

Clinico-epidemiological profile of snake bite in children in a tertiary care hospital, South India

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Abstract

Introduction: A high incidence of snake bite envenomation is observed in India, due to rapid urbanization and deforestation. Snake bite is a life-threatening condition and remains a significant cause for hospital admissions in paediatric age group. Because of their smaller body mass, they have rapid systemic envenomation and high mortality rate. **Methods:** This is a descriptive type of study about clinical and epidemiological profile of snake bite cases in pediatric age group and also included unknown bites with features of snake bite envenomation. This was done for the period of one year from July 2015 to June 2016. Data about age, sex, bitesite, clinical features, complications, management and outcome were collected and analysed. **Results:** The study included 54 cases of snake bite victim. Majority were boys (64.8%). The common age group affected was 5-10 years (59%). Lower extremities were the most common site of bites (85%). 42.6% of cases had clinical features within 2 to 6 hours of snake bite. Bite admission interval was 6 hours. Prehospital treatment was employed in 10.3% of patients. In our study, 38.9 % of victims presented with snake bite of unknown species, 39% known species of snakes and 22.1% were cases of envenomation, where the snake was not visualized. The commonest identified species were viper bite (n=11, 20.4%), followed by rat snake (n=7, 13%) and krait (n=3, 5.6%). 23(42.6%) cases had dry bite. About 12 (22%) children had local cellulitis; 12 (22%) had combined cellulitis and hemotoxicity; 7 (13%) had neurotoxicity. In our study polyvalent Anti snake venom (ASV) was used in 55.6% of cases and 18.5% of victims developed hypersensitivity reactions to ASV. The case fatality was 11.1% and Krait was the main cause of mortality. **Conclusions:** Of the children presented with snake bite envenomation, the snake was visualized in majority of cases. Most of them developed clinical features in 2 to 6 hours of bite. Cellulitis was the commonest presentation and polyvalent ASV was used for treatment. Neurotoxic Krait bite was the commonest cause of mortality.

Keywords: Complications, Epidemiology, India, Pediatric, Snake bites

Introduction

Snake bite envenomation is a neglected but important public health problem in rural areas of South Asia, South East Asia and Sub Saharan Africa [1]. WHO estimates the problem as 4,21,000 envenomation and 20,000 deaths per annum. The same report also suggest that the burden may be as high as 1,841,000 envenomation and 94,000 deaths globally [2]. It is a well-known occupational hazard in rural part of India, where farming is the main occupation. India is reported to have highest number of deaths due to snake bites in

the world [3]. In India 1,19,368 envenomation and 1559 death per annum were reported in 2011 [4]. In India, 236 species of snakes have been reported [5]. These include venomous snakes of the family Elapidae and Viperidae. Viperidae are represented by true viper and pit vipers [6].

The family of Elapidae has 17 species, which includes cobras, king cobras, kraits and coral snakes. The spectacled cobra (*Naja naja*) is one of the commonest snake in India. Kraits are nocturnal snakes which enter human dwelling at night in search of prey and many victims are bitten in their sleep.

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The prevalence of different snakes varies in different geographical areas of the country. As a result, the clinical management and clinical practices vary.

People in countries like India prefer traditional healers rather than trained doctors mainly because of ignorance and monetary issues [7].

Since complications of snake bite develop rapidly and irreversibly, medical treatment must be prompt and appropriate [8].

WHO prescribes a standard protocol for treating snake bites in South East Asian countries [9].

A national protocol for management of snake bites in India is also in place [10]. ASV is a scarce and costly commodity.

There is a need to understand venom composition as per geographic variation in species. The data on the epidemiology of snake bites are sparse in India [11].

The current study was conducted with objective of assessing the clinical and epidemiological profile of pediatric snake bite victims, admitted to a tertiary care hospital in South India.

Materials and Methods

Place of study: The present study was carried out in the department of pediatrics of a tertiary care teaching hospital at Coimbatore.

Type of study: This is a descriptive type of observational study, conducted during the period of July 2015 to June 2016.

Results

54 cases of snake bite were admitted in pediatric intensive care unit (PICU) during the study period. It was about 5% of total PICU admissions. Majority of cases were male children (n=35, 64.3%).

Maximum incidence of snake bite occurred in the age group of 5 to 10 (n=32, 59.3%).

Lower extremities were the site of bite in more than three fourth of the cases (n=46, 85.2%).

Pre hospital treatment was employed in 10.3% of the patients (Table 1). In 12 (22.2%) cases with acute envenomation, the offending agent was not visualized.

Among the snakes visualized, the species type was not identified in 21 (38.9%) cases. The species were identified in another 21 cases.

The commonest identified species were viper bite (n=11, 20.4%), followed by ratsnake (n=7, 13%) and krait (n=3, 5.6%).

A prior approval was obtained from the institutional ethics committee.

Inclusion criteria: (1) age group 1 month to 12 years with history of snake bite, having noticed the offending snake, (2) doubtful history of snake bite, but with definitive acute symptoms and signs of local or systemic envenomation.

Exclusion criteria: (1) Bites due to other creatures (2) Doubtful cases of snake bite with no definitive history or acute signs and symptoms of envenomation.

Epidemiological and clinical data about age, sex, time and site of snake bite, type of offending agent or species of snake were recorded.

Detailed history and clinical examination were done and patient managed as per protocol.

All our snake bite patients were investigated with complete blood count, renal function tests, electrolytes, 20 minutes whole blood clotting time. ASV was given by intravenous route as infusion.

All patients were studied for complications during hospital stay. Blood products transfusion, ventilator support and dialysis were carried out as when indicated.

Patients developing severe cellulitis were given appropriate antibiotics and referred to surgeon for necessary treatment.

The duration of hospital stay and conditions at the time of discharge were noted. Study outcome was noted as discharge or death.

Table-1: Epidemiological characteristics of snake bite.

Characteristics	No. of patients	%
Age distribution		
1-5 years	16	29.6
5-10 years	32	59.3
>10 years	6	11.1
Sex distribution		
Boys	35	64.8
Girls	19	35.2
Bite site		
Lower limb	46	85.2
Upper limb	6	11.1
Others	2	3.7
Pre-Hospital Treatment		
Wound distortion	2	3.7
Tourniquet application	3	5.6
Nil	49	90.7
Type of Offending Agent		
Viper bite	11	20.4
Rat snake bite	7	13.0
Krait bite	3	5.6
Unknown snake bite	21	38.9
Unknown bite	12	22.1

23 cases (42.6%) developed clinical symptoms in 2-6 hours of bite. 23(42.6%) cases had dry bite. About 12 (22%) children had local cellulitis; 12 (22%) had combined cellulitis and hemotoxicity; 7 (13%) had neurotoxicity (Table 2). In our study, 13 cases (24%) presented with coagulation abnormality. 2 cases (3.7%) presented with acute renal failure.

Table-2: Clinical manifestations of snake bite.

	Cellulitis	Cellulitis and hemotoxicity	Neurotoxicity	Dry bite	Total	
					n	%
Viper	3	4		4	11	20.4
Rat snake				7	7	13
Krait			3		3	5.6
Snake bite with species not identified	2	6	1	12	21	38.9
Unknown bite	7	2	3		12	22
Total	12	12	7	23	54	100

n=frequency of species

ASV was used in 55.6% of cases and average vials of ASV used are 10-20 and 2 victims required less than 10 vials of ASV. 18.5% of cases who received ASV had reactions (Table 3).

Table-3: ASV requirements and its adverse reactions.

	No ASV	<10	10-20	20-30	Total	ASV reactions	
						Yes	No
	n	n	n	n	n	n	n
Viper bite	4	-	3	4	11	2	5
Rattle snakebite	7	-			7	-	-
Krait bite	-		3		3	1	2
Snakebite where species not identified	13	1	5	2	21	1	20
Unknown bite	-	1	7	4	12	1	11
Total	24	2	18	10	54	10	44

n = frequency of cases

In our study 88.8% of cases (n=46) completely recovered without any sequelae. Case fatality rate was 11.1% and kraitbite was the main cause (Table 4).

Table-4: Outcome of snake bite.

		Cured	Dead	Total
		n	n	n
Kind of snake	Viper bite	11	-	11
	Rat snake bite	7	-	7
	Krait bite	1	2	3
	Snake bite species not identified	19	2	21
	Unknown bite	10	2	12
	Total	48	6	54

n=frequency of cases

Discussion

The study included 54 children with snake bite envenomation. Majority were in the age group between 5 to 10 years. In a study by Kshirsagar VY [12] about snake bite envenomation in 162 children in Maharashtra, children over 5 years were more commonly involved. In the study conducted by Helen J Mead [13] about clinical profile of snake bite envenomation in 156 children, the mean age was 6 years.

The epidemiological character in our study showed that more common victims in children were males when compared to females. Similar observation was made by Karunanayake RK [14] in a study on 54 children with snake bite envenomation.

The most frequently bitten site in our study was the lower extremity (85.2%). Similar observations have been made in other studies [12,14]. But the study done by Aktar F [15] on snake bite envenomation in 151

children, most common location of bite was right forearm in 61.6% of children. Bites to the extremities occur in children who unintentionally disturb a snake while playing outside their houses or in the fields.

In our study, pre hospital treatment like wound distortion and tourniquet application were employed in 10.3% of patients. In the study done by Karunanayake RK [14], tourniquet application and native treatment were done as pre-hospital treatment in 16% children.

The initial first aid of the victim is to reduce the spread of venom and transfer to appropriate health facility. The methods like tourniquet application, sucking out the poison are to be discouraged. In this study, about 42.6% of cases had clinical features within two to six hours bite. The study by Kshirsagar VY [12] in rural India had similar results. Symptoms and signs of envenomation vary according to species and evolve over time. Hence frequent clinical examinations are very important.

Most common nonpoisonous snake in our area was rat snake. Among the identified poisonous snake bites, Viper was the commonest, about 20.4%. Kulkarni ML [16] did a study on snake venom poisoning in 633 children in CentralKarnataka, in which Viper was the most common poisonous snake involved in 80%. Most venomous snakes belong to the families Elapidae or Viperidae.

Among the 54 cases admitted in the hospital, 23 (43%) victims presented as dry bite. This reflects that many victims got panicked and were brought to emergency department, although they did not have poisonous manifestations. This also reflects the increased awareness about snake bite mortality among general population.

About 12 (22%) children had local cellulitis; 12 (22%) had combined cellulitis and hematotoxicity; 7 (13%) had neuro toxicity. The local effects manifested as swelling, blistering and ecchymosis. A positive 20-minute whole blood clotting test was an indication for antivenom administration.

The findings of neurotoxicity were ptosis, limb paralysis and respiratory failure. In a study done by Sankar J [17] on snake envenomation among 110 children in a teaching hospital, 64.2% had predominantly haematotoxic envenomation, 18% neurotoxicity and 16% local involvement.

Acute renal failure was seen in 3.7% children in our study whereas a higher percentage of 18% was observed in the study by Adhisivam B [18].

Anti snake venom (ASV) was administered in 30 (55%) children. 60% of them required 10 to 20 vials of ASV. In a study done by Gautam P [19] on snake envenomation in 60 children at Himachal Pradesh, the average number of ASV vials used were about 20.

The existing polyvalent ASV is efficacious against the 4 major species (Cobra, krait, Russel viper, saw scaled viper). However, there occurs envenomation due to a number of other species also, like Hump-nosed pit viper, which usually doesn't respond adequately to existing antivenoms.

In a prospective study done by Ariaratnam CA [20] on snake bite envenoming in 860 patients, 35% were bitten by Hump-nosed pit viper, in which available ASV was ineffective. In our study, Hump-nosed pit viper was not identified.

About 5 (18%) children developed anaphylactic reactions in our study. All of them responded to antihistamines, steroids and adrenaline. Seneviratne SL [21] did a study on use of antivenom serum in snake bite in 466 patients in Gampaha district, Sri Lanka. He observed that upto 55% of patients treated with ASV developed one or more adverse effects such as pyrogenic reactions, anaphylactoid reactions or late serum sickness. A review of snake bite in South Asia done by Alirol E [22] observed that severe drug reactions were under-reported.

The rates of allergic reactions varies with different antivenom preparations. Antivenom should be administered in envenomation victims, with resuscitation equipment and medications available to treat anaphylaxis.

In our study, case fatality rate was 11.1% and krait bite was the main cause for mortality. These children were brought to our facility late, after 6 hours of bite with respiratory paralysis.

Conclusion

Snake bite still remains a major public health problem in this part of the world. Knowledge must be imparted regarding the presentation of snake bites through community health programmes. This time limiting medical emergency should be dealt by aggressive management of the ABC's and immediate transfer of the victim to the hospital for neutralization of the venom by ASV. Improper first aid, delay in reaching hospital, unavailability of ASV worsens the outcome. Several RCT has to be done in concern with the rationale use of ASV. ASV availability should be made free to all victims in government and private hospitals. Issues to be emphasized in future includes

- * A national programme is to be initiated regarding this neglected emergency
- * Proper antidotes to counteract the venom reactions
- * Spetific ELISA kit biomarkers to detect venom antigens in blood
- * Importance of region specific monovalent ASV production is needed.

What is already known: Snake bite is a time limiting medical emergency

What this study adds: Signs and symptoms of envenomation vary among different species and evolve over time.

Abbreviations used: ASV-Anti snake venom, ELISA– Enzyme linked immunosorbent assay, PICU– Pediatric intensive care unit, RCT– Randomized controlled trial, WHO – World Health Organization.

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