

A Clinical Study of Scorpion Sting in the Children

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Abstract

In Maharashtra, stings by the red scorpion are quite common in Kankan 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 incidences of scorpion stings, like the type of house in which the victim resides, as "Kuchha" houses, which provide good hiding places for the scorpions, record more instances of stings. environmental factor like summer season also play an important role in the epidemiology.

Keywords: Scorpion Sting; Red Scorpion; Children.

Introduction

India is a country where agriculture forms the infrastructure of the nation's economy. The majority of land is under green belts for cultivation or is occupied by dense forests. Increased deforestation in recent years has increased the exposure of the tribals and other people living in rural areas to various form of wild life. This has led to increased incidences of various bites and stings. Scorpions are found commonly in our country. Hence, a scorpion sting constitutes an important health hazard. They are especially quite common in the rural and coastal areas. An incidences as high as 10-12 cases per month has been reported from Raigad district in Kankan, Maharashtra [1,2]. In India, about 86 species of scorpions are found, of which only two are known to poisonous. These are- 1. Mesobuthus tumulus (The red scorpion) 2. Palamneus swammerdami (the black scorpion) 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 [3,4,5] the effects of envenomation may range from mild local pain and swelling to severe systemic signs and symptoms due to "AUTONOMIC STORM" - a result of excess secretion of catecholamines [6]. The systemic manifestations may range from vomiting, profuse sweating, excess salivation, ptosis [7], priapism, hypertension, pulmonary edema, cardiac arrhythmias to disseminated intravascular coagulation, metabolic derangements hyperglycemia, hypocalcaemia, convulsions, coma and a shock like state. Clinical manifestations like Hemiplegia [8], pancreatitis [9] and gangrene [10] have also been reported. Late complications like acro-osteolysis [11] have also been reported. The impact of scorpion sting on health may be recognized from the following data:

Aims and Objective

1. To study prevalence of scorpion stings in pediatric age group.
2. To evaluate the epidemiological factors affecting the severity of scorpion envenomation.
3. To study the host factors modifying the severity, mortality and morbidity due to scorpion envenomation.
4. To study the clinical features, courses, and complications of scorpion sting.
5. To evaluate various laboratory abnormalities in victims of scorpion sting.

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Material and Methods

Setting

A medical college hospital and its rural health center which acts as a referral center for surrounding areas.

Design

A case series type of study.

Study Period

15/11/2013 to 15/05/2015. (18 months).

Inclusion Criteria

Any child between 0-12 years of age admitted in the hospital with a history of scorpion stings or if the scorpion was seen at or near site of the Accident by the victim or a concerned observer within 15 minutes of the sting.

Exclusion Criteria

Ambiguity regarding the exact nature of the sting whether scorpion or some unknown creature.

Data Analysis

Data will be analyzed as per clinical features shown in the proforma.

When the above criteria were applied, 25 cases admitted in the pediatric ward were confirmed due to scorpion sting. All these cases were examined in detail given in Performa. Specifically directed questions were asked regarding the area of residence

OT was obtained whenever indicated clinically. Electrocardiography & radiography was carried out whenever indicated. The other blood chemistries pertaining to renal profile, bleeding parameters & electrolyte derangements were carried out as and when required.

The cases were classified as follows: 1. Mild - Those with local signs only in the form of pain at the site of sting, burning sensation or edema. The pulse and blood pressure were within normal limits. One or two episodes of vomiting without any other systemic manifestations were included in this group.

Moderate - They had vomiting, profuse sweating, excess salivation, tachycardia, abdominal tenderness, hyperpyrexia, hypertension, pulmonary edema or evidence of myocarditis. They were further subdivided into :- Hypertension group/ Pulmonary edema group/Tachycardia group

Severe- These were patients brought in shock, with weak thread pulses, severe hypotension, circulatory collapse, oliguria, gasping state, comatose or with convulsions.

Statistics-The data will be analyzed using Fishers exact test (a version of CHI Square test for small sample size) and proportion test.

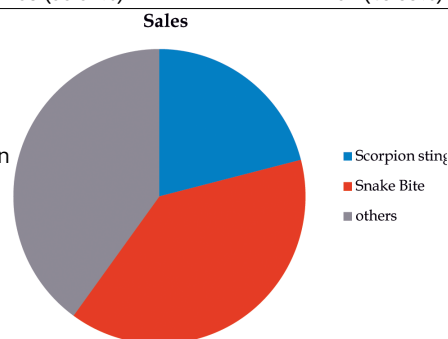
Observation and Results

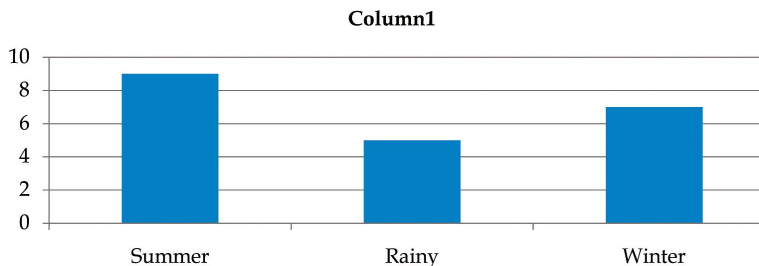
The study was carried out in the setting of a medical college hospital and its urban health center during the period from 15/11/2013 to 15/05/2015. (18 months). The prevalence of scorpion sting is given in table which shows the percentage of admissions due to scorpion sting out of all the admissions due to make and insect bites in pediatric age group.

Table 1: Prevalence of scorpion sting in pediatric age group

Diagnosis	Male	Female	Total (%)
Scorpion sting	18	7	25 (20.83%)
Snake Bite	28	19	47 (39.17%)
Others	22	26	48 (40.00%)
Total (%)	68 (56.67%)	52 (43.33%)	120 (100%)

Pie chart 1: Prevalence of scorpion sting in pediatric age group





Graph 1: Seasonal trend in scorpion sting

Table 2: Age and sex wise distribution

Age Group	Male	Female	Deaths	Total (%)
Less than 1 year	1	0	0	1 (4%)
1-3 years	6	1	2	7 (28%)
3- 10 years	8	6	2	14 (56%)
More than 10 years	3	0	0	3 (12%)
Total (%)	18 (72%)	7 (28%)	4(16%)	25 (100%)

Epidemiological Factors

Season

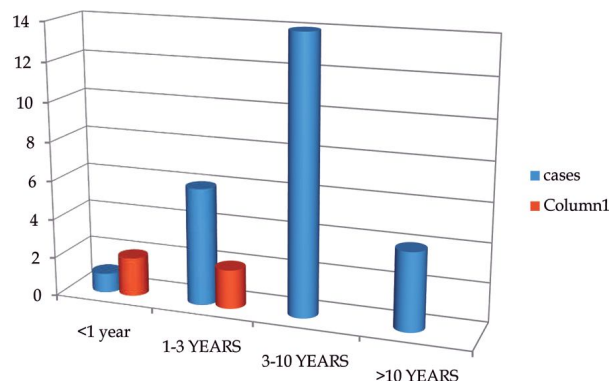
The seasonal trend in the admissions due to scorpion sting and the variation in mortality and severity of envenomation with each season were as shown in figure.

Average prevalence was 1.38 cases per month. Maximum admissions were in May, June and Factory. Highest mortality was in May and June. Admissions in winter were mainly in mild group. Admissions in summer were mainly in moderate to severe envenomation group. When Fishers exact test was applied as this sample size is small, $P > 0.05$. Hence this observation is not statistically significant.

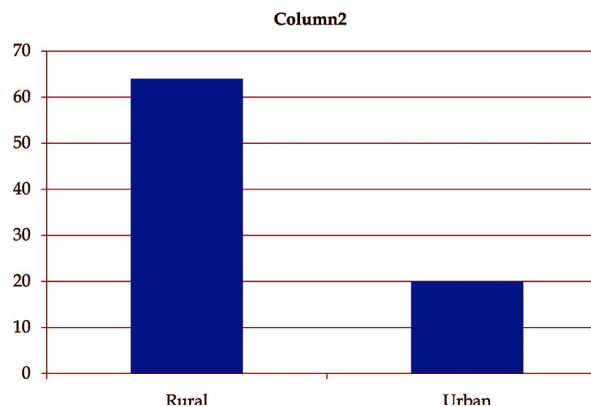
Age and Sex Wise Distribution of the Cases - N = 25

Maximum admissions were in the age 3-10 year age group (56%) followed by 28% in 1-3 year age group. Prevalence was very low in children less than 1 year of age group. Males were affected more than females, male: female ratio 5:2 Mortality was mainly in 1-3 years age group and 3-10 years age group. Percentage wise mortality was more in 1-3 year age group (28.5%) than 3-10 year age group (14.28%). When Fishers exact test was applied to this observation $P > 0.05$. Hence this observation is statistically not significant.

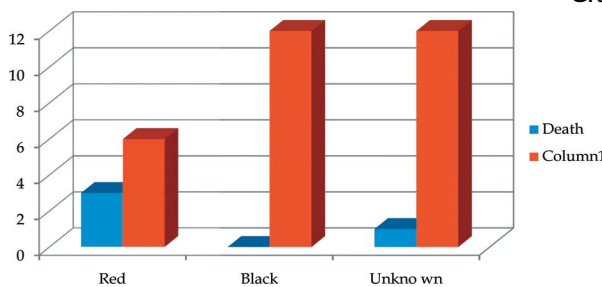
Area: (urban / rural)- Area wise distribution of the various cases, whether rural or urban, was as shown in figure.



Graph 2: Age wise mortality



Graph 3: Percentage cases by area



Graph 4: Type of house

Percentage Cases by Area

The incidents occurred much more in rural areas (64%) as against 36% in urban areas. When Proportion test is applied to this observation, $P < 0.01$. Hence this observation is statistically significant.

Type of House in Which the Victims Resided was also a Major Factor in the Study

80% of the cases occurred in "kuchcha" type of houses i.e. either huts or old stone buildings or "wadas". When Proportion test was applied to this observation, $P < 0.05$. Hence this observation is statistically significant.

Type of scorpion was identified in most of the cases and the prevalence black scorpion stings was as shown in figure. Mortality in Scorpion Sting Cases by Type of Scorpion 12 cases (48%) cases were due to black scorpion sting, while 8 (32%) due to red scorpion sting. There were 3 deaths in Red scorpion sting and 1 death in unknown group. But no deaths were reported were reported in Black scorpion stings. When Fishers exact test was applied, $P = 0.0491$. Hence this observation is statistically significant.

Site of sting was a major determinant of the severity of envenomation and also an indicator of the mode of causation. 60% of the cases were due to stings on the feet, mostly due to accidental stepping on the scorpion.

Table 3: Time of presentation

Time (hrs)	No. of Cases	Deaths	% Mortality
<1 hour	4	0	0
1-5 Hours	13	1	7.69%
5-12 Hours	5	1	20%
>12 Hours	3	2	66.6%

Time of Presentation Since Sting and Mortality

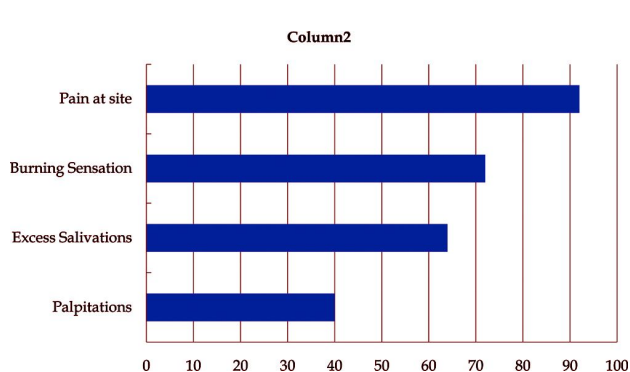
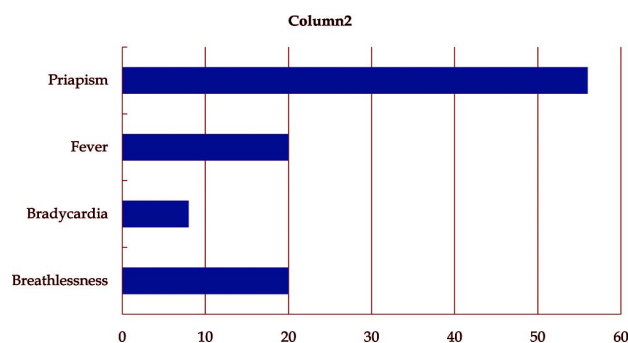
Mean time of presentation was 4.8 ± 1.3 hrs. A delay in presentation was associated. To check the statistical significance Fishers exact test was applied to this data. It was checked between the cases presented within 12 hours to those presented after 12 hours. $P = 0.056$. Hence it is statistically not significant.

Severity of Envenomation

A significant increase in mortality was associated with increasing severity of envenomation. Severe envenomation is associated with 100% mortality. When Fishers exact test is applied to this observation. $P = 0.001$. Hence this observation is statistically significant.

Table 4: Severity of envenomation

Severity	Cases	Deaths	% Mortality
Mild	7	0	0
Moderate	15	1	6.6%
Severe	3	3	100%



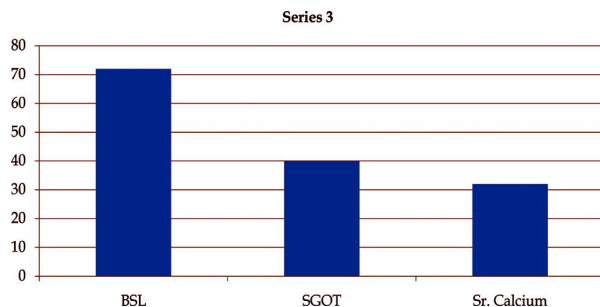
Graph 6 & 7: Clinical features percentage wise

Table 5: ECG finding in scorpion sting

ECG Finding	Number	%
Sinus Tachycardia	5	33.33%
ST-T Changes	2	13.33%
Bradycardia	2	13.33%

Table 6: Blood pressure finding in scorpion sting

Blood Pressure	No. of cases	Deaths	% Mortality
Hypertension	12	1	8.33%
Normotensive	10	0	0
Hypotension	3	3	100%

**Graph 8:** Laboratory finding in scorpion sting*Clinical Features: (Percentage Wise)*

Pain at site of scorpion sting was commonest presenting symptom in 92% of the cases, as was vomiting (80%) and a burning sensation (72%).

Electrocardiography was Done in All 25 Cases, of Which 9 Showed Abnormality. (N = 9)

Sinus tachycardia was the commonest finding (33.33%).

Blood Pressure was Measured in All 25 Cases.

100% Hypotension was associated with an almost 100% mortality. When Fishers exact test was applied to this observation, $P = 0.001$. Hence this observation of increased mortality associated with hypotensive patients as compared to normotensive + hypertensive patients is statistically significant.

Laboratory Abnormalities

72% of the patients had hyperglycemia, whereas SGOT was abnormal in 40% of total. Hypocalcaemia was observed in 32% of total cases.

Analysis and Discussion

Scorpion sting constitutes a public health hazard. It is common in rural areas as well as on the outskirts of cities. In this study, 25 cases admitted with a history of scorpion sting during the study period of 18 months and constituted 20.83% of the admissions due to insect and snake bites during the study period. Prevalence of scorpion sting in pediatric age group - In this study, a total of 25 cases were admitted in the

hospital over a period of 18 months. On an average the annual prevalence was 1.38 cases per month. This was much less than that reported by Bawaskar et al who reported an incidence as high as 10-12 cases per month [1]. However, it was much more than reported in other studies, which was as low as 9-10 cases per year [3] or 5-6 cases per year [4].

*Epidemiology**Seasonal Variation*

A significant variation was found in this study with the maximum cases occurring in the month of May, June and February which formed 44% of the total cases throughout the year. A similar seasonal variation was described by P.M. Mundle, also reported increased number of cases in the month of February and June [4]. A similar difference was found in the severity of envenomation with most cases in winter being mild whereas those in summer being severe. Such differences have also been reported by P.M. Mundle [4].

Vector

In this study, stings due to black scorpion were found to be much more common (48%) than red scorpion stings (32%). This was contradictory to other studies as reported by Bawaskar et al and Rajrajeshwari. (12) This is due to the fact that red scorpions are much more common in konkan area than this part of Pune district.

Host Factors

Age: In this study, maximum numbers of cases were found in age group of 3-10 years (56%) followed by 1-3 years (28%). Similarly the mortality was found to be higher in younger age group of 1-3 years (28.57%) as given that in 3-10 years (14.29%). These findings are in accordance with those of other authors like Ahmed et al who reported a mortality of 22.6% in 0-3 year age group as against 0% in 3-10 year age group [5]. This may be explained by more concentration of injected venom [per square meter surface area due to smaller size of the victim in younger age groups.

Sex

In this study, a much higher prevalence of scorpion

stings was found among males as compared to females with a male ratio of 5:2. Eighteen (72%) of the cases occurred in males as against 7(28%) in the females. Similar incidence has been reported by Ahmed [3] and Rajrajesliwari [12]. This can be explained by the fact that in rural areas the male children have more time to play outdoors and to interact with their peers and indulge in group play.

Site of Sting

The most common site of sting was found to be over the lower extremity (60%) mainly feet and toes. This is very similar to that in the study of Amitai et al in which 61% of stings were on the feet and toes with 30% on the upper extremities. This may be explained by the fact that most of the stings occurred while playing outdoors and are usually due to accidental stepping over the scorpion thus provoking a sting from it.

Time of Presentation

This is defined as the time interval between actual sting and time of presentation of hospital. It was found to be a significant factor influencing the mortality. In this study, the mortality found to increase from the number of cases who presented within one hour (0%) to those presenting within one hour to 66.6% who reported after 12 hours. Similar findings were reported by Ahmed. In this series death rate was 0% in those presenting within 1 hour to 75% who reported after 5 hours [3].

Clinical Features

Pain

At the site of sting was the most common symptom present in 23 out of 25 cases i.e. 92%. This was similar to that in other studies as that of Ahmed who found these symptoms in 100% of his cases [3] and Bawaskar who found it in 80% of his cases. This was due to the toxic components of the venom which stimulated and irritated the free nerve endings causing an intense pain at the site.

Vomiting

This was next common symptoms seen in 80% of the cases in this study. Similar incidence of 86.96% was seen in the study of Ahmed [3], 60% as reported by Rajrajeshwari [12] and 37% as reported by Amitai et al. Cases with only one or two episodes of vomiting with no other systemic signs of symptoms were included in mild group as against those with severe,

continues vomiting. The exact cause of vomiting was not known. Burning sensation: The incidence of this symptom was much higher in this study (72%) as against other reports which range from 40-50% [3,12]. This is usually due to the direct irritant effect of the toxin on nerve endings which may be enhanced by the action of tourniquet tied proximity.

Excess Salivation and Profuse Sweating

These were seen in 64% of the cases in the present study with reports varying from 65% [3] to 69% [12] with a low of 39% [12].

Restlessness: This was seen on ten of the cases amounting to 40% as against that of 60-80% . een in other studies [3, 12]. This may be due to the younger age group found in this study where other systemic manifestations take an upper hand.

Palpitations: This symptom was found in 40% of cases in this study, all in the age group of greater than 4 years as reported by other authors.

Convulsions: In this study, 12% of the patients presented with convulsions as also was seen in the study by Ahmed et al -11% and Rajrajeshwari 6% [3, 12]. Convulsions were associated with 100% mortality and all patients who presented with convulsions expired. This may be due to the fact that convulsions are a late feature of toxicity and indicate severe envenomation which is associated with high mortality.

Pain in abdomen: This was found in 6 cases amounting to 24% cases of the total cases. A similar incidence was reported by Ahmed et al of 26% as against 7% 7% by Shivprakashan [3, 12].

Priapism: This was found in 14 of 25 cases amounting to 56% of the total whereas the 18 male cases it formed an important finding constituting 77% of the male. All the cases with priapism had some or other form of cardiovascular manifestations in this study amounting to appositive predictive value of almost 100%. Similar incidence of priapism has been reported by Bawaskar H.S. A significant correlation between priapism and cardiovascular toxicity was also proposed by Bawaskar who showed a positive predictive value of 86%. This may be due to the excess catecholamines which are responsible for the cardiovascular manifestations and cause priapism by action on penile blood vessels. Fever: This was found in 20% of the cases in this study as reported by others ranging from 15-20%. Excess secretion of catecholamines and their stimulatory action on hypothalamus may be a major factor.

Hypertension: This was found in 12 cases out of

25(48%) with only one patient from this group died. The mortality associated with it was 4%. Similar reports have been published by Bawaskar et al who had 31% incidence of hypertension with a similar report by Amitai et al. This is mainly caused by autonomic storm due to excess release of catecholamines in the circulation due to action of scorpion venom. Hence it is an early manifestation. The mean time of reporting in these cases was 3.2 +/- 1 hour with the range from 1/2 to 6 hours as also found in other studies. The blood pressure range from 130/90 to 160/110 mm of Hg with a mean blood pressure of 140/96 mm of Hg.

Myocarditis: This was found in 24% of the cases and diagnosed by the presence of muffled heart sound, a gallop rhythm, tachycardia and ST - T changes on the electrocardiogram. Most of the cases had hypertension as reported by Bawaskar and others.

Bradycardia: This was found in 2 cases (8%) as in other studies where it ranged from 6-12 % (3,12). It was associated with a high mortality of 100%. All these cases in addition had evidence of poor peripheral circulation, coma, convulsions and both the cases were brought in gasping state and died within 2 hours of admission. Hence it may be a preterminal event. Atropine was not found to be useful in the management as also reported by Bawaskar.

Tachycardia: This was found in 7 cases (28%). It was associated with sinus tachycardia on ECG.

Electrocardiographic Abnormalities: were found in 15 cases amounting to 60% of the cases. The prevalence was similar to that reported that reported in other studies as that of 46% in the study by S. SOFER [17], 41% in the study by Gueron to as high as 95% in the study by Santhankrishnan. The commonest abnormality was sinus tachycardia (33.3%) followed by ST - T changes(26.67%). Sinus Bradycardia was seen in only 2cases amounting to 13.33% but was associated with a much higher mortality. Similar findings were seen in the study by Yaron et al which showed ST-T changes in about 40%. In the study by Santhankrishnan et al T wave inversion and sinus tachycardia were the most common findings in 85% followed by ST-T changes in 60%.

Pulmonary edema: This was found in 5 cases [20%] as also reported by Bawaskar who found an incident of 30% It was usually associated with hypotension, bradycardia, peripheral circulatory failure, frothing at mouth and a high mortality. This was probably due to the late time of presentation and other features of severe systemic envenomation. This was similar to

that reported by Mundle, Gaitonde and others authors [4, 13]. Convulsions were seen in 12% of the cases, which was associated with 100% mortality.

Ptosis (transient external ophthalmoplegia) was found in 2 cases. Both the patients recovered fully with treatment.

Laboratory Studies

Blood sugar level(BSL): Random blood sugar level was estimated in all 25 cases and was found to be elevated in 18%. of them, amounting to 72% of the cases. Normal blood sugar value in our laboratory is 80-120mg%.

In these 72% cases, the mean value was 170mg % with the range from 136-204 mg %. It however had no significant relation with mortality. Hyperglycemia has been variably reported by authors from Sofer 60% with mean blood glucose of 180 mg % [17] and 68 mg% as reported by Gueron.

SGOT (Serum Glutamate Oxalate Transferase): • This was estimated in 15 patients who had ECG abnormalities and was found to be abnormal in 6 cases (40%). Of these 4 patients died amounting to a mortality of 66%. The normal value was 5-25 IU/L whereas it was raised in 6 cases ranging from 40 - 110IU/L with a mean of 75 IU/L.

A raised SGOT was reported by Gueron in 67% of cases as against 30% reported by Santhankrishnan et al. In this series the mean value was 116 units. The increased mortality as seen with raised SGOT could be explained by the fact that it was a definitive indicator of myocardial damage or necrosis.

Serum calcium: Hypocalcaemia was observed in 8 cases (32%).

Outcome

- The prevalence of scorpion sting in pediatric age group was found to be 20.83% of all the cases admitted due to insect and snake bites with an average 1.38 admissions per month.
- Increased incidence was found in summer season as also was an increased mortality during that period.
- Males were affected more than females with a ratio of 5:2
- Maximum prevalence was found in 3-10 years age group. Mortality was found to be lower with an increasing age.
- Sting were more common in rural than urban areas as also in Kuchacha as against Pucca houses.
- Site of sting was most commonly on the lower extremity.
- The time interval between sting and presentation to hospital is a useful prediction of severity with increase in mortality as the time interval increased.

• Moderate envenomation is more common in pediatric age group. Pain at the site of sting was the most common presenting symptom. Frothing at mouth was associated with severe pulmonary edema and a high mortality. Priapism was a useful predictor of cardiovascular toxicity in the male victims. Cardiovascular abnormalities were common with hypertension being the most common. Bradycardia was associated with a high mortality. Pulmonary edema was also associated with a high mortality in this study. Central nervous system toxicity presenting with convulsions was associated with a poor outcome. Hyperglycemia was a common finding but did not directly contribute to the mortality. Pulmonary edema was associated with high mortality. The mortality in this study was 16% thus indicating the importance of scorpion stings as a public health hazard.

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