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Original Research Article

Epidemiological and clinical profile of snakebite patients: a retrospective analysis at a tertiary care teaching hospital of southern Rajasthan, India

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ABSTRACT

Background: Snakebite - a global public health problem can be a traumatic experience for patients. They may develop local pain and swelling at the site with or without systemic involvement (haematological and neurological) and at times complications depending upon nature of snake. The present study was planned to determine the epidemiological and clinical profile of snakebite patients at a tertiary care teaching hospital of southern Rajasthan, India.
Methods: This retrospective observational study was carried out at a tertiary care teaching hospital only after approval from institutional ethics committee. The data of patients aged between 18-80 years of either gender that had presented with a history of snakebite and admitted to the intensive care unit (ICU) in past 3 years were included. Data related to epidemiological, clinical and investigational parameters was collected and analysed. Data was presented as number (percentage) or mean ± standard deviation.
Results: Total 80 patients were analyzed. Male:female ratio was 1.67:1 and mean age of study population was 33.91±14.34 years. Maximum 71 (89%) patients belonged to rural region. Only 16 (20%) patients complained of local pain. Bleeding was noted in 5 (6.25%) patients whereas 36 (45%) patients had ptosis. Prolonged coagulation markers were reported in 35 (44%) patients. Only 2 (2.5%) patients had acute kidney injury. Altered liver and renal function tests were noted in 71 (89%) and 63 (79%) patients respectively. Mechanical ventilation was required in 27 (34%) patients.
Conclusions: Young adult males and rural population were prone to snakebites. Local and systemic manifestations were noted in relatively lesser patients compared to the published data. Only fewer patients in I.C.U. required mechanical ventilation.

Keywords: Bleeding, Coagulation markers, Intensive care unit, Snakebite, Anti-snake venom

INTRODUCTION

Snakebites are scary and traumatic experiences for victims. According to World Health Organization (WHO), it is a global public health problem especially in the rural, hilly or forest regions.[1] In India, commonly encountered victims are farmers, gardeners, children playing in fields, tribal population etc. Reports suggest that 0.33% Indian population has been living in areas where an absolute risk of dying from snakebite before 70 years is 1% or higher.[2] The annual incidence of snake bites in India is 66-163 cases per lakh population while annual morbidity and mortality is 1.4-6.8 and 1.1-2.4 per lakh population respectively.[3] However, this data on snakebites is skewed

as the rural victims prefer to visit traditional healers due to lack of awareness.

Depending upon the type of snakes, bites can be non-poisonous or poisonous. Immediately following the snakebite, victim develops local pain and swelling at the site. Gradual systemic involvement leading to neurological, haematological complications or even organ failures have been noted with venomous snakebites.[4] Coagulopathy is one of the most common manifestations which can be detected by blood coagulation tests. Few others show neurological abnormalities presenting as paralysis. Toxins from venomous snakebites can also result in life-threatening and acute emergency situations. Here, higher morbidity and mortality rate can be attributable to inaccurate knowledge of rural population, inappropriate first-aid measures, loss of vital time in acquiring medical support, cost of treatment being an additional hurdle resulting in delayed timely treatment of victims.

The treatment of snakebite includes: first-aid by cleaning the wound, immobilization of part, tetanus toxoid vaccine, analgesics, antibiotics, intravenous fluids, immunotherapy [envenomingwith lipolyzed, polyvalentanti-snake venom (ASV)], anti-histaminics.[5]

Literature search showed few studies on a similar background in Rajasthan, India.[5,6] The present study is the first at our centre and its data could add information to the existing literature. Thus, this study was conducted at a tertiary care teaching hospital of southern Rajasthan, India to determine the epidemiological and clinical profile of snakebite patients.

METHODS

The present study was conducted only after obtaining Institutional Ethics Committee approval. It was a retrospective, observational, single centric study conducted for patients that had been admitted during 3-year duration (August 2017 to August 2020) to the Intensive care unit (ICU), at a tertiary care teaching hospital in southern Rajasthan, India. The data of all patients aged between 18-80 years of either gender that had presented to the emergency department with a history of snakebite and admitted to the I.C.U were included in the study. Those snakebite patient files with incomplete data were excluded from the study.

After a detailed examination of patient's records for history, clinical examination and laboratory investigations; following information regarding epidemiological, clinical and investigational parameters was collected on a case record form such as : age, gender, month of snakebite, type of setting (rural/urban), clinical features (local and systemic), complete blood count, coagulation profile, liver and renal function tests, blood transfusion. These snakebite patients had been treated as per the national snakebite management guidelines.

Once the data entry was completed, statistical analysis was carried out using Microsoft Excel Office 365. The data was presented as number (percentage) or mean ± standard deviation (S.D.) wherever appropriate.

RESULTS

Total 80 snakebite patients were analysed. Male:female ratio was 1.67:1 with 50 (62.5%) male and 30 (37.5%) female patients. Within an age range of 18-80 years, mean age of study population was 33.91±14.34 years while mean age of males and females were 35.30±15.27 and 31.60±12.53 years respectively. Majority 38 (47.5%) patients belonged to 21-40 years age group whereas only 04 (5%) patients were aged 61 years and above. (Figure 1)

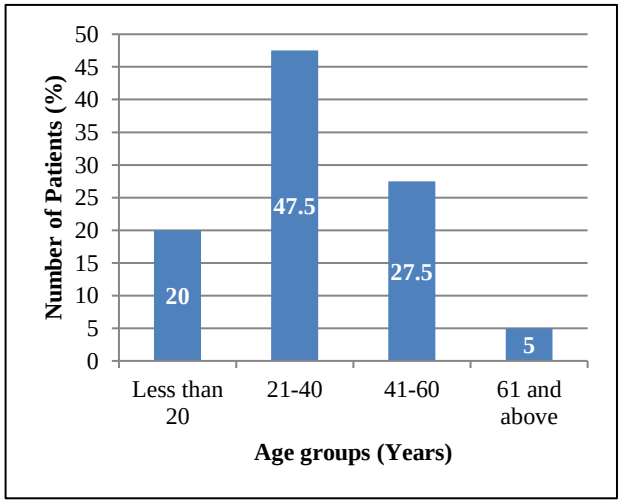

Figure 1: Age distribution of snakebite patients (n=80).

Out of 80 snakebite patients, maximum 71 (89%) patients belonged to rural region of India. Altogether 30 (37.5%) patients presented with snakebite in year-2018. August month showed increased frequency of snakebites with 24 (30%) patients. (Table 1)

Among 80 snakebite patients, 16 (20%) patients had complained of local pain; with co-existing local swelling in 9 (11.25%) patients. Only 8 (10%) patients had haematological manifestations in the form of bleeding (5), haematuria (2) and disseminated intra-vascular coagulation (DIC) (1) cases.

Among 36 (45%) patients with ptosis, co-existing dysarthria and limb weakness were present in 9 patients whereas only 7 patients experienced altered sensorium with ptosis and dysarthria. Among 22(27.5%) patients with limb weakness; 02, 06, 11 and 03 patients fell into grade 1, 2, 3 and 4 respectively. (Table 2)

Laboratory investigations of 80 patients had indicated anaemia in 25 (31.25%) patients, altered total leucocyte count (TLC) as well as altered platelet count in 45 (56.25%) and 19 (23.75%) patients respectively.

Table 1: Baseline characteristics of snakebite patients.

Baseline characteristics	Total no. of patients (n=80)
Gender [n (%)]	
Males	50 (62.5)
Females	30 (37.5)
Age (years)	
Mean age ± S.D. Median [range]	33.91 ± 14.3430 [18-80]
Type of setting [n (%)]	
Rural	71 (89.00)
Urban	09 (11.25)
Month distribution [n (%)]	
January	00
February	02 (2.50)
March	01 (1.25)
April	01 (1.25)
May	02 (2.50)
June	13 (16.25)
July	13 (16.25)
August	24 (30.00)
September	12 (15.00)
October	08 (10.00)
November	04(5.00)
December	00

Table 2: Clinical profile of snakebite patients.

Clinical features	Total no. of patients (n=80) [n (%)]
Local	
Pain Swelling	16 20.00) 09 (11.25)
Systemic	
Haematological Bleeding Haematuria DIC	**08 (10.00)** 05 02 01
Neurological	
Bilateral ptosis Dysarthria Limb weakness Altered sensorium	36 (45.00) 31 (38.75) 22 (27.50) 07 (8.75)
Respiratory	
Breathlessness	26 (32.00)
Gastrointestinal	
Abdominal pain	20 (25.00)
Renal	
Acute kidney injury	02 (2.50)

Prolonged prothrombin time (PT) and activated partial thromboplastin time (aPTT) were noted in 35 (44%) out of 80 patients.

Raised levels of total serum bilirubin and SGOT + SGPT were reported in 11 (13.75%) and 60 (75%) patients respectively whereas raised serum urea and creatinine levels were reported in52 (65%) and 11 (13.75%) patients respectively. Serum electrolyte levels (sodium (Na+), potassium (K+), and chloride (Cl-)) were altered in 16 (20%), 15 (19%) and 37 (46%) patients respectively. (Figure 2)

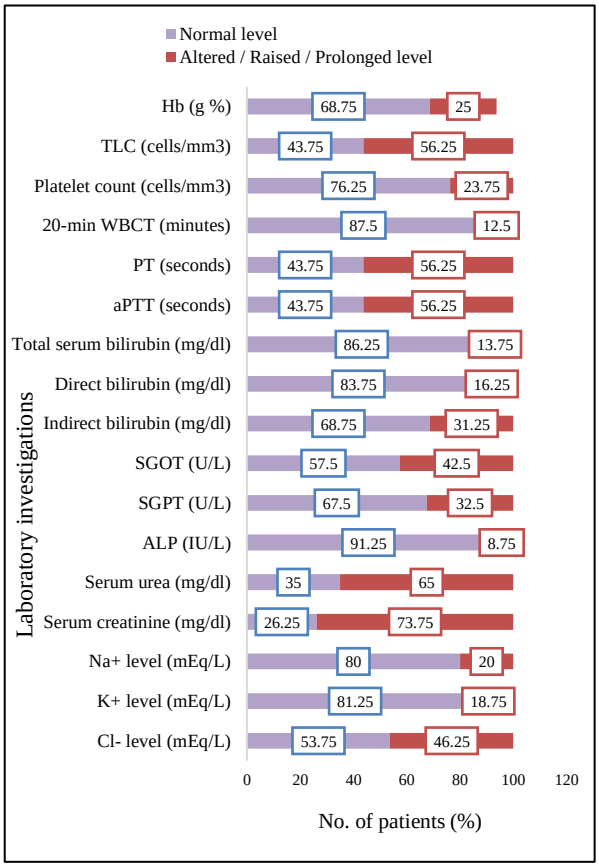

Figure 2: Laboratory investigations among snakebite patients (n=80).

Anti-snake venom (ASV) was given to 68 (85%) out of 80 patients, where 46 (57.5%) patients were infused with10 vials and 14 (17.5%) patients with 20 vials of ASV. Mechanical ventilation was required in 27 (34%) patients where maximum 22 patients had required it for 1-5 days duration and only 1 patient had required it for 22 days duration. Only 6(7.5%) out of 80 patients had undergone blood transfusion while 2 (2.5%) out of 80 patients had required dialysis. Post snakebite complications (shock, cardio-pulmonary resuscitation, myoclonic seizures) were noted in 4 (5%) out of 80 patients.

DISCUSSION

India is home to 216 species of snakes, out of which venomous species are only four - Cobra, Krait, Russell's viper and Saw scaled viper.[7] As per the statistics, India has been identified as a nation with higher incidence, higher morbidity and highest mortality rates due to snakebites

among Asian countries.[8] Considering the impact of snakebites on Indian population, various observational studies from different geographical regions of India have been conducted and published till date, thus adding data to WHO database.[2,3,5,9,10] This study is one such from southern Rajasthan, India.

In the present study, majority population presenting with snakebites were young adults (21-40 years) with mean age of 33.91±14.34 years. This finding is in accordance with the results from Chandrakumar et al study where mean age of the study sample was 36.86±17.99 years with maximum patients being young adults.[8] In Narvencar et al study, mean age of study sample was 39.5±15.6 years with equal distribution among age groups of 20-39 and 40-59 year.[3] Majority victims in the present study comprised of males than females. Higher male preponderance was noted in other studies.[3,11,12] This can be attributed to the fact that young adults and males were more involved with outdoor occupations of farming and agriculture, indicating that snakebites can be occupational hazards in them.

In the present study, nearly 90% snakebite patients belonged to rural India. Similar result was noted in Jarwani et al study in which almost 71% victims of snakebite were from rural areas.[10] Overall, a larger Indian population has been living in rural than urban regions where agriculture is a predominant occupation. In them, disadvantages were lack of availability of good protective work shoes, habit of sleeping outside in the fields, etc.[10] This can be one of the reasons for higher incidence of snakebites in rural India. The type of hospital setting in their respective locality, where patients visit for snakebite treatment might also be an important determinant.[13]

During the 3-year study period, June-September months saw hospitalization of approximately 75% snakebite patients at our centre. Patil et al study showed similar results with maximum cases between July-September.[7] In Narvencar et al study, distinct seasonal variation was noted with highest cases between June-July, September and December.[3] This indicates that rainy season is associated with an increased frequency of snakebite cases as snakes tend to come out of their shelters and might bite humans owing to their defensive mechanisms. More so, farmers are harvesting during monsoon, making them one of the most common victims.[14]

The clinical profile of snakebite patients was ranged from local pain, swelling and cellulitis to systemic manifestations like coagulopathy and paralysis. This pattern may vary in intensity from patient-to-patient with respect to geographical distribution of snake species, nature of snakebite (non-poisonous versus venomous), time of snakebite to onset of treatment, type of hospital setting etc. In the present study, only 20% patients experienced local pain and swelling. Similar result was noted in Menon et al study with 26% patients having local symptoms.[15] On the contrary, several studies showed frequency of snakebite induced local manifestations as high as approximately 85%, 91%, and 80% respectively.[13,16,17] This indicated variation in the number of patients presenting with local symptoms around the site of snakebite, around India.

In present study, hemotoxicity like bleeding, DIC and haematuria were present only in 10% of the patients. This was confirmed with laboratory investigation for coagulation markers like PT INR and aPTT, 20-minute whole blood clotting test (WBCT). Reports of more than 50% patients showed prolonged PT and aPTT while10% patients showed prolonged 20-minute WBCT in the study. In Agarwal et al study, PT and APTT were prolonged in approximately 25% patients and only 3/53 patients developed hemotoxicity.[18] Sharma et al had reported bleeding manifestations in approximately 35% patients[14] In Kumar et al study, clotting time was prolonged in 68% patients.[11] Thus, even though larger study population may present with prolonged coagulation markers, hemotoxicity may be noted in only a few with others remaining asymptomatic. Nearly 45% patients had ptosis which was the most common neurological manifestation in the present study. Few patients had co-existing dysarthria, limb weakness or altered sensorium. Ptosis was the commonest manifestation in Kumar et al study as well.[11] Similar to our study, Sharma et al also reported ptosis and dysarthria in 50% and 30% study patients respectively indicating that frequency of neurotoxic envenoming varied from10-60% whereas few other studies reported zero cases each.[13,14,19] Neurotoxicity (or neuroparalysis) was noted in no patients from present study however. Contradictory to this, results from two studies had reported 40% and 25% patients with neurotoxicity.[15, 20]

Abdominal pain, an early manifestation among snakebite patients was noted in 25% patients of present study. The studies by Menon et al and Anjum et al had reported approximately 40% and 30% patients with abdominal pain respectively.[15,20] However, no cases of abdominal pain post snakebite have been reported in few studies.[3, 14, 19] In the present study, breathlessness was reported in approximately 30% patients whereas acute kidney injury (AKI), an important complication of snakebite envenoming was reported in only 2% of the patients. A study by Jayakumar et al had reported7.8% cases of AKI caused by snakebites.[21] Narvencar et al has also suggested that depending upon the geographical distribution of snake species, local symptoms may be reported more from central, south and east India; hemotoxic features from central, south and west India, neuroparalytic symptoms more commonly from eastern and northern India whereas abdominal pain from north or east India.[3]

At our setup, approximately 30% snakebite patients had anaemia while more than 50% patients had showed altered white blood cell (WBC) and platelet counts. A study by Harshavardhana et al reported 13 patients with anemia, 24 with thrombocytopenia, 30 with prolonged 20-minute WBCT and 24 patients that were transfused with fresh frozen plasma.[22] In Kumar et al study, 23% patients had

anaemia, 36% had leucocytosis and 29% had thrombocytopenia.[11] Few patients from present study had elevated bilirubin levels while majority had raised SGOT and SGPT levels. Elevated levels may indicate liver inflammation or scarring and even hepatotoxicity. Reports of renal function tests of majority patients were also raised indicating renal injury but remained asymptomatic. These patients should have been followed up even after discharge from hospital to check on development of any complications or not.

In the present study, for the treatment maximum patients had received 10 or lesser anti-snake venom (ASV) vials whereas only2.5% patients had required higher ASV doses (22 and 40 vials). Narvencar et al study showed that majority patients received an initial dose between 10-15 vials.[3] So, the requirement of ASV varied depending upon the presentation of snakebite patients in different geographical regions. Among all study patients, approximately 30% patients had been on mechanical ventilation with duration of 1-5 days in maximum patients. Only a single patient had 22-day I.C.U. stay with mechanical ventilation. Based on the severity of complications, less than 10% patients were transfused with fresh frozen plasma and dialysis was required only by those with AKI. Cardio-pulmonary resuscitation, shock, seizure were noted in 5% of the study patients.

As mentioned earlier, snakebite victims tend to visit traditional healers before approaching hospital setting due to their traditional beliefs. Miah et al mentioned that the incidence of cellulitis was higher in those taking useless/harmful treatment from traditional healers but number of such patients was not very high in the study from Bangladesh; which was a good sign that reflected awareness among people.[4] This emphasizes on the fact that awareness programmes among rural population, especially to visit a hospital for timely treatment of snakebite should be conducted at regular intervals. It will help to reduce snakebite induced mortality rates in India. Awareness for snake identification; snake bite prevention and appropriate treatment as well as early identification of danger signs of snakebites should also be planned and implemented among doctors for prompt treatment of snakebite patients.

The present study was limited by data on type of snake species, nature of snakebite (non-poisonous versus venomous) and time passed between snakebite and onset of treatment in a hospital setting that may show association between prognosis and complications among patients.

CONCLUSION

In the present study, young adult males were more prone to snakebites with higher involvement of rural Indian population. Monsoon season led to an increase in cases of snakebites. Known local and systemic manifestations were noted in relatively lesser patients compared to published data. Most common haematological and neurological manifestations were bleeding and ptosis respectively. Respiratory involvement was higher as compared to renal involvement among snakebite patients. Only fewer patients in I.C.U. required mechanical ventilation.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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