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CASE REPORT

Clinico-Epidemiological Profile of Snake Bite Victims Admitted in a District Hospital in Northern Maharashtra, India

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Abstract

***Background*:** Recognized by the World Health Organization as a neglected tropical disease in 2009, snake bites continue to contribute substantially to morbidity and mortality in tropical countries. Maharashtra, experiences high incidence of snake bites due to its extensive agricultural activity. Based on clinical manifestations, snake bite envenomation is broadly classified as neurotoxic, vasculotoxic, or myotoxic.
***Case presentation*:** This case series reports on 60 snakebite patients presenting to a district hospital in Bhandara, Northern Maharashtra, between May and July 2024. Cases were evaluated by clinical features, time to presentation, and offending snake species, with outcomes measured in terms of complication rates and mortality.
***Discussion*:** In this series of 60 snakebite cases, mostly involving young rural males, early hospital presentation and prompt antivenom administration were linked to markedly better outcomes, achieving 85% complete recovery with a mortality rate of 1.6%. Neurotoxic bites (cobra, krait) and vasculotoxic bites (Russell's viper) demonstrated distinct symptom profiles, with viper bites causing the highest complication rates. Delayed medical care, often due to traditional practices, significantly increased the risk of adverse outcomes.
***Conclusion*:** This study highlights the significant impact of early intervention, species-specific envenomation patterns on the outcomes of victims. Timely presentation and prompt administration of antivenom were strongly associated with favorable clinical outcomes, while delays were linked to increased complications.

Keywords: Snakebite envenomation, Antisnake venom therapy, vasculotoxicity, Rural healthcare, case series

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INTRODUCTION

Snake bite envenomation remains a significant public health concern in India, particularly in rural and agrarian regions. Recognized by the World Health Organization (WHO) as a neglected tropical disease in 2009, snake bites continue to contribute substantially to morbidity and mortality in tropical and subtropical countries, with India accounting for a disproportionately high number of global deaths [1].

Maharashtra, especially its northern districts, experiences a high incidence of snake bites due to extensive agricultural activity, warm climate, and widespread rural habitation [2]. The predominant venomous species in this region include the Indian Cobra (Naja naja), Russell's Viper (Daboia russelii), Common Krait (Bungarus caeruleus), and Saw-Scaled Viper (Echis carinatus), which together form the "Big Four" snakes [3, 4].

Clinically, snake bite envenomation is broadly categorized as neurotoxic, vasculotoxic, or myotoxic, depending on the predominant toxic effect [1,4]. Despite the availability of Anti-Snake Venom (ASV) and the implementation of national guidelines, challenges remain in effective management. These include delays in seeking medical attention, limited access to well-equipped healthcare facilities, irregular ASV supply, and reliance on traditional or indigenous remedies—particularly in rural communities [4, 5].

Snake bite incidence peaks during the monsoon season, driven by ecological and occupational factors. Increased agricultural activity, dense vegetation, and reduced visibility heighten the risk of human–snake encounters [1, 3].

The present study aims to evaluate the clinico-epidemiological profile, treatment approaches, and outcomes of snake bite patients presenting to a tertiary care hospital in Northern Maharashtra. By analyzing

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demographic characteristics, treatment delays, species distribution, and associated complications, this case series seeks to generate data that can guide public health interventions and improve clinical preparedness in endemic regions [1, 4].

CASE PRESENTATION

This case series was primarily performed in medicine wards and the ICU in the District Hospital, Bhandara, including patients who presented with a confirmed history of snake bite between May 2024 and July 2024.

All the patients were enrolled using a structured Google form, after taking informed consent. Demographic data, time of presentation, type of snake bite, and clinical features, and treatment received were analysed, and the outcome of each patient was assessed.

The study period was selected due to the surge in snake bite cases observed in this period. A total of 60 confirmed cases of snakebite were included in the study. This comprised patients in whom the offending species could be identified, as well as those with a definite snakebite history but without species identification. Cases with uncertain or unconfirmed bites, lacking typical fang marks or clinical features, were excluded.

Data collection tools

A case record form (attached herewith) was used to collect demographic details, clinical manifestations, and treatment received. Clinical outcomes of all patients were also recorded as follows: Recovery, Complication, or Death.

Statistical Analysis: Chi-square test; significance at $p<0.05$; data analyzed using SPSS version 26

Case record form link :

https://docs.google.com/forms/d/e/1FAIpQLSfKHaux2maex322G9NvkMA61KwIJoZz4biNlZlnULwwuXLbQQ/viewform?vc=0&c=0&w=1&flr=0&pli=1&fbzx=-1871472197357944464

1. Patient Demographics

There was nearly equal gender distribution among snakebite victims. As depicted in table 1, most of cases included individuals below 45 years of age. Notably, 75% of the victims were from rural areas, highlighting the higher risk associated with agrarian activities.

Table 1. Distribution of cases as per Age group

Age Group (Years)	Male (n=32)	Female (n=28)	Total (n=60)	Percentage (%)
18–30	12	8	20	33.3
30–45	11	9	20	33.3
45–60	6	7	13	21.7
> 60	3	4	7	11.7
Total	**32**	**28**	**60**	**100**

2. Time since snake bite

The majority of snakebite cases (51.6%) presented within 6 hours, facilitating timely intervention. Delayed presentations beyond 24 hours were rare, observed in only 5% of cases.

3. Species of snake

Among identified species, venomous snakes such as Russell viper (26.7%) and common krait (20%) were the predominant culprits. A significant proportion of cases (28.3%) involved unidentified species (Figure 1).

4. Manifestations

Manifestations that were commonly observed on presentation were classified as local, neurotoxic, and vasculotoxic. Out of which, paresthesias were common neurological features, followed by ptosis, and limb cellulitis was a commonly seen vasculotoxic feature. Figure 2 compares recovery, complication, and mortality rates in patients grouped by the time of anti-snake venom (ASV) administration.

5. Association of time since bite with outcomes

Table 3 demonstrates a clear association between early presentation and favorable outcomes in snakebite cases. Complete recovery was highest in those presenting within 6 hours, while delayed presentation beyond 24 hours was linked to increased mortality and complications. The p value calculated was statistically significant.

6. Outcome of patients according to time of ASV administration

Early ASV administration (within 6 hours) resulted in a high recovery rate (86.7%) with minimal complications. Delayed ASV (7–12 hours) was associated with a rise in adverse outcomes (47.6%). Notably, all patients who did not receive ASV recovered, likely indicating non-venomous or dry bites. The Decision to administer ASV was taken based on the species of snake and clinical judgement. P value was < 0.003, statistically significant.

7. Association between species of snake and outcome of the patient

Bites from unidentified species (n=24) and kraits (n=12) resulted exclusively in complete recovery. In contrast, Russell viper bites (n=16) were associated with a higher morbidity, with 7 cases developing complications and 1 resulting in death. Cobra bites (n=4) showed a mix of outcomes, including 1 complication. All bites from non-poisonous (n=3) and other species (n=1) led to complete recovery.

DISCUSSION

This study presents a comprehensive clinico-epidemiological profile of 60 snakebite victims, shedding light on critical factors influencing outcomes. The majority of patients were young to middle-aged males (56%), predominantly from rural areas (75%), with farmers and

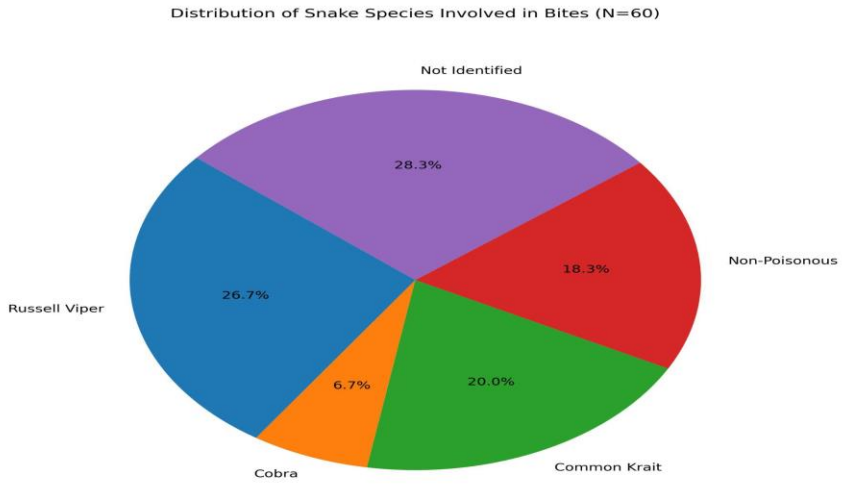

Figure 1. Clinical Manifestations of Snakebite Victims (frequency of local, neurological, and hematological manifestations observed in 60 patients)

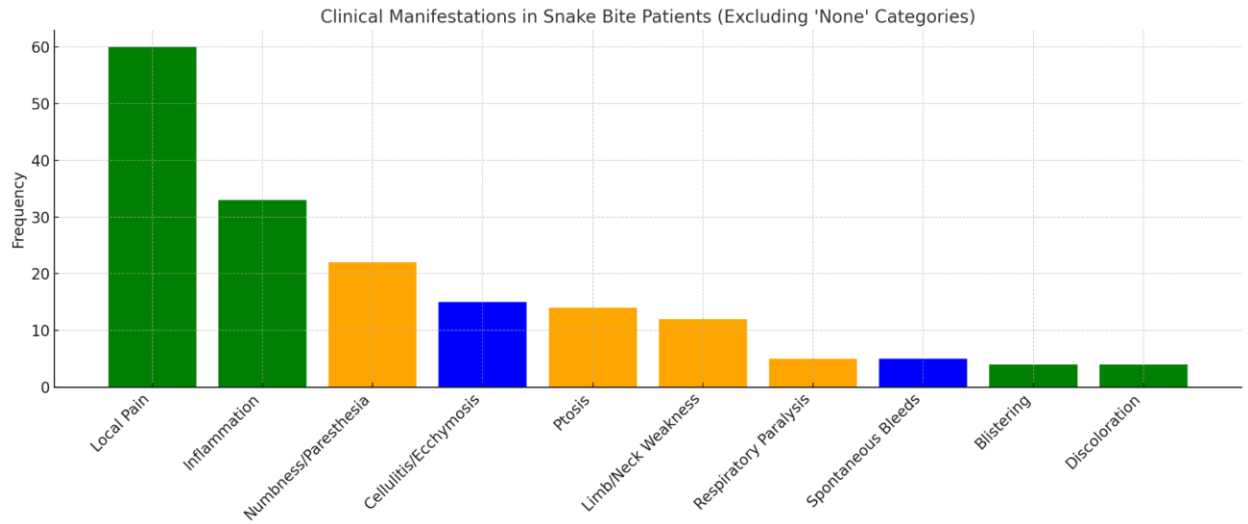

Figure 2. Outcomes based on timing of ASV administration
Green: Local manifestations, Orange: Neurological manifestations, Blue : Hematological manifestations

laborers comprising 55%—underscoring the occupational vulnerability of this demographic.

Timely medical attention was strongly linked to better outcomes. Delays are strongly correlated with complications, a trend consistently highlighted in Indian literature. [2, 3, 6]

Patients presenting within 6 hours of the bite had a 93.5% complete recovery rate, whereas all patients who presented after 24 hours experienced complications, including one death. Most of the patients also received appropriate first aid at local Primary health care centres before referral, which aided to a better recovery. Similarly, those who received antivenom (ASV) within 6 hours had significantly fewer complications (13.3%) compared to those treated after 12 hours, where the complication rate rose to 47.6%, consistent with Arjun et al., [7].

Table 2. Spectrum of clinical manifestations across different snake species

	Local symptoms				Neurologic			Hematologic		Total
	Pain	Swelling	Cellulitis	Ptosis	Respiratory paralysis	Dysphagia	Parasthesia	Cellulitis/ ecchymosis	Spontaneous bleeds	
Cobra	4 (100.0%)	4 (100.0%)	1 (25.0%)	3 (75.0%)	1 (25.0%)	0 (0.0%)	3 (75.0%)	1 (25.0%)	0 (0.0%)	4
Krait	12 (100.0%)	7 (58.3%)	0 (0.0%)	8 (66.7%)	3 (25.0%)	4 (33.3%)	10 (83.3%)	0 (0.0%)	0 (0.0%)	12
Russell viper	16 (100.0%)	15 (93.8%)	11 (68.8%)	0 (0.0%)	1 (6.2%)	0 (0.0%)	4 (25.0%)	13 (81.2%)	5 (31.2%)	16
Unidentified	24 (100.0%)	7 (29.2%)	1 (4.2%)	3 (12.5%)	0 (0.0%)	0 (0.0%)	5 (20.8%)	1 (4.2%)	0 (0.0%)	24
Non poisonous	4(100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	4
Total										60

Table 3. Outcome of Patients in Relation to Time of Snakebite

Time since bite	Complete recovery	Complication	Death	All	p value
6-24 hours	18 (37.5%)	8 (72.2%)	0 (0%)	26 (43.3%)	
< 6 hours	29 (60.4%)	2 (18.18%)	0 (0%)	31 (51.6%)	< 0.001
> 24 hours	1 (2%)	1 (9%)	1 (100%)	3 (5%)	
total	51	8	1	60	

Patients presenting with a confirmed history of snake bite presented as the following group of symptoms:

1. Progressive local swelling - including ecchymosis, blistering, or compartment syndrome
2. Neuroparalytic features: Ptosis, diplopia, dysarthria, respiratory paralysis

The severity of neuroparalytic symptoms was primarily assessed by the single breath count test (normal > 25).

3. Vasculotoxic features: Bleeding tendencies, cellulitis, AKI, DIC. The severity of these was primarily evaluated by Whole blood clotting time (normal < 20 min).

Neuroparalytic and vasculotoxic manifestations varied by species, aligning with clinical profiles reported by Thapar et al., and Ghosh et al., [1,8].

The Russell's Viper was the most clinically severe species encountered, responsible for the highest rates of complications (43.7%) and the only recorded death, primarily due to vasculotoxic effects such as spontaneous bleeding and necrotizing fasciitis. In contrast, krait and cobra bites were associated with neurotoxic symptoms, including ptosis and respiratory paralysis, but showed a dramatic recovery on early intervention and airway protection. Among the few patients who presented, the species of snake could not be identified, but snake envenomation was confirmed; these were grouped as Unidentified species bite, and further management was decided based on the severity of clinical features. Figure 3 shows ptosis in patients following a neuroparalytic snake envenomation.

Neurological symptoms were frequent, with numbness (36%), ptosis (23.3%), and respiratory paralysis (8.3%)observed. Hematological signs such as ecchymosis and cellulitis (figure 4) were seen in 25% of cases. All presenting victims were primarily evaluated and categorised based on severity and species of snake to assess the need for ASV. As per National Health Mission guidelines of India

Figure 3. Clinical manifestations of ptosis demonstrated in patients of neuroparalytic snake envenomation

Figure 4. Clinical manifestations of cellulitis demonstrated in patients of vasculotoxic snake envenomation

[4] , In patients with confirmed venomous bite or with progressive symptoms, ASV was administered without delay as follows:

An initial dose of 10 vials of lyophilised ASV →

1. Neuroparalytic	2. Vasculotoxic
Repeat after 1 hour if no improvement	Repeat after 30 mins (if WBCT > 20 min) Repeat after 30 mins (if WBCT > 20 min)

Additionally, neuroparalytic bites were given a trial of 'AN challenge test': Atropine 0.6 mg followed by neostigmine (1.5 mg) to be given IV stat and repeat dose of neostigmine 0.5 mg with atropine every 30 minutes for 5 doses. Neostigmine, an anticholinesterase, is effective for post synaptic neurotoxins such as those of Cobra, with some doubtful usefulness also demonstrated in Krait bites, which have a presynaptic toxin.

Overall, 85% of patients made a full recovery, 13.3% had complications, and mortality remained low (1.6%), largely

due to early presentation and appropriate ASV administration. Our outcomes closely mirror those in previous case series from Marathwada and Midnapore [3,8].

These findings emphasize the critical importance of early recognition, prompt transport, and timely ASV administration, especially in high-risk rural populations, and reinforce the need for enhanced public health strategies.

With particular reference to the patient who succumbed following presentation, this case underscores the critical importance of early treatment-seeking behavior in snakebite management. The patient, a 60-year-old, presented after 2 days of a confirmed Russel Viper bite after seeking treatment from a quack who used some powder and inappropriate first aid measures. The patient was comatose on presentation, with active bleeding from all orifices and nil urine output. He was intubated and provided supportive care along with ASV, but succumbed within hours of presentation. This case highlights the lifesaving potential of timely intervention available at government healthcare facilities, where ASV is readily available, and emergency care is accessible at minimal or no cost. Nonetheless, a lack of public awareness continues to drive individuals toward harmful traditional practices.

Some limitations of this study include:

1. Detailed laboratory investigations could not be completed, as patients with uncomplicated presentations were discharged before the reports were available.
2. Long-term disease progression in patients who developed complications could not be assessed due to a lack of follow-up data.

CONCLUSION

This study highlights the significant impact of early intervention and species-specific envenomation patterns on the outcomes of snakebite victims in rural India. Timely presentation and prompt administration of antivenom were strongly associated with favorable clinical outcomes, while delays were linked to increased complications and mortality. Russell's Viper emerged as the most clinically severe species, underscoring the need for species-targeted management strategies. These findings emphasize the importance of strengthening rural healthcare infrastructure, improving frontline provider training, and ensuring consistent availability of antivenom.

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