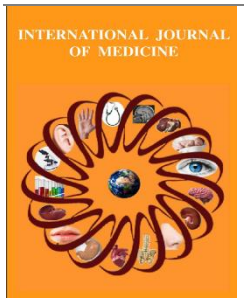

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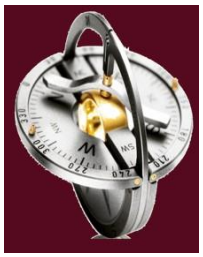

**Original Research**

# Clinical Profile and Outcome of Snake Bite Patients in A Tertiary Health Care Centre, Punjab.

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**Abstract**

***Introduction***:Snakebites pose a significant global public health challenge, causing a high number of fatalities and long-term health complications. The World Health Organization (WHO) estimates that between 81,000 and 138,000 individuals worldwide succumb to snakebite envenomation annually (1). India experiences around 1.2 million snakebite fatalities between 2000 and 2019, with an average of 58,000 deaths per year. Most of these fatalities occurred in rural areas during the monsoon season, with the highest death rates observed in states like Uttar Pradesh, Andhra Pradesh, Bihar, and Madhya Pradesh (2). ***Materials and Methods: Study design:*** The present observational, descriptive study was carried out in Medicine Emergency and Wards of Government Medical College and Rajindra Hospital, Patiala, India. A tertiary care hospital for a time duration of one year, from April 2024 to March 2025. ***Results***: Among symptomatic cases, 37.5% patients required oxygen support, out of them 9.5% required either Bipap or ventilator support. 16.2% symptomatic patients required ionotropic support. ***CONCLUSION***: With most patients experiencing complete recovery, this study highlights the importance of creating awareness, timely referral and medical intervention in snake bite cases. Seasonal variations in symptoms highlight the need for heightened alertness during the rainy and winter seasons.

## Introduction

Snakebites pose a significant global public health challenge, causing a high number of fatalities and long-term health complications. The World Health Organization (WHO) estimates that between 81,000 and 138,000 individuals worldwide succumb to snakebite envenomation annually [(1)]. India experiences around 1.2 million snakebite fatalities between 2000 and 2019, with an average of 58,000 deaths per year. Most of these fatalities occurred in rural areas during the monsoon season, with the highest death rates observed in states like Uttar Pradesh, Andhra Pradesh, Bihar, and Madhya Pradesh [(2)].

Snakebite envenomation is a significant public health concern in Punjab too, with rural areas experiencing the highest prevalence. Common species involved include cobras, vipers, and krait snakes. In 2023, Punjab recorded 2,693 snakebite cases, resulting in 54 deaths, despite availability of anti-snake venom free of cost in government hospitals [(3)]. However, the studies on the mortality, morbidity and incidence from snake bite are highly inadequate.

## Materials and Methods

Study design: The present observational, descriptive study was carried out in Medicine Emergency and Wards of Government Medical College and Rajindra Hospital, Patiala, India. A tertiary care hospital for a time duration of one year, from April 2024 to March 2025.
Sample size: A total of 269 cases were admitted to Medicine emergency and Wards during this time period.

**Inclusion criteria:** Patients/relatives willing to give written consent were included.

**Exclusion Criteria:** Patients/relatives not willing to give written consent to be the part of this study.

**Methodology:**
Approval was taken from the internal ethics committee of the institution. Patients with snake bite reporting to medicine emergency and medicine wards in Rajindra Hospital, who are willing to give written consent were enrolled.

Data regarding sociodemographic and clinical profile of the patients was collected. Detailed information like time of snake bite, season of the bite, place of bite, site of bite, bite mark, type of snake, time interval to treatment was noted. A thorough clinical examination was done to see the type of symptoms present. Investigations that included complete blood count, liver function test, renal function test, ECG, chest X-ray and coagulation profile was done for all the patients. Data regarding the treatment (particularly anti-snake venom) given to the patients and any complications developed during the hospital stay, duration of ICU stay, and outcome of the patients was recorded.

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**Results:**

TABLE 1: Sociodemographic Profile Of The Patients

| | | Frequency | Percentage |
|---|---|---|---|
| Age | 16-35 | 80 | 29.9% |
| | 36-55 | 151 | 56.3% |
| | 56-75 | 35 | 13.1% |
| | >75 | 2 | 0.7% |
| Sex | Male | 213 | 79.5% |
| | Female | 55 | 20.5% |
| Occupation | Farmer | 83 | 31.0% |
| | Labourer | 112 | 41.8% |
| | Others | 73 | 27.2% |
| Residence | Rural | 191 | 71.3% |
| | Urban | 77 | 28.7% |

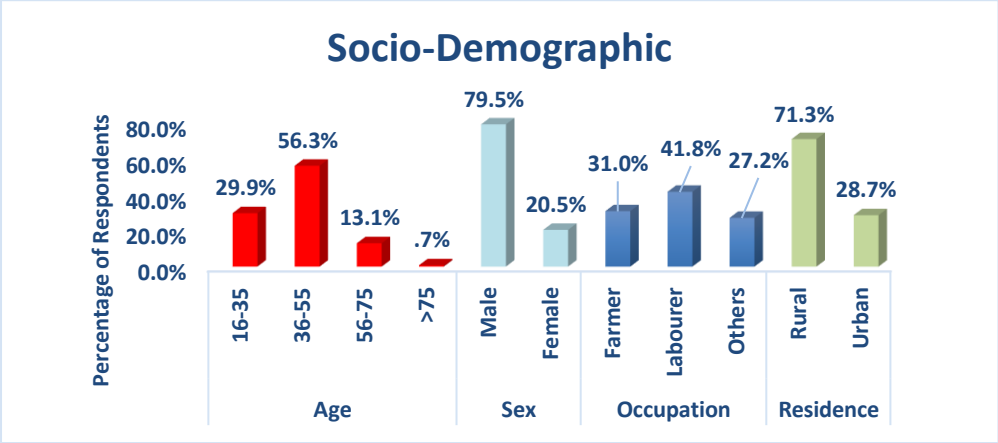


**Figure1: Sociodemographic profile of patients**

A significant majority of respondents were within the age group of 36-55 years, comprising 56.3% of the sample, followed by those aged 16-35 years at 29.9%.

**There was a male predominance (79.5%). Rest (20.5%) were females**
Occupation-wise, labourers were the largest group (41.8%), followed by farmers at (31.0%), and those in other professions were (27.2%). Majority (71.3%) of respondents lived in rural areas, while (28.7%) resided in urban settings.

TABLE 2: Distribution of Snake Bites by Time, Season, Month, and Location

| | | Frequency | Percentage |
|---|---|---|---|
| Time of Snake Bite | Early Morning | 28 | 10.4% |
| | Day | 65 | 24.3% |
| | Evening | 40 | 14.9% |
| | Night | 135 | 50.4% |
| Season | Summer | 47 | 17.5% |
| | Rainy | 193 | 72.0% |
| | Winter | 28 | 10.4% |
| Month | January | 2 | .7% |
| | February | 2 | .7% |
| | March | 0 | 0.0% |
| | April | 10 | 3.7% |
| | May | 9 | 3.4% |
| | June | 28 | 10.4% |
| | July | 111 | 41.4% |
| | August | 53 | 19.8% |
| | September | 30 | 11.2% |
| | October | 20 | 7.5% |
| | November | 1 | .4% |
| | December | 2 | .7% |
| Place of Bite | Indoor | 38 | 14.2% |
| | Outdoor | 230 | 85.8% |

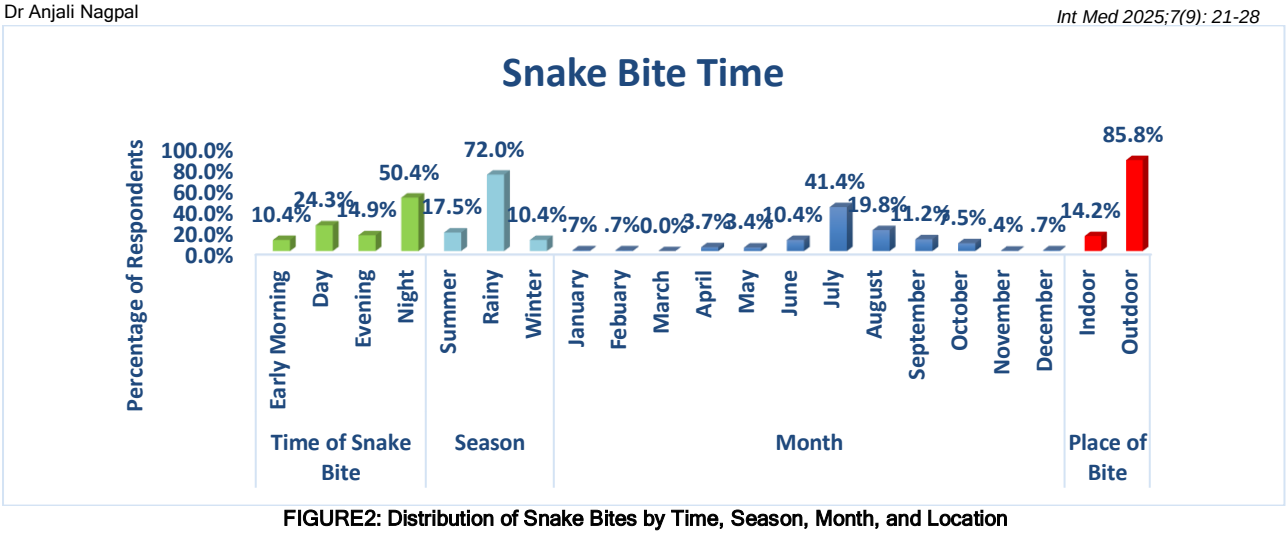


FIGURE2: Distribution of Snake Bites by Time, Season, Month, and Location

Maximum snake bites (50.4%) took place at night, followed by daytime bites 24.3%, 14.9% snake bite occurred during evening time, and early morning bites were only 10.4%.

The majority of bites (72.0%) were reported during the rainy season, while summer and winter accounted for 17.5% and 10.4% of incidents, respectively.

When considering the monthly distribution, July sees the highest number of bites (41.4%), followed by August (19.8%) and June (10.4%). Other months, such as April, May, and September, report fewer incidents, with March, November, and December showing minimal occurrences.

The majority of snake bites occured outdoors (85.8%), with only a small proportion happening indoors (14.2%).

TABLE 3: Characteristics of Snake Bites: Site, Snake Identification, First Contact, and Treatment Response

| | | Frequency | Percentage |
|---|---|---|---|
| **Site of Bite** | Lower Limb | 212 | 79.1% |
| | Upper Limb | 48 | 17.9% |
| | Trunk | 7 | 2.6% |
| | Head & Neck | 1 | .4% |
| **Bite Mark** | Present | 177 | 66.0% |
| | Absent | 91 | 34.0% |
| **Snake Seen** | Yes | 200 | 74.6% |
| | No | 68 | 25.4% |
| **Type of Snake Seen** | Cobra | 15 | 7.5% |
| | Krait | 57 | 28.5% |
| | Viper | 10 | 5.0% |
| | Unidentified | 118 | 59.0% |
| **First Contact** | Faith Healer | 45 | 16.8% |
| | Local practitioner/local government body | 204 | 76.1% |
| | Tertiary Health Care Centre | 18 | 6.7% |
| | Other | 1 | .4% |
| **Time Lag to Treatment** | <1 Hour | 20 | 7.5% |
| | 1-6 Hours | 120 | 44.8% |
| | 6-12 Hours | 100 | 37.3% |
| | >12 Hours | 28 | 10.4% |

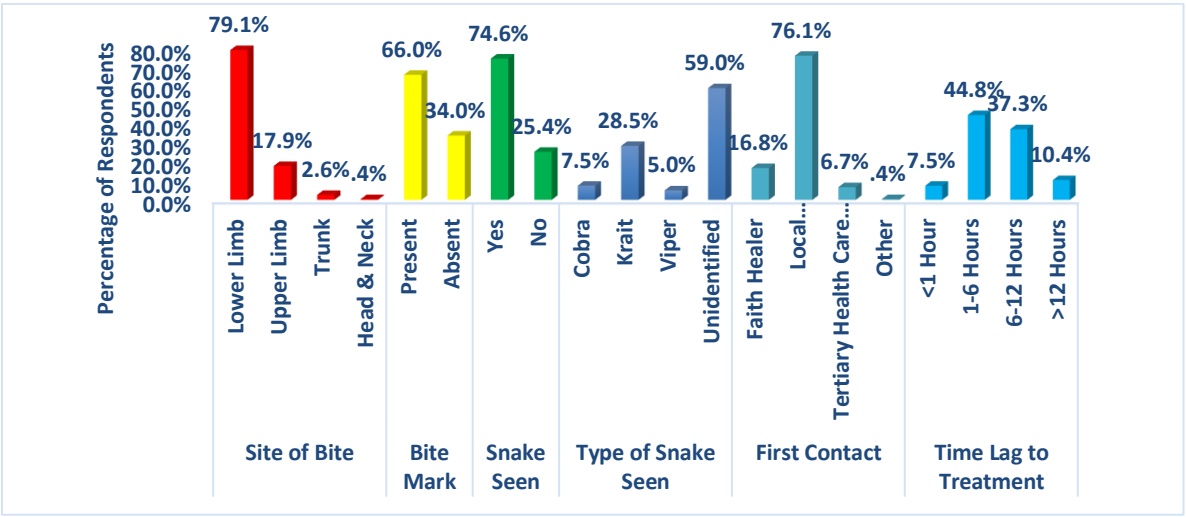


FIGURE 3: Characteristics of Snake Bites: Site, Snake Identification, First Contact, and Treatment Response

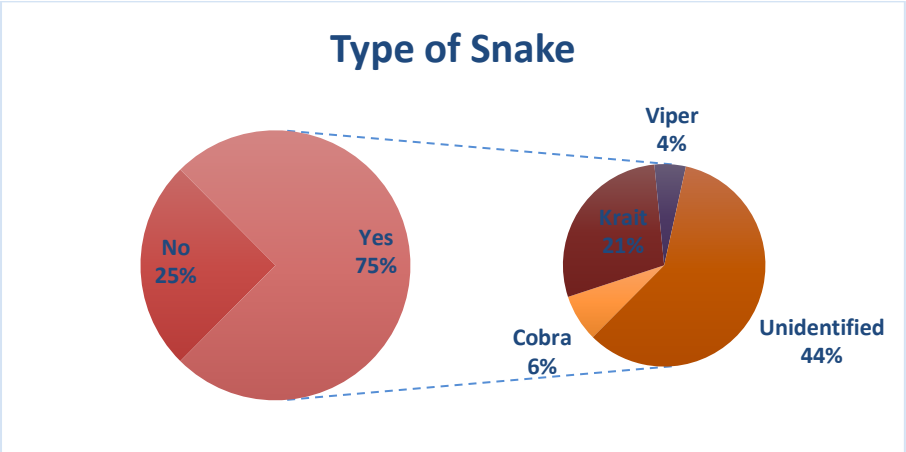


**FIGURE 4:** TYPE OF SNAKE

Maximum number of snake bites were seen on the lower limbs (79.1%), followed by the upper limbs (17.9%), only 0.4% snake bites were seen on head and neck area. (Table 3, Figure 3)

Majority (66.0%) of cases had a visible bite mark, while some (34.0%) did not. As for the snake itself, most respondents (74.6%) had seen the snake, while few (25.4%) could not see the snake. (Table 3, Figure 4)

Among those who had seen the snake, 28.5% mentioned it as a krait, 7.5% identified it as a cobra, and 5.0% identified a viper, while majority (59.0%) of respondents were unable to identify the snake. (Table 3, Figure 4)

Regarding the first point of contact, the majority (76.1%) sought help from local practitioners or government bodies, 16.8% turned to faith healers, and only 6.7% went to a tertiary healthcare centre directly. (Table 3, Figure 3)

In terms of time to treatment, only 7.6% victims received treatment within one hour of snake bite, good number (44.8%) of victims received treatment within 1-6 hours of snake bite, 37.3% received treatment within 6-12 hours, and 10.4% after more than 12 hours. (Table 3, Figure 3)

**Table 4: Clinical Profile of the patients**

| | | Frequency | Percentage |
|---|---|---|---|
| **Clinical Profile** | Asymptomatic | 132 | 49.3% |
| | Symptomatic | 136 | 50.7% |
| **Neurological Symptoms** | Yes | 89 | 65.4% |
| | No | 47 | 34.6% |
| **Haematological Symptoms** | Yes | 24 | 17.6% |
| | No | 112 | 82.4% |
| **Local Symptoms** | Present | 74 | 54.4% |
| | Absent | 62 | 45.6% |
| **Muscle Necrosis** | Present | 5 | 1.8% |
| | Absent | 121 | 98.2% |
| **CBC** | Normal | 227 | 84.7% |
| | Deranged | 41 | 15.3% |
| **LFT** | Normal | 248 | 92.5% |
| | Deranged | 20 | 7.5% |
| **RFT** | Normal | 231 | 86.2% |
| | Deranged | 37 | 13.8% |
| **Coagulation Profile** | Normal | 246 | 91.8% |
| | Deranged | 22 | 8.2% |

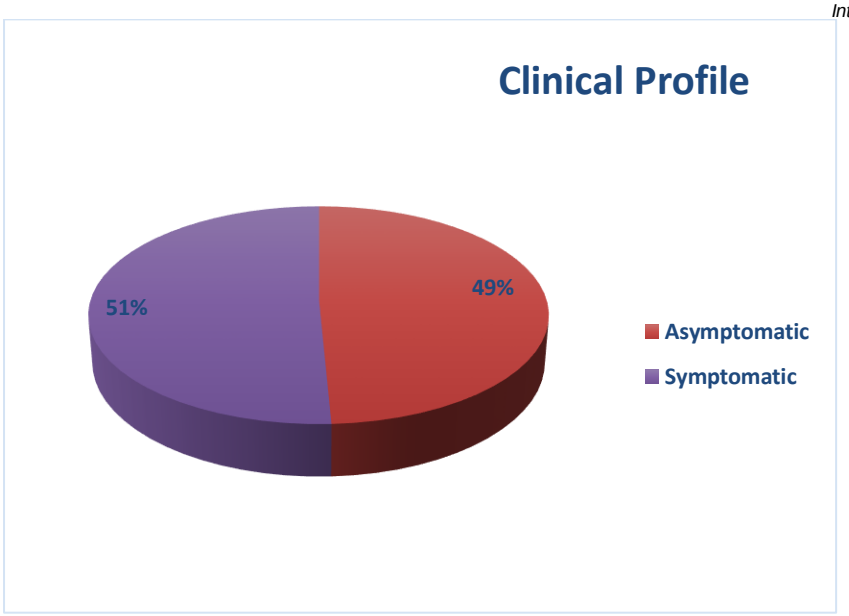


Figure 5: Clinical Profile of patients: Asymptomatic vs Symptomatic

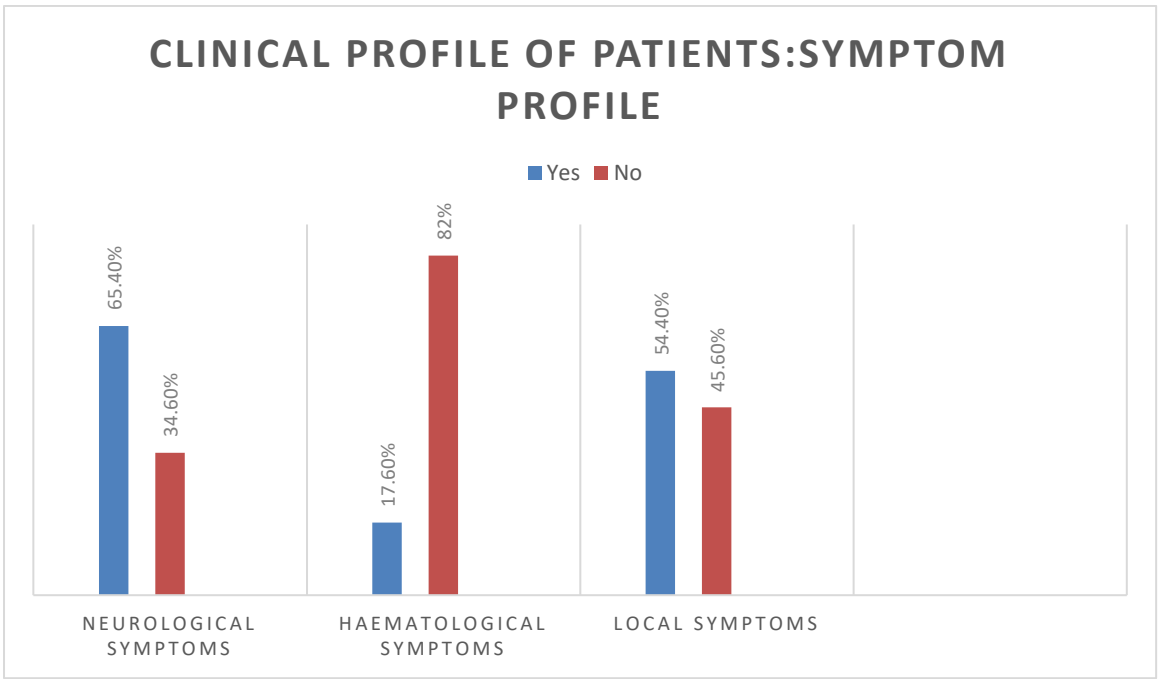


Figure 6: Clinical Profile of patients: Symptom profile

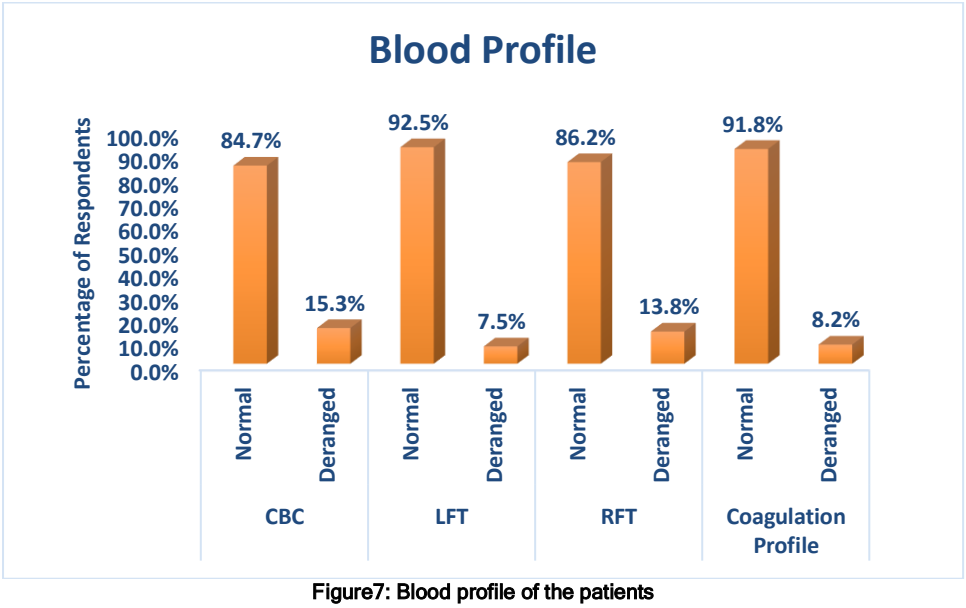


Figure7: Blood profile of the patients

50.7% patients were symptomatic, while 49.3% patients were asymptomatic (Table 4, Figure5) and showed normal test results such as CBC, LFT, RFT and Coagulation Profile etc. (Table 4, Figure 7)

Out of symptomatic snake bite cases, Neurological symptoms were commonest (65.4%) in our study, haematological symptoms were seen in 17.6% cases and local symptoms were present in 54.4% cases. (Table 4, Figure 6)

Muscle necrosis was seen in 5 patients (1.8%%) of total snake bite cases. (Table 4, Figure6)

**TABLE 5: Management given to the patients**

| | | Frequency | Percentage |
|---|---|---|---|
| **Transfusion Blood Products** | Yes | 10 | 7.3% |
| | No | 126 | 92.6% |
| **ICU Stay** | Required | 41 | 30.15% |
| | Not Required | 95 | 69.9% |
| **Inotropic Support** | Required | 22 | 16.2% |
| | Not Required | 114 | 83.8% |
| **Ventilator/ Bipap Support** | Required | 12 | 9.5% |
| | Not Required | 126 | 89.2% |
| **Oxygenation** | Given | 51 | 37.5% |
| | Not Given | 85 | 62.5% |
| **ICU Stay Duration** | None | 191 | 71.3% |
| | 1 day | 32 | 11.9% |
| | 2 days | 20 | 7.5% |
| | >2 days | 25 | 9.3% |
| **Anti-Snake Venom** | <10 Vials | 34 | 12.7% |
| | 10-20 Vials | 74 | 27.6% |
| | >20 Vials | 23 | 8.6% |
| | Not Given | 137 | 51.1% |
| **Sensitivity to ASV** | Present | 1 | 0.7% |
| | Absent | 135 | 95.1% |

Out of those who were symptomatic (50.7%) cases, 30.1% patients required ICU care while rest of them were treated in wards.
Among symptomatic cases, 37.5% patients required oxygen support, out of them 9.5% required either Bipap or ventilator support. 16.2% symptomatic patients required ionotropic support.

All symptomatic patients were given ASV. Out of those who needed ASV, 12.7% needed <10 ASV vials, 27.6% patients required 10 to 20 ASV vials and only 8.6% patients were given >20 ASV vials.

Sensitivity to ASV was rare and was seen in only one patient.

Blood and blood products needed to be transfused in 3.7% patients.

**TABLE 6: Distribution of Clinical Profiles (Asymptomatic vs Symptomatic) Across Different Seasons**

| | | Clinical Profile | | | |
|---|---|---|---|---|---|
| | | Asymptomatic | | Symptomatic | |
| | | N | % | N | % |
| Season | Summer | 36 | 76.6% | 11 | 23.4% |
| | Rainy | 84 | 43.5% | 109 | 56.5% |
| | Winter | 12 | 42.9% | 16 | 57.1% |

- The majority of **asymptomatic** patients were found during the **summer season** (76.6%).
- The majority of **symptomatic** patients were also during the rainy and **winter** season (56.5% and 57.1% respectively).
- The **summer season** has the fewest symptomatic patients (23.4%) but a notable proportion of asymptomatic cases (76.6%).

**TABLE 7: Distribution of patient outcomes after snake bite**

| | | Frequency | Percentage |
|---|---|---|---|
| OUTCOME | Complete Recovery | 255 | 94.7% |
| | Discharged with mild disability | 5 | 1.85% |
| | Death | 9 | 3.3% |

- The majority of patients experienced complete recovery (94.7%).
- A small percentage of patients were discharged with minor disability (1.85%),
- Death occurred in 3.3% of cases, all by neurotoxic snake bites.

**Discussion**
In the index study, a total of 269 cases were enrolled over a period of 1 year. The age distribution shows that the majority of patients (56.3%)

were in the age group of 36-55 years. This age group, being in the prime of their working years, is particularly vulnerable to snake bites while engaged in outdoor activities such as farming or labour. This finding is in line with the findings of previous studies by Patil A [4].

The greater representation of rural population (71.3%) further emphasizes the significance of snake bites as a public health issue in rural areas, with most bites occurring in outdoor areas (85.8%) in the farms or construction sites etc. Rural population is often more exposed to snakes due to living in close proximity to natural habitats, including agricultural fields, and other areas where snakes are commonly found. Most previous studies have the same finding [5,6].

Males (79.5%) clearly outnumber the female patients, since it is most men who are engaged in field jobs. The occupation of most patients in the present study is farming (31%) and labour (41.8%). People with these occupations are more exposed to the natural habitats like fields and also lack of protective gears like shoes. Similar results have been seen in most studies [5,6].

In the index study, snake bites predominantly occur at night (50.4%) followed by 24.3% in the daytime. This could be attributed to various factors like the nocturnal behaviour of many snake species, which are more active during the night in search of food or mates. Nighttime conditions, such as reduced visibility and cooler temperatures, may increase the likelihood of accidental encounters between humans and snakes. The morning snake bites might correspond to peak agricultural activities. These findings are similar to most studies done in the past [6,7]. A large majority of bites (72.0%) occurred during the rainy season. This is linked to environmental factors such as flooding and the proliferation of vegetation, which can drive snakes into human-populated areas in search of food or shelter. Similar results have been reported by studies done in the past[8].

A striking 79.1% of snake bites occurred on the lower limbs, which is consistent with findings from previous studies. This might be due to the fact that individuals in rural areas, where snake encounters are more frequent, often walk through vegetation or agricultural fields, increasing the likelihood of stepping on a snake [4,5]. 66.0% of respondents had visible bite marks aligns with the expectation that many snake bites are discernible, particularly from venomous species that leave distinctive puncture marks. However, the remaining 34.0% of cases, where no visible bite mark was observed, is noteworthy. This result is in line with studies indicating that not all snakebites are immediately apparent, especially in cases involving small or non-venomous snakes [9]. 59.0% of respondents in this study were unable to identify the type of snake, a finding consistent with previous research that emphasizes widespread misidentification or lack of knowledge about the various types of snakes and the venomous snakes in rural India[10,11]. 28.5% victims correctly identified the snake as a krait, 7.5% identified the snake as cobra and 5% victims identified the snake as viper. The inability to recognize venomous species could delay appropriate treatment, increasing the risk of fatality.

Regarding treatment-seeking behaviour, 76.1% of respondents sought help from local practitioners or government bodies, while 16.8% turned to faith healers. This reflects a strong reliance on traditional healing methods, a trend observed in other studies [12,13].The relatively low number (6.7%) seeking treatment directly at tertiary healthcare centres underscores the challenges of healthcare access in rural areas, where people may turn to faith healers or local practitioners due to logistical or cultural reasons[12,13]. The continued influence of these practices suggests that public health interventions focusing on snake identification and timely medical care are crucial to reduce morbidity and mortality. In terms of time to treatment, 44.8% of victims received treatment within 1-6 hours, a crucial window for effective intervention, while 37.3% sought help later (6-12 hours). Delayed treatment, as seen in 10.4% of cases, remains a significant concern, as delayed administration of antivenom can lead to poor outcomes. Majority of deaths in the index study were observed in this group. This delay is consistent with findings from previous studies, which suggest that inadequate healthcare infrastructure and cultural practices contribute to prolonged treatment-seeking behaviour[13]. This study sheds light on the clinical presentation and symptomatology of snake bite victims. A key finding is that nearly half (49.3%) of the patients were asymptomatic, showing normal results in tests such as CBC, LFT, RFT, and coagulation profiles, indicating that not all snake bites result in severe envenoming. This is consistent with other studies that have highlighted the variation in clinical outcomes of snake bites, where a significant proportion of bites result in mild symptoms or no symptoms at all [11,12]. However, the majority of patients in this study (50.7%) were symptomatic, underscoring the need for timely medical intervention in cases where symptoms do arise. This might be due to the fact that this study is conducted in a tertiary health care centre with large number of referral cases. Among symptomatic cases, neurological symptoms were the most commonly observed, affecting 65.4% of the patients. Among these patients ptosis was most commonly observed symptom followed by dysphagia, weakness of limbs, difficulty in breathing and unconciousness. This aligns with findings from previous studies which have reported neurological manifestations, such as paralysis and cranial nerve dysfunction, as a prominent feature in cases of envenoming by species like the krait and cobra [11,14].

Hematological symptoms seen with bite from certain venomous species like vipers were present in 17.6% of the cases, but these symptoms were mild in form of bleeding from the site of bite, haematuria or abnormal coagulation profile. While in some other studies hematological abnormalities were more commonly observed [12,13].

Local symptoms, such as swelling, cellulitis and pain at the site of the bite, were noted in 54.4% of cases. These symptoms are typical of envenomations, especially with species like the cobra or viper, where local tissue damage and inflammation are common. The presence of local symptoms in over half of the cases highlights the importance of local care in snake bite management, including wound cleaning and the monitoring of potential complications like infection or necrosis.

Among symptomatic cases, 30.15% required ICU admission, In 9.3% cases ICU stay was for more than two days emphasizing the severity of envenomations. The need for oxygen support was common (35.1%), with 9.5% requiring advanced respiratory support such as Bipap or ventilator. Inotropic support was needed in 16.2% of cases, indicating cardiovascular instability, which is typical of severe venomous bites[6,7]. (Nearly 50%) All the symptomatic patients were administered Antivenom (ASV), 12.7% patients required less than 10 ASV vials, 27.6% required 10 to 20 ASV vials and 8.6% required more than 20 ASV vials for complete reversal of symptoms reflecting the severity of envenoming and varying venom loads. ASV sensitivity was rare and seen in only (0.7%) patients. [15]. Blood transfusions were required in 7.3% of symptomatic cases, likely due to coagulopathies, common in bites from vipers or similar species [12].

The majority of asymptomatic snake bites (76.6%) occurred in the summer while the rainy and winter seasons saw more symptomatic cases (56.5% and 57.1%, respectively), possibly linked to heightened snake activity and aggression during these periods. Summer had the fewest symptomatic cases (23.4%), with most being asymptomatic. These findings underscore the need for heightened awareness and timely treatment, especially during the rainy and winter seasons when severe envenomations are more common [6,7,8].

Index study shows that the majority of snake bite patients (94.79%) experienced complete recovery indicating successful management in most cases. A small percentage of patients had minor disabilities (2.6%) in the form of some residual ptosis or mild weakness at the time of discharge. Unfortunately 3.3% of patients succumbed to their injuries, highlighting the ongoing challenges in managing severe cases in the form of awareness, cultural habits, education and most importantly timely referral. As in the present study all the deaths occurred in the patients with delayed referral more than 12 hours of snake bite. All were brought to the institute in very sick condition. Out of 9 reported deaths 4 died within two hours. All deaths were due to neurotoxic snake bites indicating very high prevalence neurotoxic snake species like krait and cobra in the region. These findings emphasize the importance of creating awareness about timely referral and appropriate medical intervention to improve patient outcomes and reduce mortality rates.

## Conclusion

With most patients experiencing complete recovery, this study highlights the importance of creating awareness, timely referral and medical intervention in snake bite cases. Seasonal variations in symptoms highlight the need for heightened alertness during the rainy and winter

seasons. While mortality remains low, a small proportion of patients faced mild disabilities at the time of discharge emphasizing the need for continuous care. The findings reinforce the critical role of early diagnosis, proper antivenom administration, and addressing healthcare access barriers to improve outcomes for snake bite victims.

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