ORIGINAL ARTICLE

Retrospective Study of Children with Scorpion Envenomation in a Tertiary Care Center of North India

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Abstract

Background: Scorpion envenomation is a common public health problem worldwide and children are at greater risk of developing severe cardiac, respiratory and neurological complications. Scorpion envenomation is a preventable life-threatening medical accident. This study aims at identifying the demographic parameters, clinical features, complications, outcome and response to prazosin in scorpion envenomation of children admitted at tertiary care hospital.
Material and Methods: It was a retrospective cross sectionalstudy conducted on 52 pediatrics cases admitted in department of Paediatrics, Uttar Pradesh University of Medical Science (UPUMS), Saifai from Jan 2016 to Dec 2019 with history of scorpion sting. The clinical details, investigations, treatment and prognosis of all children were evaluated based on the scorpion envenomation. Parameters were expressed as percentage.
Results: Majority of children were in the age group of 1 to 6 years 34 (65.38%) with 32 (61.53%) male and belonging to rural area 44 (84.62 %) with sting at lower limb 27 (51.92%) and gap b/w sting and hospitalization was < 6 hours 28 (53.85%). Most common clinical presentation was pain 46 (88.46%) and pulmonary edema 10 (19.23%) was common complications. Majority of children had received prazosin 49 (94.23%) within 6 hours 26 (51.02 %) with 3-6 doses 24 (48.98 %). 51 (98.0%) were successfully discharged and one patient was expired.
Conclusion: Scorpion envenomation in children is a significant environmental health hazard especially in rural areas. Scorpion envenomation is an acute lifethreatening emergency, and recovery from scorpion sting is hastened by administration of prazosin therapy with excellent prognosis without use of scorpion antivenom

Keywords: Scorpion sting,Scorpion Envenomation, Scorpion treatment, Prazosin, Children

How to cite this article: Yadav, R, Alim, M, Yadav YS, Singh DK, Kumar A. Retrospective Study of Children with Scorpion Envenomation in a Tertiary Care Center of North India . *Asia Pac J Med Toxicol* 2020; 9(3):91-96.

INTRODUCTION

Scorpion envenomation is an acute life threatening medical emergency, if left untreated. It is a frequent event in the tropical, subtropical and the temperate zones of the world and poses a public health problem in certain parts of India (1). Mesobuthustamulus or the Indian red scorpion is the most lethal scorpion species. These are found abundantly in western Maharashtra, northern Karnataka, Andhra Pradesh, Saurashtra,Tamilnadu and Uttar Pradesh (2-3). Mesobuthustamulus or the Indian red scorpion was found in this region and it was same kind of scorpion as found in other part of India. As previous studies were done from other part of country like south and central India, but only few studies were done from North India. Children are at greater risk of developing severe envenomation like cardiac, respiratory and neurological complications as compared to the adults. The clinical manifestations of scorpion envenomation are vomiting, profuse sweating, cold extremities, pulmonary edema and death (4-5). Case fatality rates of 3-22% were reported among children hospitalized for scorpion stings in India (6) Most of the deaths due to scorpion sting are attributed to cardiopulmonary complication such as myocarditis and acute pulmonary edema. (7)

Outcome of scorpion sting depends upon the dose of the venom, the age of the child, the season of the sting and the time lapse between the sting and hospitalization. Time gap between hospitalization of patient and scorpion sting is one of significant risk factors for determining outcome and mortality. Children who present to hospital after six hours of sting have significantly higher mortality rate (8). Prazosin, a postsynaptic alpha –1 blocker, counteracts the effects of excessive catecholamines and arrests the development of severe systemic features. It has been found to be an effective drug for scorpion sting envenomation and it has reduced the mortality rate to 1% as compared to a 30% mortality rate in

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the pre-prazosin era (8-10).

Early administration of prazosin is advocated for better outcome. Therefore, prudent knowledge on systemic manifestations of the disease and timely management is pivotal for physicians.Most of the scorpion sting cases admitted in tertiary care center arebeing referred in a state of peripheral circulatory failure due to lack ofknowledge regarding the clinical course and the outcome.Sparse published data are available regarding scorpion envenomation in children from North India. Few studies were done from North India and in most of previous studies prazosin was given along with scorpion antivenom. In our study, most patients were referred from periphery of rural area without treatment. So we studied effect of prazosin without use of scorpion antivenom in children of northern region of India. So this study would help to fill gap of knowledge in clinical features and management of scorpion envenomation

This study was aimed to describe the demographic parameters, clinical features, complications,outcome and to assess the effect of prazosin without scorpionantivenomin scorpion envenomation in children admitted at a tertiary care hospital.

METHODS

The retrospective observational study was carried out in the department of Pediatrics at tertiary care hospital, Uttar Pradesh University of Medical Science(UPUMS),Saifaiwith the approval of institutional ethical committee for those children who were admitted with the history of scorpion envenomation during January 2016 to December 2019.

All the case sheets of admitted children of age 1 year to 15 years, who were admitted with history of scorpion sting and clinically suspected cases of scorpion sting envenomation in the department of Pediatrics were studied and recruited in this study. Children with h/o of other insect/animal bites were excluded from this study..

Careful history and detailed clinical examination wererecorded from case sheets of admitted children at the time of enrollment of patient's record.Scorpion envenomation patients were selected and examined clinically for local manifestation like pain and swelling, diaphoresis, salivation, cold extremity, features of autonomic storm. The children were examined for development of complications like myocarditis, acute pulmonary edema, shock and encephalopathy. All routine investigations including complete blood count, X-ray chest & Electrocardiogram (ECG) of all admitted children were done.

Patients were classified into three different grades (1-3) according to signs and symptoms, based on Abroug'sClassificatio (11)

Grade I: Local pain

Grade II: Systemic manifestations(autonomic storm) - Hypertension, sweating,vomiting, fever,priapism, shivering

Grade III: Life threatening manifestationspulmonary edema, cardiogenic shock,altered sensorium.

Intervention:

Regular monitoring were done for next 24 hours or till the patientsshows clinical improvement as it was necessary in each case and entered in the proforma. Each child was managed according to clinical manifestation. Asymptomatic children were kept under observation for 24 hours with repeated monitoring of vital signs. Symptomatic children were managed according to their clinical status on the basis of the treatment protocol. Cases with autonomic storm were given Prazosin30µg/kg/dose, next dose was repeated after three hours followed by every six hourly till recovery, maximum eight doses were given.Dopamine was also given to patients who did not respond to prazosin therapy and mechanical ventilation support was given according to severity of symptoms.

Statistical Analysis:

Case sheets of all the scorpion envenomation children were studied and details of clinical presentation, complications, treatment given and outcome were noted in a standard proforma.

Data were analyzed with Microsoft Excel 2010(Microsoft Corp, Redmond, USA). Continuous variables were summarized as mean ± standard deviation as appropriate. Categorical variables were summarized as percentages.

RESULTS

During the study period 52 children with featuressuggestive of scorpion envenomation were admitted in department of Paediatrics, UPUMS, Saifai.The basic demographic characteristics of scorpion envenomation in children are summarized in Table 1. Majority of children were in the age group of 1 to 6 years 34 (65.38%). Among 52 children 32 (61.53) children were male and majority of children were being belongs to the rural area 44 (84.62 %). Around half of children 28 (53.85%) were being sting during April to June season and timing of bite was more common in day time (6 am to 6 pm). Common site of sting was in lower limb 27 (51.92%). In most of children gap b/w sting and hospitalization was < 6 hours 28 (53.85%).

Table 1. Demographic characteristic of scorpion envenomation in children (N=52)

Variables	Number (No.)	Percentage (%)
Age (Years)		
1 to 6	34	65.38
7 to 15	18	34.62
Sex		
Male	32	61.53
Female	20	38.47
Resident		
Rural	44	84.62
Urban	08	15.38
Season		
Jan-March	04	07.70
April-June	28	53.85
July-Sept	14	26.92
Oct-Dec	06	11.53
Time of Bite		
6 am to 6 pm	30	57.70
6pm to 6 am	22	42.30

Table 1. Continued

Variables	Number (No.)	Percentage (%)
Site of Bite		
Upper limb	18	34.61
Lower limb	27	51.92
Trunk	07	13.46
Gap b/w bite & hospitalization		
< 6 hours	28	53.85
6-12 hours	14	26.92
12-24 hours	06	11.53
> 24 hours	04	07.70

Among 52 admitted children of scorpion envenomation, majority children had local pain at sting site 46 (88.46%) as shown in Table 2. The common clinical presentation of scorpion envenomation in children were restlessness 38 (73.07%), sweating24 (46.15%), tachycardia 21(40.38%) followed by cold periphery 19 (36.54%). Other clinical features were noticed in children were difficulty in breathing 10 (19.23%), fever 08 (15.38%), frothing from mouth 06 (11.54%) & altered sensorium 02 (3.85%) (Table 2).

Among 52 admitted children of scorpion envenomation, some children had developed complications. Most common complication was pulmonary edema 10 (19.23%), whereas 08 (15.38%) children had developed myocarditis. Periphery circulatory failure 07 (13.46%), priaprism 06 (11.54%), hypotensive shock 05 (9.61%) seizures 02 (3.85%) and ptosis 01 (1.92%)were other important complications encountered (Table 3).

All 52 children of scorpion envenomation were admitted and their treatments were started according to severity of symptoms. Majority of children had received prazosin 49 (94.23%) and i/v fluids 44 (84.62%). Most of children were received 1-3 doses 16 (26.53 %) & 3-6 doses 24 (48. 98 %) of prazosin. Maximum of children had received prazosin within 6 hours 26 (51.02 %) & 6-12 hours 18 (28. 57%) of sting by scorpion. Dopamine 16 (30.77%) and mechanical ventilation 08 (15.38%) were used as other treatment modality in complications of scorpion envenomation in children (Table 4).

Table 2. Clinical presentation of scorpion envenomation in children (N=52)

Clinical Presentation	No	%
Pain	46	88.46
Restlessness	38	73.07
Sweating	24	46.15
Tachycardia	21	40.38
Cold Periphery	19	36.54
Hypertension	12	23.07
Difficulty in breathing	10	19.23
Fever	08	15.38
Frothing from mouth	06	11.54
Altered Sensorium	02	3.85

Table 3. Complications of scorpion envenomation in children (N=52)

Complications	No.	%
Pulmonary edema	10	19.23
Myocarditis	08	15.38
Periphery circulatory failure	07	13.46
Priaprism	06	11.54
Hypotensive shock	05	9.61
Seizures	02	3.85
Ptosis	01	1.92

Table 4. Treatment given in children of scorpion envenomation (N=52)

Type of Treatment	No	%
IV Fluids	44	84.62
Prazosin	49	94.23
Number of Doses of Prazosin Given		
No dose	03	06.12
1-3 dose	13	26.53
3-6 dose	24	48.98
6-8 dose	09	18.37
Sting-Prazosin interval		
< 6 hours	25	51.02
6-12 hours	14	28.57
12-24 hours	06	12.25
>24hours	04	08.16
Inotropes(Dopamine)	16	30.77
Mechanical Ventilation	08	15.38

Out of 52 children of scorpion envenomation, 51 (98.0%) were successfully discharged and one patient was expired. Majority of children 32(61.54%) were admitted for > 48 hours after admission **(Table 5)**.

DISCUSSION

Scorpion sting envenomation is an acute life threatening medical emergency of villages (12) Dominant clinical effects varies from species to species and from one geographical location to another (13) Case fatality rate varieswidely among different region from3-22 % and over the years, with improvement in management protocols, there has been a dramatic reduction in mortality (14) We studied 52 cases of scorpion sting, admitted todepartment of Paediatrics, UPUMS, Saifai from January 2016 to December 2019. The study was planned to asses clinical profile, outcome of scorpion envenomation in children and to evaluate the effectiveness of prazosin therapy in scorpion envenomation.

In this study, it was found that scorpion envenomation in children were more common in 1-6 years of age groups (65.38%). Previous studies were also hadsimilar findings (15-`17) It is because of children's curiosity about the unknown creatures and their innocent acts like intruding the arthropod's space.Most ofchildren were male (61.53 %)

Table 5. Outcome of scorpion envenomationin children (N=52)

Variables	No	%
Discharged	51	98.0
Expired	01	02.0
Gap b/w admission& outcome		
< 24 hours	08	15.38
24-48 hours	12	23.08
>48 hours	32	61.54

and belonging to rural area (84.64%). These findings were also observed in past studies(15-17) Boys are more prone to scorpion sting because they go outside more commonly.The reason for rural scorpion envenomation in children may be because most of rural public belong to low socio-economic status and they live in kachcha house.

Studies by other investigators have suggested that scorpion envenomation was more common in summer season and scorpion sting timing was day time, usually at lower limb. (18-20) This study also had similar findings. The reason for the high ratio of scorpion sting in extremities is considered to be due to the socio-economic structure depending on agriculture in rural areas, wearing sandals, walking barefoot, putting on shoes without pre-shaking.This study reveals that most of scorpion envenomation children were arrived in hospital withinsix hours of sting. Time lapsed between the sting and admission was probably a key factor for better outcome. Similar findings were also noticed by previous studies.(4, 21) The reason for delay in arriving hospital was approaching a locally available quack or medical facility and reaching at tertiary care center only when there was no improvement in the condition or when condition has worsened.

Clinical observations of patients stung by various species of scorpions have shown that the patientsusually display local symptoms including pain, hyperemia, swelling, burning and itching and severe cases display systemic symptoms including hypotension, hypertension, drying of the mouth, thirst, sweating, tachycardia, dyspnea, paresthesia, hyperthermia, nausea, vomiting, increased body secretions, convulsion, confusion and restlessness.In this study, the most frequently observed symptoms were pain at sting site 46 (88.46%), restlessness 38 (73.07%), sweating 24 (46.15%), tachycardia 21 (40.38%) followed by cold periphery 19 (36.54%).Similar findings were also noted by some other studies. (15-20) Central nervous system manifestations are infrequently encountered in India. The incidence of CNS manifestations reported in India varies from 3% to 7% (3, 12). In this study, two children had presented with seizure & altered sensorium.

Systemic effects of scorpion envenomation include massive autonomic neurotransmitter release (autonomic storm, adrenergic or cholinergic) as a result of excitatory neurotoxins of scorpion venom. Alphareceptor stimulation by the scorpion toxin plays a major role resulting in hypertension, tachycardia, myocardial dysfunction, pulmonary edema and cool extremities. (4, 11)] Previous studies on scorpion envenomation reported left ventricular dysfunction, myocarditis, respiratory failure, Hematuria and pulmonary edema in victims of scorpion stings.(5, 22-25)

In this study, common complications of scorpion envenomation in children were pulmonary edema 10 (19.23%), myocarditis08 (15.38%), periphery circulatory failure 07 (13.46%) andpriaprism 06 (11.54%). In this study, prazosin was administrated to 49(94.23%) with 25 (51.02%) children had received prazosin within six hours of sting and majority of them received 3-6 doses of prazosin. This study showed that nearly 30 % patients with scorpion envenomation also required dopamine and around 15% needed mechanical ventilation. Previous studies by many investigators showed that early and effective prazosin therapy, good supportive care, close monitoring and management of complications can limit the resulting morbidity and mortality significantly.(9, 17, 19, 26)

In our therapeutic approach, prazosin had a prominentposition. Prazosin was administered to all childrenwho developed autonomic storm and excellent resultswere derived with the exception of only one death of patients. Prazosin is an antidote to venom action bothat hypertension and hypotension. At hypertensionstage, it acts as an antihypertensive agent by reducingafter-load. Prazosin has been reported to reverse thehaemodynamic changes even in tachycardia withhypotension of scorpion envenomation, where it actsas a vasodilator agent that corrects hemodynamicabnormality by reducing preload and after-load withouttriggering tachycardia(23) Prazosin reverses both inotropic(hypertension) and hypokinetic (pulmonaryoedema, hypotension and tachycardia) phases evokedby scorpion envenoming. (23) In our opinion, prazosin has dropped mortality ratesuccessfully since the advent of prazosin.

Bawaskar et al (13) found that morbidity and mortality due to scorpion envenomation depend upon time gap between sting and administration of prazosin. We believe that early hospitalization and prazosin therapy mighthave prevented complications and mortality so morbidity and mortality of scorpion envenomation is directly related to the sting-prazosin interval. This study also showed that four children of scorpion envenomation who were admitted after 24 hours of sting had received prazosin and three were recovered completely. This means that morbidity and mortality of patients can be prevented by prazosin and supportive care without scorpion antivenom. Previous studies also showed thatprazosin is as effective as scorpion antivenom. (17, 19)

The gap between scorpion sting and clinical presentation to hospital is one of the significant risk factors, which determine outcome and mortality. Studies by Ramesh Pol and Biswal N have showed that children who presented after six hours of the sting had a significantly higher mortality rate (7.5%). (4, 28) In this study, only one mortality (2%) was encountered due to massive pulmonary edema and delayed arrival at hospital (after 24 hours) since most of children the children in the study group were admitted within six hours and early administration of prazosin therapy with strict monitoring. The mortality rate in various other studies range from 3.5% to 15%.(27-29) This study revealed that hospital stay of most of children with scorpion envenomation was 2-3

days. These findings were similar to previous studies. (30-31)

Prazosin which can be a boon for patients with severe scorpion envenomation in rural setup with poor financial background where scorpion antivenom may not be available. Timely referral and early therapy with prazosin may be lifesaving. The study concludes that scorpion sting cases when treated with prazosin, most of the cases responded well. Early administration of prazosin seems to improve the clinicalsymptoms.Further studiesare needed to clearly define the effect of differentmanagement modalities including prazosin and early scorpion antivenom use in childhood scorpion envenomation.

The strength of our study was that it was done in a rural center with a reasonable amount of data and all children with scorpion envenomation were managed with prazosin therapy with excellent prognosis. We did not use scorpion antivenom in the present study

Further, prospective studies with appropriate sample size calculations are required to determine poor prognostic features and a long-term prospective study may answer the issue of long-term complications following a sting. Further, randomized control trials (RCTs) are also required to answer efficacy of prazosin versus scorpion antivenom in children with scorpion envenomation.

Awareness and educating to health care workers at all primary health centers and government hospitals about scorpion sting and its need for early treatment with prazosin may reduce complications and mortality.A concept similar to that “Golden Hour” in trauma care should be proposed for scorpion envenomation in children.Further, prazosin should be made available widely at primary health centers to prevent complications and mortality due to scorpion envenomation.Scorpion sting should be included in regular medical teaching at least in tropical and subtropical countries.

LIMITATIONS

These include presence of missing data, incomplete or inconsistent data, as it was a retrospective study done by analysis of case records. Further, sample size calculation was not done.

CONCLUSION

Prazosintherapy can be a boon for patients with scorpion envenomation in rural setup where scorpion antivenom may not be available. Further, prazosin should be made available widely at primary health centers to prevent complications and mortality due to scorpion envenomation.

Funding and support : None
Conflicts of interest: None to be declared

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