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Original Research Article

Understanding Paediatric Snake Bites: Clinical Profiles and Outcomes

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Abstract:

Introduction –Snake bites are a significant public health concern, particularly in rural and impoverished regions where children are disproportionately affected. The World Health Organization (WHO) has classified snakebite envenoming as a Neglected Tropical Disease, highlighting its severe impact on global health. Each year, millions of people suffer from snake bites, with children being especially vulnerable due to their smaller body mass and higher likelihood of encountering snakes during outdoor activities. Effective prevention and management strategies are crucial to reduce the burden of snake bites among children. This study aims to explore the epidemiology, clinical features, and outcome of paediatric snake bites, emphasizing the need to protect this vulnerable population.

Methods: This study is a retrospective single centre study conducted in Government Medical College in Raigarh Chhattisgarh from July 2022 to December 2024 including 71 paediatric patients below 14 years of age, who presented with a history of snake bite. Clinical data about age, sex, clinical manifestations, complications, management and outcome were collected and analysed.

Results: In our study including of 71 patients, maximum snake bites incidents were noted in age group of 6-10 years (38.0%) with male predominance (64.2%). Most of the bites occurred during monsoon season (42.3%) in day time (57.7%) during outdoor activity (85%). Site of bite was mainly on lower limbs (80.3%) of patients. Almost 100% were unprovoked bites. Among all patients 35 (49.9%) children had signs of envenoming. Among those who had signs of envenoming majority of the bites were neuroparalytic (93.9%) and maximum cases responded to 10-20 vials of anti-snake venom (ASV). Mortality was 11.4% and it was higher among children who received ASV after 6 hours.

Conclusions: This study provides a comprehensive analysis of the clinical profile and outcomes of snake bites among children. Our findings indicate that early intervention and appropriate management significantly improve recovery rates and reduce complications. The data underscores the importance of public health initiatives aimed at educating communities about snake bite prevention and first aid measures. The serious clinical features of snake bite in children also warrant early referral and management in tertiary care centres.

Keyword: Snake envenomation, Children, Neuroparalytic, Anti snake venom.

Introduction

Snake bites represent a significant public health concern worldwide, with children being particularly vulnerable to their adverse effects [3, 4]. The incidence of snake bites in paediatric populations varies widely depending on geographic location, local snake species, and healthcare accessibility [5]. While snake bites can occur in any age group, children are disproportionately affected due to their smaller size, curiosity, and often limited awareness of danger [6]. Snakebite envenomation often leads to premature death of children mostly from rural areas. Studies have shown that children under 15 years old account for two-third to three–fourth of the total cases of snakebite [7] Children are at risk of sustaining snakebite mainly because of their curiosity about the unknown creatures, innocent act of invading the reptile's space, and habit of barefoot walking particularly in the darkness [8]. The consequences of snake bites in children can be severe, ranging from local reactions and systemic envenomation to long-term health complications and even fatalities. Despite the critical nature of this issue, there remains a notable gap in research focused specifically on paediatric cases of snake bites. This study aims to address this gap by providing a comprehensive review of snake bite incidents involving children. We explored the epidemiology of paediatric snake bites, analysed clinical presentations and outcomes, in young populations. By focusing on the distinctive needs and responses of children, we hope to enhance understanding, improve treatment protocols, and ultimately reduce the burden of snake bites on this vulnerable group.

Methodology

This study is a retrospective, single centre, descriptive study conducted in Paediatric department in Government Medical College Raigarh Chhattisgarh from July 2022 to December 2024. All the children who were 14 years of age or lesser, who were admitted in Paediatric Department with a history of snake bite were enrolled. After retrieving the registration number, the medical records were obtained from the medical case files from the Medical Record Section and Statistical Service of the institute. Clinical data about age, sex, clinical manifestations, complications, management and outcome were collected and analysed. Comparisons of categorical data were carried out using Pearson's Chi Square or Fisher's exact test where appropriate. A P value of less than 0.05 was taken as statistically significant.

Results

In present study 71 children below age of 14 years were enrolled. Their demographic and clinical data were collected.

Table 1: Age wise Distribution

Parameter	Variable
<1 year	3 (4.2 %)
1-5 year	20 (28.1%)
6-10 years	27 (38.0%)
>10 years	21 (29.7%)

The data shows that the highest number of snake bites occurred in the age group of 6-10 years (38.0%), followed by >10 years (29.7%). The youngest group <1 year had the lowest incidence (4.2%).

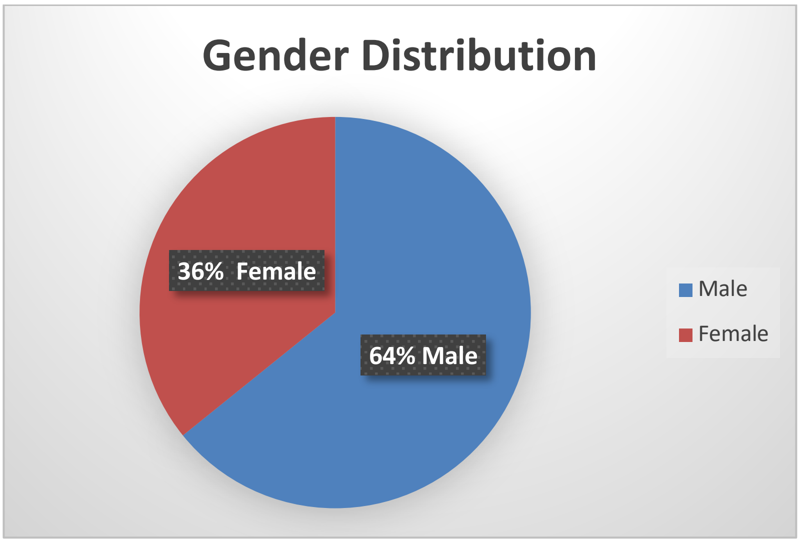

Figure 1: Gender wise Distribution

This data shows that the majority of snake bite cases involved males (64.2%), while females accounted for 35.8%. The higher incidence in males could be due to increased exposure to outdoor activities, which puts them at greater risk of snake bites.

Table 2: Time of Snake Bite

Parameter	N (%)
Daytime	41 (57.7 %)
Night time	30 (42.3%)

Most snake bites occurred during the daytime (57.7%), though a substantial number (42.3%) took place at night, indicating that snakebite prevention strategies should target both day and night activities.

Table 3: Seasonal variation of Snake Bite

Season	N (%)
Spring (February to March)	6 (8.5%)
Summer (April to June)	18 (25.4%)
Monsoon (July to September)	30 (42.3%)
Autumn (October to November)	12 (16.8%)
Winter (December to January)	5 (7.0%)

The highest incidence of snake bites was observed during the monsoon season (42.3%), which may be due to increased snake activity and human exposure. This is followed by the summer (25.4%), with fewer bites in winter and spring.

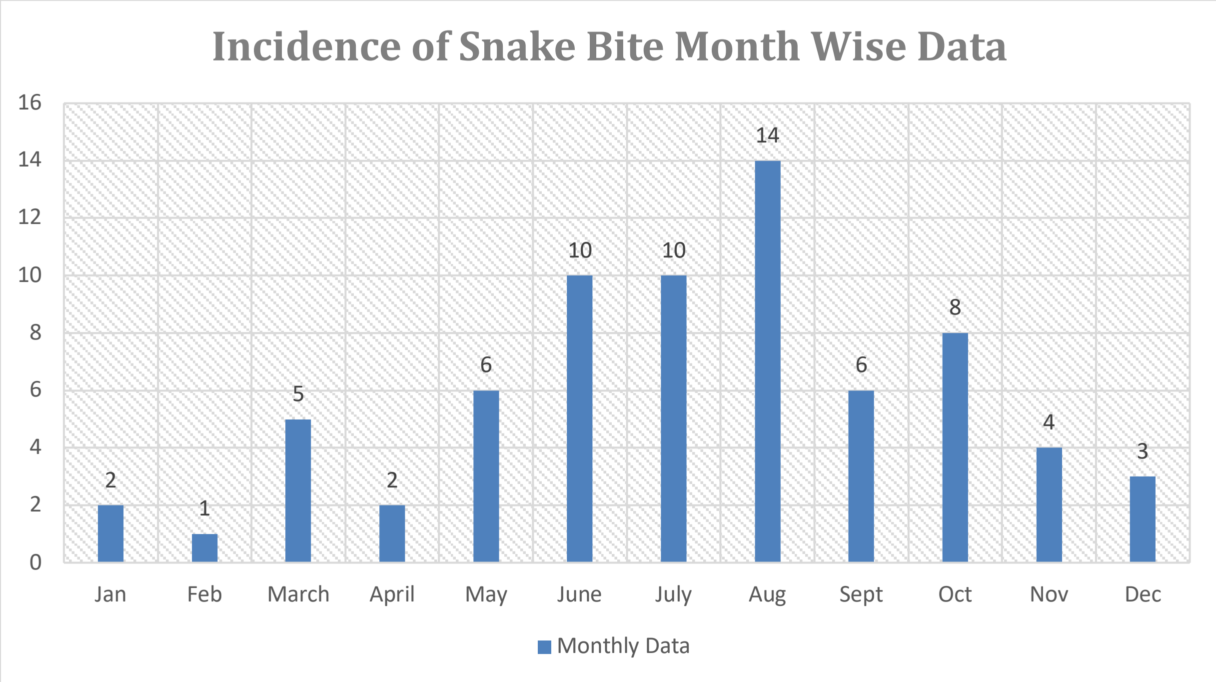

Figure 2:

The highest incidence of snake bites occurred in August (14 cases), followed by July and June with 10 cases each. This aligns with the monsoon season (July to September), when snake activity tends to increase due to rains and human exposure in the environment.

Table 4: Site of bite

Site	N (%)
Lower Limb	57 (80.3 %)
Upper Limb	13 (18.3%)
Head and Neck	1 (1.4%)

The lower limb was the most common site of snake bites (80.3%), consistent with patterns where people are bitten while walking or working. Upper limb bites (18.3%) may occur during outdoor activities, while bites on the head and neck are rare (1.4%). Almost 100% were unprovoked bites.

Systemic Manifestations

About half of the patients 36 (50.1%) remained asymptomatic which could be non-venomous snake bites or dry bites, while the other half 35 (49.9%) developed systemic symptoms.

Neuroparalytic effects (93.9%) were the most common among those with systemic manifestations, highlighting the venom's effect on the nervous system.

Haematological symptoms were observed in 6.1% of patients. Among those who had snake envenomation most common presenting symptoms were

Table 5:

Common presenting Symptoms	N (%)
Diplopia	13 (37.1%)
Ptosis	12 (34.3%)
Sensory Motor Symptoms	11 (31.4%)
Shock	6 (17.1%)
Respiratory Failure	6 (17.1%)
Local Swelling of Limb	3 (8.6%)

The most common symptoms presenting symptom were diplopia (37.1%) and Ptosis (34.3%), both indicating neurological involvement, with a smaller number presenting with Respiratory Failure (17.1%), shock (17.1%) or local swelling (8.6%).

Table 6: ASV administration and adverse reaction

Anti-Snake Venom Vials	N (%)
<10 Vials	0
10-20 Vials	30 (85.7%)
>20 Vials	5 (14.3%)

Most patients (85.7%) required 10-20 vials of ASV, and those who received ASV only 3 (8.5%) of these had an adverse reaction.

Table 7: Bite to Needle time and outcome

Bite to Needle time	N (%)	Mortality
≤6 hours	25 (71.5 %)	1 (4.0%)
>6 Hours	10 (28.6%)	3 (33.3%)

P Value 0.04

The data suggests that receiving treatment within 6 hours of a snake bite significantly reduces the mortality rate.

Only 4.0% of cases resulted in death when treatment was administered within this timeframe. However, when treatment was delayed beyond 6 hours, the mortality rate increased dramatically to 33.3%. This indicates that delays in treatment are associated with a higher risk of death. After running Fisher's Exact Test, the p-value is found to be approximately 0.04. A p-value of 0.04 suggests that there is a statistically significant difference in mortality rates between the two groups (≤6 hours vs. >6 hours) at a conventional alpha level of 0.05.

Therefore, the difference in mortality rates between those who received treatment within 6 hours of the bite and those who received it later is statistically significant.

Table 8:

Outcome	N (%)
Discharged	31 (88.6%)
Death	4 (11.4%)

Among 35 patients who had systemic signs of envenoming 31 (88.6%) were recovered and discharged and mortality was 11.4%.

Discussion

Snakebite is a common medical emergency encountered among Indian population(9). Paediatric patients are a special group of the general population. They differ from the general adult population in terms of physiology, pathology, and therapeutic dosing [10]. Snakebite envenoming is a significant medical emergency, particularly in paediatric populations. Children are at a higher risk of severe outcomes due to their smaller body size and the higher relative dose of venom received. The clinical presentation of snakebite in children can vary widely, from mild local symptoms to severe systemic effects, including coagulopathy, neurotoxicity, and renal failure. Effective management requires prompt recognition, appropriate first aid, and timely administration of antivenom. Despite advancements in medical care, snakebite remains a neglected tropical disease with substantial morbidity and mortality, especially in low-income settings [11, 12]. In present study the data shows that the highest number of snake bites occurred in the age group of 6-10 years (38.0%). This is similar to a study by Chandrashekaraswamy SS et al which also found that maximum snake bites incidents were noted in age group of 6-10 years (47.16%) of the rural population [13].

In our study majority of snake bite cases involved males (64.2%), while females accounted for 35.8% which is also noted in other Indian studies [13]. This could be attributed to mainly due to more outdoor activity among males. It was also noticed that most snake bites occurred during the daytime (57.7%), though a substantial number (42.3%) took place at night. This was also documented by Chandrashekaraswamy SS et al [13]. However Shrestha BM in her study noticed that snakebite envenomation occurred more frequently (52%) during night time [8]. This indicates that snakebite prevention strategies should target both day and night activities.

In present study the highest incidence of snake bites was observed during the monsoon season (42.3%). This was also supported by Kumar et al (2024) which noticed The highest number of cases (35.5%) were reported during July–September during monsoon season [14]. This could be attributed to increased snake activity during monsoon season.

In our study the lower limb was the most common site of snake bites (80.3%), consistent with patterns where people are bitten while walking or working while bites on the head and neck were rare (1.4%). In literature Kumar et al (2024), Kulkarni ML et al also documented that lower limb is most common site for snake bite [9] [14].

Present study shows about half of the patients 36 (50.1%) had no symptoms that could be because non-venomous snake bites or dry bites, while the other half 35 (49.9%) developed systemic symptoms. Kshirsagar VY, et al also documented in his study that among snake bites (33.33%) bites are due to non-poisonous snakes [15]. Snakes may benefit from delivering warning bites devoid of venom (‘dry bites’) to predators and threats, thereby saving their venom for future prey. Thus, in many encounters, where snakes bite human victims, the victim may fortuitously only receive a dry bite [16].

Among those who had signs of systemic manifestations neuroparalytic effects (93.9%) were most commonly observed in which 37.1% had diplopia and 34.3% had ptosis indicating neurological involvement. In another study Kumar, et al. (2024) also documented neurological manifestations were observed 45.8%, with ptosis being the most common symptom in 20.3% [14]. In another study Meshram RM et al. (2017) also documented that 31.82% and 22.73% patients had developed diplopia and ptosis after snake bite [17].

In our study most patients (85.7%) required 10-20 vials of ASV and only 14.3% required more than 20 vials of ASV. This is similar to other study by Jayaraman T et al where 80.6% required 20 vials and only 8.3% required 30 vials of ASV [18].

In present study the data suggests that receiving treatment within 6 hours of a snake bite significantly reduces the mortality rate. Only 4.0% of cases resulted in death when treatment was administered within this timeframe.

However, when treatment was delayed beyond 6 hours, the mortality rate increased dramatically to 33.3%. This indicates that delays in treatment are associated with a higher risk of death. Bite-to-needle time dictates the morbidity and mortality of snakebite patients.

The amount of ASV required to neutralize increases as the venom gets a long time to be present in the body, and hence chances of systemic envenomation increase [18]. In his study Jayaraman T et al also found that patients with a bite- to-needle time of under 6 hours spent less time in the hospital and experienced fewer complications [18]. In our study 88.6% patients recovered and discharged and mortality was 11.4%. This is similar to study by Meshram RM et al where case fatality rate was 11.25% [19]

Conclusion

The data emphasizes that snake bites are common in children (6-10 years), predominantly occur during the monsoon season, and affect the lower limbs. Neuroparalytic symptoms are the most frequent systemic manifestation, and early treatment with 10-20 vials of ASV is the most common approach with low reaction rates.

In summary, prompt medical intervention is crucial in reducing mortality rates following a snake bite. The sooner the treatment is administered, the better the chances of survival.

Recommendations

1. Health education about preventive and first-aid measures of snake bite to general population
2. Community participation and Involvement of local doctors and health workers about early referral to health facility.
3. Follow a standard management protocol of snake bite to decrease morbidity and mortality among children.

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