# Original Article

# Clinico-epidemiological Profile of Snake Bite in a Rural Tertiary Care Hospital of West Bengal

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**Background :** Snake-bite is a common medical emergency in developing tropical countries. In India 46,000 people are dying every year from Snake bites. Because of under-reporting, the actual pattern of morbidity and mortality in India is unknown. Aim of the study is to analyse the epidemiology, clinical profile and outcomes of the snake bite patients admitted to a rural tertiary care Hospital of West Bengal.

**Materials and Methods :** It was a hospital based cross sectional study carried out in the department of general medicine in Midnapore Medical College and Hospital. All the snake bite patient admitted with signs of envenomation from July, 2019 to June, 2020 were included. Data were collected using a pre-tested semi structured questionnaire and analysed using Statistical Package for Social Sciences version 27.0.

**Results :** Among 201 patients with signs of envenomation, majority of victims were male (66.2%) and maximum patients were in the age group between 31-50 years. Majority of victims were from rural areas (88.6%) and most of the bites occurred at night (56.7%), mainly on the lower limbs (82.1%), during March to October (84%) and during the farming activities (57.7%). Russell Viper was the pre-dominant identified snake (34.8%). Common symptoms were local pain(82.1%) and swelling (81.1%), followed by ptosis (22.4%) and hematuria (18.4%). Mean dose of Anti-snake Venom Serum was 16.91±7.84 vials. Acute Kidney Injury was the predominant complication (13.4%) and the mortality rate was 4.5%. Mean bite to hospital admission time, oliguria, albuminuria, complications were significantly higher in non-survivors.

**Conclusion :** Snake bite is a neglected and life-threatening medical emergency in India. General awareness, easy availability and appropriate use of Anti-snake Venom Serum, close monitoring, institution appropriate therapy and timely referral may reduce the mortality. There is an urgent need to educate the rural population about the complication of Snake bite and early intervention.

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**Key words :** Clinico-epidemiological profile, Snake bite.

Snake bite is a major public health problem throughout the world especially in tropical and sub-tropical countries. Snake bite is one of the neglected tropical diseases that World Health Organization (WHO) aimed to eradicate. South Asia, South East Asia and Sub-Saharan Africa regions are mainly affected by Snake bite. Because of under reporting, usual disability and mortality is unknown. Globally every year, more than 5 million people are bitten by snakes, resulting in approximately 20,000 to 1,25,000 deaths[1]. Envenomation in India is estimated to be highest in the world followed by Sri Lanka, Vietnam and Brazil[2].

India has the highest mortality due to Snake bite in the world with 35,000-50,000 deaths every year[4]. Because of under reporting, the actual pattern of morbidity and mortality in India is still unknown. Rural people of the lower Socio-economic strata especially those who are engaged in agriculture and forestry bear a high burden of Snake bite. Some Snake bite victims seek traditional treatment that have been found to be ineffective and even fatal.

> **Editor's Comment :**
> - Snake bite is a neglected and life-threatening medical emergency mainly in developing countries and predominantly affects the younger and working population.
> - The longer the time span between the bite and hospital admission, the higher is the mortality.
> - General awareness, appropriate preventive measures, easy availability and appropriate use of ASV, institution of renal replacement therapy or ventilator support if required and timely referral may reduce the mortality.

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Out of 216 species of snake in India, only 52 species are poisonous. Mainly four venomous land snakes, spectacled cobra (Najanaja), common krait (Bungarus caeruleus), saw-scaled viper (Echiscarinatus) and Russell's viper (Daboia russelii) pose public health problems in India and accounts for 99% of venomous bite[4]. Clinically, Snake envenomation is categorized into hemotoxic, neurotoxic and myotoxic syndromes. Hemotoxic clinical features is caused by snakes of Viperidae family like Russel viper and Saw scale viper, neurotoxic features are caused by Kraits and Cobras and myotoxic features are caused by sea Snake bite.

In spite of the availability of Anti-snake Venom Serum (ASV), the mortality rate in India is high. Illiteracy, faith on traditional methods of treatment, delay in hospitalization, scarcity of health care facilities and lack of trained medical professional contribute the high mortality.

There is increasing trend in both the cases and deaths in West Bengal. Hati AK, *et al* reported an annual mortality of 16 per 100,000 population in rural areas of West Bengal. Unlike other public health problems, the problem of Snake bite has been neglected by Public Health Professional, Physicians and Policy makers though its social and economic impact is wide-spread. There is limited data on clinico-epidemiological profile of Snake bite from the district of Paschim Medinipur in West Bengal. Hence the study is carried out to know the epidemiology, clinical profile and outcome of Snake bite in a Rural Tertiary Care Hospital in West Bengal and to assess the number of vials of ASV required for the treatment.

## Materials and Methods

This is a single centred, hospital based cross sectional study conducted in the Department of Medicine in Midnapore Medical College and Hospital, West Bengal over a period of one year between July 2019-June 2020 after taking approval of the institutional Ethics committee. In 201 patients were selected with history of Snake bite with signs of envenomation and willingness to participate the study. We excluded patients less than 12 years of age and patient with history of Snake bite without signs of envenomation. A detailed information of demographic and epidemiological parameters such as Age, Sex, Residence, Occupation, Education, Place and Site of bite, Time and Month of Bite, Type of snake and Time to reach hospital were obtained. Examination details like presenting symptoms and signs, complications and period of survival were noted. 20-minutes Whole Blood Clotting Test (20 WBCT), Complete Blood Count, Renal Function Test and Urine Routine and microscopic examination were carried out in patients with hematotoxic Snake bite. In neurotoxic bite, muscle weakness was assessed by Single Breath Count Test, inability to maintain upward gaze and head lag. Initial dose of ASV, observation of the response to ASV, and criteria for repeating the initial dose of ASV were followed according to the WHO/SEARO guidelines[5]. For statistical analysis data were entered into a Microsoft excel spreadsheet and then analysed by SPSS (version 27.0; SPSS Inc, Chicago, IL, USA) and Graph Pad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. p-value $\leq 0.05$ was considered for statistically significant.

## Result

In 201 cases of venomous Snake bite cases were analysed. The mean age of the study population was $39.23 \pm 14.23$ years. The highest proportion of Snake bite was reported in the age group of 31-50 years (n=89, 44.3%) followed by >50 years. Majority of Snake bite victims were males (133, 66.2%) with a male to female ratio of 1.95:1. 57.7% of the population was engaged in agriculture followed by Housewife (16.9%), Students (14.4%), Labourer(4.5%)and others accounting to 6.5% were unemployed. More than three-fourth (178, 88.6%) of the patients resided in the rural areas.62 patients (30.8%) were illiterate. 84.1% (169) of the bites occurred in outdoor. Most of the bites occurred in the lower limbs (165, 82.1%) between 06.00 PM to 12.00 AM (114, 56.7%). The maximum number of Snake bite was reported during March to October (169, 84%) followed by November to February (32,15.9%). The species was identified by 98 patients and majority of snake bite in the study area was inflicted by Russel's viper (70, 34.8%), followed by Common krait (22, 10.9%) and Cobra (6, 3%)(Table 1).

The most common symptom was local pain (82.1%) and swelling (81.1%). Hematotoxic symptoms like hematuria (18.4%), gum bleeding (5.5%) and oliguria (13.4%) were observed in patients with Russell viper bite. The neurotoxic symptoms such as Ptosis (22.4%), Dysphagia (16.4%), Head lag (10.4%), Slurred speech (10%) and breathlessness (7.5%) were reported in Common Krait and Cobra bite (Table 2).

In 13.4% patients had Acute Kidney Injury (AKI), 0.5% patients had Disseminated Intra-vascular Coagulation (DIC), 4.0% patients had respiratory failure, and 2.0% patients had Shock (Fig 1). The incidence of complications were more in the sub-group of patients who admitted after a delay of >6 hours.

| Table 1 — *Demographic profile of snake bite victims* | | |
|---|---|---|
| | | Number/Percent |
| **Age Distribution (years) :** | 12-30 | 63(31.3%) |
| | 31-50 | 89(44.3%) |
| | >50 | 49(24.4%) |
| **Gender Distribution :** | Female | 68(33.8%) |
| | Male | 133(66.2%) |
| **Educational Status :** | Illiterate | 62(30.8%) |
| | Primary education | 67(33.3%) |
| | Secondary education | 50(24.9%) |
| | Upper secondary | 22(10.9%) |
| **Occupation :** | Agriculture | 116(57.7%) |
| | Housewife | 34(16.9%) |
| | Labourer | 9(4.5%) |
| | Student | 29(14.4%) |
| | Unemployed | 13(6.5%) |
| **Domicile :** | Rural | 178(88.6%) |
| | Urban | 23(11.4%) |
| **Site of Bite :** | Lower limb | 165(82.1%) |
| | Trunk | 4(2%) |
| | Upper limb | 32(15.9%) |
| **Location at time of Bite :** | Indoor | 32(15.9%) |
| | Outdoor | 169(84.1%) |
| **Season of the Year :** | March to October | 169(84.1%) |
| | November to February | 32(15.9%) |
| **Time of Bite :** | 0.01 to 6.00 | 18(9%) |
| | 6.01 to 12.00 | 26(12.9%) |
| | 12.01 to 18.00 | 43(21.4%) |
| | 18.01 to 24.00 | 114(56.7%) |
| **Type of Snake :** | Cobra | 6(3%) |
| | Common krait | 22(10.9%) |
| | Unknown bite | 103(51.2%) |
| | Russell viper | 70(34.8%) |

| Table 2 — Clinical features of snake bite victims | | |
|---|---|---|
| | | Number/Percent |
| **Local Manifestation :** | Pain | 165(82.1%) |
| | Swelling | 163(81.1%) |
| **Hematotoxic Manifestation :** | Hematuria | 37(18.4%) |
| | Oliguria | 27(13.4%) |
| | Gum Bleeding | 11(5.5%) |
| | Abdominal Pain | 41(20.4%) |
| **Neurotoxic Manifestation :** | Ptosis | 45(22.4%) |
| | Dysphagia | 33(16.4%) |
| | Head Lag | 21(10.4%) |
| | Slurred Speech | 20(10%) |
| | Breathlessness | 15(7.5%) |



Fig 1 — Distribution of complications of Snake bite
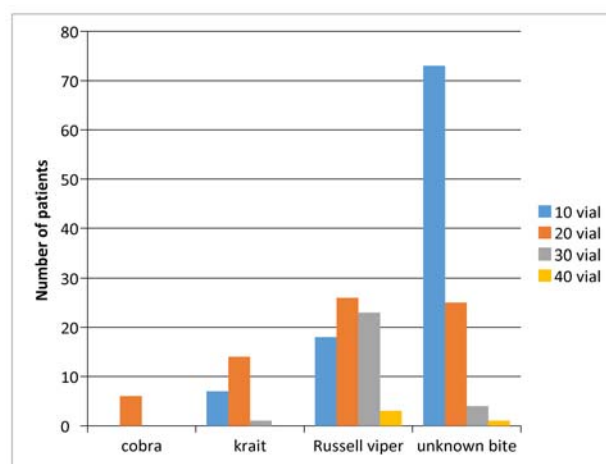


Fig 2 — Dose of ASV given in different type of Snake bite

The mean dose of ASV for the treatment of Snake envenomation was 16.91±7.84 vials. 98(48.8%) patients received 10 vials of ASV, 71(35.3%) patients received 20 vials and other 28(13.9%) and 4(2.0%) patients received 30 vials and 40 vials respectively. The mean dose of ASV for the treatment of Russell viper envenomation was 21.57±8.62 vials, 17.27±5.50 vials in common Krait envenomation and 20±0 vials for Cobra envenomation (Fig 2). Allergic reaction to ASV were observed in 5 cases (chills and rigor -2 cases, urticaria -2 cases and anaphylactic shock in 1 patient).
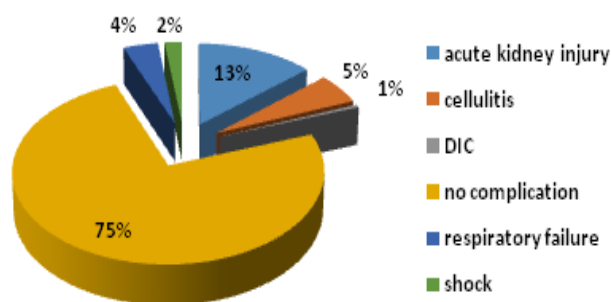
The mean duration of hospital stay was 5.16 ± 3.56 days. The mean duration of hospital stay in non-survivor was 5.14± 3.54 days.

The case fatality rate was 4.5%. The mean bite to hospital admission time was 8.89± 2.26 hours in non-survivors and 5.54± 2.69 hours in survivors. The difference of mean of bite to hospital admission time within both the groups was statistically significant (p=0.0003). Oliguria was reported significantly (p=0.0052) more in non-survivor 4(44.4%) than survivor 23(12.0%). Complications were significantly higher in non-survivor group (p-value < 0.0001). Albuminuria was more in non-survivor 4(44.4%) than survivor 16(8.3%) with statistical significance (p=0.0004). The association of other parameters with outcome (survived/death) were not statistically significant (Table 3).

## Discussion

Snake bite is one of the medical emergencies, common in developing countries in tropical region. In India, approximately one person is bitten by Snake in every 10 seconds and one person dies every two hours. It is a common occupational hazards in Farmers, Plantation workers and labourers with a significant morbidity and

| Table 3 — Comparison of parameters between Survivor versus Non-survivor | | | |
|---|---|---|---|
| Parameters | Death | Survived | P-value |
| **Age in years :** | | | |
| 12-30 | 4 | 59 | 0.2140 |
| 31-50 | 5 | 84 | |
| >50 | 0 | 49 | |
| **Gender :** | | | |
| Female | 4 | 64 | 0.4910 |
| Male | 5 | 128 | |
| **Education :** | | | |
| Illiterate | 3 | 59 | 0.6995 |
| Primary education | 4 | 63 | |
| Secondary education | 2 | 48 | |
| Upper secondary | 0 | 22 | |
| **Occupation :** | | | |
| Agriculture | 6 | 110 | 0.7494 |
| Housewife | 1 | 33 | |
| Labourer | 1 | 8 | |
| Student | 1 | 28 | |
| Unemployed | 0 | 13 | |
| **Domicile :** | | | |
| Rural | 8 | 170 | 0.9744 |
| Urban | 1 | 22 | |
| **Site of Bite :** | | | |
| Lower limb | 9 | 156 | 0.3578 |
| Trunk | 0 | 4 | |
| Upper limb | 0 | 32 | |
| **Location at the time of Bite :** | | | |
| Indoor | 0 | 32 | 0.1816 |
| Outdoor | 9 | 160 | |
| **Type of Snake :** | | | |
| Cobra | 0 | 6 | 0.8926 |
| Common krait | 1 | 21 | |
| Unknown bite | 4 | 99 | |
| Russell viper | 4 | 66 | |
| **Clinical Features :** | | | |
| Local Pain | 8 | 157 | 0.5862 |
| Local Swelling | 8 | 155 | 0.5411 |
| Hematuria | 2 | 35 | 0.7625 |
| Oliguria | 4 | 23 | 0.0052 |
| Gum bleeding | 1 | 10 | 0.4466 |
| Abdominal pain | 1 | 40 | 0.4792 |
| Ptosis | 2 | 43 | 0.9902 |
| Dysphagia | 2 | 31 | 0.6305 |
| Head lag | 1 | 20 | 0.9469 |
| Slurred speech | 2 | 18 | 0.2082 |
| Albuminuria | 4 | 16 | 0.0004 |
| Mean bite to hospital admission time (Hours) | 8.89±2.26 | 5.54±2.69 | 0.0003 |

affected more often than the females.

We found that most of the patients belonged to age group of 31-50 years, which was similar to studies conducted by Hotwani R, et al[10] and Anjum A, et al[11]. This may be due to the higher exposure of the people in this age group to agricultural work and most of the people in this age group contribute to the working population of the society.

The higher incidence of Snake bite in rural areas can be due to large number of people working in the field, and the habit of walking bare foot. In rural areas, majority of houses are built of mud that provide access and shelters to Snakes, as well as the habit of sleeping on the floor and outside the house may be responsible for the increased incidence of snake bites.

Majority of Snake bite was reported during the month of March to October that was in supported by other studies[6,12]. Whereas some studies reported higher incidence during post-monsoon season[13,14]. Maximum Snake bite occurs during the monsoon season, because of the flooding habitats of snakes and their prey. This is the life cycle of natural prey of these Snakes that govern their contact with human.

In 52% cases snakes were identified in our study and Cobra, Russel Viper and Common Krait were commonly encountered species. Our observation was in accordance with other studies in India[9,14]. Mana K, et al[15] found that 5% of people could not identify the snakes in Ghatal Subdivision hospital in Paschim Medinipur.

Most of the bites reported to occur between 6 pm to 12 am in our study which was similar to other studies[9,12,16]. Snakes come out in search of their prey during this period. People may accidentally step on the Snakes causing in bites as a result of poor vision at dusk and night.

Commonest site of bite was lower limbs which was in conformity with other observations[6,17,18]. Bite on upper limbs and chest was due to the habit of sleeping in the floor in rural areas and working in the field.

Commonest symptoms of Snake bite was local pain and swelling. The symptoms of hematotoxic snake bite were hematuria, gum bleeding and oliguria and symptoms of neurotoxic bite were ptosis, dysphagia, slurred speech, head lag and breathlessness. The findings were close to study conducted by Indrani D, et al[19] and Ghosh R, et al[20].

We observed, most common complication was AKI followed by cellulitis, respiratory failure, shock and DIC.13.4% patients had AKI, among which 70.4% patients developed AKI due to the Russell viper bite and 29.6% patients developed AKI due to unknown

Mortality that remains largely under-reported.

Male to female ratio in our study was 1.95:1. Similar results had been reported in different parts of India[6,7]. Whereas the studies from Karnataka reported a lower male to female ratio[8,9]. Men are the main earning members of the family and the agriculture is the main occupation in India. As the males are engaged in agricultural activities than the females and sleep in the farmyards during harvesting season, so males are

bite. Meenakshi B, *et al*[21] reported that cellulitis was the major complication followed by AKI and DIC. We noticed AKI in13.4% patients whereas Saini, *et al* reported only 4% of AKI[22]. This difference in different studies was attributed to the subtle differences among venoms of the viperine sub-species in different areas or delay in initiation of treatment.

In our study, the mean dose of ASV required for treatment was 16.91±7.84 vials and majority (48.8%) of patients received 10 vials (range10-40 vials). A study on use of ASV and clinical outcome of Snake envenomation showed a similar result where mean dose ASV was18.21±15.51 vials[23]. Whereas Sharma, *et al* reported that average number of ASV used to treat elapid bite was 51 vials and 31 vials for viper bite. Punde, *et al* found that the dose of ASV for treatment of neurotoxic bite was 4-32 vials and 2-25 vials for viper bite[24].

Allergic reaction to ASV were observed in 2.5% of cases in our study. Halesha BR, *et al*[8] reported reaction to ASV in 12.7% of patients which was higher than our study. The lesser adverse reaction to ASV may be due to prophylactic use of subcutaneous adrenal in prior to administration of ASV.

The case fatality rate in our study was 4.5%. Ghosh R, *et al* reported 3.5% mortality rate in our institution during the period of 2012-2016. 3-10% mortality rate were reported from different parts of the country[6,25] (Table 4).

Mean bite to hospital admission time, oliguria, albuminuria, occurrence of complications were significantly higher in non-survivors than the survivors. The association of age, residence, literacy, occupation, type of Snake bite, diurnal and seasonal variation, dose of ASV and 20 WBCTwith outcome were not statistically significant. Kumar KS, *et al* reported that thrombocytopenia, prolongation of 20 WBCT, serum creatinine >3 mg/dL and albuminuria were associated with an adverse outcome[26]. Most of the studies observed this association between bite to hospital time and complications or mortality[27,28]. This can be explained by the fact that incidence of complications is directly proportional to the duration of venom in the blood prior to its neutralization by ASV[28].

Several limitations are acknowledged. This is single centred study with only 201 patients. As the study is from a Tertiary Care Hospital, Hospital bias cannot be ruled out.

## CONCLUSION

Snake bite is a neglected and life- threatening medical emergency mainly in developing countries. Snake bite is an occupational hazardand predominantly affects working population. General awareness, easy availability and appropriate use of ASV, close monitoring, institution appropriate therapy and timely referral may reduce the mortality. There is an urgent need to educate the rural population about the complication and early intervention of Snake bite. People should be educated to use gumboots to prevent bite, removal of sheltering of rats by closure of crevices and holes or use of mesh to cover the outlets in rural houses.

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Table 4 — *Comparison of mortality rate in different studies*

| Author | Published (Year) | Number of Cases | Mortality Rate |
|---|---|---|---|
| Hati AK, *et al* | 1992 | 307 | 10.1% |
| Sharma SK, *et al* | 2004 | 66 | 3% |
| Punde DP, *et al* | 2005 | 427 | 4.7% |
| Suchitra N, *et al* | 2008 | 200 | 3% |
| Ahmed SM, *et al* | 2012 | 59 | 5.1% |

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