Original Article
Eurasian Journal of Toxicology

Retrospective Evaluation of Clinical and Epidemiological Characteristics of Scorpion Sting Cases Presenting to the Emergency Department in Izmir

Hüseyin ACAR[1], Mehmet Göktuğ EFGAN[1], Osman Sezer ÇINAROĞLU[1], Kadriye ACAR[1], Serkan BİLGİN[1], Ahmet KAYALI[1], Zeynep KARAKAYA[1]

[1]Izmir Katip Celebi University, Ataturk Training and Research Hospital, Department of Emergency Medicine, İzmir, Türkiye

Abstract

Objectives: The aim of this study is to evaluate the epidemiological and clinical features of scorpion sting cases admitted to the emergency department of a tertiary hospital in the Izmir province.

Materials and Methods: This is a retrospective cross-sectional study. Patients who applied to the emergency department because of scorpion sting between 2000-2022 years were included in the study. Demographic and clinical data and laboratory test results of the patients were searched through the hospital's electronic database. Student t test was used to compare the difference between two independent groups. P<0.05 was considered statistically significant.

Results: A total of 101 patients were included in the study. It was observed that the scorpion sting in the extremity was associated with the elevation of white blood cell count, neutrophil count, and creatine kinase level (p=0.0030, p=009, and p=0.001, respectively). Additionally, the elevation of white blood cell count, neutrophil count and potassium level were found to be significant for the development of critical illness (p<0.001, p<0.001, p=0.009, respectively).

Conclusion: Although severe poisoning findings are seen in scorpion sting cases in Izmir province, the mortality risk is low. White blood cell count, neutrophil count, and potassium level can be used as a warning tool for serious disease.

Keywords: Scorpion sting, poisoning, toxicology, epidemiology

Özet

Amaç: Bu çalışmanın amacı İzmir bölgesinde 3. Basamak bir hastanenin acil servisine başvuran akrep sokması vakalarının epidemiyolojik ve klinik özelliklerinin değerlendirilmesidir.

Gereç ve Yöntem: Bu çalışma, retrospektif kesitsel bir çalışmadır. Çalışmada 2000-2022 yılları arasında acil servise akrep sokması nedeniyle başvuran hastalar dahil edildi. Hastalara ait demografik ve klinik veriler ile laboratuvar test sonuçları hastanenin elektronik veri tabanında tarandı. Bağımsız iki grup arasındaki farkın karşılaştırılmasında student t test kullanıldı. P<0.05 istatistiksel olarak anlamlı kabul edildi.

Bulgular: Çalışmaya toplam 101 hasta dahil edildi. Akrep sokmasının ekstremitede olmasının beyaz küre sayısı, nötrofil sayısı ve kreatin kinaz seviyesindeki yükseklikle ilişkili olduğu görüldü (sırasıyla p=0.0030, p=009 ve p=0.001). Ayrıca beyaz küre sayısı, nötrofil sayısı ve potasyum düzeyi kritik hastalık gelişimi için anlamlı bulundu (sırasıyla p<0.001, p<0.001, p=0.009).

Sonuç: İzmir bölgesinde akrep sokması vakalarında ciddi zehirlenme bulguları görülsede mortalite riski düşüktür. Beyaz küre sayısı, nötrofil sayısı ve potasyum düzeyi ciddi hastalık için uyarıcı olarak kullanılabilir.

Keywords: Akrep sokması, zehirlenme, toksikoloji, epidemiyoloji

Introduction

Although scorpion bites are more common in tropical and semi-tropical regions, they can be seen all over the world. It is known that about 50 of 1753 scorpion species in the world are poisonous and 20-25 are mortal[1,2]. There are approximately 1,200,000 scorpion stings cases in the world annually and approximately 3000 deaths occur due to scorpion stings[3]. Mortal scorpion species in Turkey are generally seen in the Southeast Anatolia region. The most common scorpion species in the Aegean region is Mesobuthus gibbosus (Anatolian yellow scorpion), which is a non-lethal poisonous scorpion species[4].

Although the most common findings in scorpion stings are local pain, swelling and redness, serious systemic findings that can result in death can also be seen. Poisonous scorpion species often contain venom, which is a mixture of cardiac toxins, nephrogenic toxins, neurogenic toxins, and hemolytic toxins. Deaths are mostly associated with heart failure and pulmonary congestion[5]. Since the effects of different scorpion species in different regions vary, it would be a beneficial approach for the hospitals in the region to

Corresponding Author: Hüseyin ACAR **e-mail:** dracar@hotmail.com
Received: 08.06.2022 • **Revision:** 18.06.2022 • **Accepted:** 20.06.2022
Cite this article as: Acar H, Efgan MG, Çınaroğlu OS, Acar H, Bilgin S, Kayalı A, Karakaya Z. Retrospective Evaluation of Clinical and Epidemiological Characteristics of Scorpion Sting Cases Presenting to the Emergency Department in Izmir. Eurasian J Tox. 2022;4(2): 40-43

develop their own treatment and follow-up protocols against scorpion sting cases.

According to the epidemiological studies conducted to date, the Aegean region is the geographical region with the lowest incidence of scorpion bites[6]. Therefore, studies in this region are very limited. This study was carried out to examine the clinical features and treatment approaches of scorpion sting cases admitted to the emergency department of a tertiaryvhospital in the Izmir province.

Material and Methods

Study Design and Setting

This study is a cross-sectional study conducted retrospectively. The study was carried out with patients presented to the emergency department of a tertiary hospital in Izmir between 2000 – 2022 years. Ethics committee approval with an application number of 2022-GOKAE-0246 was obtained before starting the study.

Patient Selection

Patients admitted to the emergency department due to scorpion sting between 2000-2022 were included in the study. Pregnant women, patients who used alcohol or drugs within 24 hours before applying to the emergency department, and patients who had simultaneous multitrauma were excluded from the study.

Data Collection Tools

The age, gender, scorpion sting site, systolic blood pressure (SBP), diastolic blood pressure (DBP), pulse rate, white blood cell (WBC) count, neutrophyl count, lymphoside count, platelet (PLT) count, international normalized ratio (INR), Activated Partial Thromboplastin Clotting Time (APTT), creatinin, creatin kinase (CK) and potassium (K) levels, development of serious disease and treatment administered in the emergency room of the patients who met the inclusion criteria were searched through the hospital's electronic database and recorded in the case report form. Severe disease was defined as presence at least one of hypotension, tachycardia, hypoxia, altered mental status, organ failure, need for intensive care or need for intubation.

Statistical Analysis

We used IBM SPSS statistics version 26 for Windows to analyse the data obtained from the study. The skewness-kurtosis value, the shapiro wilkins test and the kolmogov smirnov test were used to determine whether the data were normally distributed. Numerical data were given as mean and standard deviation. Categorical data were given as numbers (n) and percentages (%). When comparing the mean of two independent groups, the student-t test was used because the data fit the normal distribution. Categorical parameters were analyzed using the chi-square and Fischer exact test. $P<0.05$ was considered statistically significant.

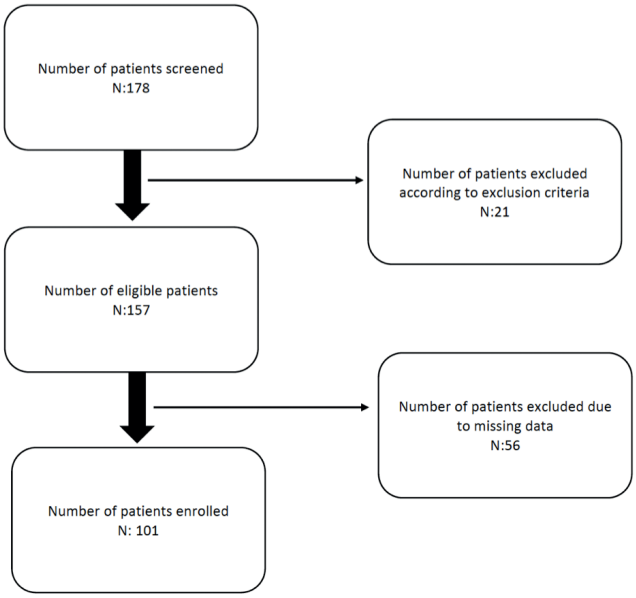

Figure 1: Work Flow Chart

Results

In the present study, 178 patients were screened, and after the patients excluded due to exclusion criteria and missing data, a total of 101 patients were analyzed. The work flow chart was presented in Figure 1. The mean age of the patients was 44 ± 18 years and 57 (56.4%) were female and 44 (43.6%) were male. In 27 (26.7%) of the patients, the scorpion sting site was on any extremity, while in 74 (73.3%) patients the scorpion sting site was in a body region other than the extremity. A total of 7 (6.9%) patients required scorpion antivenom treatment and mortality was not observed in any patient. Other descriptive characteristics of the patients were presented in Table 1.

When the vital signs and laboratory values of the patients were examined, the mean systolic blood pressure (SBP) of the patients was 132 ± 25, the mean diastolic pressure (DBP) was 71 ± 12, the mean pulse rate was 76 ± 16, the mean WBC count was 9.5 ± 3, mean neutrophyl count was 2.70±1.78, the mean PLT count was 243000 ± 71000, the mean INR value

Table 1: Descriptive characteristics of the patients

		Mean (%)
Sting Site	Non-extremity	27 (26.7%)
	Extremity	74 (73.3%)
Tetanus vaccine	No	76 (75.2%)
	Yes	25 (24.8%)
Antivenom	No	94 (93.1%)
	Yes	7 (6.9%)
Analgesia	No	68 (67.3%)
	Yes	33 (32.7%)
Antibiotheraphy	No	96 (95%)
	Yes	5(5%)
Steroid	No	58 (57.4%)
	Yes	43 (42.6%)

Table 2: Comparison of clinical features and laboratory test results of patients according to scorpion sting site

	Non-extremity N:27	Extremity N:74	Total	p
SBP (mmHg)	137 ± 26	131 ± 26	133±26	0.375
DBP (mmHg)	72 ± 12	71 ± 13	71±12	0.790
Pulse rate (/min)	75 ±9	77 ±17	76±15	0.644
WBC	9.18 ± 3.22	11.07 ± 4.00	10±4.91	0.030
Neutrophyl	5.67 ± 2.94	7.90 ± 3.95	7.30±3.83	0.009
Lymphoside	2.74 ± 1.40	2.69 ± 1.91	2.70±1.78	0.910
PLT	229000 ± 63000	254000 ± 72000	247,000 ± 70,000	0.116
INR	1.04 ± 0.10	2.45 ± 11.73	2.07±10.04	0.535
APTT	29 ± 17	25 ± 4	26.44±9.33	0.077
Creatinin	0.82 ± 0.22	0.83 + 0.18	0.83±0.19	0.830
CK	59 ± 13	152 ± 143	127±130	0.001
Potassium	4.23 ± 0.41	4.30 ± 0.45	4.31±0.48	0.485

SBP: Systolic blood pressure, DBP: Diastolic blood pressure, WBC: White blood cell, PLT: Platelet, INR: International normalization ratio, CK: Creatin kinase.

was 2.1 ± 10, CK was 115 ± 132 and mean K value was 4.3 ± 0.5. When the patients were divided into two groups according to the bite site, it was seen that the WBC count, neutrophyl count and CK value of the patients with scorpion sting on any extremity was significantly higher than the patients had a scorpion bite on the trunk, head or neck. There was no significant difference between the groups in terms of other laboratory results and vital signs. The mean of all vital signs and laboratory values of the patients and their comparisons between the groups are presented in Table 2.

When compared according to the presence of critical illness, high levels of WBC, neutrophyl and potassium were found to be associated with severe illness. Other laboratory parameters and vital signs were not significant in terms of serious disease. The distribution of the mean values of the laboratory tests and vital signs of the patients according to the severity of the disease was given in Table 3.

Considering the distribution of the cases according to the months, it was observed that the highest number of emergency visits due to scorpion sting was in August. In the seasonal distribution of cases, summer was the season with the highest number of applications to the emergency department with scorpion sting. The distribution of cases by months was shown in figure 2.

Discussion

In this study, scorpion sting cases in Izmir province were examined. There was no death due to scorpion sting in the region, but it was determined that serious disease could develop which can be predicted by an increase in WBC, neutrophils, lymphocytes and potassium.

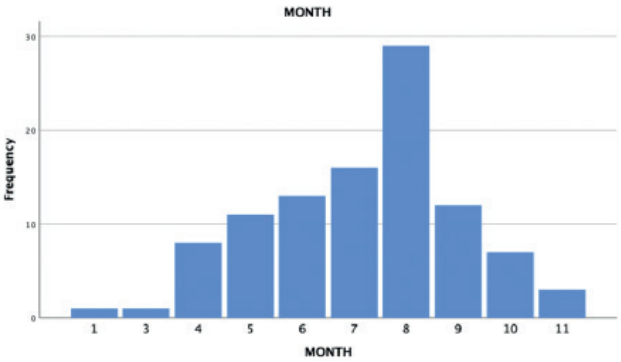

Figure 2: The distribution of cases by months

Deaths due to scorpion stings in Turkey are mostly seen in the Southeastern Anatolia region, where some of the most dangerous scorpion species live. As far as is known, Mesobuthus gibbosus, a scorpion species seen in Izmir, is poisonous but not mortal[4]. In a study conducted by Ozan et al., 24,261 scorpion sting cases were examined across Turkey and it was seen that none of the cases were mortal[7]. Rich et al. in a pediatric study evaluating scorpion stings in the Aegean region, reported no deaths[8]. In this study, no case resulted in mortality, consistent with the literature.

While scorpion stings are mostly seen in the lower and upper extremities, the head and neck are the body parts where the scorpion bite is least seen[9,10]. Bosniak et al. divided the scorpion sting areas into four as lower extremity, upper extremity, trunk and head-neck and reported that the scorpion sting site had no effect on the severity of the disease[11]. In this study, scorpion sting site was examined in two groups as extremity and non-extremity, and it was seen that the extremity was the body part most affected by scorpion sting. The reason for the high CK level in scorpion sting cases

Table 3: Comparison of clinical features and laboratory test results of patients according disease severity

	Non-critical (n:85)	Critical (n:16)	Total	p
SBP (mmHg)	132±25	135±35	133±26	0.715
DBP (mmHg)	71±11	75±18	71±12	0.289
Pulse (/min)	76±15	82±18	76±15	0.125
WBC	9.38±2.85	16.87±2.16	10±4.91	<0.001
Neutrophyl	6.08±2.7	13.8±1.9	7.30±3.83	<0.001
Lymphoside	2.54±1.14	3.56±3.61	2.70±1.78	0.038
PLT	244,000±71,000	263,000±66,000	247,000±70,000	0.328
INR	2.26±10.9	1.10±0.13	2.07±10.04	0.672
APTT	26.70±10	24.80±4.20	26.44±9.33	0.453
Creatinin	0.80±0.18	0.91±0.19	0.83±0.19	0.065
CK	123±140	148±31	127±130	0.484
Potassium	4.26±0.47	4.60±0.47	4.31±0.48	0.009

SBP: Systolic blood pressure, DBP: Diastolic blood pressure, WBC: White blood cell, PLT: Platelet, INR: International normalization ratio, CK: Creatin kinase,

in which the extremity is affected may be the presence of more muscle tissue in the extremities. Therefore, in cases of scorpion sting in which the extremities are affected, it should be evaluated in terms of CK elevation, which may cause nephropathy if not treated appropriately. In addition, it is thought that WBC and neutrophil levels were increased due to local or systemic inflammation developed in the scorpion sting cases.

Celik et al., in a study conducted in pediatric patients, have shown that the increase in the leukocyte, neutrophil, PLT and glucose levels of the patients was associated with the severity of the disease[12]. In this study, we observed that WBC, neutrophil, leukocyte and K elevations were associated with the development of serious disease. This was thought to be due to the systemic inflammatory response and rhabdomyolysis in severe disease.

With the effect of increasing air temperature, both scorpions are more active and people go to rural and natural areas more. Therefore, scorpion sting cases are more common in summer[6]. In this study, it was seen that the most cases of scorpion stings are seen in August, and when evaluated seasonally, the most cases are seen in the summer season.

This study has some limitations. Retrospective nature is the main limitation of this study. Due to the large number of missing data, detailed treatment information of the patients could not be accessed, and the long-term effects of scorpion poisoning could not be evaluated.

Conclusion

This study suggests that scorpion sting cases in Izmir province may show signs of severe poisoning, but are not mortal. WBC, neutrophil, lymphocyte and K can be used predictively for the development of severe disease.

References

1. Khatony A, Abdi A, Fatahpour T, Towhidi F. The epidemiology of scorpion stings in tropical areas of Kermanshah province, Iran, during 2008 and 2009. J Venom Anim Toxins Incl Trop Dis. 2015;21:45.
2. Yılmaz HL. Akrep Sokması. İçinde: Karaböcüoğlu M, Yılmaz HL, Duman M, editörler. Çocuk Acil Tıp: Kapsamlı ve Kolay Yaklaşım. 1. Baskı. İstanbul: İstanbul Tıp Kitapevi, 2012:1777-85.
3. Isbister GK, Bawaskar HS. Scorpion envenomation. N Engl J Med. 2014;371(5):457-63.
4. Özkan Ö, Karaer KZ. Türkiye akrepleri [The scorpions in Turkey]. Türk Hij Den Biyol Derg. 2003;60(2):55-62.
5. Yılmaz F, Arslan ED, Demir A, Kavalcı C, Duru T, Yılmaz MS, et al. Epidemiologic and clinical characteristics and outcomes of scorpion sting in the southeastern region of Turkey. Ulus Travma Acil Cerrahi Derg. 2013;19:417–22.
6. Cesaretli Y, Ozkan O. Scorpion stings in Turkey: epidemiological and clinical aspects between the years 1995 and 2004. Rev Inst Med Trop Sao Paulo. 2010;52(4):215-20.
7. Ozkan O, Uzun R, Adiguzel S, Cesaretli Y, Ertek M. Evaluation of scorpion sting incidence in turkey. J. Venom. Anim. Toxins incl. Trop. Dis.2008;14(1):128-40.
8. Zengin N, Anıl M, Anıl AB, Can FK, Bal A, Bıcılıoğlu Y ve ark. Ege Bölgesinde Çocuklarda Akrep Sokmasının Klinik Özellikleri: Bir Eğitim ve Araştırma Hastanesi Deneyimi.J Pediatr Emerg Intensive Care Med 2016;3:69-75.
9. Mahshidfar B, Basir Ghafouri H, Yasinzadeh MR, Mofidi M, Rezai M, Farsi D et al. Demographics of Scorpion Sting in Iran; a Cross Sectional Study. Emerg (Tehran). 2017;5(1):e77.
10. Moosavy SH, Shahi M, Rafinejad J, Zare S, Madani A, Navidpour S. Epidemiological aspect of scorpion sting in Bandar Abbas, Iran, during 2009-2011. Electron Physician. 2016; 8(4):2286-90.
11. 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.
12. Çelik E, Çağlar A, Çelik SF. Clinical Effects and Predictive Factors Affecting the Clinical Severity of Scorpion Envenomations in Western Turkey. J Trop Pediatr. 2021; 67(3): fmab053.