e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2024; 14(12); 115-120

Original Research Article

Clinical Profile of Snake Bites in Children at Tertiary Care Centre

Buddagandla Harathamma[1], Nagesh Nayak Meravath[2], Sathvan Singh Porika[3], Shavala Prem Kumar[4]

[1]Senior Resident, Department of Paediatrics ESIC Medical College Sanathnagar, Hyderabad, Telangana
[2]Assistant Professor, Department of Paediatrics, Govt. Medical College, Mahabubnagar, Telangana
[3]Assistant Professor, Department of Pediatrics ESIC Medical College, Sanathnagar Hyderabad, Telangana
[4]Senior Resident, Department of Paediatrics ESIC Medical College Sanath Nagar Hyderabad, Telangana

Received: 01-12-2024 / Revised: 12-12-2024 / Accepted: 23-12-2024
Corresponding Author: Dr. Shavala Prem Kumar
Conflict of interest: Nil

Abstract

Background: Snakebite envenomation kills many people each year around the world, particularly in rural areas of developing countries. this study was conducted to assess the clinical profile and outcome of snakebites in children less than 12 years.

Materials and Methods: This prospective observational study was conducted in the Department of Pediatrics for a period of one year. All willing pediatric patients with a history of snakebites who were admitted were enrolled for the study. . Parameters studies included clinico-demographic profile of patients, treatment provided, and complications, if any.

Results: Majority of patients were in the age group of 9 to 12 years, and 68% were male. 82% of patients were from rural area, and lower limb was the commonest site of snakebite (80%). In most of the patients, clinical symptoms appeared within 3-6 hours (34%), Complications were reported in 9 patients, among which respiratory failure and encephalopathy were more common. Complications were significantly higher in patients with severe envenomation, requiring higher number of ASV vials.

Conclusion: Delays in reaching the hospital, improper first aid, lack of ASV availability, and adverse reactions to ASV can worsen outcomes. Early referral to tertiary care significantly reduces fatality rates, highlighting the importance of timely medical intervention.

Keywords: anti-snake venom; outcome assessment; snakebite; snakebite envenoming;

Introduction

Snakebite envenomation causes significant mortality globally, particularly in rural areas of developing nations. [1] Agricultural laborers in countries like India are especially vulnerable during the rainy season. [2] Common scenarios for snakebites include stepping on snakes while barefoot, encountering snakes indoors at night (e.g., kraits), or sleeping on the floor. In June 2017, the World Health Organization (WHO) classified snakebite as a neglected tropical disease due to its public health impact in tropical and subtropical regions. [3] The global burden disproportionately affects children in low-income settings, often resulting in lasting physical and psychological consequences. [4,5] Snakes evoke widespread fear and are surrounded by numerous superstitions. Found worldwide except in the Arctic, New Zealand, and Ireland, they are most prevalent in tropical and subtropical regions. [6] Of over 2,000 snake species globally, about 300 are found in India, with 52 being venomous. Major venomous families in India include Elapidae (e.g., common cobra Naja naja, king cobra, and common krait Bungarus caeruleus), Viperidae (e.g., Russell's viper, saw-scaled viper, and pit viper), and Hydrophidae (sea snakes). [7] School-aged children, adolescents, and young adults are frequent victims, with rural areas reporting the highest morbidity and mortality. Children, due to their smaller body mass, experience faster systemic envenomation, leading to higher mortality rates. [8] Contributing factors include delays in seeking care and inadequate awareness among primary care physicians regarding proper treatment protocols. Clinical manifestations are classified as neurotoxic, hematotoxic, or locally toxic, depending on the venom type. Prompt diagnosis and treatment significantly improve outcomes. Despite the prevalence of snakebites, few studies focus on pediatric cases, particularly in India, highlighting

the need for further research on their clinical profiles. Thus, this study was conducted to assess the clinical profile and outcome of snakebites in children less than 12 years.

Materials and Methods

This prospective observational study was conducted in the Department of Pediatrics, from December 2020 to November 2021 after obtaining approval from Institutional Ethical Committee. All willing pediatric patients with a history of snakebites who were admitted to the department of pediatrics during study period were enrolled for the study. However, unwilling patients/ guardian, patients above 12 years of age, those who left against medical advice, and unknown cases of snake bite in the absence of fang marks or any other symptoms, not suggestive of venomous snake bite were excluded from the study. Written informed consent was obtained from each patients prior to their enrolment in the study. Parameters studied included clinico-demographic profile of patients, treatment provided, and complications, if any.

Statistical analysis

The collected data was entered into MS EXCEL spread sheet, analyzed using Epi Info software version 7.2.2.6, and represented in the form of suitable tables and charts. The descriptive data was presented as frequencies and the association using a chi-square test where p-Value of less than 0.05 was taken as a significant association.

Results:

In this study, 22 of 50 patients were in the age group of 9 to 12 years, and majority were male (68%). 41 patients were from rural area, and lower limb was the commonest site of snakebite observed in 40 patients. Fangs marks were observed in 47 patients, and 13 patients had received primary treatment before visiting our institute. In most of the patients, clinical symptoms appeared within 3-6 hours (34%), followed by 1-2 hours (30%). (Table 1)

Table 1: Characteristics of Study Patients

Parameters		Total (n=50)
Age groups (in years)	≤ 4	12 (24%)
	5-8	16 (32%)
	9-12	22 (44%)
Gender	Male	34 (68%)
	Female	16 (32%)
Residence	Urban	9 (18%)
	Rural	41 (82%)
Site	Upper limb	9 (18%)
	Lower limb	40 (80%)
	Others	1 (2%)
Fang marks	Two marks	43(86%)
	Multiple marks	4 (8%)
	Total present	47 (94%)
	Absent	3 (6%)
Treatment received before presenting to hospital	Only Inj. TT	4 (8%)
	Only ASV	3 (6%)
	Inj. TT & ASV	5 (10%)
	Tie	1 (2%)
	Total	13 (26%)
	No	37 (74%)
Onset of clinical symptoms (hours)	1 –2	15 (30%)
	3 –6	17 (34%)
	≥ 7	3 (6%)
	NIL	15(30%)

Majority of the snakebites occurred during the months June to September. (Figure 1)

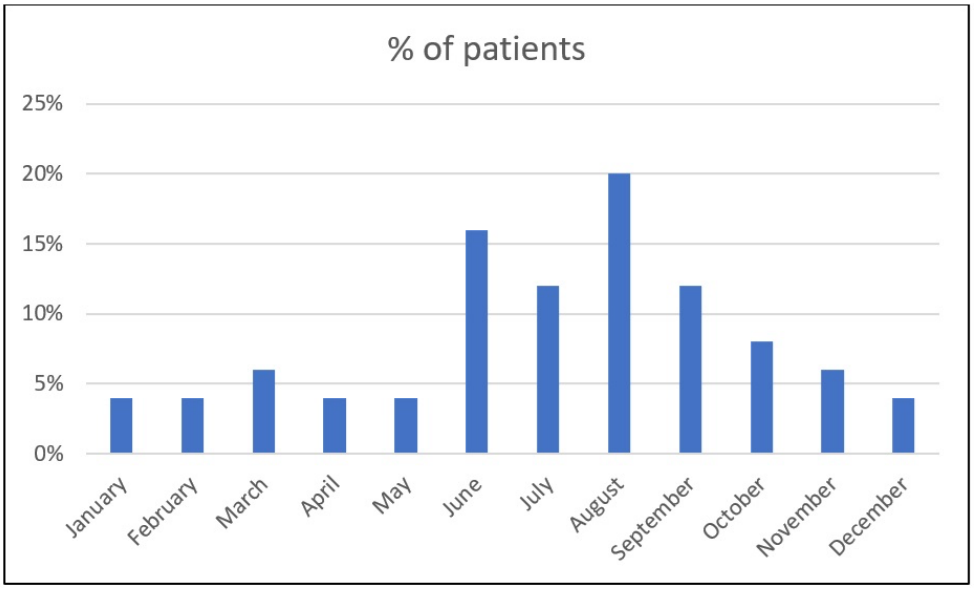

Figure 1: Month-Wise Distribution of Snakebite

Each case of snakebite presented with more than one clinical feature, with the commonest clinical feature being pain and local edema followed by cellulitis, whereas 15 cases were dry bite. (Table 2)

Table 2: Type of snake & clinical features

Type of Snake bites			Clinical Features of Snake Bite								
		Pain at the bite site	Local swelling	Cellulitis	Abdominal pain & vomitings	Hematotoxic	Respiratory distress	Ptosis	Diplopia	Dry bite	Total
Known bite	Non- poisonous	0	0	0	0	0	0	0	0	4	4(3%)
	Viper	18	18	15	0	6	0	1	0	7	66(50%)
	Krait	0	0	0	3	0	3	3	3	0	12(9.1%)
	Cobra	4	4	0	0	0	1	4	4	0	17(12.9%)
Unknown snake bite		9	9	5	1	3	1	1	0	4	33(25%)
Total		31 (23.6%)	31 (23.6%)	20 (15.2%)	4 (3%)	9 (6.87%)	5 (3.8%)	9 (6.87%)	7 (5.3%)	15 (11.4%)	131 (100%)**

** Each case of snakebite presented with more than one clinical feature

Complications were reported in 9 patients, among which respiratory failure and encephalopathy were more common. (Table 3)

Table 3: Complications of a snakebite envenomation

Complications of snake bite	N (%)
Present	9 (18%)
a) Compartment syndrome	1 (2%)
b) DIC	1 (2%)
c) Encephalopathy	1 (2%)
d) Gangrene	1 (2%)
e) Respiratory failure	2 (4%)
f) Swelling of Joints (>1 Joint)	1 (2%)
g) Respiratory failure + Encephalopathy	2 (4%)
Absent	41 (82%)
Total	50 (100%)

More the duration between snakebite and hospital visit and later initiation of anti-snake venom (ASV) had more

complications. Complications were significantly higher in patients with severe envenomation, requiring higher number of ASV vials ($p<0.05$). (Table 4)

Table 4: Association of Study Parameters with Complications in Patients

Parameters		Complication		Total (n=50)
		Yes	No	
Duration between snakebite and hospital visit	< 4	3 (11.5)	23 (88.5)	26 (52%)
	≥ 4	6 (25.0)	18 (75.0)	24 (48%)
No. of ASV vials used	0	00 (0.00)	17 (100.0)	17 (34%)
	10	1 (6.2)	15 (93.8)	16 (32%)
	> 10	8 (47.1)	9 (52.9)	17 (34%)

Mortality was reported in only one patient. There was significant association between patient outcome and onset of clinical symptoms (≤6 hours), duration of hospital stay (>7 days), presence of complications, other modalities like ventilator support, and type of snake (Krait species). (Table 5)

Table 5: Association of study parameters with outcome in patients

Parameters		Outcome		Total (n=50)	p-value
		Alive	Death		
Age groups (in years)	≤ 4	12 (100%)	00 (0%)	12 (24%)	>0.05
	5-8	16 (100%)	00 (0%)	16 (32%)	
	9-12	21 (95.5%)	1 (4.5%)	22 (44%)	
Gender	Male	34 (100%)	00 (0%)	34 (68%)	>0.05
	Female	15 (93.8%)	1 (6.3%)	16 (32%)	
Residence	Urban	9 (100%)	00 (0%)	9 (18%)	>0.05
	Rural	40 (97.6%)	1 (2.4%)	41 (82%)	
Onset of clinical symptoms (in hours)	1 –2	15 (100%)	00 (0%)	15 (30%)	<0.05
	3 –6	17 (100%)	00 (0%)	17 (34%)	
	≥ 7	2 (66.7%)	1 (33.3%)	3 (6%)	
	NIL	15 (100%)	00 (0%)	15(30%)	
Duration of hospital stay (in days)	≤ 7	40 (100%)	00 (0%)	40 (80%)	<0.05
	> 7	9 (90%)	1 (10%)	10 (20%)	
Duration between snake bite and hospital visit	< 4	26 (100%)	00 (0%)	26 (52%)	>0.05
	≥ 4	23 (95.8%)	1 (4.2%)	24 (48%)	
Complications	Present	8 (88.9%)	1 (11.1%)	9 (18%)	<0.05
	Absent	41 (100%)	00 (0%)	41 (82%)	
No of ASV vials used	0	17 (100%)	00 (0%)	17 (34%)	>0.05
	10	16(100%)	00 (0%)	16 (32%)	
	> 10	16 (94.1%)	1 (5.9%)	17 (34%)	
Other modalities of treatment used	Blood products	1 (100%)	00 (0%)	1 (2.0)	<0.05
	Fasciotomy	2 (100%)	00 (0%)	2 (4%)	
	Ventilator support	4 (80%)	1 (20%)	5 (10%)	
	None	42 (100%)	00 (0%)	42 (84%)	
Type of snake	Cobra	4 (100.0)	00 (0.00)	4 (8%)	<0.05
	Krait	2 (66.7)	1 (33.3)	3 (6%)	
	Viper	25 (100.0)	00 (0.00)	25 (50%)	
	Non-poisonous	4 (100.0)	00 (0.00)	4 (8%)	
	Unknown snake	14 (100.0)	00 (0.00)	14 (28%)	

Discussion

This study included 50 children who were bitten by snakes, with most of them being between 9 and 12 years old, followed by 5 to 8 years. Previous literature showed that boys over six years of age were at a higher risk, likely because they are more involved in outdoor activities, especially in rural areas. [9,10] In this study, 68% of the victims were boys, while 32% were girls, which aligns with earlier findings by Karunanayake RK et al [11]. Most of the snakebites (82%) happened in rural areas, a pattern similar to what Pandala et al[10] found, where 83.5% of cases came from rural settings. The bites mostly occurred on the lower limbs (80%), with a lower-to-upper limb ratio of 4.4:1. This is likely because children accidentally step on snakes while walking or playing, often in the dark. Similar observations have been reported

in other studies.[9,11] Snakebites were most common between June and September (50%), during the monsoon season when snakes are displaced from their habitats due to flooding, as was reported by Bhusanpatnaik et al [12].

In 64% of cases, symptoms appeared within 1–6 hours, which is consistent with findings by Vinayak Kshirnagar et al [9] in rural India. However, when symptoms appeared after 6 hours, they were usually more severe, including neurological problems, and were associated with poorer outcomes. This highlights the importance of regular clinical monitoring, as symptoms can change depending on the snake species involved. Only 26% of children received any treatment before reaching the hospital in this study, and just 5 cases were given both tetanus toxoid (T.T) and anti-snake venom (ASV). Fang marks were visible in 94% of cases, but these marks alone cannot confirm envenomation since even non-venomous bites can leave similar marks. Of the three cases which presented without fang marks, in one case, child presented with encephalopathy and two others showed blood-related complications.

Vipers were the most common species identified (50%) in this study. Shyna et al [13] also reported a higher occurrence of viper bites, whereas Sharma et al [14] found elapid bites to be more frequent in certain regions. Interestingly, 30% of the cases were "dry bites," where no venom was injected, suggesting that many children were brought to the hospital out of fear rather than actual symptoms. Common complications in this study included pain and swelling (23.6%), bleeding (6.8%), cellulitis (15.2%), and in some cases, respiratory paralysis requiring ventilator support. A positive 20-minute whole blood clotting time was often a key sign for administering ASV. We observed that Viper bites caused the most varied symptoms, including bleeding and localized swelling. Bhusanpatnaik B et al [12] noted cellulitis as a common issue, which was also observed in this study. One child bitten by a Russell viper showed ptosis, a neurotoxic symptom in this study. Serious complications like blood clotting issues, compartment syndrome, and gangrene required surgical treatment.

Unidentified snake bites made up 28% of cases. Many of these children experienced pain, swelling, or cellulitis, while some presented with neurotoxic symptoms in this study. Since children often cannot identify the snake, a syndromic approach to treatment is crucial. Elapid bites, particularly from kraits and cobras, showed distinct patterns. Kraits, which bite mostly at night, caused severe complications like respiratory paralysis but had minimal local symptoms, making them harder to detect. This aligns with findings by Bawaskar HS et al [15]. Cobra bites, which occur more often during the day, caused swelling and neurotoxic symptoms, which responded well to neostigmine. Cobra venom contains alpha-bungarotoxin, which temporarily blocks nerve receptors, while enzymes like hyaluronidase cause swelling. [15]

Of the three krait bites and one unidentified bite that caused encephalopathy, one case resulted in death. Krait bites are often painless and lack visible signs, which delays recognition and treatment. Among the four krait cases, respiratory paralysis required artificial ventilation. Neurotoxic symptoms like abdominal pain were also noted. Anticholinergic drugs are less effective for krait venom due to beta-bungarotoxin, which irreversibly damages nerve receptors, though some studies (42) suggest they can help in specific cases. Respiratory paralysis was the most serious complication of elapid bites, affecting five children. Sadly, one child died, leading to a mortality rate of 2%, comparable to a previous study. [16] Morbidity was higher in venomous bites, particularly from vipers.

ASV was administered to 33 children, with 17 requiring more than 10 vials (34%). Anaphylactic reactions occurred in 18% of cases but were successfully managed with antihistamines and adrenaline. Seneviratne SL et al [17] observed a higher rate of adverse reactions (55%) in their study. The time between the bite and hospital admission played a critical role in outcomes. Complications were more frequent when this delay exceeded four hours. Respiratory failure was the leading cause of death, with krait bites being the most fatal due to delayed symptoms and treatment.

Conclusion

Snakebites are a preventable yet often overlooked public health hazard in rural areas, particularly among children. Snakebites are a time-sensitive medical emergency requiring immediate hospital transfer for anti-snake venom (ASV) administration to neutralize the venom. Delays in reaching the hospital, improper first aid, lack of ASV availability, and adverse reactions to ASV can worsen outcomes. Early referral to tertiary care significantly reduces fatality rates, highlighting the importance of timely medical intervention.

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