

## To Evaluate the Epidemiological Factors Affecting the Severity of Scorpion Envenomation in Pediatric Age Group

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### Abstract

*Background and objectives:* Scorpion sting is a frequent, life-threatening medical emergency in children. They constitute a significant public health problem in many underdeveloped countries, including India. This study was done to study the epidemiological factors responsible for high prevalence of scorpion sting in our community. *Methodology:* This is an observational study of 35 cases of scorpion sting, admitted at our institute. An epidemiological study was done to determine the factors predisposing to prevalence of scorpion sting in the community. *Results:* Scorpion sting is a common, pediatric emergency in our area. Rural male children, from lower socioeconomic groups, aged between 1-3 years (28%) and 3-10 years, (57%) were most commonly affected. Maximum admissions in May, June. *Conclusion:* Scorpion sting is a serious, potentially fatal emergency in our area. Cardiovascular manifestations are most common and life-threatening. Scorpion stings constitute a "occupational hazard" for children employed as agricultural laborers. The epidemiological factors affecting the severity of scorpion envenomation are studies in the present study. The various factors are season summer being 49% cases, rural area common being 64%, scorpion sting common in lower socioeconomic strata residing in kaccha house. Sting found more in night time and 44% were in outdoor. Sixty eight percent scorpion stings were on exposed part of body.

**Keywords:** Scorpion sting; Prazosin; Occupational hazard.

### Introduction

Scorpion envenomation is an important public health hazard in tropical and subtropical regions. Envenomation by scorpions can result in a wide range of clinical effects, including, cardiotoxicity, neurotoxicity and respiratory dysfunction. Out of 1500 scorpion species known to exist, about 30 are

of medical importance. India is a country where agriculture forms the infrastructure of the nations economy.<sup>1</sup> The majority of land is under green belts for cultivation or is occupied by dense forests. Increased deforestation in recent years have increased the exposure of the tribals and other people living in rural areas to various forms of wildlife. This has led to increased incidences of various bites and stings.

Scorpions are found commonly in our country. Hence, scorpion stings constitute an important health hazard. They are specially quite common in the rural and coastal areas.<sup>2</sup>

In India, about 86 species of scorpions are found of which are only two are known to be poisonous.

### These are:

1. Mesobuthus tamulus (the red scorpion)
2. Palamneus swammerdami (the black scorpion)<sup>3</sup>

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In Maharashtra, stings by the red scorpion are quite common in Konkan area and the dry districts of Ahmednagar and Aurangabad. Scorpion stings are relatively less hazardous in adults, but may lead to serious toxicity in children. Hence, it assumes so much clinical importance in children.

Various epidemiological factors play a major role in the incidence of scorpion sting, like the type of house in which the victim reside, as "kuchcha" houses, which provide good hiding places for the scorpions, record more instances of stings.<sup>4</sup>

Environmental factor like summer season also play in important role in the epidemiology.

Other factors, which may determine the severity of envenomation, include:

- \* Age of the victim
- \* Size of the victim
- \* Breeding time of the scorpions
- \* Number of stings
- \* Time interval between sting and initiation of treatment
- \* Season<sup>1,5</sup>

## Materials and Methods

### Method of collection of data

#### Study group:

All the children admitted for scorpion sting in 2 hospitals: Anand Rishiji hospital & Siddhivinayak Children's hospital during the period of 11 month formed the study group.

#### Inclusion criteria:

1. All cases of definite scorpion sting in children up to 18 years of age in which a scorpion was seen in the vicinity either by the patient or by the parents, immediately after the sting.
2. Children with history of bite coupled with classic clinical manifestations of scorpion sting were also included in the study.

#### Exclusion criteria:

1. Cases of scorpion sting in patients > 18 year of age.
2. Unknown bites and cases where the clinical manifestation was not compatible with scorpion sting envenomation were excluded.

### Study design

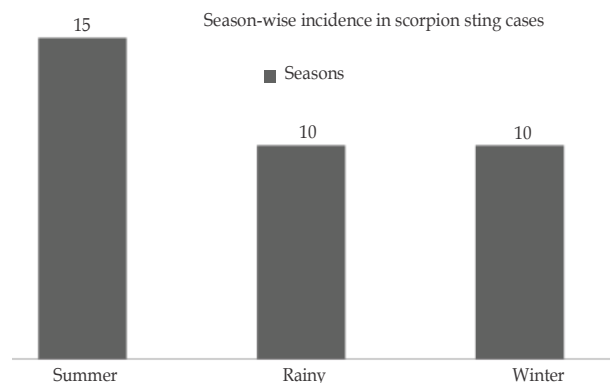
Thirty-five cases of scorpion sting, admitted at our institute from 15 July 2011 to 15 June 2012 were included in the study. On admission, a detailed clinical history, including the time of sting, symptomatology, details of treatment received before admission was taken. Further description of the scorpion and details about the circumstances leading up to the sting were obtained.

All the patients were subjected to a detailed clinical examination at admission and at frequent intervals thereafter, as was necessary in each case. Hourly monitoring of heart rate, respiratory rate, blood pressure, urine output, cardiovascular and respiratory status was done.

## Results

### Season

- Maximum admissions were in May or June.
- Admissions in winter were mainly in mild groups.
- Admissions in summer were mainly in moderate to severe envenomation groups.



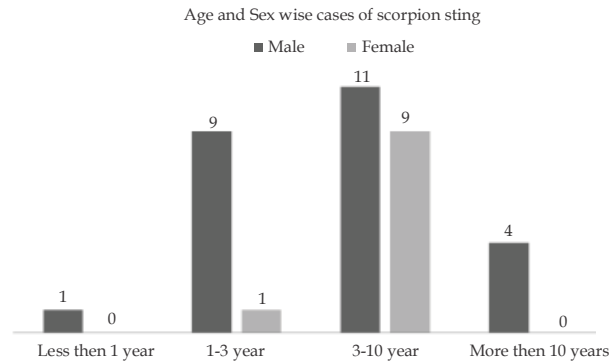
Graph 1: Season-wise incidence in scorpion sting cases

### Age & Sex

- Maximum admissions were in the 3–10 age group (56%) followed by 28% in 1–3 age group.
- Prevalence was very low in children less than 1 year of age group.
- Males were affected more than females, M:F ratio 5:2.
- Mortality was mainly in 1-3 age group and 3–10 age group. Percentage wise mortality more in the 1–3 age group (28.5%) than the 3–10 age group (14.28%).

**Table 1:** Age & Sex wise Distribution of The Cases of Scorpion Sting

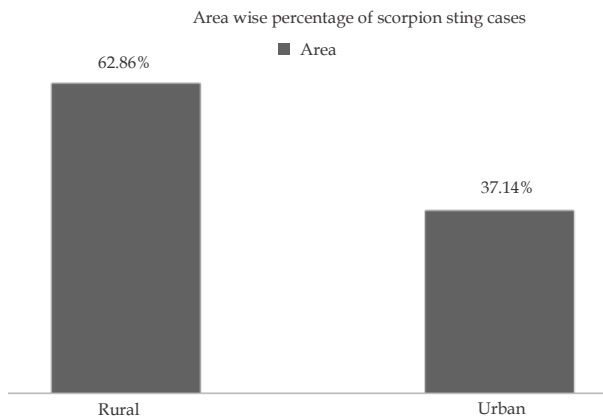
Age group	Male	Female	Total (%)
Less than 1 year	1	0	1 (2.86%)
1-3 years	9	1	10 (28.57%)
3-10 years	11	9	20 (57.14%)
More than 10 years	4	0	4 (11.43%)
Total (%)	25 (71.43%)	10 (28.57%)	35 (100%)



**Graph 2:** Age and Sex-wise cases of scorpion sting

**Area: (Urban/Rural)**

Area wise distribution of various cases, whether rural or urban, was as shown in



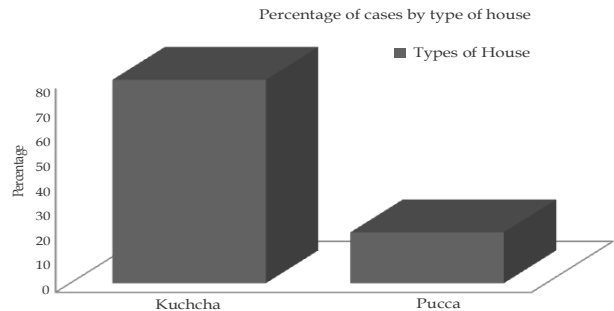
**Graph 3:** Area-wise percentage of scorpion cases

- The incidents occurred much more in rural areas (62.86%) as against 37.14% in urban areas.

**Type of House**

The type of house in which victim resided was also a major factor in the study as shown in the diagram Graph 4.

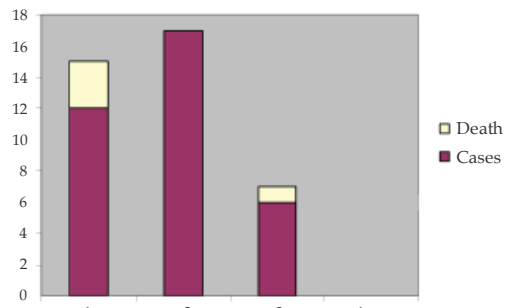
- Eighty percent of the cases occurred in “kuchcha” type of the house, i.e. either huts or old stone building or “wadas”.



**Graph 4:** Percentages of cases by type of House

**Type of Scorpion**

The type of scorpion was identified in most of the cases and the prevalence of the red versus black scorpion stings was as shown in Graph 5.



**Graph 5:** Mortality in scorpion sting cases by type of scorpion

- 17 cases (48%) were due to black scorpion sting, while 12 (32%) due to red scorpion sting.
- There were 3 deaths in red scorpion stings and 1 death in unknown group. But no death was reported in Black scorpion stings.

**Site of Sting**

The site of sting was a major determination of the severity of envenomation and an indicator of the mode of causation. Sixty percent of the cases were due to stings on the feet, mostly due to accidental stepping on the scorpion.

**Time of Presentation Since sting and Mortality**

Following table shows correlation between time of presentation and mortality due to scorpion sting.

**Table 2:** Correlation between time of presentation and mortality due to scorpion sting.

Time (Hr)	No. of cases	Deaths	Mortality %
less than 1 hr.	6	0	0
1-5 hr	18	1	5.56
5-12 hr	7	1	14.2
More than 12 hr	4	3	75

- Mean time of presentation was 6 +/- 1.3 hr.
- A delay in presentation was associated with a significant increase in mortality.

### Severity of Envenomation

**Table 3:** Severity of Envenomation in Cases and its Relation with Mortality.

Severity	Cases	Deaths	Mortality %
Mild	10	0	0
Moderate	21	1	4.76
Severe	4	4	100

- A significant increase in mortality was associated with increasing severity of envenomation.
- Severe envenomation is associated with 100% mortality.

### Discussion

- Scorpion sting is an acute life-threatening, time-limiting medical emergency of villages. Numerous envenomations go unreported and the true incidence is not known.<sup>5</sup> Dominant clinical effects vary from species to species and from one geographical location to another.<sup>1</sup> Case fatality rates vary widely among different regions from 3% and over the years, with improvement in management protocols, there has been a dramatic reduction in mortality.
- We studied 35 cases of scorpion sting, admitted to 2 hospitals under Anand Rishiji Hospital and Siddhivinayak Children's Hospital from 15 July 2011 to 15 June 2012, and our observations are discussed below.
- Clustering of cases was noted in the summer months (49%) and in the early winter months (28%). No study has documented the seasonal pattern of scorpion sting, but it is widely observed that cases of scorpion stings increase dramatically in summer and are lowest in winter. This is in keeping with the hibernatory behavior of scorpions in winter. Scorpions tend to creep out of the Burrows in summer, thus increasing the risk of accidental human contact and thus leading to an increased incidence of stings.<sup>6</sup>
- A majority of cases (64%) were from rural areas. Scorpion sting is mainly a rural emergency, with habitats of scorpions being primarily, paddy fields, sugarcane, coconut

and banana plantations. Thus, children from rural areas are at highest risk for accidental contact with scorpions.

- The proportion of scorpion stings, sustained indoor was almost equal to that sustained outdoors. However, female children and children from urban areas were more likely to be stung indoors, when compared to male children from rural population. Rural male children, are more often involved in agricultural activities and hence are more at risk of accidental contacts with scorpions in the fields. This could explain the high incidence of stings sustained outdoors in them.<sup>7</sup>
- The incidence of scorpion sting is higher in children living in Kuchcha houses. Kuchcha houses have mud floors and walls and thatched roofs. Scorpions inhabit the crevices and underground burrows in dwellings and these houses provide a safe haven for them. In contrast, Pukka houses with tiled floors and cemented walls and roofs are safer.<sup>8</sup>
- A higher incidence of sting was noted in lower socioeconomic groups. The high incidence of stings in this group, is probably due to the type of housing and to their predominantly agricultural presents.
- Most of the stings sustained outdoors were in the fields (44%), when children accidentally trod over or handled the scorpion and were stung. Barefoot walking also increased the risk of sustaining a sting. Stings sustained indoor were mostly when children were sleeping on the floor. Infants were stung, while sleeping in a cradle or a swing made of cloth and hung on the roof (Hammock). Stings also occurred when scorpions were hidden in clothes and in poorly lighted rooms. Outdoor stings are more common than indoor stings in all parts of the world.<sup>10</sup> However we noted a significant number of indoor stings especially in the urban areas and in females. Further, a number of stings in infants were related to the cradles and hammocks used to put babies to sleep. This should be considered when suggesting appropriate measures for prevention of scorpion stings. Stings due to *Mesobuthus* species (Red scorpion) were slightly less than those due to *Palamneus* species (Black scorpion). This could be because of an increased prevalence of scorpions of the

Mesobuthus species, scorpions of this species being more venomous, could result in increased rates of hospitalization in children with stings due to this species.<sup>10</sup>

- Night-time stings were more common in our study. This is similar to earlier studies, which showed a preponderance of stings sustained during night-time due to nocturnal habits of the scorpion.<sup>11</sup> This could be because a significant proportion of stings in our study were sustained outdoors while engaged in agriculture-related activities.
- Although any part of the body can be exposed to sting, in 68% of cases in our study, the sting was sustained on the extremities. This is comparable to many studies in the past which showed an increased incidence of stings on the peripheries of 60–80%.<sup>8</sup> Most of the cases in our study were stung when accidentally stepping over or handling scorpion in fields or in poorly lighted rooms. Thus, most of the stings were sustained on extremities.
- The epidemiological factors affecting the severity of scorpion envenomation are studies in the present study. The various factors are season summer being 49% cases, rural area common being 64%, scorpion sting common in lower socioeconomic strata residing in kaccha house. Sting found more in night time and 44% were in outdoor. Sixty-eight percent scorpion sting were on exposed part of body.

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