



## A clinico-epidemiological study of snakebite among children in a rural medical college from eastern India

Dr. Surjit Naik<sup>1</sup>, Dr. Bidyut Kumar Khuntar<sup>2\*</sup>, Dr. Mahesh Prasad Mohanta<sup>3</sup>, Dr. Sumon Mondal<sup>4</sup>

<sup>1</sup> MD (Pediatrics) Assistant Professor (Pediatrics) Bhima Bhoi Medical College, Balangir, Odisha, India

<sup>2\*</sup> MD (Pediatrics), Associate Professor (Pediatrics), Midnapore Medical College, Medinipur, West Bengal, India

<sup>3</sup> MD (Pediatrics), Naba Diganta Hospital, Keonjhar, Odisha, India

<sup>4</sup> Junior Resident, Department of Paediatrics, Midnapore Medical College, Medinipur, West Bengal, India

**Corresponding Author:** Dr. Bidyut Kumar Khuntar

### Abstract

**Background:** Snakebite is a neglected tropical disease and one of the major causes of mortality in developing countries like India.

**Methods:** A cross-sectional hospital based study was done among paediatric population admitted to the hospital with history of snakebite.

**Results:** Deaths due to snakebite were 2.8% of total death. Most of the cases were during monsoon (55%) and from rural area (93%). Only 13.6% patients came to hospital within 6 hours. Prothrombin time and activated partial thromboplastin time were prolonged in 36.67% and 33.33% cases respectively. The 20-minute Whole Blood Clotting Test (WBCT20) was positive in 47.6% of poisonous snakebites and in 63.6% of vasculotoxic snakebites. 62% cases recovered with 10 vials of ASV, however some needed >20 vials.

**Conclusion:** Epidemiological data are vital for evaluation of exact scenario of snakebite cases. Poor health care seeking behaviour of community increases mortality.

**Keywords:** snake bite, epidemiology, haemostatic profile, death

### 1. Introduction

Venomous snakes are found throughout most part of the world, except for a few Islands, frozen environments, and high altitudes. According to World Health Organization (WHO), about 5.4 million cases of snakebites occur every year with about 2.7 million envenoming. Around 100,000 people die each year and many more are permanently disabled because of snake bites. Most snake bite cases occur in the developing countries of Sub-Saharan Africa, South Asia and South East Asia [1]. Snakebite cases often go under-reported in developing countries like India, because of poorly developed health system as well as belief in traditional healers. A community based study reported around 50,000 deaths due to snakebites in India, which is 30 times higher than the official report [2]. Snakebite envenoming has been added recently to the WHO's list of Neglected Tropical Diseases. It is truly a neglected cause of preventable deaths, which needs more attention than it receives right now [3]. With this background this study was undertaken as epidemiological data on snakebite will help in planning and preparedness to deal with the problem in a better way.

### 2. Materials and Methods

This is a cross-sectional hospital based observational study, in which all the case records of patients admitted to the Paediatrics department of Midnapore Medical College, between May 2014 and April 2015, were scrutinized. Patients  $\leq 12$  years of age with definitive history of snake bite were included and those with diagnosed

bleeding/coagulation disorder,

Preexisting neurological illness and co-existent infections associated with bleeding manifestation were excluded. Non-probability purposive sampling method was used and the sample size was 103. The case records of snakebites were separated and studied in details. According to the protocol of the institution, all the snakebite cases had been thoroughly examined for clinical features, detailed history examined from the register. Different laboratory investigations such as complete blood count, bleeding time, clotting time, renal function test, urine for haematuria, 20 minute Whole Blood Clotting Test had been carried out. The cases of snakebites which had clinical features of toxicity or had positive 20 minute Whole Blood Clotting Test Positive, had been started with ASV (Anti-Snake Venom). The follow up notes were also studied for the development of any complications and for the final outcome. The epidemiological details were noted down and the data were tabulated. The study was approved by the Ethical committee of Midnapore Medical College.

### 3. Results

The total number of admissions during the above period was 8204 and admissions due to snakebite were 103 (1.25%). Deaths from any cause were 212 and deaths due to snakebite were 6(2.8%). Out of all cases of snakebites admitted, the death rate was 5.8% and if we take only poisonous snakebites, the mortality was 10%. Admissions due to vasculotoxic snakebites was more common, but mortality was higher in case of neurotoxic snakebites

(12.5% vs. 9%). The results have been displayed in the Tables below.

**Table 1: Mortality Due To Snake Bite**

	Total Number of Cases	Deaths due to Snake Bite	Percentage
Total Admissions between May 2014 and April 2015	8204	6	0.07%
Death from Any cause	212	6	2.8%
All Admissions due to Snakebites	103	6	5.8%
Admissions due to Poisonous Snakebites	60	6	10%
Admissions due to Vasculotoxic Snakebites	44	4	9%
Neurotoxic Snakebites	16	2	12.5%

**Table 2: Demographic Characteristics**

Total number of cases (103)	Sex Distribution		Age Distribution (Years)			Urban- Rural Distribution		Seasonal Distribution		
	Male	Female	<5	5-8	>8	Urban	Rural	Monsoon (July to October)	Winter (November to February)	Summer (March to June)
No of Cases	63	40	21	40	42	8	95	57	3	43
Percentage	62%	38%	20%	39 %	41%	7%	93%	55%	3%	42%

**Table 3: Time and Site of Bite**

Time and Site of Bites	Day (6am to 6pm)	Night (6pm to 6am)	Lower Limb	Upper Limb
No of Cases	64	39	70	33
Percentage	62%	38%	68%	32%

**Table 4: Time Taken to Reach Hospital and Receive ASV after Snakebite**

Time Interval	Hospital Time (N=103)	Percentage	ASV Time (N=60)	ASV Time (N=60)
<6 hours	14	13.6%	5	8.3%
6-12 hours	66	64%	45	75%
>12 hours	23	22.4%	10	16.7%
Mean	8.3hours		12.7hours	

The mean time taken to reach Hospital following snakebite was 8.3 hours and mean time of administration of ASV following snakebite was 12.7 hours. Care givers of 8.33% cases first consulted traditional health care practitioner,

53.34% reached primary health centre while 38.33% reached tertiary hospital. Out of 5 cases, who consulted traditional health care practitioner, 3 patient died, having *p* value 0.005, which is significant.

**Table 5: Clinical Manifestations of Snakebite Cases**

Characteristics (Total No. Of cases 103)	Fang Marks Present	No Clinical Features (Non-Poisonous/Dry bites)	Clinical Manifestations in Poisonous Bites (N=60)				
			Local Swelling	Local Necrosis	Vasculotoxic Features	Neurotoxic Features	Mixed Features
No of Cases	72	43	56	5	44	16	3
Percentage	70%	42%	93.3%	8.3%	73%	36%	5%

Out of 103 cases of snakebites, fang marks were present in 72 (70%) of cases, however only 60 cases developed features of envenoming and required ASV. 43(42%) cases were dry bites or due to non- poisonous snakebites. In many cases, where the bite was during day time, people recognised the snake. Out of 60 poisonous bites, 44 had vasculotoxic features and 16 had neurotoxic features and 3 cases had features of both at the time of admission.

**Table 6: Vasculotoxic Manifestations (N=44)**

Manifestation	Number of cases	Percentage
Bleeding from Injection Site	28	64%
Haematuria	20	45%
Bleeding Gums	7	16%
Hematemesis	3	7%
Haemoptysis	2	4.5%
Epistaxis	1	2.2%

**Table 7: Neurologic Manifestations (N=12)**

Manifestation	Number of cases	Percentage
Ptosis	12	100%
Altered Sensorium	9	75%
Dysarthria	5	42%
Dilatation of Pupil	5	42%
Respiratory Paralysis	2	17%
Convulsions	1	8%

In the present study, anaemia was observed in 53.33%cases leukocytosis was observed in 60% of cases and thrombocytopenia was seen in 8.33% cases. The 20 minute Whole Blood Clotting Test was done in 82 cases. It was not

done in cases where there were already obvious bleeding manifestations. It was positive in only 28 cases (47.6%) of poisonous snakebites and in 63.6% of vasculotoxic snakebites (28/44).

**Table 8:** WBCT20 TEST

Total No of Cases	103
Cases where Test was Done	82 (80%)
Positive	28 (34%)
Negative	54 (66%)
Positive in Poisonous Snakebites	28/60 (47.6%)
Positive in Vasculotoxic Snakebites	28/44 (63.6%)

Bleeding time and clotting time were prolonged 13.33% and 56.67% cases respectively whereas prothrombin time (PT) and activated partial thromboplastin time (APTT) were prolonged in 36.67% and 33.33% cases respectively

**Table 9:** Distribution of Cases Based on Variation in Haemostatic Profile

	Normal	Prolonged
Bleeding time	86.67%	13.33%
Clotting time	43.33%	56.67%
Prothrombin time	63.33%	36.67%
Activated partial thromboplastin time	66.67%	33.33%

ASV was used in all poisonous cases. Most recovered with 10 vials. Total 6 cases died in spite of use of higher amount of ASV. There were 2 deaths due to respiratory paralysis. Rest 4 deaths were due to vasculotoxic bites.

**Table 10:** Uses of ASV

Dosage	10 Vials	20 Vials	30 Vials
No of Cases	37	22	1
Percentage	62%	37%	1%

#### 4. Discussions

Snakebite is an important cause of mortality among children. Though admissions due to snakebite accounted only 1.25% of total admission into the paediatric ward during the year, death rate was as high as 10% among the poisonous snakebites (Table No. 1). In a similar study from Maharashtra *Kshirsagar et al.* found mortality to be 1.8%. All of the children who died had come to hospital after 6 hours of bite [4]. In our study also, the deaths typically occurred in patients who presented to the hospital more than 6 hours after the snake bite. In our study only 8.3% cases could come to hospital within 6 hours of bite. May be that was the reason for higher mortality in our study. In another study from 4 different tertiary hospitals near Bengaluru, 27 patients died out of 270 cases of snakebites admitted, hence the mortality was 10%, which was exactly same as our study [5]. *Halesha et al.* found mortality to be 3.8% in another study from a Karnataka Medical College. They have also noted that most mortality occurred when the victim was brought to hospital late [6]. A retrospective study at Ghatal Sub-divisional Hospital, West Bengal found the Mortality to be 1.5% [7]. Another similar study from Pashim Medinipur District reports the mortality to be 1.04% [8]. The above two studies were from district hospitals and involved cases of all age groups. The high mortality found in our study may be due the fact that our study involved pediatric age group only and was in a tertiary centre.

According to our study (Table No.2), snakebites occur mostly in children aged >5 years, reflecting their outdoor activities. Male children out number females may be because of more adventurous temperament of boys. Most

snakebite cases occur in rural area and in the rainy season. All these findings are similar to the findings of other authors [4, 5, 6]. In our study (Table No.3) most cases of snakebites occurred during daytime. Lower limbs are the most frequent site of bite. Time taken to reach hospital (Table No.4) and to receive ASV is an important factor for favourable outcome. All the deaths occurred in cases where the child reached hospital after 6 hours and ASV started after 12 of snakebite. Similar observation was made in other studies [4, 7]. The delay in presentation to hospital is not only because of the poor communication and transport facility, but also because of the superstitious nature of the people at large, preferring traditional healers [2]. Out of 103 cases of snakebites, fang marks were present in 72 (70%) of cases (table 5), however only 60 cases developed features of envenoming and required ASV. 43(42%) cases were dry bites or due to non-poisonous snakebites. Out of 60 poisonous bites, 44 developed vasculotoxic features and 16 developed neurotoxic features. 3 cases had both features. Most common features of vasculotoxic bite were bleeding from injection site and hematuria (Table 6). Ptosis was the earliest sign of neurotoxic snakebite (Table 7). Deaths in vasculotoxic poisoning were due to acute renal failure and extensive bleeding. In neurotoxic bites it was due to respiratory failure. Anaemia in 53.33% cases, leukocytosis in 60% of cases and thrombocytopenia in 8.33% cases were observed. The 20 minute Whole Blood Clotting Test (WBCT20) is not always helpful. It was not positive in all cases of vasculotoxic bites (Table No 8). Bleeding time and clotting time were prolonged 13.33% and 56.67% cases respectively whereas prothrombin time (PT) and activated partial thromboplastin time (APTT) were prolonged in 36.67% and 33.33% cases respectively (Table No. 9). ASV was used in all cases of snakebites, which developed features of poisoning, as evidence by bleeding or positive WBCT20, or neurotoxic features such as ptosis (Table No 10). Most cases (62%) recovered with 10 vials of ASV, however some needed 20 vials. In one case 30 vials of ASV was used, but the patient died in spite of that.

#### 5. Conclusion

Snakebite is an important cause of mortality. ASV, the only definitive treatment of envenoming should be started as early as possible for the best outcome. Awareness among the common people to bring the victims to hospital is therefore the need of the hour.

#### 6. References

- Snakebite Envenoming. World Health Organisation. Available at <https://www.who.int/news-room/fact-sheets/detail/snakebite-envenoming>, accessed 13/10/2019
- Mohapatra B, Warrell D, Suraweera W, Bhatia P, Dhingra N, Jotkar R. *et al.* Snakebite Mortality in India: A Nationally Representative Mortality Survey. *PLoS Neglected Tropical Diseases*. 2011; 5(4):e1018.
- Menon J, Joseph J, Jose M, Punde D, Mazumdar D, Bawaskar H. *et al.* Management protocol of venomous snakebite in India: a consensus statement. *Toxin Reviews*. 2016; 35(3-4):147-151.
- Kshirsagar V, Ahmed M, Colaco S. Clinical Profile of Snake Bite in Children in Rural India, *Iran J Pediatr*. December. 2013; 23(No.6):632-636

6. Kiran Nagaraju, Nagappan Kannappan, Gopinath K. Survey on pattern of Snake bite cases admitted in South Indian Tertiary Care Hospitals. *International Journal of Pharmaceutical Science and Research*. 2015; 6(10):4362-4367.
7. Halesha BR, Harshvardhan L, Channaveerappa PK, Venkatesh KB. A Study on the Clinico-Epidemiological Profile and the Outcome of Snake Bite Victims in a Tertiary Care Centre in Southern India. *Journal of Clinical and Diagnostic Research*. 2013; 7(1):122-126
8. Kaushik Manaa, Rituparna Ghoshb, Kripasindhu Gantaita, Kanchan Sahaa, Poulami
9. Paruaa, Upasana Chatterjeea, Sumana Sarkhela, Incidence and treatment of snakebites in West Bengal, India. *Toxicology Reports*, 2019; 6:239-243. Available online <https://doi.org/10.1016/j.toxrep.2019.02.008>
10. Sumana Sarkhela, Rituparna Ghosha, Koushik Manaa, Kripasindhu Gantaitb. A hospital based epidemiological study of snakebite in Paschim Medinipur district, West Bengal, India. *Toxicology Reports*, 2017; 4:415-419. Available online
11. <http://dx.doi.org/10.1016/j.toxrep.2017.07.007>