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Snake bite in Children: A retrospective study in a tertiary care centre in Southern India

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ABSTRACT
Background: *Snake bite is the most neglected disease and causes significant mortality in both adults and children. Studies on pediatric snake bite are limited. Timely administration of anti-snake venom can prevent morbidity and mortality due to snake bite. Our study emphasizes the importance of timely ASV administration and the need for improving primary and secondary health care centers in providing ASV.*
Objective: *The objective of this study is to describe the demographic pattern, clinical features and outcome of snake bitten children presenting to a tertiary care hospital in Southern India.*
Study design: *A hospital record based retrospective descriptive study.*
Setting: *Pediatric intensive care unit of a tertiary care hospital in Southern India.*
Materials and Methods: *Seventy children admitted with snake bite from January 2016 to December 2016 were studied. The data were analyzed using Statistical Package for Social Services (SPSS) software Version 21.0 (Armonk, NY: IBM Corp).*
Results: *There were 70 children enrolled in the study. Out of this 43 were males, 27 were females. Most bites occurred after 6 pm. Lower limb is the most commonly bitten site. 33 children had toxic features and required anti-snake venom for treatment. Hemotoxicity is more common than neurotoxicity. 12.1% developed allergic reaction to ASV. Death occurred in 6 patients. Neuroparalysis is the most important factor contributing to mortality.*
Conclusion: *Awareness must be created among public on early approach to health care after snake bite. Strengthening primary and secondary health care centers to manage snake bite cases is the need of the hour.*
Keywords: *Snake bite, anti- snake venom, toxicity, neuroparalysis, hemotoxicity, outcome.*

INTRODUCTION

Snake bite is an important cause of death in developing countries. It is included in the list of neglected tropical diseases by the World Health Organization. About 216 identified species of snakes are present in India, most of which are nonpoisonous. Among the poisonous species four namely common cobra (Najanaja), Russell's viper (Dabiolarusselii), saw-scaled viper (Echiscari-natus) and common krait (Bungaruscaeruleus) are highly venomous and believed to be responsible for most of the poisonous bites in India[1,2].

Viperine bites cause hemostatic abnormalities. Krait bite causes neuroparalysis. Cobra bite in addition to neuroparalysis causes severe local envenomation with blistering and necrosis[3]. Hospital based reports estimate about 1,300 to 50,000 annual deaths from snakebites per year in India. It is reported only 40% people report to hospital after snake bite and majority seek local treatment[4]. Timely ASV administration can reduce deaths due to snake bite. Adverse reactions to ASV have often been identified as reason for not administering ASV in smaller local hospitals. The objective of this study is to describe the epidemiological and clinical features of snake bite victims and other factors like referral time, delay in ASV administration and outcome of these patients.

MATERIALS AND METHODS

This is a hospital record based retrospective descriptive study in Government medical college hospital, Vellore, a tertiary referral centre.

Children less than 12 years admitted with alleged history of snake bitefrom January 2016 to December 2016were selected for the study. Data of seventy such children were collected from the Medical Records Department. Diagnosis of the species of snake is important for optimal clinical management. However this is not possible always and hence in our study syndromic approach is used in treating snake bite victims. We looked for toxicities in all witnessed and suspected snake bites with fang marks. We treated patients with bleeding tendencies, neuroparalysis and progressive cellulitis with polyvalent Anti Snake Venom as per WHO guidelines. Data on demographic factors, clinical features, complications, treatment details, delay in seeking treatment and outcome of the victims were recorded.

For continuous data such as age, the descriptive statistics Mean ± SD was presented. For categorical data, the number of participants and percentage was presented. The age and sex distribution was displayed to the data. The Fisher's exact test was used to assess the association between factors and outcome. All tests was two-sided at α=0.05 level of significance. All analyses was done using Statistical Package for Social Services (SPSS) software Version 21.0 (Armonk, NY: IBM Corp).

RESULTS

70 children admitted with snake bite from January 2016 to December 2016 were included in this study. Majority of the children belonged to school age (6 to 12 years), with mean age of 7.5 ± standard deviation 3.4 (range 4 – 11 years). Larger proportion of the victims was males (61.4%) and the male to female ratio was 1.6:1. The age and sex wise distribution of male and female victims is shown in figure1. All children are from families of lower socioeconomic status. Most of the bites occurred during rainy season between middle of June to September. Diurnal variation is noticed in the timing of snake bite with 33 victims (47.1%) bitten after 6 pm. Lower extremity is the most commonly bitten site. The various demographic characters of the study population are presented in table-1.

Figure 1: Age and gender distribution of snake bite

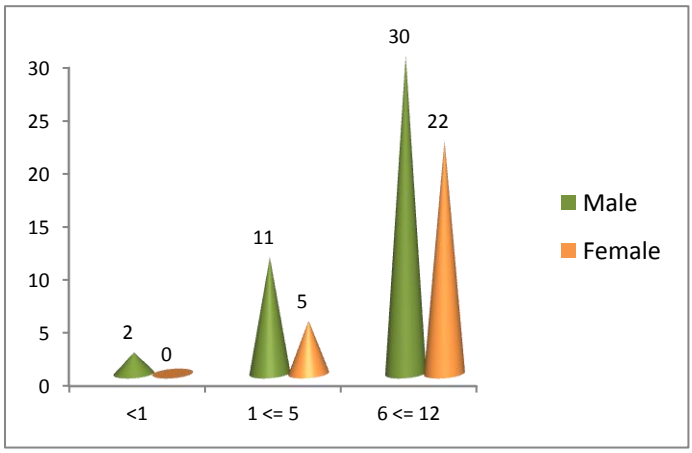

Table 1: Demographic characteristics of snake bite victims

Parameters		N=70
Age (years)		7.5 ± 3.5
Gender	Male	43 (61.4)
	Female	27 (38.6)
Month		6.1 ± 3.2
Timing	Day (6 AM- 12PM)	14 (20.0)
Afternoon	(12 PM- 6 PM)	16 (22.9)
Night	(6 PM-12 AM)	33 (47.1)
Early Morning	(12 AM-6AM)	7 (10.0)
Site of snake bite	Arm	13 (18.6)
	Leg	57 (81.4)
Values presented as Mean ± SD for continuous data and n (%) for categorical data		

Among 70 victims admitted, 37 children (52.9%) had no features of envenomation, 33 children (47.1%) showed features of systemic and / or local envenomation. The varied clinical manifestations of poisonous snake bite victims are as shown in table 2. Majority of the children had hemotoxicity evident as whole blood clotting time more than 20 minutes, local bleeding or systemic bleeding in form of hematemesis, hematuria. Among patients with toxicity all 33 children showed some local reaction, however 15 patients had extensive local reactions with progressive cellulitis, blisters or necrosis. 6 out of 33 toxic patients (18%) required intervention in form of debridement or fasciotomy for complications like necrosis or compartment syndrome. 17 patients had neurotoxicity, 9 of them required mechanical ventilation for respiratory failure.

Table: 2 Clinical Characteristics of Poisonous Snake Bite Victims (N =33)

Parameters	n (%)
Hemotoxicity and neurotoxicity	15 (45.4%)
Hemotoxicity	14 (42.4%)
Neurotoxicity	2 (6.1%)
Isolated progressive cellulitis requiring ASV	2 (6.1%)

Polyvalent Anti Snake Venom (ASV) is used for symptomatic snake bite victims in our hospital. The mean dose of ASV required is 17 vials. The mean interval between bite to ASV administration is 2.7 hours. 42 patients were referred from peripheral hospitals. 27 of them had toxic features; however only half of the symptomatic victims (48.1%) received ASV in referring hospitals. Allergic reactions noted in 4 patients (12.1%).The average duration of hospital stay is 3.8 days. Death occurred in 6 victims. Male and female children were affected equally (3- male, 3-female). The observed causes are shock, respiratory failure, brain death secondary to neuroparalysis (3 cases, all 3 died in less than 24 hours), disseminated intravascular coagulation (1 case), acute respiratory distress syndrome (2 cases). Neuroparalysis is seen in all 6 cases with combined hemotoxicity and neurotoxicity in 5 children. Neuroparalysis as cause of mortality is significant statistically (p value <0.0001). 5 children were referred from outside hospitals. 4 out of this5 children from periphery were not given Anti Snake Venom before referral. However this finding is not significant statistically.

Table: 3 Treatment and Outcome

PARAMETERS		n (%)
ASV	Yes	31 (44.3)
	No	39 (55.7)
Referred	Yes	42 (60.0)
	No	28 (40.0)
ASV referring hospital	Yes	13 (31.0)
	No	29 (69.0)
Allergy	Yes	4 (12.5)
	No	28 (87.5)
Outcome	Alive	64 (91.4)
	Death	6 (8.6)
Ventilation	Yes	9 (12.9)
	No	61 (87.1)
Time lapse between bite and periphery hospital (hours)		1.5 ± 1.1
Referral time (hours)		2.4 ± 2.7
Time lapse between bite and tertiary hospital (hours)		4.7 ± 11.4
Time lapse between bite and ASV administration(hours)		2.8 ± 2.2

Table: 5 Factors associated with outcome (N =70)

PARAMETERS		DEAD n (%)	ALIVE n (%)	P VALUE
Gender	Male	3 (50.0)	40 (62.5)	0.67
	Female	3 (50.0)	24 (37.5)	
Hemotoxicity	Yes	5 (83.3)	22 (34.4)	0.029
	No	1 (16.7)	42 (65.6)	
Neurotoxicity	Yes	6 (100.0)	11 (17.2)	< 0.0001
	No	0 (0)	53 (82.8)	
Cellulitis	Yes	4 (66.7)	29 (45.3)	0.41
	No	2 (33.3)	35 (54.7)	
ASV in referring hospital	Yes	1 (20.0)	12 (32.4)	1.00
	No	4 (80.0)	25 (67.6)	
Bite- ASV time interval (hours)	<= 3	4 (66.7)	18 (72.0)	1.00
	>3	2 (33.3)	7 (28.0)	
*obtained from Fisher's Exact test				

DISCUSSION

74.2% of the children belonged to school age (6 to 12 years), with mean age of 7.5 ± standard deviation 3.4 (range 4 – 11 years). Studies on pediatric snake bite victims were limited, however similar observation was seen by Kshirsagar et al and Karunanayakeet al with 89% and 48% children more than 5 yearsrespectively[5,6]. The mean age of 10.7 years is reported by Schulte et al[6].Larger proportion of the victims were males (61.4%) and the male to female ratio was 1.6:1. This correlates with various studies with higher incidence in males. This is consistent with various adult as well as pediatric studies with69% males in study by Sankar et al, 68% males by Schulte et al, 60.55% males and male to female ratio of 1.5:1 by Halesha B.R et al[7–9]. Lower extremity is the most commonly bitten site and is comparable to other studies around 70 to 80%[6,9–12].

Most of the bites occurred during rainy season between middle of June to September. This is a common finding when snake habitat gets flooded and this has been seen inseveral studies[5,9,11]. Many snake species are nocturnal in nature. Diurnal variation is noticed in the timing of snake bite with 33 victims (47.1%) bitten after 6 pm. Similar observation seen by Bhalla et al with 72.6% night time bites, Karunanayake et al 59% bites between 6 pm to 6 am[6,10].Species identification can help us in anticipating development of possible symptoms in the victims. However this is not possible always. Hence vigilant observation for emerging pattern must be maintained. In our study we observed that among the 70 children admitted with snake bite 52.9% had toxic features and 47.1% showed no envenomation. The results seen in other studies were 50.7% of poisonous bites and 49.3% of non-poisonous bites by Bhalla et al, 66.6% poisonous bites and 33.33% non-poisonous bites by Kshirsagar et al[5,10]. This observation of more patients presenting with toxic features may be because of people approaching hospital care after development of symptoms rather than after identifying snake bite and subsequently leading to delay in presentation to hospital.

The clinical pattern in our study showed more vasculotoxic bites than neurotoxicity. 45.4% patients had combined hematotoxicity and neurotoxicity, 42.4% hadhemotoxicity, 6.1% had neurotoxicity and 6.1%had progressive cellulitis requiring ASV. Similar observation with vasculotoxicity (55.26%) more than neurotoxicity (27.63%) was seen by Bhalla et al[10]. Study by Pore et al showed 75% vasculotoxicity , 16% neurotoxicity, 5.68%neuro plus hemotoxicity ;Halesha et al showed 60% vasculotoxicity and 40% neurotoxicity[9,13].Study by Gautam et al in Himachal showed moreneuroparalytic cases (53.3%) than hemotoxic cases (35%)[14].Chauhan and Thakur found difference in clinical present-ation with neuroparalysis common in north india and more of hemotoxicity in southern regions[15].

Hemotoxicity is manifested in form of abnormal clotting time (whole blood clotting time >20 minutes), gastrointestinal bleeding, hematuria, DIVC. 79.3% victims with hemotoxicity had abnormal clotting time and 58.6% had deranged Coagulogram. Bhalla et al reported abnormal bleeding and clotting time in all vasculotoxic snake bites[10].15 patients had extensive local reactions with progressive cellulitis, blisters or necrosis. 6 out of 33 toxic patients (18%) required

intervention in form of debridement or fasciotomy for complications like necrosis or compartment syndrome. 17 patients had neurotoxicity, 9 of them required mechanical ventilation(52.9%) for respiratory failure. Halesha B.R. et al reported 38.8% (28 of 72 neuroparalytic cases) patients requiring assisted ventilation[9]. A study by Bhalla et al showed 90.4% neurotoxic patients requiring artificial ventilation[10].

The mean dose of ASV required is 17 vials and 12.1% patients developed some kind of allergic reaction requiring antihistamine and steroid. 10.8% patients developed reaction in study by Karunanayake et al , 12.7% by Halesha B.R et al[6,9]. Lesser reactions are seen by Pore et al 4%, Gautam et al 5%[13,14].

42 children admitted in our hospital actually had first contact with primary or secondary health care centre. Of these 27 children had features of envenomation which contributes to 81.8% (27 out of 33) of poisonous bites. This shows the awareness among primary health care givers in identifying children with toxicity and timely referral to tertiary care centre. However only 48.1% (13 out of 27) children with poisonous snake bites were administered ASV in primary health care centers before referral to tertiary care centre. This may be due to fear of adverse reactions to ASV. Studies have shown that timely ASV can reduce morbidity and mortality in snake bite victims. This explains the need for educating primary health care providers about snake bite management, management of anaphylaxis and resuscitation in case of emergencies.

The mean interval between bite to ASV administration is 2.8 hours. 29 (41.4%) patients reached health care facility within 1 hour and 38 (54.2%) patients within 6 hours of snake bite. The Time lapse between bite to needle is more in study byGautam et al (Himachal) with 52 % presenting after 6 hours of bite[14]. 38.8% of patients reached hospital after delay of 6 hours in study by Halesha B.R et al[9]. The mean duration of hospital stay in our study is 3.8 days. Similar observation was made by various investigators with mean stay between 4 to 6 days[9,13,14].

Death occurred in 6 victims (8.5%). Neuroparalysis as cause of mortality is significant statistically (p value <0.0001). Mortality rate of around 5 % is observed in varied studies with neuroparalysis being a major contributing factor[6,9,12,13].

CONCLUSION

Our study signifies the need for increasing ASV administration in primary health care centres and to increase awareness among the general public for approaching health care facility without delay.

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