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ORIGINAL RESEARCH

Epidemiological, Clinical Features, and Complications of Scorpion Sting in the Mediterranean Region of Turkey; A Cross-sectional Study

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Abstract: **Introduction:** Scorpion sting (SS) resulting in envenomation is a life-threatening emergency and causes serious health problems in tropical and subtropical regions. This study aimed to present the epidemiologic and clinical features of scorpion sting in the mediterranean region of Turkey. **Methods:** In this cross sectional study the epidemiologic, clinical characteristics, and outcomes of cases who presented to the Emergency Department (ED) of Antalya Training and Research Hospital with scorpion stings between January 2017 and December 2020 were analyzed using SPSS version 23. **Results:** 843 cases with the mean age of 40.49±21.26 years were evaluated (19.8% <18 years and 50.5% female). Allmost all patients (98%), had been stung by a yellow scorpion. The majority of patients were in grade 1 and grade 2 severiry (40.1%, n=338; 47.9%, n=404, respectively) according to the clinical grading. One patient died, 4.4% (n=36) were admitted to the intensive care unit and 89.4% of the patients were discharged from the ED. While cases of scorpion stings in children were prevalent during the winter months, cases affecting adults and the elderly were more common during the summer and autumn. **Conclusion:** The majority of scorpion stings in Antalya and its environs were with yellow scorpion, in urban area, among adults, in distal parts of the extremities, and with mild clinical severity. There was a significant correlation between age group and seasona, age group and laboratory findings, and clinical severity and laboratory findings.

Keywords: Scorpion Stings; Epidemiology; Antivenins; Emergency Medicine

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1. Introduction

On a global scale, the incidence of scorpion stings ranges from approximately one million to one and a half million annually, with a mortality rate of up to 3,000 deaths (1, 2). Given the predominance of scorpion envenomation in rural regions and the potential for underreporting, these numbers are supposed to remain below. The severity of envenomation is influenced by several factors, including the anatomical location of the sting, as well as the age, weight, and health status of the victim (3). Children younger than 10 years old and elderly individuals represent with the highest propensity for severe envenomation subsequent to a scorpion sting (4-6). In Turkey, the following species of scorpions are of particular concern in terms of public health: A. crassicauda, L. quinquestriatus, Mesobuthus gibbosus, and Mesobuthus eupeus. All of these species are members of the Buthidae family (3). Scorpion sting cases are particularly prevalent in the southeastern Anatolian region of Turkey due to a confluence of geographical, climatic, and socioeconomic factors (7).

The clinical manifestations of scorpion envenomation appear to be secondary to the activation of both the sympathetic and parasympathetic nervous systems. Although the venoms of certain species may produce apnea, bradycardia and hypotension more commonly, activation of the sympathetic nervous system leads to hypertension and pulmonary edema. Severe scorpion envenomations, marked by cardiovascular, pulmonary, and neurological manifestations, pose a grave threat to life due to complications such as myocardial dysfunction, shock, pulmonary edema, and hypertensive encephalopathy. Furthermore, the toxins released by scorpions have the potential to induce severe central nervous system manifestations, such as irritability and unconsciousness (2, 8).

The management of stings typically entails supportive therapy, including the administration of ibuprofen, the cleansing of the affected area, and the administration of tetanus prophylaxis. Patients should be monitored at least four hours

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although life-threatening symptoms occurs more rapidly in children, with an average onset time of 14 minutes (9). Most scorpion stings are mild and not life-threatening. However they can cause significant harm, especially to some special populations as mentioned above (4-6). In such cases, prompt recognition and management of the airway become paramount, as the efficacy of antivenom and other therapeutic interventions may have limited effects on treating cases (10, 11).

This study aimed to evaluate demographic and clinical characteristics, as well as outcomes of patients with scorpion sting envenomation in the meditranian region of Turkey.

2. Methods

2.1. Study design and setting

This cross-sectional study was conducted retrospectively after approval of the Non-Interventional Scientific Research Ethics Committee at the Antalya Training and Research Hospital, Health Science University (Ethics code: 11/12, 23.07.2020). Patients who were admitted to the Emergency Department (ED) of Antalya Training and Research Hospital with scorpion sting injuries between January 2017 and December 2020 were included.

This Hospital is a referral center in the West Mediterranean region of Turkey, receiving nearly all patients with scorpion stings. Cases admitted to our ED were initially evaluated and managed by emergency physicians. The diagnosis of scorpion envenomation was based on a history of cases. Patient data was accessed via the Hospital Information Management System and processed in accordance with the Declaration of Helsinki.

2.2. Participants

The study included patients who presented to the emergency department due to scorpion stings. They were identified through the hospital information management system using ICD-10 codes associated with scorpion stings. There was no any sex or age limitation for inclusion in this study. Those with missing data or suspected incorrect diagnoses were excluded.

2.3. Approaches

Complete blood count (CBC) test, coagulation profile and biochemistry tests including arterial blood gas analyses were performed and recorded for each patients. Electrocardiography (ECG) was performed in all patients, while echocardiography was utilized selectively.

One or two vials of scorpion polyvalent antivenom (Refik Saydam Hygiene Center, Turkey) were administered according to severity of toxicityon on admission. Furthermore, when indicated, tetanus toxoid was administered concomitantly. Patients exhibiting altered mental status, autonomic storm, vomiting, seizures, dyspnea, or pulmonary edema were subsequently transferred to the intensive care unit (ICU).

2.4. Data gathering

The demographic details, the location of the sting, the temporal interval between the sting and admission to the hospital, seasonal admission trends, and the color of the scorpion (Based on the patient's verbal statement, the animal's photograph, or the animal itself if brought in) were recoreded for all patients.

The presence and manifestation of local and systemic signs and symptoms of envenomation, the results of laboratory tests, the treatment modalities and the outcomes of the patient's were evaluated. The clinical severity of each case was evaluated using the clinical grading (table 1) (2).

2.5. Statistical analysis

The data for the study were collected using the hospital information management system and subsequently analyzed with SPSS version 23 (IBM Co.). During the analysis, data typing and definition were performed. Distribution analysis was performed using the Shapiro-Wilk Test and the Kolmogorov-Smirnov One Sample Test. Categorical data were defined as percentage and frequency values, and the chi-square test was used to explain the relationship between them. Following an analysis of the distribution of numerical data, the mean ± SD value was employed for data that conformed to the normal distribution. Conversely, median and interquartile range (IQR) were employed to delineate numerical values that did not conform to the normal distribution. T-tests and one-way analyses of variance (ANOVA) were employed to compare data that conformed to the normal distribution, while non-parametric tests were utilized to compare data that did not conform to the normal distribution. The significance level was set at $p < 0.05$.

3. Results

3.1. Baseline characterictics

A total of 843 patients with the mean age of 40.49±21.26 (range: 1-96) years were included (50.5% female). 167 patients (19.8%) were younger than 18 years. While 99% (n=841) of the patients were stung by yellow scorpion, 2 patients were stung by black scorpion. The majority of scorpion stings occurred on the fingers (n = 536, 63.6%) and arms (n = 207, 24.5%). Demographic and epidemiological characteristics of the patients are shown in Table2.

810 (96.1%) patients complained local pain, 2 (0.23%) had convulsions, 1 (0.12%)patient had priapism, and 1 (0. 12%) patient died during hospital course. The majority of patients were in grade 1 and grade 2 according to the clinical grading. The grading of the cases and clinical signs and findings with their outcome were given in table 3.

Complications arose in 23 of the patients during hospital course. The most prevalent complication was myocarditis, affecting 10 (1.18%) patients. Mitral regurgitation was detected in 4 (0.47%) patients, systolic dysfunction in 2 (0.23%) patients, transient ST segment elevation on ECG in 1 (0.12%)

patient, and acute pancreatitis in 2 (0.23%) patients.

3.2. Seasonal age distribusions

Adult and geriatric victems were frequently observed during the summer and autumn months, while pediatric cases were more prevalent in the winter season. The data further revealed that 36.36% of cases observed during winter months were pediatric, while 63.64% were adult cases. Notably, no geriatric cases were documented during winter. In contrast, during the spring season, the distribution shifted, with 85.3% of cases classified as adult, 12.93% as geriatric, and 1.72% as pediatric. In the summer months, the distribution shifted, with 53.53% of cases comprising adults, 33.67% classified as pediatric, and 12.99% designated as geriatric. In contrast, the autumn data revealed a shift in the demographic composition, with 69.01% of subjects identified as adults, 21.12% as pediatric, and 9.86% as geriatric. A statistically significant difference was observed between the seasons and age groups (X2 =62.24, p<0.001, Figure 1A).

3.3. Laboratory findings

The mean WBC value of the patients was 9.32 ± 5.28. A comparison of the mean WBC values according to age group revealed that the pediatric exhibited a significantly higher mean WBC value compared to other age groups (p = 0.001). Furthermore, a substantial variation was observed among the CRP, LDH, and CK values across the various age groups (Table 4).

A comparison of WBC according to the grades of the patients revealed that the mean WBC value for grade 2 was 8.83 ± 5.25, the mean WBC value for grade 3 was 10.16 ± 3.24, and the mean WBC value for grade 4 was 13.57 ± 6.38 (p<0.001). The median CRP value for grade 2 patients was 2 (3.58), the median CRP value for grade 3 patients was 1 (1.78), and the median CRP value for grade 4 patients was 1 (1.60) (p<0.001). The comparison of WBC, CRP, LDH, and CK values according to grade is shown in Figure 2.

3.4. Tratments

Antivenom was given to 36 (4.27%) of the patients. When the antivenom given to the patients was evaluated according to their grades; no antivenom was given to grade 1 and grade 2, antivenom was applied to 24.2% (n=16) of grade 3 and 54.1% (n=20) of grade 4 patients (Figure 1B).

3.5. Outcomes

89.32% (n= 753) of the patients were discharged from the ED. 6.17% (n= 52) of the patients admitted to the hospital ward, 4.39% (n=37) of the patients were followed up in the intensive care unit, and 1 (0.12%) patient died.

4. Discussion

The under-acknowledged issue of scorpion envenomation poses a significant public health concern in tropical and subtropical regions, particularly among vulnerable populations such as children and the elderly. It can lead to severe complications, including mortality (12). Annually, more than a million scorpion stings are reported worldwide, with an estimated prevalence of 20 per 100,000 inhabitants.

Approximately 5% of reported cases are classified as severe, and of those severe cases, 0.3% result in fatalities (13). Scorpions are distributed throughout the world; however, dangerous species are more prevalent in the southwestern United States, Mexico, the central and northern regions of South America, India, and Middle Eastern countries (14). In the southern and southeastern Anatolian regions of our country, cases of SS are prevalent during the summer months (7). In this study, we conducted a retrospective analysis of scorpion stings admitted to a tertiary care teaching hospital in the Mediterranean region, where scorpion stings are most frequently reported.

A hospital-based study conducted in the Kingdom of Saudi Arabia reported an age range of two months to 101 years for cases of scorpion stings. The study found that 70.6% of the cases were under 20 years of age (15). In contrast, Nunes et al. (16) from Brazil reported that most victims were equal to or older than 50 years. In a study conducted by Yılmaz et al. (7) in the southeast of Turkey, the mean age of the patients was 33.5 years and 62.6% were female. In the present study, 50.5% of the cases were female. The majority of cases in our study were between 18 and 65 years of age, constituting 66.9% of the sample; 19.8% of the patients were children, while 13.3% were patients above 65 years of age. The preponderance of scorpion stings in women, a phenomenon that merits further investigation, can be attributed, at least in part, to the prevalence of unprotected laborers, particularly in the agricultural sector. Furthermore, we hypothesize that the elevated prevalence of scorpion stings in children is attributable to their tendency to engage in risk-taking behaviors, such as dislodging stones and donning attire and footwear without first inspecting for scorpions.

Scorpions are found in a variety of habitats, including jungles, deserts, and rocky areas. These creatures are most active at night and feed on insects and, on occasion, small rodents (11). The spectrum of their coloration exhibits a broad range, extending from shades of straw to yellow, and encompassing light brown and black. The stings of L. quinquestriatus and A. crassicauda, colloquially referred to as yellow and black scorpions, have been documented to occur with the greatest frequency in rural areas during the summer months and at nighttime (17). As reported by Jahan et al. (18), 49% of the cases of scorpionism (SS) were attributed to black scorpions, while 38% were attributed to yellow scorpions. In the study conducted by Yılmaz et al. (7) revealed that 53.7% of the scorpion cases were black, 30.9% were yellow, and the majority of cases were observed during the summer and autumn months. In the present study, the majority of exhibited cases during the summer and autumn months, yet 98.2% of the scorpions were identified as yellow.

The findings of epidemiological studies have indicated that

SSs manifest more frequently in the extremities (19-22). A further analysis revealed that 97.2% of the stings occurred in the extremities, including the hands, arms, legs, thighs, and feet. While studies have shown that SSs commonly involve the upper extremity in our country, the literature data suggest a lower extremity predominance (19, 20, 23, 24). In the present study, the prevalence of stings was found to be predominantly in the upper extremity, constituting 88.1% of the cases. The higher incidence of stings affecting the extremities in Antalya can be attributed to the agricultural-based lifestyle of the region. Agricultural workers are exposed to these stings due to their work in the fields without proper protection during the hot seasons. Individuals wearing sandals, children walking barefoot, and those carelessly lifting stones or searching for scorpions at home with their bare hands also contribute to the prevalence of these stings. Stings to the head, neck, and other parts of the body usually occur during sleep or while dressing.

The clinical manifestations of scorpionism vary depending on the subspecies of the scorpion, its age, size, the amount of venom, and its feeding characteristics. Additionally, seasonal conditions play a role in the presentation of symptoms (25). Scorpion venom is a water-soluble antigenic complex mixture composed of neurotoxins, cardiotoxins, nephrotoxins, hemolysins, phosphodiesterases, phospholipases, hyaluronidases, histamine, and other chemicals (10). The venoms of different scorpion subspecies may vary in their composition and potency. Furthermore, the effects of scorpion venom may extend beyond the immediate locale of the sting, manifesting as systemic reactions within the initial 12 to 24 hours post-injection. The manifestations of scorpion envenomation can vary widely, with symptoms ranging from local discomfort and paresthesia to systemic effects. A study of 66 to 90 percent of scorpion stings revealed that the majority of cases exhibited only local pain, paresthesias, and skin changes, such as central puncta with swelling, erythema, and localized piloerection, without any indication of systemic toxicity (2, 26). Paresthesias and pain may persist for several days. In the present study, local pain, erythema and extremity tenderness were the most prevalent signs and symptoms.

The manifestation of systemic autonomic findings occurs within 30 minutes following the sting and typically becomes apparent within four hours. The findings depend on the species of scorpion. The combined autonomic effects of these stings typically manifest as tachycardia, hypertension, tachypnea, wheezing, hypoxemia, and altered mental status (26, 27). The most common parasympathomimetic effects include bradycardia, bradyarrhythmias, bronchorrhea, wheezing, vomiting, and priapism. The most common sympathomimetic effects are delirium, sinus tachycardia and tachyarrhythmias, hyperthermia, hypertension, diaphoresis, and vasoconstriction with cold extremities. In patients with delayed presentations, cardiogenic shock with hypotension and acute pulmonary edema are indicative of left ventricular heart failure. Coma and seizures may occur as a secondary consequence of cardiogenic shock with pulmonary edema and hypoxia, cerebral ischemia, or hyperthermia (8). Acute pancreatitis is characterized by the presence of epigastric pain that radiates to the back, vomiting, abdominal tenderness, and elevated serum amylase or lipase levels. This condition frequently occurs in conjunction with systemic toxicity (2, 27, 28). In the present study, the most prevalent systemic findings were chest pain, dyspnea, and tachycardia. A total of 16 patients with cardiac involvement developed pulmonary edema. One patient with ST segment elevation on electrocardiography (ECG) underwent emergency coronary angiography, but without any significiant occlussion requiring coronary intervention. In two patients diagnosed with acute pancreatitis, the findings resolved within 48 hours. Spontaneous intracerebral hemorrhage was detected in one patient with hypertension and coma after a scorpion sting, and died one week later.

As indicated in the study by Yıldırım et al., 1.13% of scorpion stings exhibited no indications of intoxication, 33.9% demonstrated mild intoxication, 60.45% manifested moderate intoxication, and 4.52% displayed severe intoxication (29). In the analysis conducted by Gökay et al., 189 pediatric patients were examined, and the following results were obtained: 46.6% of the cases were classified as grade 1, 32.3% as grade 2, and 21.2% as grade 3 (30). In the present study, the majority of the cases were classified as grade 1 and 2 (40.1% and 47.9%, respectively), while grade 3 and grade 4 cases constituted 7.5% and 4.5%, respectively. In the context of scorpion stings, the type of scorpion influences the toxin effects. In this trial SS were frequently caused by yellow scorpions that made the majority of our cases in lower grades while advanced grades are observed at higher frequency in regions with venomous scorpions.

A comprehensive evaluation of biochemical parameters following scorpion stings has yielded significant findings, particularly concerning severe envenomation. As the severity of the envenomation progresses, there is an observable increase in creatine kinase, WBC, CRP, and LDH levels (3, 30). As demonstrated in the present study, a substantial increase was observed in WBC, LDH, and creatine kinase levels with increasing envenomation grade. Consistent with the findings in the extant literature, the severity of intoxication, complications, and mortality increase with the degree of intoxication. A similar result was observed in the present study.

Clinical and experimental studies have reported that scorpion venom is distributed throughout the body at an expeditious rate. Consequently, the interval between SS and antivenom administration is of paramount importance (31, 32). A delay in the provision of medical assistance can result in an unfavorable prognosis. This risk is particularly pronounced in patients who present to medical care two hours after the sting (33). Preliminary data indicates that the mean duration for patients with suspected snake bites to reach the medical facility was 4.6 hours. Those exhibiting systemic manifesta-

tions were promptly administered antivenom.

The efficacy of antivenom therapy remains a subject of considerable debate within the scientific community. A substantial number of authors have expressed their conviction that the use of antivenom therapy is not necessary, while others have issued recommendations in its favor (32-34). The treatment of mild symptoms is typically managed with the administration of analgesics and antihistamines. In contrast, the management of symptoms that manifest with systemic signs necessitates the administration of antivenom, subsequent to the implementation of measures to prevent an anaphylactic reaction (7). In the present study, antihistaminic medications and steroids were utilized in the vast majority of patients (90%). Furthermore, antivenom treatment was administered to patients exhibiting systemic manifestations. While It is anticipated that this study will assist healthcare providers in implementing measures to prevent scorpion stings, taking into account local epidemiological characteristics. Furthermore, the findings of this study can be employed to identify demographic groups that require education on the prevention and treatment of scorpion stings.

5. Limitations

It is important to note that the study is subject to limitations inherent to its retrospective design. Additionally, the hospital functions as a referral center for cases of high intoxication, leading to an increased frequency of evaluations for such cases. This is attributable to the center's role in managing complex cases within its catchment area. The expansion of this study to other hospitals in the region is expected to yield more detailed information about the cases.

6. Conclusions

Based on the findings the majority of scorpion stings in Antalya and its environs were with yellow scorpion, in urban area, among adults, in distal parts of the extremities, and with mild clinical severity. There was a significant correlation between age group and seasona, age group and laboratory findings, and clinical severity and laboratory findings.

7. Declarations

7.1. Acknowledgments

None.

7.2. Authors' contributions

Data Collecting: EB, NT, TD, YY; Literature research: FY, EA; Data analysis: ÖZ, FY, Draft writing: CK, EA, Proff: ÖZ, FY; Read and approve the final version of manuscript: all authors.

7.3. Funding/Support

No financial supports

7.4. Conflict of interest

There is no conflict of interest between the authors and other institutions.

7.5. Data Availability

The study data is limited. Personal data is kept confidential in accordance with the Declaration of Helsinki. Contact the coressponding author for any additional information.

7.6. Ethical considerations

This retrospective study was conducted with the permission of the Non-Interventional Scientific Research Ethics Committee at the Antalya Training and Research Hospital (11/12, 23.07.2020).

7.7. Using artificial inteligence chatbots

AI applications have been used for language editing.

References

1. Chippaux JP. Emerging options for the management of scorpion stings. Drug design, development and therapy. 2012;6:165-73.
2. Isbister GK, Bawaskar HS. Scorpion envenomation. The New England journal of medicine. 2014;371(5):457-63.
3. Bosnak M, Ece A, Yolbas I, Bosnak V, Kaplan M, Gurkan F. Scorpion sting envenomation in children in southeast Turkey. Wilderness Environ Med. 2009;20(2):118-24.
4. Chakroun-Walha O, Karray R, Jerbi M, Nasri A, Issaoui F, Amine BR, et al. Update on the Epidemiology of Scorpion Envenomation in the South of Tunisia. Wilderness Environ Med. 2018;29(1):29-35.
5. Santos MS, Silva CG, Neto BS, Grangeiro Junior CR, Lopes VH, Teixeira Junior AG, et al. Clinical and Epidemiological Aspects of Scorpionism in the World: A Systematic Review. Wilderness Environ Med. 2016;27(4):504-18.
6. Ornelas RC, Silva LD, de Macedo LR, de Matos IM. Scorpion Stings in Minas Gerais (Brazil): A Monocentric Retrospective Study Evaluating All Envenoming Cases of Local Scorpionism. Wilderness Environ Med. 2023;34(4):442-50.
7. Yilmaz F, Arslan ED, Demir A, Kavalci C, Durdu T, Yilmaz MS, et al. Epidemiologic and clinical characteristics and outcomes of scorpion sting in the southeastern region of Turkey. Ulus Travma Acil Cerrahi Derg. 2013;19(5):417-22.
8. LoVecchio F. Scorpion envenomation causing autonomic dysfunction (North Africa, Middle East, Asia, South America, and the Republic of Trinidad and Tobago). Uptodate. Uptodate: Wolters Kluwer; 2024.
9. Boyer LV, Theodorou AA, Berg RA, Mallie J, Chávez-Méndez A, García-Ubbelohde W, et al. Antivenom for critically ill children with neurotoxicity from scorpion stings. The New England journal of medicine. 2009;360(20):2090-8.

10. Shamoon Z, Peterfy RJ, Hammoud S, Khazaeni B. Scorpion Toxicity. StatPearls. Treasure Island (FL)2024.
11. Ersoy S, Yılmaz F, Sönmez BM, Kara AY, Güçlü A. Journal of Emergency Medicine Case Reports. 2017;8(1):10-2.
12. Puzari U, Das B, Mukherjee AK. Advancements in diagnostic techniques for scorpion venom identification: A comprehensive review. Toxicon. 2025;253:108191.
13. Godoy DA, Badenes R, Seifi S, Salehi S, Seifi A. Neurological and Systemic Manifestations of Severe Scorpion Envenomation. Cureus. 2021;13(4):e14715.
14. Hernández-Muñoz EA, Zavala-Sánchez EV, Rubio-Atondo A, López-Chávez JA, Arredondo-Rojas V, Reyes-Reyes JS. Scorpion sting envenomation outbreak in Mexico. Strategies for prevention and control. Toxicon. 2024;237:107549.
15. Al-Asmari AK, Al-Seif AA, Hassen MA, Abdulmaksood NA. Role of prazosin on cardiovascular manifestations and pulmonary edema following severe scorpion stings in Saudi Arabia. Saudi medical journal. 2008;29(2):299-302.
16. Nunes CS, Bevilacqua PD, Jardim CC. [Demographic and spatial aspects of scorpion stings in the northwest region of Belo Horizonte City, Minas Gerais, 1993-1996]. Cadernos de saude publica. 2000;16(1):213-23.
17. Bawaskar HS, Bawaskar PH. Scorpion sting: update. The Journal of the Association of Physicians of India. 2012;60:46-55.
18. 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.
19. Adiguzel S, Ozkan O, Inceoglu B. Epidemiological and clinical characteristics of scorpionism in children in Sanliurfa, Turkey. Toxicon. 2007;49(6):875-80.
20. Pipelzadeh MH, Jalali A, Taraz M, Pourabbas R, Zaremirakabadi A. An epidemiological and a clinical study on scorpionism by the Iranian scorpion Hemiscorpius lepturus. Toxicon. 2007;50(7):984-92.
21. Ozkan O, Adigüzel S, Yakiştiran S, Cesaretli Y, Orman M, Karaer KZ. Androctonus crassicauda (Olivier 1807) scorpionism in the Sanliurfa provinces of Turkey. Turkiye parazitolojii dergisi. 2006;30(3):239-45.
22. Jarrar BM, Al-Rowaily MA. Epidemiological aspects of scorpion stings in Al-Jouf Province, Saudi Arabia. Annals of Saudi medicine. 2008;28(3):183-7.
23. Altınkaynak S, Ertekin V, Alp H. Çocuklarda akrep zehirlenmeleri Orijinal Araştırma. Türk Pediatri Arşivi. 2002;37(1).
24. Söker M, K. H. Scorpion sting in children. Çocuk Sağlığı Hastalıkları Derg. 2000(43):43-51.
25. Caglar A, Kose H, Babayigit A, Oner T, Duman M. Predictive Factors for Determining the Clinical Severity of Pediatric Scorpion Envenomation Cases in Southeastern Turkey. Wilderness Environ Med. 2015;26(4):451-8.
26. Cupo P. Clinical update on scorpion envenoming. Revista da Sociedade Brasileira de Medicina Tropical. 2015;48(6):642-9.
27. Auza-Santiváñez JC, Franco Lacato AOJGMB. Picadura de escorpión en Bolivia: una revisión crítica de la literatura. 2023;46(2):108-13.
28. Albuquerque PLMM, Magalhaes KdN, Sales TdC, Paiva JHHGL, Daher EdF, Silva Junior GBdJRdIdMTdSP. Acute kidney injury and pancreatitis due to scorpion sting: case report and literature review. 2018;60:e30.
29. Cesaretli Y, Ozkan O. Scorpion stings in Turkey: epidemiological and clinical aspects between the years 1995 and 2004. Revista do Instituto de Medicina Tropical de Sao Paulo. 2010;52(4):215-20.
30. S. Gokay, S. Yilmaz, H. L. Yildizdas, R. D. Celik, T. Ekinci, F., et al. A Relationship Between Clinical and Laboratory Characteristics in Children With Severe Scorpion Envenomation in Cukurova, Turkey. Pediatric emergency care. 2020;36(7):338-44.
31. Petricevich VLJMoi. Scorpion venom and the inflammatory response. 2010;2010(1):903295.
32. Ghalim N, El-Hafny B, Sebti F, Heikel J, Lazar N, Moustanir R, et al. Scorpion envenomation and serotherapy in Morocco. 2000;62(2):277-83.
33. Abourazzak S, Achour S, El Arqam L, Atmani S, Chaouki S, Semlali I, et al. Epidemiological and clinical characteristics of scorpion stings in children in Fez, Morocco. 2009;15:255-67.
34. Prasad A, Worrall BB, Bertram EH, Bleck TP. Propofol and midazolam in the treatment of refractory status epilepticus. Epilepsia. 2001;42(3):380-6.

Table 1: Clinical grading for scorpion sting

Grade	Signs and symptoms
Grade I	Local effects only
Grade II	Autonomic excitation, Agitation and anxiety
Grade III	Pulmonary edema, Hypotension and cardiogenic shock, Severe neuromuscular excitation
Grade IV	Multiorgan failure, including coma, seizures, and end-organ damage caused by hypotension

Table 2: Demographic and epidemiological characteristics of patients with scorpion stings

Variables	Value	Variables	Value
Gender		**Site of scorpion sting**	
Female	426 (50.5)	Head and neck	16 (1.9)
Male	417 (49.5)	Arms	207 (24.5)
Age (year)		Fingers	536 (63.6)
Pediatrics (0-18 years)	167 (19.8)	Toes	22 (2.6)
Adults (18-65 years)	564 (66.9)	Ankle	14 (1.7)
Geriatrics (65+ years)	112 (13.3)	Leg	36 (4.3)
Color of scorpion		Trunk 8 (0.9)	
Yellow	841 (99.8)	Thigh	4 (0.5)
Black	2 (0.2)	District	
Hospital arrival time (hour)		Rural	332 (39.4)
Mean ± SD	4.6 ± 4.1	Urban	511 (60.6)

Data are presented as mean ± standard deviation (SD) or frequency (%).

Table 3: The grading, clinical signs, and outcomes of patients with scorpion sting

Variables	Number (%)	Variables	Number (%)
Systemic signs		Clinical grading	
Chest pain	26 (3.1)	Grade 1	338 (40.1)
Dyspnea	12 (1.4)	Grade 2	404 (47.9)
Tachycardia	6 (0.7)	Grade 3	63 (7.5)
Hypertension	5 (0.6)	Grade 4	38 (4.5)
Sweeting	3 (0.4)	Local signs	
Convulsion	2 (0.2)	Local pain	810 (96.1)
Priapism	1 (0.1)	Erythema	659 (78.2)
Follow-up		Tenderness in extremities	181 (21.5)
Discharge from ED	754 (89.4)	Itching	166 (19.7)
Admitted Service	52 (6.2)	Numbness	46 (5.5)
Intensive care unit	37 (4.4)		
Death	1 (0.1)		

Data are presented as number (%). ED: emergency departement.

Table 4: Comparing the biochemical findings of scorpion sting cases between age gropus

Variables	N	Value	Pediatrics	Adults	Geriatrics	p-Value
WBC (10^3/mL)	494	9.32±5,28	11.02±4.79	8.88±5.73	8.5±2.41	<0.001
CRP (mg/dL)	486	2 (1-4)	1 (0.3-2)	2 (1-5)	2 (0.7-4)	<0.001
LDH (IU/L)	471	270.1±96.9	312.21±91.3	256.63±94.7	263.91±97.85	<0.001
CK (mg/dL)	459	137.5 (90-225)	161 (50-180)	129 (50-165.5)	121 (62-154)	0.001

WBC: White blood cell, CRP: C-reactive protein, LDH: Lactade dehydrogenase, CK: Creatinkinase.

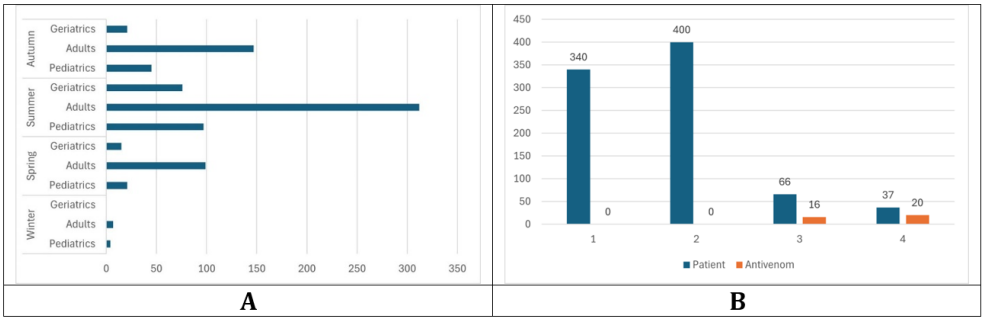

Figure 1: A: Seasonal and age distribution of cases with scorpion stings; B: Distribution of patients according to clinical severity and antivenom rates.

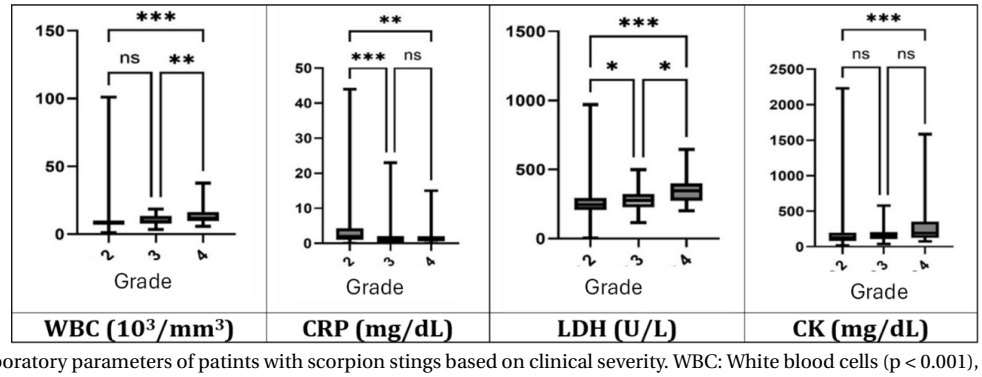

Figure 2: Laboratory parameters of patints with scorpion stings based on clinical severity. WBC: White blood cells ($p < 0.001$), CRP: C-reactive protein ($p < 0.05$), LDH: Lactate dehydrogenase ($p < 0.01$), CK: Creatine kinase ($p > 0.05$).