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Clinical and socio-epidemiological characteristics of scorpion envenomation in children presented in a Tertiary Care Hospital, India

Meena Patel (MD) [1], Sandeep Singh (MD) [2], Chayan Chakma (MD) [3], Gaurav Derashri (MD) [4 *]

1. Associate Professor, Shyam Shah Medical College, Rewa, Madhya Pradesh, India; drsandeepsingh@gmail.com.
2. Associate Professor, Shyam Shah Medical College, Rewa, Madhya Pradesh, India; drsandeepsingh@live.in.
3. Senior Resident, Shyam Shah Medical College, Rewa, Madhya Pradesh, India; chayanchakma582@gmail.com.
4. Post Graduate Medical Officer, Narwar, Ujjain, Madhya Pradesh, India; drgauravderashri@gmail.com.

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ABSTRACT

Background and Objective: Scorpion envenomation (SE) is a common health problem in some regions of the world, especially in children. The aim of the current study was to evaluate the epidemiological and clinical features as well as outcomes of SE patients.

Methods: In this retrospective study, the information of 46 children with scorpion sting, referred to Gandhi memorial hospital, India were assessed for 8 months (1st April 2018 to 30th November 2018). The SE recognition was based on a history of scorpion stings. The clinical characteristics and severity (Abroug's classification) of the disease were checked. The data were analyzed using SPSS 22.

Findings: Most children were 1-5 years old. Most of the stings were seen in exposed extremities (85.4%), generally in the upper limbs (44 local pains, hyperemia itching, dry mouth, swelling, malaise and sweating) and thirst was the most frequent problem of the Local and autonomic nervous system. There were 11 (26.8%) and 17 patients (41.4 %) in the grade III and II groups, respectively. At the end of the study, 2 (5%) children died from scorpion stings.

Conclusion: This analysis showed that intoxications caused by scorpions were mostly seen in hot summer months, in labor class people and people living in rural areas. In clinical assessment, local and systemic effects were found. We propose that this information is beneficial for health education and the prevention of scorpion sting cases.

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Introduction

Scorpions are venomous arthropods, included in the class Arachnida and order Scorpiones [1]. There are approximately 100 species of scorpion globally, the majority of which are present in India. Among those, the

*Corresponding Author: Dr. Gaurav Derashri (MD);
Address: Community Health Centre, Narwar, Ujjain, Madhya Pradesh, 486001, India.
Tel: +91 9870204240 E-mail: drgauravderashri@gmail.com

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Mesobuthus tamulus (Indian red scorpion) and Heterometrus swammerdami (black scorpion, formerly Palamneus) are of medical importance [2]. Scorpion stings occur mainly due to fortuitous contact with a scorpion. Especially when harshly handled or stamped on. Scorpions do not always inject venom while stinging because venom vesicles are surrounded by a striated muscular layer, regulating the ejection of venom; thus, the sting can be complete, partial or dry [3]. Scorpion envenomation (SE) depends on numerous factors, taking into account both scorpion and victim. The species and size of scorpion, the content of the venom glands, the state of the telson's venom ducts, the number of stings and the amount of venom injected can all be considered [4]. The anatomical position of the sting in addition to the victim's age, weight and health status must all be considered in relation to the victim [4, 5].

Medically significant SE is nearly always characterized by intense local agony, frequently without regional tissue injury. Systemic effects are seen in a smaller percentage of SE cases, depending on the type of scorpion involved and are driven by a spectrum of excitatory neurotoxins [6]. Although local symptoms like acute pain and a burning feeling at the sting site are the most common, systemic signs might occur. After being stung by an Indian red scorpion, cardiovascular issues are likely to increase [7]. Of the myriad of clinical features of scorpion sting envenomation, cardiovascular effects such as tachyarrhythmias, pulmonary edema and hypertension are mainly responsible for morbidity and mortality, affected by the time of presentation and administration of vasodilators [8]. An autonomic storm leads to a mixture of both cholinergic and adrenergic manifestations [9].

SE is more prevalent in childhood, and the clinical signs of envenomation could be more extensive and severe in children, leading to multi-organ failure and death [5]. Due to delays in institutionalization, lingering superstitions, and reliance on traditional healers, SE causes substantial morbidity and mortality, particularly in rural areas [10].

SE is graded as minor, moderate or severe, and the therapeutic method is governed by the severity of the condition. The victims' management is comprised of three parts: symptomatic therapy, vital organ support and antivenom administration. The time between the sting and provision of appropriate medical attention is pivotal to the patient's prognosis [11].

There are only few studies in the pediatric age group. Hence, the aim of this study was to evaluate the epidemiology-clinical characteristics and outcomes of SE patients. The finding of the current study can be implemented in clinical settings as a predictor of grim outcomes and can develop countermeasures.

Methods

Study design and participant

This was a retrospective descriptive study of all SE children hospitalized in the Pediatrics Department at Sanjay Gandhi Memorial Hospital, affiliated to Shyam Shah Medical College in Rewa, M.P., India, from April 1st to November 30th, 2018. Prior to initiating the study, the Institutional Ethical Committee (IEC) approved the present study. Informed written consent was obtained from the guardians of all participants.

Method sampling was census. All patients admitted to the Department of Pediatrics (at the time of the study) with a history of SE having complete clinical and epidemiological information in the case record were entered into the study. Patients who were admitted to the Department of Pediatrics with a history of SE but either absconded or taken leave against medical advice (LAMA) were excluded from the study. During the research period, a total of 46 SE patients were hospitalized, out of these, 03 were absconded and 02 were LAMA so 41 patients were selected for the study.

Data Collection

Each case's clinical severity was established utilizing Abroug's criteria [12]. Local signs such as pain, erythema, and paresthesia constrained to the sting area were labeled as class I; shivering, fever, excessive

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sweating, nausea, vomiting, diarrhea, hypertension, and priapism were listed as class II; and cardiovascular, respiratory or neurological symptoms were defined as class III (such as cardiogenic shock, pulmonary edema, altered consciousness, and convulsive crisis).

The data obtained from 41 cases for the current study were divided into two sociodemographic and epidemioclinical sections. Socio-demographic characteristics were age, gender, address, and details about scorpion bite such as time and location of the bite, site of the bite, history of first aid, and relevant information of history, examination, investigation including electrocardiography and treatment from hospital records. Interns were recruited to gather the data.

Data Analysis

The data was collected on predesigned proformas as well as descriptive and frequency statistical analyses were performed using SPSS 22.0 (trial).

Results

Table 1 demonstrates epidemiological characteristics of children stung by scorpions. The mean age of patients was 6.5±3.9 years (range: 1.2-15 years). The highest sting incidence (46.3%) afflicted 1-5-year-old children. Male children were most commonly stung (56%). The majority of the children were stung in rural areas (80.4%), outside of their residence (60.9%), at night time (63.5%) and on an upper extremity (44%).

Taking animal color into consideration, brown scorpion (68.3%) was easily identified either by children or their guardians. The average time elapsed between sting and admission to the hospital (time after sting – TAS) was 7.3±6.9 hours (range-1-14.5 hours). Furthermore, 34.2% of the victims arrived at the hospital more than five hours after their accidents. Taking envenomation severity into account, Class II was most frequently observed.

Table 2 illustrates that local pain is the most common (73.1%) local sign followed by hyperemia (26.8%) and also in Class 1 severity. Sweating, headache and nausea and vomiting were common with Class 2 severity whereas tachycardia was the most common (72.7%) systemic sign in Class 3 SE followed by gallop and pallor.

Table 3 represents that tachycardia is the most common (80.4%) electrocardiogram (ECG) finding overall along with individual severity classes followed by ST-segment depression (9.7%). Atrial fibrillation was observed in only 3 (7.4%) patients. None of our patients were injected with scorpion antivenom. However, 12 (29.2%) of them received dobutamine infusion on admission and 4 (9.7%) were administered dopamine.

Discussion

The purpose of this study was to assess the socio-epidemiological and clinical aspects of SE in children presenting to a tertiary care hospital. The findings of the ongoing study indicated that scorpion intoxications were more common during the hot summer months, in those of lower socioeconomic status and among rural dwellers. In clinical evaluations, both local (pain, redness, swelling, itching, burning and numbness) and systemic (gallop, crepitations, headache, sweating, nausea, vomiting, pallor, tachycardia, tachypnoea, dizziness, convulsions and hypothermia) effects were observed.

In the present study, the mean age of patients was 6.5 years old. The 1-5-year-old patients had the greatest (46.3) sting incidence. Existing research indicates a disparity in the age distribution of scorpion stings. Adiguzel et al. [13] noticed that children aged 9 to 15 were more likely to be impacted (54.1%) than other age groups (38.8% for 3-8 years old and 7.1% for 0-2 years). According to Osnaya-Romero et al.[14], the distribution of scorpion stings was higher among 1-3-year-old children. In the current study, male children were most commonly stung (56%). The majority of the children were stung in rural areas (80.4%), outside of their residence (60.9%), at night time (63.5%) and on an upper extremity (44%). In agreement with the current study, Rajashekhar et al. [15] discovered that the majority of patients (2/3rd) were men while more than half of the cases

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were from rural regions, even though the most common location of the bite was at home (66.7%). Meanwhile, in a study done by Kumari Meena et al[16] in Tamilnadu and another prospective observational study in Allahabad, Uttar Pradesh [17], the foot was more commonly afflicted followed by hand. However, in another prospective observational study in Khammam, Telangana [18], the upper limb has sustained a sting in 55% of the cases and the lower limb in 45% of the cases.

In the present study, when the animal color was seen, brown scorpion (68.3%) was easily identified either by children or their guardians. Meanwhile, it was yellow and red scorpion according to Abourazzak S et al. [19] and Kumari P et al., [16] respectively. In the current study, the average time elapsed between sting and admission to the hospital (time after sting – TAS) was 7.3 hours (standard deviation: 6.9 hours; time range: 1 to 14.5 hours). On the other hand, Abourazzak S et al. [19] reported TAS to be 3.36±2.5 hours (range: 0.5-19 hours).

Table 1. Demographic and epidemiological characteristic of children stung by scorpions

Variable		Number (N=41)	Percentage
Age (years)	<1	01	2.5
	1-5	19	46.3
	6-10	13	31.7
	11-15	08	19.5
Gender	Male	23	56
	Female	18	44
Type of scorpion	Red	12	29.2
	Brown	28	68.3
	Black	01	2.5
Envenomation severity	Class I	13	31.8
	Class II	17	41.4
	Class III	11	26.8
Locality	Rural	33	80.4
	Urban	08	19.6
Place of bite	Outside of home	25	60.9
	inside of home	16	39.1
Time of bite	Day	15	36.5
	Night	26	63.5
Site of bite	Lower extremity	17	41.4
	Upper extremity	18	44
	Head and face	1	2.5
	Thorax & abdomen	5	12.1
Duration between sting & admission (in hours)	<1	06	14.6
	≥1-5	13	31.7
	>5-10	14	34.2
	>10-15	05	12.1
	>15	03	7.4
Outcome	Recovery	37	90
	Death	02	5
	Referred	02	5
Duration of stay in hospital	1 day	1	2.5
	2 days	6	14.6
	3 days	12	29.2
	4 days	9	21.9
	5 days and more	13	31.8

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Table 2. Distribution of local and systemic manifestation according to Abroug's classification

Signs and symptoms		Class 1 (N=13)	Class 2 (N=17)	Class 3 (N=11)	Total (N=41)
Local sign	Pain	11 (84.6)	11 (64.7)	9 (81.8)	31 (75.6)
	Redness	5 (38.4)	2 (11.8)	4 (36.3)	11 (26.8)
	Swelling	4 (30.7)	1 (5.9)	0	5 (12.2)
	Itching	1 (7.6)	5 (29.4)	0	6 (14.6)
	Burning	6 (46.3)	4 (23.5)	3 (27.2)	9 (22)
	Numbness	1 (7.6)	0	1 (9)	2 (4.8)
Systemic signs and symptoms	Gallop on admission	0	0	5 (45.4)	5 (12.2)
	Crepitations on admission	0	1 (5.9)	4 (36.3)	5 (12.2)
	Sweating	1 (7.6)	10 (58.8)	2 (18)	13 (31.7)
	Headache	0	8 (47)	4 (36.3)	12 (29.2)
	Nausea & vomiting	0	11 (64.7)	3 (27.2)	14 (34.1)
	Pallor	1 (7.6)	2 (11.8)	5 (45.4)	8 (19.5)
	Tachycardia	0	3 (17.6)	8 (72.7)	11 (26.8)
	Tachypnea	0	3 (17.6)	7 (63.6)	10 (24.3)
	Hypothermia	0	0	1 (9)	1 (2.4)
	Convulsion	0	0	2 (18)	2 (4.8)
	Dizziness	0	0	5 (45.4)	5 (12.2)

Table 3. Electrocardiogram (ECG) changes in the study population

ECG Findings	Class 1 No (%) N=13	Class 2 No (%) N=17	Class 3 No (%) N=11	Total No (%) N=41
ST depression	1 (7.6)	3 (17.6)	0	4 (9.7)
T inversion	0	1 (5.8)	0	1 (2.4)
Tall T waves	2 (15.2)	0	1 (9)	3 (7.4)
Tachycardia	10 (76.9)	15 (88.2)	8 (72.7)	33 (80.4)
Atrial Fibrillation	0	1	2 (18.2)	3 (7.4)

In the ongoing study, local pain was the most common (73.1%) local sign observed followed by hyperemia (26.8%) overall and also in Class 1 severity. Sweating, headache, nausea and vomiting were common with Class 2 severity whereas tachycardia was the most common (72.7%) systemic sign in Class 3 SE followed by gallop and pallor. In concordance to our study, in a cross-sectional study [15] conducted in Karnataka, the most common complaint was pain (98.6%), followed by cold peripheries (48.1%), paresthesia (44.3%) and others. In a retrospective descriptive study [20] conducted in Raichur, Karnataka, the majority of the patients complained of pain at the site of the sting (93.9%). Sweating and palpitation were present in 33.7% and 27.3% of the patients securing second and third positions, respectively. Abdominal discomfort was present in only 6% of the cases. These observations [20, 21] are in agreement that local pain is the most common symptom.

In the ongoing study, tachycardia was the most common (80.4%) ECG finding overall along with individual severity classes followed by ST-segment depression (9.7%). Atrial fibrillation was observed in only 3 (7.4%) patients. Moreover, Karuppan et al. [22] reported that tachycardia (n = 10, 20%) was the most common ECG finding followed by T wave inversion, tall T waves (10% each), ST depression (4%) and atrial fibrillation (2%). In a prospective observational study done in Turkey [23], sinus tachycardia was present in 17.1% of the patients and ST changes were found in 7.9% of the individuals. In another cross-sectional study conducted in Iran [24],

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tachycardia was noted in 11.6% of the cases, ST depression was seen in 9.3% of the individuals and T wave inversion was observed in 4.6% of the cases. Differences in the venom load could be the reason for these differences.

SE is graded as minor, moderate or severe, and the therapeutic method is governed by the severity of the condition. The victims' management comprised of three parts: symptomatic therapy such as pain management and local anesthetics, vital organ support, and antivenom administration including administration of Prazosin. As a consequence, each envenomed patient should be seen by a local hospital or clinic. Furthermore, children with advanced systemic symptoms should be admitted to an intensive care unit (ICU) environment due to the heterogeneous nature of the symptoms and the increased risk of death if they register at the hospital with severity class III symptoms (acute pulmonary edema, coma and shock), the dangers of anti-venom administration, as well as the necessity for airway or blood-pressure support. Likewise, the time that transpired between the sting and the delivery of adequate medical care is fundamental to the patient's survival.

Unfortunately, scorpion antivenom is not widely available in India. Early Prazosin, anticipation and close monitoring of complications are critical in the management of Scorpion sting. Prazosin is a recognized antidote to the venom of the Mesobuthus tamulus scorpion. The injection of Prazosin at 3-hour intervals prevents the development of sequelae and inevitably results in a swift recovery.

Limitations of the study

Since this research was a retrospective descriptive study conducted in a hospital setting, only patients visiting the hospital were included in the study. Many people who were stung by a scorpion seek out local treatments because they were unaware of the consequences of severe envenomation.

Conclusion

In overview, this analysis revealed that scorpion intoxications in the central India region were most common during the warmer months, in labour class people, and in rural dwellers where there are problems of slums and squatter settlements, overcrowding, and unhygienic waste disposal methods. The bulk of the incidents involved children under the age of five. Either local and systemic effects were documented clinically. The current revealed that in several of these occurrences, the youngsters were stung as a product of reckless conduct such as wandering barefoot, picking up stones and putting on clothing and shoes without first checking for scorpions; therefore, the prophylaxis was strongly recommended. This protection begins with the use of protective apparel such as shoes, which may help to avoid SE. Next, yards should be maintained clear of rubbish, which can provide a haven for scorpions. Furthermore, you should think twice before going barefoot, particularly at night when scorpions are active.

This basic descriptive research will develop the measures of scorpion sting prevention measures, which should take into account local epidemiological aspects of SE. These data may also be used to identify which populations require the greatest education about scorpion sting avoidance and treatment. In conclusion, we recommend that robust medical care aimed precisely at the organ systems damaged by scorpion venom can be successful. A credible prospective investigation will be required to validate or reject whether antivenom reduces morbidity and death in patients with a lower incidence of reported systemic symptoms.

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Ethical approval

The Human Research Ethics Committee of the Shyam Shah Medical College affiliated to Sanjay Gandhi and Gandhi Memorial Hospital, Rewa (M.P.) authorized the questionnaire and protocol for this study. [Approval No 9388/SS/PG/MC/2019 Dated 22/05/2019].

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Conflict of interest

The authors have no conflicts of interest to declare that are relevant to the content of this article.

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