

## ORIGINAL ARTICLE

# Clinico-Epidemiological Analysis and Treatment Outcomes of Snake Bite Cases: A Hospital-Based Study

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**ABSTRACT**

**Context:** Snake bite is a significant health hazard in tropical regions, particularly affecting rural populations engaged in agriculture.

**Objectives:** To evaluate the demographic profile, clinical features, and outcomes of snake bite victims treated at a tertiary care hospital in southern India.

**Methods:** This cross-sectional study analysed medical records of 51 snake bite cases admitted from September 2023 to November 2024. Data collected included age, gender, residence type, bite location, clinical features, complications, antivenom use, and patient outcomes.

**Statistical Analysis:** Data were summarized using descriptive statistical measures including counts, proportions, mean values, and minimum–maximum distribution

**Results:** Mean age was 35.2 years with 67% male predominance. Eighty percent were from rural areas. Pain (98%) and swelling (84.31%) were the main symptoms. Antivenom was given to 68.62% of patients. The mortality rate was 5.88%, with 94.11% patients surviving.

**Conclusion:** Early hospital access, prompt antivenom administration, and supportive care significantly reduce snake bite mortality. Strengthening rural healthcare systems and community awareness are essential for better outcomes.

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**Key Message:** Timely hospital care with prompt antivenom administration and supportive treatment markedly improves survival and reduces mortality in snake bite cases, especially among rural populations.

## KEYWORDS

- Antivenom • Clinical features • Epidemiology • Hemotoxic envenomation
- Snake bite

## INTRODUCTION

Snake bite remains a major public health problem in warm climates, especially in agricultural areas. The World Health Organization recognizes it as a neglected tropical disease requiring urgent action. India accounts for a substantial share of global snake bite incidents, with thousands of deaths reported annually.<sup>1</sup>

Four main venomous snake species cause most medically significant bites in India: common krait, Indian cobra, Russell's viper, and saw-scaled viper.<sup>2</sup> When a snake bites, venom enters the body through the wound and spreads locally or systemically, causing tissue damage, bleeding disorders, nerve damage, and organ failure.<sup>3</sup> The type and severity of injury depend on the snake species, amount of venom injected, and the victim's health status.

Common clinical signs include fang marks, pain, local swelling, tissue death, and infection from bacteria present in the snake's oral cavity.<sup>4</sup> Some snake bites cause immediate severe pain and swelling, while others may produce minimal local symptoms despite serious systemic involvement. Complications include tissue loss, compartment syndrome requiring surgical intervention, acute kidney injury, and respiratory failure.

In India, snakebite management has traditionally focused on the "Big Four" venomous snakes; however, recent studies suggest that this concept may not fully represent regional variations in medically important snake species responsible for envenomation.<sup>7</sup>

Karnataka state has diverse snake species including vipers and cobras. Russell's viper and the spectacled cobra are responsible for most snake bite deaths in this region.<sup>8</sup> The state government has launched a plan to reduce snake bite deaths by 50% by 2030. This study

examines the clinical patterns and outcomes of snake bite victims treated at a tertiary care hospital in Karnataka.

## MATERIALS AND METHODS

### Study Design and Setting

This was a retrospective cross-sectional study conducted at R.L. Jalappa Hospital, Kolar, Karnataka. Medical records of snake bite victims were reviewed from the Department of Forensic Medicine and Toxicology.

### Study Period

September 8, 2023 to November 19, 2024 (14 months)

### Study Population

Medical records of all confirmed snake bite cases admitted during the study period were reviewed. The sample size was 51 cases. Disease classification used the ICD-10 coding system.

### Data Collection

Information recorded included:

- Patient age, gender, and residence (rural/urban)
- Time and location of bite
- Snake species (if identified)
- Symptoms: pain, swelling, bleeding, breathing difficulty
- Complications: kidney injury, infection, respiratory failure
- Treatment given, including antivenom use
- Patient outcomes (survived or died)

Mortality was confirmed by autopsy findings or death certificates.

### Inclusion and Exclusion Criteria

All confirmed snake bite cases admitted during the study period were included. Cases with

incomplete records or uncertain diagnosis were excluded.

### Ethical Approval

The study followed institutional guidelines for retrospective medical records research and ensured patient confidentiality.

### Statistical Analysis

Data were summarized using descriptive statistical measures including counts, proportions, mean values, and minimum-maximum distribution.

## RESULTS

### Demographic Characteristics

Fifty-one snake bite victims were studied. Mean age was 35.2 years (range: 2–84 years). Males comprised 67% of cases. Kolar district had the most cases, followed by Malur. Eighty percent lived in rural areas and 20% in urban areas. The foot was the most common bite site (43%), followed by ankle (28%), and toes (15%).

### Time to Hospital Arrival

Most victims reached the hospital within 6 hours (43.14%), followed by 6–12 hours (35.29%), 13–24 hours (19.61%), and over 24 hours (1.96%). Delayed arrivals were due to remote locations, poor transportation, and multiple referrals.

### Clinical Symptoms and Complications

Table 1 shows clinical features. Pain was reported in 98.04% of cases and swelling in 84.31%. Breathing difficulty occurred in 41.18% and bleeding in 29.41%. One case had drooping eyelid (1.96%). Serious complications were uncommon: kidney injury (1.96%), skin infection (3.92%), and respiratory failure (3.92%).

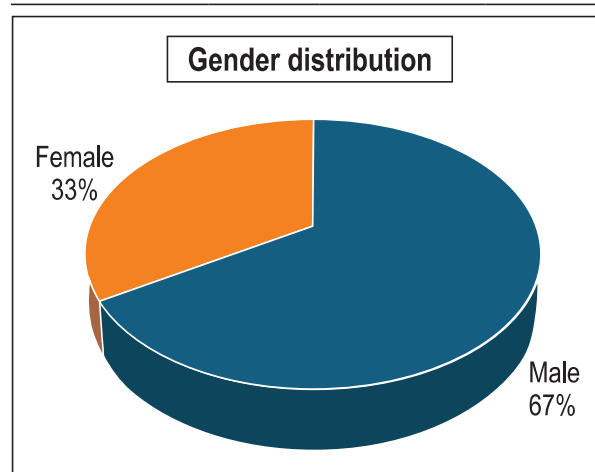
**Table 1:** Clinical Features and Complications of Snake Bite Victims (n=51)

Parameter Category	Number of Cases	Percentage
<i>Time Interval (hrs)</i>		
<6 hours	22	43.14
6–12 hours	18	35.29
13–24 hours	10	19.61
>24 hours	1	1.96

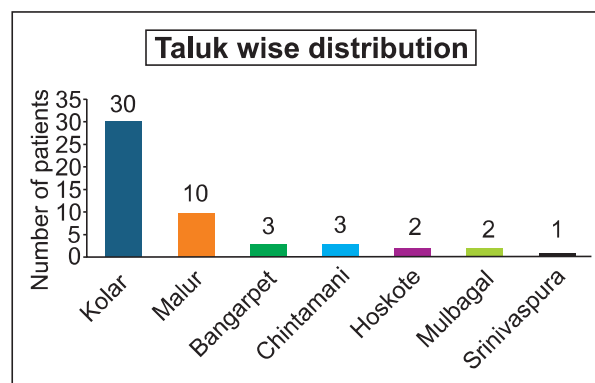
Parameter Category	Number of Cases	Percentage
<i>Symptom</i>		
Pain	50	98.04
Swelling	43	84.31
Bleeding	15	29.41
Ptosis	1	1.96
Respiratory distress	21	41.18
<i>Complications</i>		
Acute Kidney Injury	1	1.96
Cellulitis	2	3.92
Respiratory Failure	2	3.92

**Table 2:** Antivenom Use and Patient Outcomes

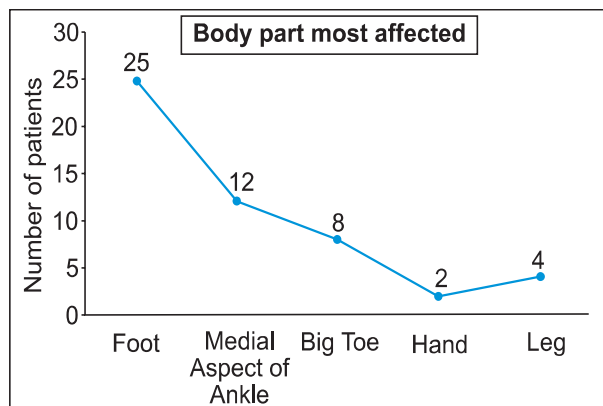
Parameter	Category	Number of Cases	Percentage
Antivenom Given	Yes	35	68.62
	No	16	31.37
Fatality	Yes	3	5.88
	No	48	94.11



**Figure 1:** This pie chart shows the proportion of male (67%) and female (33%) patients affected by snakebite



**Figure 2:** This bar diagram depicts the geographical distribution of snakebite cases across various taluks, with the highest number reported from Kolar



**Figure 3:** This line graph illustrates the anatomical sites of snakebite, with the foot being the most commonly affected region

### Antivenom Use and Outcomes

Antivenom was administered to 68.62% of patients (35 cases), while 31.37% (16 cases) did not receive it. Superficial bites without systemic effects were managed without antivenom. Three deaths occurred (5.88 mortality rate), and 48 patients (94.11%) survived and were discharged.

### DISCUSSION

Snake bite poses a serious challenge in rural India, particularly among agricultural workers. This finding aligns with national epidemiological data showing that males are more commonly affected due to occupational exposure.<sup>6</sup> The 80% rural involvement reflects increased risk from barefoot field work and outdoor activities, consistent with earlier studies by Mitra *et al.* (2015) and Satyanarayan *et al.* (2022).<sup>8,9</sup>

The lower extremity, especially the foot and ankle, is the most common bite site. This pattern is expected because agricultural workers labour barefoot in fields. The majority of patients (43%) reached hospital within 6 hours, which is favourable. However, some experienced delays due to transportation problems in remote areas. These barriers need targeted improvement strategies.

Pain and swelling were the predominant symptoms in 98% and 84% respectively, indicating local venom effects. Breathing difficulty in 41% and bleeding in 29% suggest systemic toxicity affecting the nervous system and blood coagulation. The low rate of severe complications likely reflects rapid hospital care and effective supportive treatment.

Antivenom remains the main treatment for snake bite. In this study, 68.62% received antivenom – a reasonable proportion reflecting clinical judgment, as superficial dry bites do not require it. The 5.88% mortality rate shows that hospital-based care significantly reduces deaths compared to community outcomes.<sup>6</sup> This improvement results from antivenom availability, standardized treatment protocols, and early recognition of severe cases.

Some patients experienced adverse reactions to antivenom, highlighting the need for better formulations suited to this region. Karnataka's public health initiative aims to reduce snake bite mortality and disability by 50% by 2030.<sup>10</sup> Key strategies include training healthcare workers, improving emergency supplies, enhancing transportation, and providing affordable antivenom.<sup>11</sup>

### CONCLUSION

Snake bite remains a significant health problem in rural southern India, particularly among agricultural workers. This study confirms the need for improved rural healthcare access, community education about prevention and first aid, and timely specialized care. Coordinated efforts among government health agencies, hospitals, and communities are essential to reduce snake bite deaths and disabilities and achieve national health goals.

**Acknowledgement:** Nil

**Conflict of Interest:** Nil

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