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CLINICAL AND FORENSIC INSIGHT INTO SNAKEBITE ENVENOMATION IN NORTHERN INDIA DISTRICT

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Abstract: Snakebite is a significant public health problem, especially in the hilly and rural areas of India. The Northen India district - Doda region of Jammu and Kashmir is one such location where the snakebite burden is high due to environmental and geographical challenges. A total of 74 cases were studied. This study analyses the epidemiological characteristics, clinical manifestations, and outcomes of snakebite cases in this region. Our findings indicate that most cases occur in young males during monsoon months, with lower limb bites being predominant. The use of antivenom and supportive management led to favourable outcomes in most patients, but delays in presentation and inadequate first aid often worsened prognosis. Increased awareness, training, and better healthcare access are essential to reduce mortality and morbidity. The snakebite necessitates thorough medicolegal investigation to rule out whether the bite is accidental, rarely suicidal and suspicious of homicidal.

Keywords: snakebite, envenomation, antivenom, public health, rural epidemiology, medico-legal.

INTRODUCTION

Snakebite is a well-documented but neglected medical emergency, primarily affecting the rural poor in tropical and subtropical countries. The World Health Organization categorizes snakebite envenoming as a high-priority neglected tropical disease due to its substantial burden and the preventable nature of its complications (1). Globally, it is estimated that 5.4 million snakebites occur each year, resulting in 1.8 to 2.7 million envenomation's and around 81,000 to 138,000 deaths annually (2). India accounts for nearly half of the global deaths due to snakebite (3).

The Doda district of Jammu and Kashmir, with its forested terrain, hilly slopes, and agricultural lifestyle, is a hotspot for human-snake interaction. The prevalence of snakebites here is exacerbated by limited access to health care, reliance on traditional healing practices, and poor transport infrastructure (4, 5). Snakebite envenomation typically occurs during the monsoon season when both snake activity and human agricultural activity increase (6) such data are crucial for public health authorities and medicolegal expert.

There is a lack of epidemiological data from the region, which hampers planning and effective intervention. Previous studies have mainly focused on southern and central India, with very limited data from Jammu and Kashmir (7). This study addresses the epidemiological, clinical, and therapeutic aspects of snakebites in the Doda region and aims to provide insights for improved management and policy formation (8).

MATERIALS AND METHODS

A retrospective observational study was conducted at the Government Medical College associated hospital in Doda district over a 24-month period (January 2021 to December 2022). All patients admitted with a history of snakebite were included.

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Inclusion Criteria

Patients of all age groups and genders with definitive history or signs of snakebite.

Exclusion Criteria

Cases of suspected snakebite without visible fang marks or clinical symptoms.

Data Collection

Hospital records were reviewed to collect information on demographic profile, time and site of bite, clinical features, treatment received (including anti-snake venom administration), complications, and outcomes.

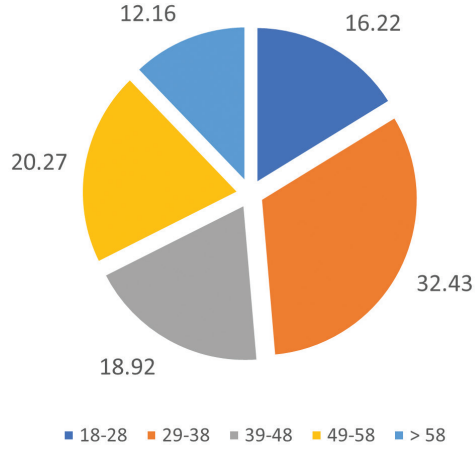

Figure 1. Describing the study groups as per age seasonal incidences of snake bite.

Statistical analysis

Descriptive statistics were used. Data were expressed as percentages, means, and standard deviations where applicable.

RESULTS

Out of the 74 patients included in this study, 24 (32.43%) were aged 29–38 years, followed by 15 (20.27%) in the 49–58 age group. Males constituted 58.1% (n=43) and females 41.9% (n=31) (Fig. 1).

The majority of cases (71.6%) were reported among farmers, followed by housewives and students (Table 1).

The most common site of the bite was the lower limb (approximately 70%), and evening hours (5 PM–8 PM) were the most frequent time for bite incidents (Table 2).

A seasonal trend was observed, with over 50% of cases occurring during the monsoon months of July to October (Fig. 2).

In 80% of the cases, the snake was not identified. Of the total, 19 cases were found to be venomous. Among them, vasculotoxic features were

Table 1.

Occupation	No of cases	Percentage
Snake Charmer	0.00	0.00
Housewife	14.86	14.86
Student	13.51	13.51
Farmer	71.62	71.62
Total	74	100.0

Table 2.

Site of bite	No. of non-poisonous cases		No. of poisonous cases		p-value
Upper Extremity	10	18.18	04	21.05	0.658
Lower Extremity	40	72.73	12	63.16	
Other sites (Face, trunk, neck, genitals)	05	9.09	03	15.79	
Total	55	100.0	19	100.0	

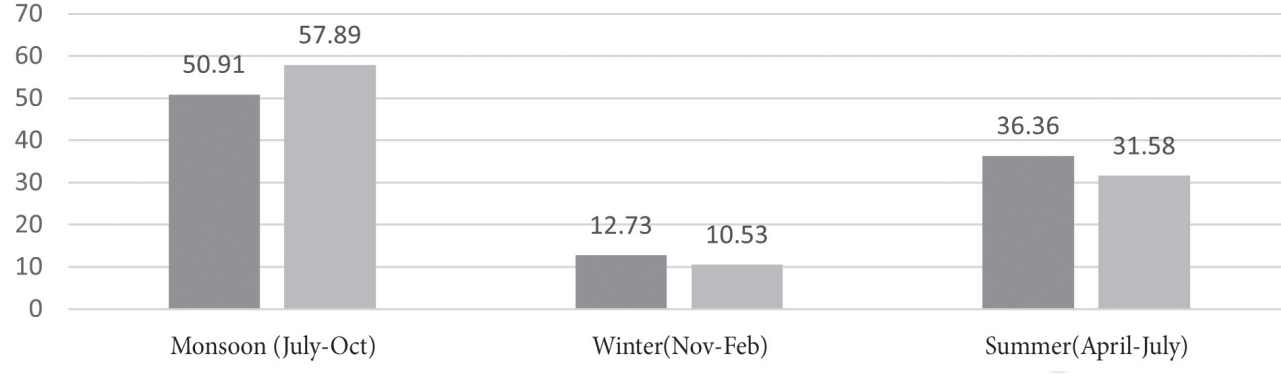

Figure 2. Describing the study groups as per age group.

more common than neurotoxic manifestations.

ASV administration was tailored to severity: mild cases received an average of 50 ml, moderate 107.6 ml, and severe 176.2 ml. Five patients required ventilator support, and three required dialysis. There was one mortality recorded.

DISCUSSION

This study reaffirms the high burden of snakebite envenomation in the rural and hilly areas of North India, particularly in Doda. Males in their most productive age group were predominantly affected, likely due to occupational exposure during farming and outdoor work (9). The monsoon months pose the highest risk as snakes seek shelter and food, and farmers are more active in fields during this season (10).

The predominance of lower limb bites is consistent with other regional and national studies, as accidental stepping on snakes during outdoor activity is a common scenario (11). Most patients presented with local signs of envenomation, followed by haematological and neurotoxic symptoms—suggestive of the presence of both viperid and elapid snakes in the area (12).

Tourniquet use and incisions were common among first aid practices. These methods, despite being ineffective and potentially harmful, persist due to lack of awareness and reliance on traditional beliefs (13). Public education campaigns are urgently required to dispel such myths and encourage prompt medical attention (14).

Antivenom therapy remains the cornerstone of treatment. Polyvalent ASV is widely used in India due to the prevalence of the "Big Four" venomous snakes (common krait, Indian cobra, Russell's viper, and saw-scaled viper) (15). However, the absence of region-specific antivenom may reduce efficacy in certain cases.

The mortality rate of 3.6% observed in this study is lower than national averages but still highlights the need for earlier hospital access, especially in remote areas (2,5). Mechanical ventilation was crucial in neurotoxic envenomation, further emphasizing the need for well-equipped peripheral health centres.

In conclusion, snakebite remains a major public health challenge in the Doda region despite the availability of effective treatment, outcomes are highly dependent on the time to medical intervention. Snakebite fatalities are considered medicolegal cases under unnatural death and necessitating autopsy. To reduce snake bite morbidity and mortality there is an urgent need for structured intervention including community awareness, health worker training, better transportation and medical infrastructure in rural hilly regions.

Conflict of interest

The authors declare that they have no conflict of interest.

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