

Original Research Articles
***The Scorpion Sting: Epidemiology, Clinical
Symptoms, Treatment, Surveillance and Reporting
Obstacles in the Salfit District (West Bank) (2014-
2015)***

ABSTRACT

Aim: This study was conducted in order to highlight the epidemical status of scorpion stings for the period 2014- 2015 in the Salfit District, and the Obstacles facing the Ministry of Health in surveillance and reporting of scorpion sting, also to provide information to decision-makers to take the appropriate decisions in order to strengthen and activate the epidemiological surveillance system which is the most important to control the disease especially in tropical disease

Study Design and methods : A retrospective and cross sectional study were done to discuss the epidemiological scorpion sting of Sixty stung patient reports (32 males and 28 females) during the years 2014-2015, data were available in governmental health sectors (Salfit Primary Health Care Center (SPHCC) and Salfit Hospital), also to estimate the Number of scorpion sting cases treated in private sectors, and to highlighted the main causes which prevent this sectors from reported the cases to SPHCC. specific questionnaire was prepared and randomly distributed to 40 private clinical doctors in the Salfit district during the years 2014-2015(20 questionnaire per year). And all data was analyzed using SPSS software Version 17.

Results: The results were that scorpion sting affected both sexes with more prevalence among males (53.3%) and in all age groups, The scorpion sting site were more prevalent in limbs (63.4%), The most prevalent of the patients was from Salfit City (25%). The results show that the most scorpion stings occurred in the summer and autumn seasons (50%, 40%) respectively and most of them occurred by a scorpion of an unknown color (61.7%), Most of clinical manifestations were localized symptoms with (Class I) (63.3%). The unity- histamine (Promethazine) and corticosteroid (Dexamethasone) were drug treatments that were the most used for all cases. The results also show that the number of cases treated in public health sectors were 60 cases during the years 2014-2015, average (30 cases yearly), and the estimated number of cases treated in private health sectors were 643 cases during the years 2014-2015 with average (321.5 cases yearly), and (75%,80%) of the private clinical centers included in the study received cases of scorpion stings during the years 2014-2015 respectively; (85%,95%) of these cases were not reported to the Salfit Primary Health Care center (SPHCC) during the years 2014-2015 respectively. The results show the private doctors and private clinical centers didn't reported the cases to SPHCC because of they not considered an important event, and due to the weakness of the relationship between the public and private sectors . The results show that The epidemiological profile of scorpion sting cases is not yet clarified in (SPHC) and in the public hospital. And absence of a connecting system between SPHCC and the public hospital, which led to lost data and under reporting

Limitations of Study: this study for the specific geographical area (Salfit district) to evaluate the epidemiology of 60 scorpion sting patients in the Salfit district recorded at Salfit Primary Health Care center SPHC and the Salfit public hospital for the period 2014 to 2015. lack in information available because of the absence of specific reports of scorpion stings. The data found to be lacking were the site of sting, the place of sting, scorpion body color or species, time from sting until assistance (TSA)(hours), and clinical manifestations.

Conclusion: more studies are needed to understanding the epidemiological status of scorpion sting and to have full information about the causes of un reported cases in public health sectors but according to this study the results show that there were gaps in the information available about scorpion stings in SPHC and in the public hospital. The results show that lack of collaboration between the private health and public health sectors and more collaboration is needed between inter-sectoral public health services.

Keywords: scorpion sting; Salfit district; epidemiology; distribution.

1. INTRODUCTION

Approximately 2,000 species of scorpions have been reported worldwide {1}. Despite the huge number, only a very few (approximately 25 of these species) are recognized to be medically significant to humans {2}. Toxins vary according to species, and consist of a mixture of proteins and other substances, and toxicity depends on time and other factors {2}. Worldwide, the overall estimated number of scorpion stings is approximately 1.2 million per year, with approximately 3,250 deaths per year (0.3%) {2}. The clinical presentation can be challenging for emergency physicians because there is a wide spectrum of clinical manifestations of the sting, ranging from simple localized skin signs to critical conditions with possible fatality {1,2,3}. Current available guidelines for management of scorpion stings mainly focus on symptomatic treatment and observation {3}. Epidemiological surveillance and reporting systems are important to venom control and it is necessary to put in place appropriate strategies and plans to reduce the effects of the scorpion sting and reduce human morbidity and mortality {4,5,6}. A scientific study found that three families of scorpions have been recorded in the West Bank (Buthidae, Scorpionidae, and Diplocentridae) {7,8}. In Palestine little information and studies are available about the epidemiology of scorpion stings, scorpion species and their venom, although Sawalha et al. and Qumsiyeh et al. have produced studies that discuss the poisoning of scorpions and its species and biology {7,9}. According the annual report of Palestinian Authority Ministry of Health during the year 2014, 441 cases of scorpion stings were reported with an incidence rate of 15.8 per 100,000. 116 (26%) cases were from Jericho and the Jordan Valley {10}. In the Salfit district there is a lack of information available about the epidemiology of scorpion stings and about the species of scorpions and their biology which is medically important. The data that is available is insufficient to provide relevant information that can be used by decision makers to develop a suitable strategy to control incidences of scorpion stings. Thus, this study will be the first to highlights this subject , provide information, and evaluate the epidemiology of the scorpion sting and its distribution in the Salfit district, while also providing information about the causes of un-reported cases at the SPHCC.

2. MATERIAL AND METHOD

2.1 study area: Salfit District located at 32° 7 ' 5.5" N, 35° 5 ' 25" E with total area of almost 202 sq km. It is one of 17 districts of the Palestinian National Authority, and is located in the northwestern West Bank, bordered by the district of Ramallah and al-Bireh to the South, Nablus to the East, and Qalqilya to the North as well as Israel to the West. According to the Palestinian Central Bureau of Statistics (PCBS), in 2007 the governorate had a population of 59,570 inhabitants, most of whom work in agriculture and trade. Economic activity depends on agriculture, where olives, almonds, figs, grapes, and apples are the main crops. It has a hot climate, dry summers and rainy winters, and has the average maximum temperature of 29 degrees Celsius, while the average minimum temperature is 6 degrees Celsius. The average humidity in the region is 62%, which may rise to 67%. Rainfall concentrates in the winter and the average rainfall is 660 mm per year. In some years the rainfall can reach 1,000 mm, as reported in 1981. The health services found in the Salfit district are offered through public means (primary health care centers exist in all localities and one public hospital; through the private sector (private doctors are found in most localities or through a private health center found in Beida locality); and also different local non-governmental health organizations that offer

the medical services to the local community, such as the Palestinian Crescent Society, and the Palestinian Medical Relief Society. The SPHCC has many of the health services provided to citizens, such as Preventive Medicine and vaccination Department, Maternity care, Health education, General Medicine, and other different services.

2.2 Methods

2.2.1 A retrospective study: that reviewed the records of all scorpion sting cases recorded at the Salfit primary health care center and the Salfit governmental hospital (called Yaser Arafat) for the period 2014 – 2015 (between June 2014 - November 2015 respectively).

2.2.2 A cross sectional study: 30 private clinics were found in salfit district, in this study Salfit district was divided in to four similar geographical sectors (A,B,C,D) ,and in each sectors five clinics were involved, 40 special questionnaires were prepared and randomly distributed to this clinics during the year 2014- 2015(20 questionnaires per year) . The purpose of the questionnaire was to collect more information about the epidemiology of scorpion stings and to give an accurate estimation of the annual number of scorpion sting cases in the Salfit district and also to study the reasons behind cases that were not reported at the SPHCC, but were treated in the private sector.

2.2.3 Data Analysis

All data obtained were collected and analyzed by using SPSS Software Version 17 (frequencies, mean, percentages).

3. RESULTS

3.1 Patients recorded in public sectors: Sixty patients were recorded at SPHCC and Salfit Hospital during the years 2014-2015; 32 (53.3%) were male and 28 (46.7%) were female. In this study the majority of sting patients were in the age group of 11-21 years of age (26.7%) followed by those between 33-43 (16.7%) and > 50 (16.7%) years of age. Most patients were from Salfit city, Farkha locality and other localities nearest to the hospital (15%, 13.3% and 13.3% respectively) (Tables 1, 2,3, 5). According to registration profiles, most scorpion stings occurred in the summer (50%), especially in July (23.3%) and autumn (40%), especially in October (23.3%) (Tables 6,7). The results show that most scorpion stings were in upper limbs (36,7%) and in lower limbs (26,7%). The results show that the Scorpion body color was mainly un known (61.7%), black (25%) and yellow 13.3% (Tables 4,8) with no data available about the species. The results show the clinical manifestations of scorpion sting victims were local signs and symptoms (63.3%); and localized pain and redness (50%) and with 63.3% having a clinical severity classification of Class 1 (Table 9). All patients in the SPHCC or in Salfit Hospital were treated with Promethazine amp and Dexamethasone amp drugs and only one patient (1.6%) was treated with Antivenom (Table 10).

3.2 private clinical centers: The results which obtained from the distributed questionnaires show that the estimated number of scorpion sting were 643 cases during the year 2014-2015 with average 321.5 cases, and (75%,80%) of the private clinical centers received and treated scorpion sting cases during the years 2014-2015 respectively. (80%,90%) of them did not refer the patient to a hospital during the years 2014-2015 respectively, also (85%,95%) did not report the case to the Ministry of Health (SPHCC) during the years 2014-2015 respectively and (45%,60%) indicated that there is a weakness of collaboration between private and public health sectors during the years 2014-2015 respectively. The unimportance of the event of a scorpion sting and was found to be the main cause of non reporting to the SPHCC. The results show than no doctor has a specific report for scorpion sting cases(Tables11-16). Finally The results show that the major obstacles facing the surveillance and reporting system in the Salfit district were the lack of a specific form for scorpion sting cases in both the public and private sectors, as well as the weakness of inter-sectoral and intra-sectoral

collaboration between different health sectors, considering the absence of a connecting system between SPHCC and the public hospital, which led to lost data and under reporting.

Table 1. Number of scorpion sting cases recorded at public health sectors (SPHCC and public hospital) during the years 2014 -2015

Year	Number of cases recorded in public health sectors	Percentage
2014	41	68.3
2015	19	31.7
total	60	100

*average number 30 scorpion sting per year

Table 2. Distribution of scorpion sting cases according to the sex in safit district during the years 2014 -2015

Sex	Number of the scorpion sting cases according to the sex	Valid Percent of the scorpion sting cases according to the sex
male	32	53.3
female	28	46.7
Total	60	100.0

Table 3. Distribution of scorpion sting cases according to the age group in safit district during the years 2014 -2015

Age (years)	Male	female	Total	Valid Percent
<5	3	4	7	11.7
6-10	2	0	2	3.3
11-21	12	4	16	26.7
22-32	6	3	9	15.0
33-43	3	7	10	16.7
44-54	1	5	6	10.0
>55	5	5	10	16.7

Table 4. Distribution of scorpion sting cases according to the site of sting in safit district during the years 2014 -2015

parts	Number the scorpion sting cases according to the site of sting	Valid Percent of the scorpion sting cases according to the site of sting
upper limb	22	36.7
lower limb	16	26.7
head	1	1.7
unknown	21	35.0
Total	60	100.0

Table 5.Distribution of scorpion sting according to the locality in safit district during the years 2014-2015

LOCALITY	Number of scorpion sting cases according to the locality	Valid Percent of scorpion sting cases according to the locality
Salfit	15	25.0
Bedia	1	1.7
Qrawa	2	3.3

Dear istia	1	1.7
Haris	1	1.7
Kefel haris	3	5.0
Qira	3	5.0
Iskaka	2	3.3
Yasouf	5	8.3
Marda	2	3.3
Frakha	8	13.3
Others	9	15.0
Kofer aldeek	8	13.3
Total	60	100.0

*Others : localities nearest and out site of salfit district

Table 6. Distribution of scorpion sting cases according to the season in safit district during the years 2014 -2015

Seasons	Number of the scorpion sting cases according to the season	Valid Percent of the scorpion sting cases according to the season
spring	3	5.0
Autumn	24	40.0
winter	3	5.0
summer	30	50.0
Total	60	100.0

Table 7. Distribution of scorpion sting cases according to the month in safit district during the years 2014 -2015

months	Number of the scorpion sting cases according to the month	Valid Percent of the scorpion sting cases according to the month
January	1	1.7
February	2	3.3
April	2	3.3
may	1	1.7
June	8	13.3
July	14	23.3
august	8	13.3
September	9	15.0
October	14	23.3
November	1	1.7
Total	60	100.0

Table 8. scorpion body color recorded at SPHCC and Salfit Hospital during the years 2015-2015

Color	Number of scorpion	Valid Percent of scorpion
Black	15	25.0
Yellow	8	13.3
un known	37	61.7
Total	60	100.0

Table 9. Clinical symptoms developed by victims of scorpion stings and severity class

Local signs (%63.3)	Number of cases according to local symptoms	Valid Percent of cases according to local symptoms	Systemic signs (5%)	Number of cases according to systemic symptoms	Valid Percent of cases according to systemic symptoms	Unknown signs (31.7%)	Number of cases according to Unknown signs	severity class	Number of cases according to severity class	Valid Percent of cases according to severity class
Localized pain and Redness	30	50%	Vomiting	1	1.7		19	class I	38	63.3
Swelling	5	8.3	Fever	2	3.3			class II	3	5.0
Erythema	1	1.7						class III	0	
Cough	2	3.3						unknown	19	31.7

Table 10. Drug used in treatments for scorpion sting

Drug used in treatments	Frequency of drug used in treatments	Percent of drug used in treatments
Antivenom	1	1.6
Promethazine amp	60	100
Fexofenadine tab	2	3.3
Dexamethasone amp	60	100
Lidocaine amp	2	3.3
Morphine amp	2	3.3
Hydrocortisone	4	6.6
Non steroidal anti inflammatory (diclofen amp)	4	6.6
Ranitidine amp	2	3.3

Table 11. Number of scorpion sting cases recorded at private sectors during the years 2014 -2015

Year	Number of cases recorded in private health sectors	Percentage
2014	334	52
2015	309	48
Total	643	100

*average number 321.5 scorpion sting cases per year

Table 12. Number of private doctors treated scorpion sting in salfit district in the year 2014- 2015

Do you receive and treat the cases of scorpion sting?

Answer	Number of private doctors treated scorpion sting in 2014	Valid Percent of privet doctors treated scorpion sting in 2014	Number of private doctors treated scorpion sting in 2015	Valid Percent of privet doctors treated scorpion sting in 2015
yes	15	75.0	16	80.0
no	5	25.0	4	20.0
Total	20	100.0	20	100.0

Table 13. Number of converted cases to hospital during the year 2014-2015

Did you converted any cases to hospital?.

Answer	Number of converted cases to hospital in 2014	Valid Percent of converted cases to hospital in 2014	Number of converted cases to hospital in 2015	Valid Percent of converted cases to hospital in 2015
yes	4	20.0	2	10.0
no	16	80.0	18	90.0
Total	20	100.0	20	100

Table 14. number of scorpion sting reported to ministry of health by private doctors during the year 2014- 2015.

did you reporting ministry of health for scorpion sting?

Answer	Number of scorpion sting reported to ministry of health in 2014	Valid Percent of scorpion sting reported to ministry of health in 2014	Number of scorpion sting reported to ministry of health in 2015	Valid Percent of scorpion sting reported to ministry of health in 2015
yes	3	15.0	1	5.0
no	17	85.0	19	95.0
Total	20	100.0	20	100

Table 15. Reasons of non reporting ministry of health about scorpion sting cases during the years 2014-2015.

What is the reasons of non reporting ministry of health about scorpion sting cases?

Reasons	Number of private doctors in 2014	Valid Percent of private doctors in 2014	Number of private doctors in 2015	Valid Percent of private doctors in 2015
non important event	7	35	5	25.0
1+2	9	45	12	60.0
Missing	4	20	3	15.0
Total	20	100.0	20	100

*1+2 (non important event, weakness of collaboration between private and public health sectors)

Table 16. having special reporting system for scorpion sting cases during the years 2014-2015

did you have special reporting system for scorpion sting?

Answer	Number of private sectors to have special reporting system for scorpion sting in 2014	Valid Percent of the private sectors to have special reporting system for scorpion sting in 2014	Number of private sectors to have special reporting system for scorpion sting in 2014	Valid Percent of the private sectors to have special reporting system for scorpion sting in 2014
no	20	100	20	100

4. DISCUSSION

Few studies have discussed the scorpions species and biology and its poisoning in Palestine {7,9}, also there is no any study discussed the problems which facing the surveillance and reporting system of epidemiological disease especially in scorpion sting. This study has recorded 60 cases of scorpion stings during the period from January 2014 until October 2015, and found that scorpion stings were more prevalent in males (53.3%) than females (46.7%). Similar results were found in Qatar, Tunis, Saudi Arabia, Jordan, Israel and Iran {11,2, 12, 13,14,15}. Scorpion stings were more prevalent in the age group 11- 23 (26.7%), followed by 33-43 (16.7%), and then the over 50 age group (16.7%). Similar results were reported from Saudi Arabia, India and Jordan {15,19,20}. The most common scorpion sting sites were in limbs (63.4%) with more prevalence in upper limbs (36.7%). This finding is similar to some studies from Israel, Jordan and Saudi Arabia, which found that scorpions stung most often in limbs {14,17,18}, and especially in upper limbs, as also found in an Iranian study {15}. In a comparison of the localities from which the scorpion sting patients originate, the results show that the 40% (25%, 15%) of patients were from Salfit City and other localities nearest to the hospital respectively. This indicates that the hospital is the first option considered for medical service because of its accessibility.

In the Salfit district, no previous studies discussed the epidemiology of scorpion sting, biology, behavior, color and species of scorpion, so the results show that scorpion sting cases were registered in the summer season (50%) and autumn season (40%). Similar studies have been done in Qatar, Saudi Arabia and Jordan, which found that the most prevalent season for scorpion stings is the summer season {11,12, 17,18}, with most prevalence in the month of July (23.3%), as also shown in a Jordanian study {18}, and October (23.3%) as reported in an Indian study {16}. In the Salfit district, the highest percentage of scorpion stings were recorded in the month of October, followed by July. This may be related to scorpion biology and behavior or because of the fact that October is the month of the olive harvest, which allows for increased possible contact between humans and scorpions. The dominant scorpion color recorded in this study was black (25%), then yellow (13.3%). In Palestine, few studies have discussed the scorpion and its species, although Qumsiyeh et al. (2013) {7} recorded seven species in three families in different localities in the West Bank near to the Salfit district. They found that *Leiurus quinquestriatus* (Ehrenberg, 1828) and *Hottentotta judaicus* (Simon, 1872) species were common in different localities and have yellow and black color and live in rocky and vegetated areas. The Salfit district has a similar environments which increase the opportunity of exist this species and to be suspected venoms. The Salfit district has a similar environments habitat, so more study is need around this issue. The results show that the signs of scorpion stings were localized (63.3%) with a high proportion of localized pain and redness symptoms (50%), and according to Abroug et al. {3} on clinical evaluation, 63.3% of the patients were classified as Class I severity. These results are similar to other studies in Jordan, Israel and Saudi Arabia {20,21,22}. According to medical reports in Salfit Hospital and the SPHCC, all patients were treated with Promethazine amp and Dexamethasone amp and only one patient received Antivenom drugs. According to the results obtained from this study we show lack of information in data related to the scorpion sting (color, species, and size of scorpion, place of sting (outdoor, indoor), complete information of clinical symptoms, site of scorpion sting and time to seeking medical service). This information is important to have in order to provide a better understanding of the epidemiology of scorpion stings in the Salfit district and to help decision makers to develop suitable procedures for vector control programs. The results also show that scorpion stings in the Salfit district were under reported due to treatment of cases in the private sector, which were not reported at the SPHCC (Tables 11-16). A situation analysis of what information is available about scorpion stings showed that there is a lack of specific forms for scorpion sting cases in both the public and private sectors, a weakness of inter-sectoral and intra-sectoral collaboration between different

health sectors, and an absence of a connecting system between the SPHCC and the public hospital. These were the main obstacles facing the surveillance and reporting system that led to lost data and under reporting in the Salfit district. Many scientific studies have proved that a strong surveillance and reporting system is the key to elimination of tropical diseases {4,5,6}.

CONCLUSION: more studies are needed to understanding the epidemiological status of scorpion sting and to have full information about the causes of un reported cases in public health sectors but according to this study the results show that there were gaps in the information available about scorpion stings in (SPHC) and in the public hospital. The results show that lack of collaboration between the private health and public health sectors and more collaboration is needed between inter-sectoral public health services.

ETHICAL APPROVAL

The authors have obtained all necessary ethical approval from the directors of salfit primary health care center and slafit hospital to used data in this research

REFERENCES

1. Alkahlout BH, Abid MM, Kasim MM, Haneef SM. Epidemiological review of scorpion stings in Qatar, The need for regional management guidelines in emergency departments. *Saudi Med J*. 2015; 36 (7): 851-5
2. Mansour N. Waiting time and characteristics of taking in charge scorpion pricked persons in Sidi-Bouzid region Institute Pasteur de Tunis, Tunis, Tunisia. *Archives de l'Institut Pasteur de Tunis*. 2001; 78: 25-31
3. Abroug F, Noura S, Saguiga H. Envenimations scorpioniques: avancées chimiques, physiopathologiques et thérapeutiques [Monograph]. 1994; 1-68 p.
4. Tambo E1, Ai L, Zhou X, Chen JH, Hu W4, Bergquist R, Guo JG, Utzinger J, Tanner M, Zhou XN. Surveillance-response systems: the key to elimination of tropical diseases. *Infect Dis Poverty*. 2014; 3:17
5. Bergquist R, Yang GJ, Knopp S, Utzinger J, Tanner M.. Surveillance and response: Tools and approaches for the elimination stage of neglected tropical diseases. *Acta Trop*. 2015; 141(Pt B):229-34.
6. Molyneux DH. Neglected tropical diseases: now more than just 'other diseases'--the post-2015 agenda. *Int Health*. 2014; 6(3):172-80
7. Qumsiyeh B, Salman NA, Salsaa M, Amr S. Records of scorpions from the Palestinian Territories, with the first chromosomal data (Arachnida: Scorpiones). *Zool Middle East*. 2013; 59(1): 70–6.
8. Raz S, Retzkin S, Pavlíček T, Hoffman A, Kimchi H, Zehavi D, Beiles A, Nevo E, Scorpion Biodiversity and Interslope Divergence at "Evolution Canyon", Lower Nahal Oren Microsite, Mt. Carmel, Israel. *PLoS One*. 2009; 4(4): 5214.
9. Sawalha AF, Sweileh WM, Tufaha MT, Al-Jabi DY. Analysis of the Pattern of Acute Poisoning in Patients Admitted to a Governmental Hospital in Palestine. *Basic Clin Pharmacol Toxicol*. 2010; 107(5):914-8.
10. Ministry of Health(MOH). Annual reports, 2014. WWW.MOH.PS
11. Alkahlout BH, Abid MM, Kasim MM, Haneef SM. Epidemiological review of scorpion stings in Qatar, The need for regional management guidelines in emergency departments. *Saudi Med J*. 2015; 36 (7): 851-55
12. Jahan S, Mohammed Al Saigul A, Abdul Rahim Hamed S. Scorpion stings in Qassim, Saudi Arabia -a 5-year surveillance report. *Toxicon*. 2007;50(2):302-5
13. Amr Z. Scorpionism and Dangerous Species of Jordan. *Toxinology J*. 2014; 4 181-200
14. Hemmo-Lotem M, Barnea Y, Jinich-Aronowitz C, Endy-Findling L, Leshem D, Zaretski A, Merrick J. Epidemiology of pediatric bite/ sting injuries. On year study of a pediatric emergency department in Israel. *Scientific World Journal*. 2006; 14 (6):653-60.
15. Shahbazzadeh D, Amirkhani A, Djadid D, Bigdeli S, Akbari A, Ahari H, Amini H, Dehghani R. Epidemiological and clinical survey of scorpionism in Khuzestan province, Iran (2003). *Toxicon*. 2009; 53(4):454-9
16. Pandey B, Venugopal L., Dharma Rao V and Ganesh N. Clinical Profile of Patients with Scorpion Sting. *International Journal of Am J Trop Med Hyg*. 2014; 4(9): 1038-43, 2014
17. Amr ZS, el-Oran RM, Amr SS. Scorpion stings in Jordan. *Ann Trop Med Parasitol*. 1994;88(1):99-101
18. Jarrar BM, Al-Rowaily MA. Epidemiological aspects of scorpion stings in Al-Jouf Province, Saudi Arabia. *Ann Saudi Med*. 2008; 28(3):183-7.

19. Abourazzak S, Achour S, El Arqam L, Atmani S, Chaouki S, Semlali I, Soulaymani Bencheikh R, Bouharrou A, Hida M. Epidemiological and clinical characteristics of scorpion sting in children in Fez, Morocco. *J Venom Anim Toxins incl. Trop Dis.* 2009; 15(2): 255-67
20. Bentur Y, Taitelman U, Aloufy A. Evaluation of scorpion stings: the poison center perspective, Israel. *Vet Hum Toxicol.* 2003 ;45(2):108-11
21. Al-Asmari AK1, Al-Saif AA. Scorpion sting syndrome in a general hospital in Saudi Arabia, Saudi Arabia. *Saudi Med J.* 2004; 25(1):64-70.
22. Ismail M, Abd-Elsalam MA, al-Ahaidib MS. *Androctonus crassicauda* (Olivier), a dangerous and unduly neglected scorpion –I. Pharmacological and clinical studies. *Toxicon.* 1994;32(12):1599-618. Jordan