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Original Research Article

PREDICTORS OF OUTCOME IN CHILDREN WITH SCORPION ENVENOMATION ADMITTED TO A TERTIARY CARE HOSPITAL IN SOUTH INDIA

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ABSTRACT

Background: Scorpion envenomation in children presents a unique clinical challenge and is associated with significant morbidity and mortality. Understanding the predictors of outcomes can aid in early intervention and improved management. This study aimed to analyse the predictors of outcomes in paediatric patients with scorpion envenomation at a tertiary care centre. **Material and Methods:** This study included 78 paediatric patients who presented with scorpion envenomation at the Government Ramanathapuram Medical College, Ramanathapuram. The clinical characteristics, time to prazosin administration, supportive care requirements, and hospital outcomes were analysed. **Result:** The mean age of the children was 6.11 ± 3.72 years, with 61.5% (n=48) being male. The sting occurred in an outdoor setting in 61.5% (n=48) of cases, most commonly affecting the lower extremities. The mean time from the sting to hospitalisation was 1.57 ± 1.62 hours, and the mean time to prazosin administration was 1.67 ± 1.67 hours. The shock was observed in 34.6% (n=27) of the cases, whereas tachycardia (21.8%) and priapism (14.1%) were also notable symptoms. Most patients (70.5%) required only one dose of prazosin. Fourteen patients (17.9%) required hospitalisation for ≥4 days, and one patient (1.3%) succumbed to the illness. **Conclusion:** Scorpion stings in children predominantly affect male children in outdoor settings, commonly involving the extremities. Delayed prazosin administration and shock were significant predictors of prolonged hospital stay and mortality.

INTRODUCTION

The presentation of scorpion sting is usually a dire emergency that requires immediate medical intervention and carries significant mortality, occurring commonly in rural populations and presenting to peripheral centres in India.[1] The exact burden of the disease remains unclear due to ambiguous presentation and reporting, with the predominant incidence being in rural population, but the documented case fatality rates range from 3% to 22% among paediatric patients with scorpion envenomation.[2,3]

There are 86 known species of scorpions in India, but only two are deemed medically significant: Mesobuthus tamulus and Palamneus swammerdami. The Indian red scorpion (Mesobuthus tamulus) is known to produce marked cardiovascular symptoms.[4] After a scorpion sting, there is a gamut of reported symptoms, including pain in and around the site of the sting, autonomic dysfunction including hypertension or hypotension, rise in heart rate, palpitations, pulmonary oedema, priapism, and also, less commonly, central nervous manifestations such as encephalopathy, seizures and coma may be encountered.[5,6]

Children are particularly prone to scorpion stings because of playing outdoors, less awareness, heightened curiosity to explore and also being in scorpion-prone areas at night. In addition, their immune system is not as developed as that of adults; hence, various studies have emphasised that the presentation can be more florid in children than in adults, and the symptomatology, as well as the associated morbidity and mortality, may be more profound. We endeavoured to study the predictors of scorpion envenomation outcomes at our centre. This study aimed to investigate the predictors of scorpion envenomation outcomes in paediatric patients at a tertiary care centre.

MATERIALS AND METHODS

This observational study included 78 paediatric patients who presented with scorpion envenomation at the Government Ramanathapuram Medical

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College, Ramanathapuram. The study was conducted following approval from the Institutional Ethics Committee, and informed consent was obtained from all parents or guardians.

Inclusion and exclusion criteria

Children presenting to the centre with scorpion envenomation were included in the study, whereas those with non-scorpion envenomation were excluded.

Methods

Clinical and demographic data, including age, sex, setting of the sting (indoor vs. outdoor), anatomical site of the sting, time to prazosin administration, presence of autonomic dysfunction, and need for supportive care (fluid resuscitation, inotropes, oxygen therapy, and mechanical ventilation), were extracted from medical records. Children were monitored for various clinical details and endpoints during their hospitalisation. All data were entered into an Excel sheet and presented as frequencies and percentages.

RESULTS

The mean age of the children was 6.11±3.72 years. Of the children, 61.5% (n = 48) were male and the rest were female. The scorpion sting occurred in an outdoor setting in 61.5% (n=48) of the cases, while it occurred in an indoor setting in 38.5% of the cases. The left (n=12) and right (n=11) feet were the most frequently encountered. The mean time interval between sting and hospitalisation was 1.57±1.62 hours (Table 1).

Table 1: Demographic and clinical characteristics

		No of patients	Percentage
Sex	FCH	30	38.5%
	MCH	48	61.5%
Indoor/outdoor	Indoor	30	38.5%
	Outdoor	48	61.5%
Anatomical site of the sting	Abdomen	3	3.8%
	Back	3	3.8%
	Chest wall	1	1.3%
	Head/Scalp	2	2.6%
	Left arm	1	1.3%
	Left foot	12	15.4%
	Left foot, groin	1	1.3%
	Left forearm	1	1.3%
	Left hand	4	5.1%
	Left thigh	2	2.6%
	Lt 3rd toe	1	1.3%
	Lt arm	1	1.3%
	Lt great toe	4	5.1%
	Lt hand	1	1.3%
	Lt hand & Rt FA	1	1.3%
	Lt knee	1	1.3%
	Lt leg	2	2.6%
	Right arm	1	1.3%
	Right forearm	1	1.3%
	Right groin	1	1.3%
	Right hand	2	2.6%
	Right leg	3	3.8%
	Right thigh	2	2.6%
	Rt 4th finger	1	1.3%
	Rt foot	11	14.1%
	Rt great toe	2	2.6%
	Rt hand	3	3.8%
	RT index finger	1	1.3%
	Rt Leg	2	2.6%
	Rt little finger	1	1.3%
	Rt middle finger	1	1.3%
	Rt neck, Lt hand	1	1.3%
	Rt thigh	1	1.3%
	Rt thumb	3	3.8%

All patients complained of pain; other complaints noted were excess salivation (n=8), excess sweating (n=22), fever (n=5), priapism (n=11), tachycardia and bradycardia (n=3), shock (n=27), loss of consciousness (n=2), hypotension (n=4), bleeding and cellulitis (n=1 each) (Table 2).

Table 2: Frequency of associated symptoms

		No of patients	Percentage
Pain	Yes	78	100%
Vomiting	No	68	87.2%
	Yes	10	12.8%

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Salivation	No	70	89.7%
	Yes	8	10.3%
Sweating	No	56	71.8%
	Yes	22	28.2%
Fever	No	73	93.6%
	Yes	5	6.4%
Priapism	No	67	85.9%
	Yes	11	14.1%
Tachycardia	No	61	78.2%
	Yes	17	21.8%
Bradycardia	No	75	96.2%
	Yes	3	3.8%
Hypertension	No	77	98.7%
	Yes	1	1.3%
Hypotension	No	74	94.9%
	Yes	4	5.1%
Shock	No	51	65.4%
	Yes	27	34.6%
Aloc	No	76	97.4%
	Yes	2	2.6%
Oliguria	No	77	98.7%
	Yes	1	1.3%
Pulmonary oedema	No	78	100%
Others	Bleeding	1	1.3%
	Cellulitis left foot	1	1.3%
	No	76	97.4%

Among the complete blood count (CBC) findings, leucocytosis was observed in two (2.6%) patients, while 76 (97.4%) had normal values. Abnormal results were noted for random blood sugar (RBS) 1 (1.3%), renal function tests (RFT) 1 (1.3%), serum electrolytes (SE) 1 (1.3%), liver function tests (LFT) 1 (1.3%), chest X-ray (CXR) 1 (1.3%), and electrocardiogram (ECG) 1 (1.3%), with 77 (98.7%) patients having normal results for each parameter. Additionally, one (1.3%) patient had an abnormal prothrombin time-international normalised ratio (PT-INR), whereas 77 (98.7%) had normal values (Table 3).

Table 3: Frequency of abnormal investigations

		No of patients	Percentage
CBC	Leucocytosis	2	2.6%
	Normal	76	97.4%
RBS	Abnormal	1	1.3%
	Normal	77	98.7%
RFT	Abnormal	1	1.3%
	Normal	77	98.7%
SE	Abnormal	1	1.3%
	Normal	77	98.7%
LFT	Abnormal	1	1.3%
	Normal	77	98.7%
CXR	Abnormal	1	1.3%
	Normal	77	98.7%
ECG	Abnormal	1	1.3%
	Normal	77	98.7%
Others	Normal	77	98.7%
	PT INR abnormal	1	1.3%

The time interval between the sting and prazosin administration was 1.67±1.67 hours. Fifty-five patients (70.5%) received one dose of prazosin, and one patient required five doses. Of the 28 patients who required NS boluses, one was sufficient in 20. Dobutamine was required in 10 patients, oxygen in 22 patients, CPAP in 3 patients, and mechanical ventilation in one patient. Nitroglycerin was required in one patient (Table 4).

Table 4: Supportive treatment requirements

		No of patients	Percentage
Prazosin doses	1	55	70.5%
	2	13	16.7%
	3	8	10.3%
	4	1	1.3%
	5	1	1.3%
No of NS boluses	1	20	25.6%
	2	6	7.7%

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	3	1	1.3%
	4	1	1.3%
	Nil	50	64.1%
Dobutamine days	1	6	7.7%
	2	2	2.6%
	3	2	2.6%
	Nil	68	87.2%
Oxygen	No	56	71.8%
	Yes	22	28.2%
NTG	1	1	1.3%
	2	1	1.3%
	3	1	1.3%
	Nil	75	96.2%
CPAP	No	75	96.2%
	Yes	3	3.8%
MV	Yes	1	1.3%
	Nil	77	98.7%
Others	Paracetamol	78	100%

Fourteen patients required a hospital stay of 4 days or longer, and the rest were discharged within 3 days. The mortality rate was 1.3%, with one patient dying and the others being discharged after recovery (Table 5).

Table 5: Duration of stay and outcome

		No of patients	Percentage
Duration of stay	1	4	5.1%
	2	16	20.5%
	3	44	56.4%
	4	8	10.3%
	5	5	6.4%
	6	1	1.3%
Outcome	Discharged	77	98.7%
	Expired	1	1.3%

DISCUSSION

Our study provides significant insights into the clinical profile, treatment outcomes, and predictors of severe complications in paediatric patients with scorpion stings.

Demographics and epidemiology

In our study, the mean age of affected children was 6.11 ± 3.72 years, aligning closely with Rebahi et al., who reported a mean age of 6.3 ± 4.2 years.[14] The male predominance (61.5%) in our study is consistent with multiple studies, including those by Yadav et al. and Baseer et al., who reported 61.53% and 58.4% male cases.[15,16] Additionally, the majority of stings occurred in outdoor settings (61.5%), similar to Baseer et al., where outdoor stings were more frequent than indoor ones.[16] Lower extremity stings were the most common in our study, consistent with Yadav et al., who reported that 51.92% of stings affected the lower limb.[15]

Clinical presentation

In our study, pain was a common symptom (100%), comparable to Yadav et al., where 88.46% reported pain.15 We observed that 28.2% of patients exhibited excess sweating, aligning with Saad et al., who noted sweating in 81.5% of cases.[17] Kannan et al. and Biswal et al., in particular, noted pain, paraesthesia, and sweating as common presentations alongside cold extremities.[7,9]

We found tachycardia (21.8%) to be a prominent finding, and it was also reported by Rebahi et al. as significantly associated with mortality.[14] Pazhanisamy et al. noted tachycardia to be present in more than 40% of children.10 Additionally, we noted shock in 34.6% of cases, higher than Meena et al., where shock cases were classified into varying severity grades (15.38% Grade III cases).[18] Pradeep et al. reported a case of a 19-year-old male with cardiogenic shock and pulmonary oedema who recovered with good LV function within 7 days.[11] This suggests that our study had a higher proportion of severe cases.

Treatment and hospitalization

In our study, the mean time to prazosin administration was 1.67 ± 1.67 h, which was shorter than that reported by Kumar et al., where the sting-prazosin interval varied widely (2-28 hours).[19] In our study, early administration of prazosin was critical, as delayed administration (>2 h) was associated with prolonged hospitalisation ($p<0.05$). Similarly, Kumar et al. found that prazosin administration after 4 hours was an independent predictor of myocardial dysfunction.20 Furthermore, 70.5% of our patients received only one dose of prazosin, contrasting with Yadav et al., where 48.98% required 3-6 doses.[15] The hospitalization duration was ≥4 days in 17.9% of our cases, comparable to Meena et al., where the mean duration was 2.36 ± 1.2 days, but lower than Soren et al., who reported a 3-day mean stay.[18,21]

Kannan et al., similarly conducted in children with scorpion stings, recorded a sting-to-prazosin interval of 2.7 hours, and a maximum interval of 5 h was

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observed. The mean number of prazosin doses was 1.7, and five doses were administered. The mean duration of hospital stay was 2.8 days, and the maximum duration was 7 days. The mean autonomic storm recovery time was 8.4 hours, with a maximum recovery time of around 21 hours.[7] Parab et al. also emphasized that early intervention with Prazosin within 8 hours was life-saving.[8]

Predictors of worse outcomes

We found that delayed prazosin administration and the presence of shock were major predictors of poor outcomes. Our findings align with Baseer et al., where mortality was significantly higher in children with agitation, coma, convulsions, arrhythmia, heart failure, and pulmonary oedema.[16] In our study, a mortality rate of 1.3% (n=1) was observed, lower than the 13.6% mortality reported by Baseer et al. but comparable to Yadav et al., where one fatality was recorded.[15,16]

Clinical and management implications

In our study, early administration of prazosin (≤2 hours) was a critical determinant of convenient outcomes, consistent with the findings of Kumar et al. and Rameshbabu et al., where sensitisation programs on prazosin therapy significantly reduced complications.[19,22] Our findings also emphasise the role of shock in prolonging hospital stay and increasing intensive care needs. Thus, early recognition and the institution of quality care are vital for improving outcomes. This is complicated by the fact that most patients live in rural areas and have limited access to healthcare resources. There is also a need to educate primary healthcare workers about worrying symptoms and how to diagnose them early. It is also necessary to reach out to society about early reporting to the hospital so that anti-venom may be given.[12,13]

Limitations

This study is limited by its single-centre design, which may affect the generalisability of the findings to other regions with different healthcare infrastructures and scorpion species. Additionally, the sample size was relatively small, limiting the statistical power for rare outcomes, such as mortality. The study primarily relied on retrospective data from medical records, which may have introduced information bias. Future multicentre studies with larger cohorts and prospective designs are needed to validate these findings and refine predictive models for paediatric scorpion envenomation outcomes.

CONCLUSION

Scorpion stings predominantly affect male children, with outdoor stings being common and lower extremities frequently targeted. The primary symptom is pain, often accompanied by autonomic dysfunction. The early administration of prazosin, ideally within two hours, is crucial for better clinical outcomes. Poor prognostic factors included delayed prazosin administration and the presence of shock. Despite these risks, overall mortality remains relatively low. To improve outcomes, it is essential to educate primary healthcare workers on early diagnosis and management, enhance public awareness to encourage early reporting and strengthen rural healthcare access. Future research should focus on optimising treatment protocols and reducing the time to treatment, particularly in resource-limited settings.

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