International Journal of Clinical and Experimental Medicine Research, 2024, 8(2), 191-197
https: //www.hillpublisher.com/journals/ijcemr/
ISSN Online: 2575-7970
ISSN Print: 2575-7989

Clinical Profile of Patients with Scorpion Envenomation at a Peripheral Center of Western India: A Retrospective Study

Rahul Sinha[1,*], Ankit Kumar Meena[2], Niraj Chourey[3], Arvinder Wander[4], Yugandhar Vallabhaneni[1], Priyanka Chaudhary[1], Omsakthivelan Shanmugam[1], Nirupam Roy[5], Prafull Kumar[6], Ashish Upadhyay[7]

[1]431 Field Hospital, Babina, India.
[2]Department of Pediatrics, ESIC Medical College and Hospital, Faridabad, Haryana, India.
[3]331 Field Hospital, Jhansi, India.
[4]Department of Pediatrics, All India Institute of Medical Sciences, Bhatinda, Punjab, India.
[5]Military Hospital, Babina, India.
[6]Headquarters 31Armed Division (Medical), Jhansi, India.
[7]Department of Biostatistics, All India Institute of Medical Sciences, New Delhi, India.

How to cite this paper: Rahul Sinha, Ankit Kumar Meena, Niraj Chourey, Arvinder Wander, Yugandhar Vallabhaneni, Priyanka Chaudhary, Omsakthivelan Shanmugam, Nirupam Roy, Prafull Kumar, Ashish Upadhyay. (2024) Clinical Profile of Patients with Scorpion Envenomation at a Peripheral Center of Western India: A Retrospective Study. *International Journal of Clinical and Experimental Medicine Research*, 8(2), 191-197.
DOI: 10.26855/ijcemr.2024.04.001

Received: February 18, 2024
Accepted: March 16, 2024
Published: April 15, 2024

***Corresponding author:** Rahul Sinha, 431 Field Hospital, Babina, India.

Abstract

Background: Scorpion envenomation is considered as one of the common medical emergencies in rural areas in India. The morbidity and mortality remain high in many rural areas due to inefficient access to medical facilities. This study was undertaken to know the clinical profile of patients with scorpion envenomation and analyse factors related to the outcome. **Methods:** A retrospective, observational study was conducted at a peripheral care centre in Western India from September 2023 to November 2023. All consecutive 50 adults who had reported to the peripheral care centre with scorpion envenomation during this period were included in the study. The medical records of these patients were analysed for demographic details, symptomatology, investigations, treatment modalities, and outcome. **Results:** Of the 50 consecutive patients who had scorpion, 82% were male with a mean (SD) age of 32.5(9.19) years and 24(48%) cases were categorized as mild, 22(44%) as moderate, and 4(8%) as severe. Notably, the lower limb was the predominant site of scorpion bites in 76% of the study participants. The red scorpion envenomation accounted for 38(76%) cases and 31(62%) cases experienced nocturnal bite. Pain swelling and redness were the most common symptoms of scorpion envenomation and common physical signs noted were high blood pressure (42%), tachycardia (40%), and shock (8%). Electrocardiography (ECG) changes were noted in 16% of cases, with sinus tachycardia being one of the common findings (90%). Half of our study participants did not require Prazosin, and the rest 50% received 2-4 doses of prazosin, and around 42% received prazosin within 12 hours of envenomation. The complications associated with scorpion envenomation such as high blood pressure, ECG changes, and restlessness significantly lower in participants who had received prazosin within 2-12 hours of envenomation (*P* value <0.05). **Conclusions:** This study emphasized the importance of considering geographic factors, scorpion species, and healthcare accessibility in managing scorpion envenomation cases.

Keywords

Scorpion envenomation, tachycardia, shock, sweating, restlessness

1. Background

A potentially fatal public health risk in tropical and subtropical regions of the world is scorpion envenomation [1]. Almost 2.5 billion people on the planet are in danger of being stung by a scorpion. More than one million individuals worldwide have a history of scorpion envenomation every year, which has resulted in at least 3,250 deaths [1, 2]. Farmers, labourers, and residents of rural areas make up the most susceptible category. However, in developing nations like India, very little attention is given to morbidity and mortality from venomous bite.

Scorpion venom is a complex mixture of toxins that is water-soluble and antigenic. It contains many toxins such as hemolysins, phosphodiesterases, phospholipases, hyaluronidases, neurotoxins, cardiotoxins, nephrotoxins, histamine, and serotonin. The extensive spectrum of clinical signs associated with scorpion envenomation can be attributed to them, encompassing not only localized cutaneous reactions but also neurologic, pulmonary, and cardiovascular problems. Pulmonary edema and cardiogenic shock are possible in rare instances. As per the literature, only about 30 scorpions are of medical importance. However, in India, only the Indian red scorpion (*Mesobuthus tamulus*) (Figure 1a), and the Indian black scorpion (*Heterometrus swammerdami*) (Figure 1b) are considered venomous. They can lead to significant morbidity and mortality in young children, elderly, and immuno-compromised individuals [3].

Figure 1a. Red Scorpion.

Figure 1b. Black Scorpion.

There are fewer clinical studies indicating that the venom of Indian black scorpions is less harmful than that of Indian red scorpions. The high concentration of potassium channel poisons that target the central neurological and circulatory systems is responsible for the venom of Indian red scorpions' strong toxicity [4]. With the use of prazosin, the death rate from scorpion envenomation has now dramatically decreased. In the middle of the 1980s, Bawaskar et al. conducted scientific research that proved the effectiveness of prazosin therapy in treating scorpion stings and other researchers later confirmed this finding [5, 6]. Although antivenin for scorpion stings is often used in many nations, its effectiveness in treating scorpion stings is questionable.

The main aim of the study was to analyse the clinical profile of patients with scorpion envenomation and to study the factors related to the outcome.

2. Methods

2.1 Study design and participants

It is a retrospective, observational study conducted at a peripheral care centre in Western India from September 2023 to November 2023. During the study period, 56 consecutive adults presented with scorpion envenomation, out of which 6 were excluded from the study because 4 of them did not have adequate medical records and 2 had non scorpion stings. The medical records of these patients were analysed for demographic details, symptomatology, investigations, treatment modalities, and outcome.

Abroug's classification of severity of scorpion envenomation (Class I, Class II, Class III) was followed.

2.2 Inclusion criteria

All adults who had reported to the peripheral care centre with scorpion envenomation were included in the study.

2.3 Exclusion criteria

Those with non-scorpion stings and whose medical records were not filled properly were excluded.

2.4 Statistical analysis

The Microsoft Excel spreadsheet was used to collate the data. The statistical package for the social sciences (SPSS Version 20) was used for the statistical analysis. Categorical variables were presented as number and percentage while continuous variables were presented as mean and standard deviation. The Chi-square test (χ^2) test was used to assess the association of categorical variables with scorpion envenomation. P value < 0.05 was considered statistically significant.

2.5 Results

Of the 50 consecutive patients who had scorpion envenomation between September 2023 and November 2023, 82% were male with a mean age of 32.5(9.19) (Table 1). The study flow is represented in Figure 2. The severity spectrum of scorpion envenomation, as classified by Abroug, revealed that 48% of cases were categorized as mild, 44% as moderate, and 8% as severe [7]. Notably, the lower limb was the predominant site of scorpion bites in 76% of the study participants. The red scorpion emerged as the primary culprit, accounting for 76% of reported scorpion bites. Additionally, encounters with scorpion envenomation were more prevalent during the night, with 62% of patients experiencing scorpion bites during nocturnal hours.

Table 1. Baseline demographic profile

Characteristics	No. of Study Participants (N=50)	Percentage
Male	41	82%
Female	9	18%
Age (years) Mean (SD)	32.5(9.19)	
Severity of Scorpion envenomation (Abroug's Classification)		
Mild	24	48%
Moderate	22	44%
Severe	4	8%
Type of Scorpion		
Red	38	76%
Black	12	24%
Site of Scorpion envenomation		
Foot	20	40%
Leg	18	36%
Abdomen	8	16%
Chest	3	6%
Face	1	2%
Time of envenomation		
Day	19	38%
Night	31	62%

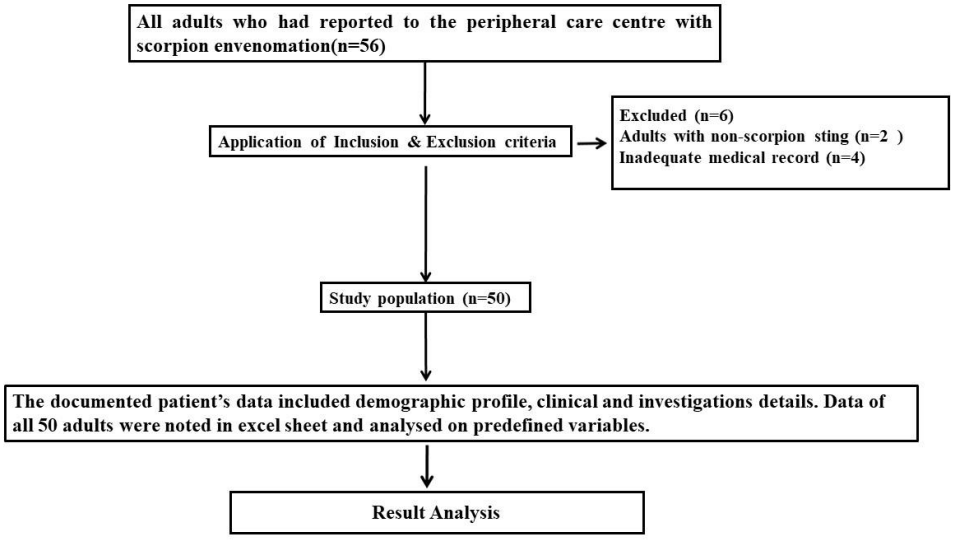

Figure 2. Flow of study.

The clinical profile of participants is depicted in Table 2. Pain at the sting site (100%), swelling (72%), redness (68%), and restlessness (22%), pain abdomen (38%), and blisters at the sting site (34%) were the most common presenting symptoms. The common physical signs noted were high blood pressure (42%), tachycardia (40%), Shock (8%), and Tachycardia (64%). ECG changes were noted in 16% of cases, with sinus tachycardia being the commonest finding (90%). 10% had ST-T changes. Shock and altered sensorium were observed in 8% and 4% respectively.

Half of our study participants did not receive Prazosin and the rest 50% received 2-4 doses of prazosin and around 42% received prazosin within 12 hours of envenomation. Around 88% received 2-3 analgesic dosages for optimum pain relief. Around 90 % participants' hospital stay was less than 72 hours (Table 3). All patients recovered fully with the treatment.

Table 2. Profile of clinical signs and symptoms of scorpion envenomation in study participants

Clinical features	N=50	Percentage
Pain	50	100%
Swelling	36	72%
Redness	34	68%
High Blood Pressure	21	42%
Tachycardia	20	40%
Pain Abdomen	19	38%
Blisters	17	34%
Sweating	13	26%
Restlessness	11	22%
ECG Changes*	8	16%
Vomiting	7	14%
Chest Pain	6	12%
Shock	4	8%
Altered Sensorium	2	4%

Note. *ECG- Electrocardiography

Table 3. Treatment and outcome profile of study participants

Variables	No. of Participants (N=50)	Percentage
Doses of Prazosin		
0	25	50%
2	4	8%
3	10	20%
4	11	22%
Time of Giving Prazosin from envenomation (Hours)		
Not Given	25	50%
2-4 Hours	1	2%
4-8 Hours	10	20%
8-12Hours	10	20%
12-16 Hours	4	8%
No. Of Analgesic Doses		
1	3	6%
2	30	60%
3	14	28%
4	3	6%
Duration of Hospital Stay		
24 Hours	2	4%
48 Hours	22	44%
72 Hours	21	42%
>72 Hours	5	10%
Recovery	50	100%

The complications associated with scorpion envenomation were hypertension in 42%, shock in 8%, altered sensorium in 4%, and ECG changes in 16% respectively (Table 4). The association of complications especially hypertension, abnormal ECG, and restlessness related with the timing of prazosin were significantly lower in participants who had received prazosin within 2-12 hours of envenomation (Table 5).

Table 4. Complications in study participants

Complications	N=50	Percentage
Hypertension	21	42%
Shock	4	8%
Altered Sensorium	2	4%
ECG changes	8	16%

Table 5. Complications and relation to the timing of giving prazosin

Complications	2-4 Hours	4-8 Hours	8-12 Hours	12-16 Hours	p Value*
High Blood Pressure	7	7	4	3	0.04
Abnormal ECG[#]	2	1	5	0	0.03
Restlessness	1	2	2	3	0.02
Shock	1	1	2	0	0.54
Altered sensorium	2	0	0	0	0.08

Notes. *Chi square test (χ^2) test was used to assess the association of categorical variables; [#]ECG- Electrocardiography.

3. Discussion

Scorpions are arthropods of the arachnid class and many species have been described, but only few are responsible for human toxicity. Scorpion envenomation stands out as a common medical emergency encountered throughout the Indian subcontinent, with higher prevalence in desert and hilly regions. The type of scorpion and clinical features exhibit variations based on the geographical distribution of scorpion subspecies, venom composition, and its dosage [8, 9].

In our study, the predominant scorpion envenomation was attributed to the red scorpion, particularly during nighttime. This prevalence aligns with the geographical distribution of the red scorpion, which is notably found in western India and is influenced by the feeding habits of this particular species [10]. The scorpion is a nocturnal arthropod, and it seeks protection from the heat during the day by sheltering under rocks or debris and is unable to tolerate high temperatures. There is an increased frequency of scorpion stings during the night as there is an increased risk of accidental contact with the scorpion in the darkness.

Pain and local reactions were the commonest clinical presentations of scorpion envenomation in our study. Notably, the limb was identified as the most frequently affected site, consistent with similar findings reported in the literature [11].

The majority of complications observed in our study were attributed to the over-activation of the sympathetic system. Scorpion venom is a water-soluble and antigenic complex mixture of various toxins like neurotoxin, cardiotoxin, nephrotoxin, phospholipases, hyaluronidases, histamine, and serotonin. These are responsible for the wide range of clinical manifestations, ranging from several local skin reactions to neurologic, respiratory, and cardiovascular complications seen in scorpion envenomation as illustrated to some extent in the current report. This is often associated with the red scorpion venom, known to contain Na+ channel toxins (neurotoxin) that mediate catecholamine release. This, in turn, leads to symptoms such as sweating, nausea, vomiting, changes in heart rate, blood pressure fluctuations, and cardiac arrhythmias [12]. Priapism and ventricular premature beats or non-sustained ventricular tachycardia may occur, though none was observed in the current study. In rare cases, there may be cardiogenic shock and pulmonary oedema. The mean duration of hospital stay was 48-72hrs which was comparable to other studies.

Many nonspecific treatments including antihypertensive drugs and neuroleptic agents have been proposed for scorpion envenomation [3, 14]. Most of the cases of mild envenoming can be managed with symptomatic measures. Although scorpion antivenin is widely used in many countries, however, its role in the management of scorpion sting is debatable. In the present study, the majority of the patients could be managed with symptomatic and supportive measures. We did not use antivenin and steroids. The medical management of scorpion envenomation involves addressing local symptoms and administering Prazosin to alleviate complications stemming from sympathetic overactivity [15]. While about 50% of our study participants received Prazosin within 12 hours of envenomation. This delay was often attributed to the remote locations of healthcare facilities. Also, there were fewer complications in those participants who received prazosin within 8 hours of envenomation. There was no mortality in the present study however it varies from from 3.5% to 15% in other studies [16].

It is very important to adhere to preventive aspects like wearing protective clothing, checking and dusting shoes, and clothes before wearing, using a mosquito net, and torch light to minimise the risk of scorpion envenomation. There are certain changes that can be made in the housing structure like the doorsteps height to be at least 25 cm high to prevent scorpion entry [17, 18]. The use of 1% lindane or dieldrin spray can also be used as a preventive measure.

4. Conclusion

This study emphasized the importance of considering geographic factors, scorpion species, and healthcare accessibility in managing scorpion envenomation cases. Further exploration of the impact of delayed Prazosin administration on patient outcomes could contribute valuable insights for optimizing treatment strategies in remote areas. Public awareness about preventive measures and early management of scorpion stings are recommended to reduce the incidence of scorpion stings and their related morbidity and mortality.

Acknowledgements

We acknowledge the contributions of all the paramedical staff who were involved in the management of cases.

Availability of data and materials

The data will be available on request.

References

[1] Chippaux JP, Goyffon M. Epidemiology of scorpionism: A global appraisal. Acta Trop, 2008, 107: 71-9.

[2] Touloun O, Slimani T, Boumezzough A. Epidemiological survey of scorpion envenomation in southwestern Morocco. J Venom Anim Toxins, 2001; 7:199-218.

[3] Ganesh J, Kumaravel KS. A study on the clinical profile of scorpion envenomation in children. Int J Contemp Pediatr, 2016; 3:125-8.

[4] Quintero-Hernandez V, Jimenez-Vargas JM, Gurrola GB, Valdivia HH, Possani LD. Scorpion venom components that affect ion-channels function. Toxicon, 2013; 76:328-42. doi: 10.1016/j.toxicon.2013.07.012.

[5] Bawaskar HS, Bawaskar PH. Utility of scorpion antivenin vs prazosin in the management of severe Mesobuthus tamulus (Indian red scorpion) envenoming at rural setting. J Assoc Physicians India, 2007; 55:14-21.

[6] Calderon-Aranda ES, Dehesa-Davila M, Chavez-Haro A. Scorpion stings and their treatment in Mexico. In: C Bon, M Goyffon, editors. Envenomings and Their Treatments. Lyon: Fondation Marce Merieux, 1996. Pp. 311-20.

[7] Abroug F, Ouanes-Besbes L, Ouanes I, Dachraoui F, Hassen MF, Haguiga H, Elatrous S, Brun-Buisson C. Meta-analysis of controlled studies on immunotherapy in severe scorpion envenomation. Emerg Med J., 2011; 28(11):963-9.

[8] Soulaymani-Bencheikh R, Faraj Z, Semlali I, Khattabi A, Skalli S, Benkirane R, et al. Epidemiological aspects of scorpion stings in Morocco. Rev Epidemiol Sante Publique, 2002; 50:341-7.

[9] Ghalim N, El-Hafny B, Sebti F, Heikel J, Lazar N, Moustanir R, et al. Scorpion envenomation and serotherapy in Morocco. Am J Trop Med Hyg., 2000; 62:277-83.

[10] Yelme G, Jindal A. Scorpion bite, a sting to the heart! Indian J Crit Care Med., 2016 May; 20(5):309-10.

[11] Al-Sadoon MK, Jarrar BM, J. Epidemiological study of scorpion stings in Saudi Arabia between 1993 and 1997. J Anim Toxins Incl Trop Dis., 2003; 9:54-64.

[12] Kumar PM, Krishnamurthy S, Srinivasaraghavan R, Mahadevan S, Harichandrakumar KT. Predictors of myocardial dysfunction in children with Indian red scorpion (Mesobuthus tamulus) sting envenomation. Indian Pediatr., 2015; 52:297-301.

[13] Gupta BD, Parakh M, Purohit A. Management of scorpion sting: prazosin or dobutamine. J Trop Pediatr., 2010; 56(2):115-8.

[14] Gupta V. Prazosin: a pharmacological antidote for scorpion envenomation. J Trop Pediatr., 2006; 52(2):150-1.

[15] Prasad R, Kumar A, Jain D, Das BK, Singh UK, Singh TB. Echocardiography versus cardiac biomarkers for myocardial dysfunction in children with scorpion envenomation: An observational study from tertiary care center in northern India. Indian Heart J., 2020; 72:431-4.

[16] Bencheikh SR, Idrissi M, Tamim O, Semlali I, Mokhtari A, Tayebi M, et al. Scorpion stings in one province of Morocco: epidemiological, clinical and prognosis aspects. J Venom Anim Toxins incl Trop Dis., 2007; 13(2):462-7.

[17] Kumar R. An update on epidemiology and management practices of Scorpion envenomation in India. J Family Med Prim Care, 2022; 11:4932-5.

[18] Warrell DA. Venomous Bites, stings, and poisoning: An update. Infect Dis Clin North Am., 2019; 33:17-38.