the frequency of stings was highest at the lower extremities, then the upper extremities and the least affected was the torso. Other studies have also shown a similar pattern of stings.^{3,4,12} Walking barefooted or wearing sandals at night or putting on shoes without having shaken them is dangerous, especially on hot summer nights. The hands are at risk when carelessly investigating scorpion shelters, such as holes, burrows, under stones, and so forth during agricultural work,^{8,23} for setting up of tents and during recreation, while stings at other parts of the body such as neck, back, and head usually occur during sleep or while resting or because of putting on clothes without checking and also not controlling bed mattresses. The arrival of sting victims in the hospital within one hour or less will end up with favorable outcome,^{23,31} and each hour's delay before receiving first medical care was associated with a 9% increase in the odds ratio for the likelihood of death in children and adolescents.²⁷ Our data showed that most of the patients could arrive at the medical care facility within reasonable time with approximately 75% reporting to a hospital within 3 hours of the sting, though some patients arrived even 8 hours after being stung by a scorpion. Earlier studies from Saudi Arabia,³ Morocco,^{23,30} Turkey,⁸ Israel,¹⁶ have also shown that most of the patients arrived at the hospital within 3 hours after the sting, suggesting a better awareness of scorpion stings not only in Saudi Arabia but also in other countries of the region.

The lack of any mortality in our study is in agreement with earlier studies,^{1,3,8,16} and contrary to reports of deaths due to scorpion stings by other investigators.^{4,6,7,9,10} The results of the present study and other recent reports,^{2,3} showing complete recovery from scorpion stings without any mortality may be attributed to the excellent health care system in Saudi Arabia and also as a result of the establishment of national records and hospitalization files on scorpionism by the Ministry of Health. On the other hand, it also provides support to the notion that in healthy adults scorpion venom rarely causes severe poisoning.¹⁶ We observed that most of the patients presented with local signs and symptoms and systemic signs and symptoms were recorded in only approximately 25% of the patients, mostly of a mild nature, which is in agreement with recent reports from Saudi Arabia and the neighboring countries.^{2,3,13,16} Pain has been suggested to be the most predominant features of stings by almost all species of scorpions, including those, which were generally considered harmless.^{17,32} Scorpion stings initially cause severe excruciating pain at the site of sting, which radiates along with corresponding dermatomes,³² and is gradually reduced in the following 24 hours. Severe local pain without systemic involvement is diagnostic of less/non-poisonous sting.³³ On the contrary, if the victim gets pain, which subsides or is rapidly reduced, but other systemic symptoms develop, then they might be suggestive of envenoming by highly poisonous or lethal scorpions.³³ Some authors have reported that clinical outcome following scorpion stings depend on the sting site, patient's age, and scorpion species.^{23,34} The clinical picture presented in our study differs from that reported from some other countries such as Tunisia wherein most of the patients are presented with severe complications including cardiogenic shock and/or pulmonary edema or severe neurological manifestations.⁴ Significant morbidity has also been reported from Mali,⁹ Iran,³⁵ and Brazil.²⁷ Though most patients were presenting with only local effects, still they were injected with the antivenom, although the role of antivenom in the management of scorpion stings remains controversial.^{5,6,22,32} Furthermore, it has also been suggested that in patients without systemic manifestations, the levels of catecholamines are low, and in these patients, scorpion anti-venom should not be used.²¹ Investigators strongly contest the role of antivenom, claiming its futility due to the pharmacokinetics (speed of distribution and irreversible effect of scorpion toxins) of venoms and they emphasize ancillary treatment with vasodilators.^{1,5,32,33} On the other hand, a recent prospective open labeled trial²¹

demonstrated that a combination of antivenom (AV), therapy with prazosin results in faster recovery than AV and prazosin alone. These results strongly suggest that the treatment of scorpion should not be limited to AV therapy or symptomatic treatments. Moreover, the antivenom being used in Saudi Arabia is raised against only 2 species of scorpions whereas more than 23 species and sub species have been reported from Saudi Arabia.¹² It had been noted that envenoming severity depended broadly on the offending species, especially as some species are very dangerous, sometimes deadly; the victim's age and the time of the day or season.⁵ Fast intervention is indispensable and is a prime factor for success, as any delay in hospitalization is crucial. It is advisable to identify the scorpion species and to hospitalize all victims especially children. Sanitation, education, and good environmental hygiene practices can considerably reduce the number of envenoming.^{24,32} However, if the first effect of the scorpion control campaign is improvement of case recording, the main consequence is to improve the treatment which reduces significantly the mortality and morbidity.⁵

Study limitations. Despite the fact that we could get substantial information on scorpion stings from the data forms distributed to the accidents and emergency departments of the 2 major hospitals in the Riyadh region, the information presented is only representative and does not correspond to the complete information on scorpion stings from the Riyadh region since it was difficult to retrieve information from other hospitals in the region due to incomplete filling of the data sheets and lack of cooperation from some of the hospitals. Additionally, detailed and specific information on the scorpion species involved could not be obtained.

In conclusion, the results of the present study suggest a predominance of weak venomous scorpion species in the Riyadh region and the practice of using antivenom for the management of scorpion stings irrespective of the severity of manifestations (local and systemic) need to be thoroughly reviewed.

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