ORIGINAL ARTICLE

Snake Bite Envenomation in a Tertiary Care Centre

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Abstract

Background: In India, it is estimated that up to 20,000 people die annually from snake bites. The present study was carried to out to estimate the snake bite related epidemiology, predictors of severity, relationship between type of snake, clinical severity, complications, outcome and usage pattern of polyvalent anti snake venom (ASV) in a tertiary care center.

Methods: All indoor patients admitted in our institute with definitive history of bite by a snake, with or without presence of fang marks, Evidence of cellulitis, acute onset of neurotoxicity or bleeding diathesis were serially recruited in the study.

Results: The majority of cases were in the range of 21- 40 years (54.7%). There were 82.8% males (53/64), 17.2% females (11/64) and 60.9% (39/64) bites were during day time. Upper limb bites were seen in 34% (22/64) of the patients and lower limb bites in 54% (35/64), and axial body bites in 6%. There were 43.8% (28/64) vasculotoxic bites, 34.4% (22/64) neurotoxic bites and 20.3% (14/64) non-poisonous bites. Viper was the most common (9%) identified snake, followed by krait (5%). References from Rural Health Centers were 57.8% (57/64), 11% were from Primary health centers and rest from private sector. Anti snake venom (ASV) was received by 68.75% (44/64) patients before reaching tertiary care. Local swelling was present in 90.6% (58/64) patients, Systemic bleeding was seen in 35.9% (23/64), and Neuromuscular weakness in 35.9% (23/64) patients. Complications like Respiratory paralysis developed in 18.75% (12/64), Acute kidney injury in 12% (8/64), DIC in 9% (6/64), and hepatic involvement in 7% (5/64) of snake bite patients. Blood transfusion was required in 20.3% (13/64) $p<0.001$), 18.75% (12/64) required Mechanical ventilation ($p=0.001$), 4 received hemodailysis and 4 required ionotropic support ($p<0.001$). Improvement was seen in 57.8% (37/64), morbidity during hospital stay was seen in 39% (25/64) and 2 patients expired (3%). ASV was received within 4 hours in 67% (42/64) patients, 22.5% (14/64) received ASV between 4 to 24 hours and remaining after 24 hours ($p=0.016$). Total ASV requierment was 24.05 vials in patients who improved and 34.4vials in patients in Morbid group and 29.0 vials in mortality group ($p>0.05$). The SSS score amongst improved was 4.76 ± 2.46 whereas among morbid, it was 8.48 ± 1.75 and amongst expired, it was 8.5 ± 0.707 ($p<0.05$).

Conclusions: Patients requiring various supportive treatments like blood transfusion, Inotropes, Haemodialysis and Mechanical ventilation, had a statistically significant correlation with poor outcome. Early administration of ASV that is within 4 hours was, associated with better outcome. The total amount of ASV (in vials) had no a significant correlation with outcome. Snakebite Severity Score correlates significantly with early recovery in vasculotoxic snake bites ($p=0.03$).

Introduction

Fear of snakes is a powerful, primordial and possibly innate human emotion.[1,2] More than 2,00,000 cases of snake bite are reported in India each year. Reports from Maharashtra state in India disclose that an estimated 10000 annual venomous snake bites account for 2000 deaths.[3] Morbidity is also significant and there has been little improvement in reducing the fatalities over the years in spite of now having good supplies of polyvalent anti-snake venom (ASV) available. The major reason for high mortality rate is the delay in getting the victim to a well-equipped casualty treatment facility fast enough. Romulus Whitaker, pointed out that, the Indian cobra (*Naja naja*), the common krait (*Bungarus caeruleus*), the Russell's viper (*Daboia russelii*) and the saw scaled viper (*Echis carinatus*) are basically four venomous snakes found in India.[4,5] In 2009, Snake bite was recognized for the first time by WHO as a tropical neglected disease.[6] To make more meaningful use of resources such as anti-venom, mechanical ventilation and renal support systems in patients with snake bite, it is important that the healthcare providers aptly identify those at high risk of potentially fatal complications. Simple demographic and clinical characteristics could be used to help doctors distinguish between high-risk and low-risk patients. The predictors like snake bite severity score are simple, accurate and clinically credible.

The present study was carried to out to estimate the snake bite related demography, clinical characteristics, severity and outcome. An attempt was made to evaluate the predictors of severity, relationship between type of snake, clinical severity, complications, outcome and usage pattern of polyvalent anti snake venom (ASV) in a tertiary care centre in West India.

Methods

This was a prospective, cross sectional study where 64 indoor patients admitted during the study period, were studied with following

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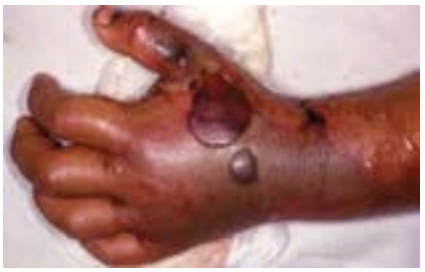

Fig. 1: Blistering and early tissue necrosis following cobra bite

Aims

1. To study demographic and clinical profile of snake bite patients including first aid received. 2. To study laboratory parameters for assessment of renal and hepatic function and hemorrheology at admission and during in-hospital stay. 3.To evaluate independent predictors of early improvement, assessing the role of ASV administration *(early vs. late)*, in impacting early recovery.

Inclusion Criteria

Presence of any one of the following qualified the patient for entry into this study 1. Definitive history of bite by a snake, with or without presence of fang marks and with or without local inflammatory signs (i.e. local cellulitis). 2. Evidence of swelling, cellulitis, bleeding at local site, but no definitive history of witnessing the snake and fang marks. 3. Evidence of acute onset neurotoxicity or bleeding diathesis but no definitive history of witnessing the snake and fang marks. The study was approved by the ethical committee of our hospital.

The demographic characters like age and sex were collected. Age was divided into four subgroups for statistical analysis viz. 0-20, 21-40, 41-60 and more than 60 years. Place of bite in terms of indoor or outdoor bites were recorded. Day time was defined as 7 am to 7 pm and night time from 7 pm to 7 am. Type of Bite: The snakebites with predominant Neuromuscular weakness as suggested by ptosis, diplopia, dysphagia were classified as neurotoxic bites. The bites with bleeding and/ or coagulation abnormalities were classified vasculotoxic snakebites. Snakes were also identified if brought to hospital. First aid received: This was the treatment received, if any, by patients before coming to our hospital like injection tetanus toxoid (TT), anti-snake venom (ASV), neostigmine. Loading dose of ASV given was noted. Patients were referred by private hospitals or by primary health centers (PHC), Rural health centres (RH). Early recovery assessment: In neurotoxic snake bites, early recovery was defined as those which do not required mechanical ventilation and those who required for less than 48 hrs. In vasculotoxic snake bites, early recovery was defined as those not requiring transfusion support and those requiring less than 8 Fresh Frozen Plasma units. Severity assessment: The severity of envenomation is assessed using to the modified snakebite severity score (SSS) according to Dart et al, 1996 and Nualong et al[7,8] *(Annexure)*. SSS is a validated tool for assessing Crotalinae snake envenomation. SSS is a composite measure of severity that corelates well with the clinical condition of the patient. Total score ranges from 0 – 20. Mild envenomation: 0 – 3 points, Moderate envenomation: 4 -7 points, Severe envenomation: 8 – 20 points. The factors that affect SSS like pre-hospitalization period, demographical variables, type of snakebite and the outcome were evaluated. Renal functions, liver functions and coagulation profile for each patient was done. The clinical outcomes were sorted out using three variables, namely improved, morbid state or fatal outcome. The variable 'improved status' was defined as state of complete recovery without any supportive management. 'Morbidity state' was defined as a state requiring supportive management during hospital stay. The treatment provided was assessed in terms of the quantity of polyvalent anti snake venom vials (ASV) administered during the hospitalization and compared with the severity and outcome. The time lapsed was compared to assess its role in predicting severity and outcome.

Following statistical tests of significance are used as per distribution of data (Normal or non-normal) *Un-paired t test –One way ANOVA test - Chi square test*.

Table 1: Laboratory parameters on presentation

	Statistics							
	Sr Fibrinogen	Hb (gm/dl)	TLC (cumm)	PLT (cumm)	BUN (mg/dL)	Creat (mg/dl)	S. Bili (mg/dL)	RBS (mg/dL)
N Valid	64	64	64	64	64	64	64	64
Mean	182.22	13.325	12715.62	549.3366	19.02	1.39	1.172	132.08
SD	40.586	2.5421	5762.969	3421.88924	23.483	1.497	1.1736	48.621
Minimum	100	1.7	1500	.27	6	0	.6	48
Maximum	350	18.2	37600	26000.00	155	8	6.9	374

Results

64 indoor patients admitted during the study period, were evaluated. Our study had 82.8%(53/64) male patients and 17.2% (11/64)) female patients. The age group of 0-20 years had 21.9% (14/64)patients, 21-40 years had 54.7% (35/64), 41-60 had 20.3% (213/64) and 2 patients above 60 years. Male to Female ratio was 4.81:1. 57.8% (37 out of 64) of our patients were referred from Rural Health Centers,10.9% from PHC, and 10.9% from private sector. There was predominance of vasculotoxic bites 43.8% (29/64), followed by neurotoxic snakebites 34.4% (22/64), and non-poisonous bite 20.3% (13/64). In identified snakes, viper was the most common implicated, 9% (6/ 64) followed by Krait 7% and 80% of the snakes were unidentified. We had 54.6% (35/64) patients with lower limb bites, 34.3% (22/64) patients with upper limb bites, and 4 axial bites. Of the lower limb bites 68.6% (24/35) were vasculotoxic and 40.9% (9 out of 22) bites on upper limbs were neurotoxic. All 4 axial bites were of neurotoxic. Regarding circumstantial and epidemiological factors, bites were more common at night 60.9% (39/64), at outdoor places 64.1% (41/64) and were unprovoked 64.1% (41/64) In our study 62.5% (40/64) patients had received ASV before they were referred to tertiary care centre, 51.6% (33/64)had received Injection Tetanus Toxoid, and 45.3% (29/64) had a tourniquet tied at or above the site of bite. Majority of the patients 90.6% (58/ 64) had local symptoms (Figure 1) at presentation. Systemic bleeding was present in 35.9% (23/64) of patients, Neuromuscular weakness was also seen in 35.9% (23/64) patients, Oliguria was present in 12.5% (8/64) and Respiratory distress was seen in 21.9% (14/64) patients at presentation.

The mean pulse on presentation was 92/min (58-130/min), Respiratory Rate was 20/min and Blood Pressure was 116/76 mm of Hg. Laboratory parameters on presentation were as shown in Table 1.Whole Blood Clotting

Table 2: Correlation of individual organ involvement with outcome

	Improved	Morbid	Expired	Total	P value
Respiratory paralysis	0	11 (91.6%)	1 (8.3%)	12	0.001
AKI	1 (12.5%)	5 (62.5%)	2 (25.0%)	8	<0.001
DIC	0	4 (66.7%)	2 (33.3%)	6	<0.001
Hepatic involvement	2 (40.0%)	3 (60.0%)	0	5	0.584
Local wound	17 (54.8%)	12 (38.7%)	2 (6.5%)	31	0.329

(Chi square test)

Table 3: Comparison of supportive treatment required with outcome

	Improved	Morbid	Expired	Total	P value
Transfusion	0	11 (84.6%)	2 (15.4%)	13	<0.001
Inotropes	0	2 (50.0%)	2 (50.0%)	4	<0.001
Dialysis	0	3 (75.0%)	1 (25.0%)	4	0.005
Mech. Ventilation	0	11 (91.6%)	1 (8.3%)	12	0.001

(Chi square test)

Table 4: Comparison of timing of first dose of ASV with outcome

	Delay in first dose			Total
	< 4 hrs	4-24 hrs	>24 hrs	
Outcome				
Improved	29 (65.9)	7 (50)	1 (16.7)	37 (57.8)
Morbid	15 (34.1)	5 (35.7)	5 (83.3)	25 (39)
Expired	0	2 (14.3)	0	2 (3.2)
Total	44	14	6	64

Percentages in parenthesis; χ^2= 12.147, Df=4 P=0.016 (Significant); (Chi square test)

Table 5: Comparison of SSS with outcome

SSS	N	Mean ± SD	P value
Improved	37	4.76 ± 2.465	<0.001
Morbid	25	8.48 ± 1.759	
Expired	2	8.50 ± .707	

Time (WBCT) >20 minutes was seen in 34.3% (22/64) patients and INR >2 minutes was seen in 23.4% (15/64) patients. Respiratory paralysis was seen in 12 patients (p=0.001), 8 patients had Acute kidney injury(p<0.001), 6 patients went into DIC (p<0.001), and 5 had hepatic complications as shown in Table 2. Respiratory paralysis, AKI, and DIC statistically correlate with outcome. 8 vasculotoxic and 15 neurotoxic snake bite patients required Intensive care. There was no statistically significant difference in ICU stay in vasculotoxic versus neurotoxic snake bites. In terms of supportive management 13 patients required platelet transfusions (p<0.001), 12 patients required Mechanical Ventilation (p=0.001), 4 required ionotropic support (p<0.001),and 4 patients required dialysis (p=0.005), Requirement of supportive treatment had a statistically significant correlation with poor outcome (Table 3). In our study 57.8 (37/64) patients improved, 39% (25/64) had some morbidity during hospital stay and 2 patients expired.

In our study 62.5% (40/64) patients had received ASV before they were referred to tertiary care centre. First dose of ASV was received within 4 hours in 68.75% (44/64) patients, between 4 to 24 hours in 22.5% (14/64) and remaining patients received after 24 hours (Table 4). Timing of first dose of ASV, less than 4 hours correlated significantly with better final outcome (P value 0.016). Total ASV duration among Improved group (N=37) was 1.83 + 0.8 days whereas among Morbid group (N=25) it was 2.96 ± 1.2 days and among expired group (N=2) it was 3.5 ± 2.1 days.This difference was statistically significant.(P < 0.001). Total ASV requirement among Improved group (N=37) was 24.05 ± 19.9 whereas among Morbid group (N=25) it was 34.44 ± 23.7 and among expired group (N=2) it was 29.0 ± 4.23.This difference was not statistically significant (P > 0.05).

The Snakebite Severity score amongst improved patients was 4.76 ± 2.46 whereas among morbid, it was 8.48 ± 1.75 and amongst expired, it was 8.5 ± 0.707.This difference was statistically significant (P<0.05), (Table 5). The SS score in non-poisonous snake group (14/64/) was 2.15 ± 0.37 whereas among vasculotoxic, it was 7.71 ± 2.25 and in neurotoxic bites it was 7.18 ± 1.79. This difference was statistically significant (P<0.05). A comparison of clinical features of various types of snakes was studied. Maximum cases of ptosis (3/5) were observed among krait bites. Respiratory paralysis was observed among cobra (2/2) and krait (2/5) envenomation. INR derangement on presentation was seen maximally in viper (4/6) envenomations. Acute kidney injury and 20WBCT did not have significant association with individual envenomations.

Discussion

The present study was carried to out to estimate the snake bite related epidemiology, clinical characteristics, severity and outcome. An attempt was made to evaluate the predictors of severity, relationship between type of snake, clinical severity, complications, outcome and usage pattern of polyvalent anti snake venom (ASV) in a tertiary care centre in West India. The demographic factors of our study are as follows.

Majority of patients in our study were in age group of 21 – 40 years (54.7%). Mean age was 31.72±12.41 years. Most of the Indian studies like Kularatne et al[9] Sanjib et al[10] and in Rojnuckarin et al's[11] study, the mean age was 31 -32 years.Our study had 82.8% male patients; most of them were in young age group. Similarly there was female clustering seen in age group of 21 to 40 years. Male to Female ratio in our study was 4.81:1. Rojnuckarin et al[11] had majority of male patients (59%). While Sharma[12] et al had a male to female ratio of 4.25:1. This difference is explained by the fact that in age group of 21 to 40 years, where most of clustering of case in both genders seen, it would be expected that these people belong to a working group.[13,14]

Two fatalities seen in our study belong to age group 21 to 40 and 41 to 60 years each. The difference was statistically not significant when compared with outcome among different age groups when analysed by Chi square test (p=0.211) and One way ANOVA test (p=0.694). Although older people might be expected to have comorbid conditions leading to higher mortality, in cases of acute event like snakebite related mortality which usually occurs in a short period after snakebite, these factors are unlikely to influence it.

57.8% of our patients were referred from Rural Health Centers; 17.2% were self referred,and rest from PHC and Private Hospitals. Referral to our center was made only in case if patient's condition merited ICU care, with or without ventilator. Kalantri et al[15] reported 37% referral rate in their study, all from PHCs..2 patients who expired were effered from peripheral centres. The higher mortality among referred peripheral cases likely reflects their overall poor general status and hence need for referral. However, there was no statistical significant correlation (p=0.346) of locality with outcome.

Our study shows predominance of vasculotoxic bites (43.8%), followed by neurotoxic (34.4%) and non-

poisonous (20.3%). We also report a case of Myotoxic snakebite with Total CPK elevation and pseudo-infarction pattern on ECG. Sanjib et al,[10] had 72% neurotoxic bites in their study. Their study was conducted in Nepal, 27% of the bites being non-poisonous in their study. Sharma[12] et al had majority of neurotoxic snake bites (60.6%), their study area being north India. Kalantri et al[15] who based their study in rural Maharashtra (in Sevagram); found the incidence of vasculotoxic bite to be 84.27%. Bawaskar et al,[16] found 68.45% snakebites to be vasculotoxic in their study done in Mahad in Western Maharshtra. Studies from this part of India have higher incidence of vasculotoxic bites with significant coagulopathy, than neurotoxic bites. In identified snakes, viper was the most common one. Bawaskar[16] et al also found Russell's viper as the most common snake responsible for snake bites in Western Maharashtra This reflects natural habitat of snakes, the predominant snake identified being Russell's viper, in Maharashtra region.

34% of our patients were bitten on upper limb, 54% on lower limb and 6% had bite on axial body. The site of bite had significant statistical correlation (p<0.001) with the type of bite. 68.6% bites on lower limbs were vasculotoxic. 40.9% bites on upper limbs were neurotoxic followed by non-poisonous bites. All 4 axial bites were of neurotoxic snakes. Upper limb bites, occurred in farmers, while bending over and working or while manually picking crops.[13,14] Axial body bites occurred during sleep. This probably reflects the diurnal and bite pattern of different snakes.[17] However, the site of bite has no statistically significant correlation (p=0.569) with outcome. Sharma et al[12] reported 38% bites on lower limbs; upper limb bites in 47% and 14% axial bites. Kalantri et al[15] noted that 66% bites were on lower limbs, rest being on upper limbs; no axial bites were reported in their study. In our study, majority of bites were in night time (60.9%) as defined from 7 pm to 7 am. Krait bites generally occur at night, whereas viper and cobra bites mostly occur during daytime.[17] There was no statistically significant correlation of time of bite with outcome in our study (p=0.159).

62.5% patients received first dose of anti-snake venom (ASV) prior to arrival. 51.6% of our patients received injection tetanus toxoid (TT) prior to arrival at our hospital. 45.3% of our patients arrived with tourniquet in place. In our study, pre-hospital did not have significant correlation with outcome (p=0.170) when compared collectively as shown in Table 16. Kalantri et al[15] reported anti-venom use as a first aid in18% of their patients; 37% had used tourniquets. Sanjib et al[10] reported tourniquet use in 88% of their patients.

90.6% patients had local complaints in form of either swelling, pain or bleeding from bite place. Majority of our patients had either systemic bleeding (35.9%) or neuromuscular weakness (35.9%); and oliguria on presentation (12.5%). 14 patients had respiratory distress (21.9%) on presentation. In their study, Kularatne et al[9] studied only neurotoxic snake bites; among them ptosis was seen in 70%, diplopia in 54% of cases (n=190). Bawaskar et al[16] reported local swelling (72%) and external ophthalmoplegia (49%) as presenting complaints in vasculotoxic and neurotoxic bites respectively. In our study mean systolic blood pressure (SBP) was 115.09±19.08. Minimum SBP was 76 mmHg and maximum of 170 mmHg. Mean respiratory rate was 19/min±3.4 with a minimum rate of 12/min and maximum of 28/min. Low SBP on presentation was associated with poor outcome. Mean platelet count was 5.4±0.34 lacs/cumm with a minimum count of 26,000/cumm. Mean Blood urea nitrogen was 19.02 mg/dL with a maximum value of 155 mg/dL and mean creatinine was 1.39 mg/dL with a maximum being 8 mg/dL. Mean Serum bilirubin was 1.172 mg/dL with a maximum value of 6.9 mg/dL (Table1) Renal involvement had a statistically significant correlation with poor outcome (p<0.05).

We studied coagulation abnormalities in our patients. Presence of DIC was studied using 20 minutes whole blood clotting time(20WBCT), prothrombin time (PT) and INR. Serum Fibrinogen level, D-dimer and fibrin degradation products (FDP) levels were not available uniformly and hence not included in our analysis. In our study, prolonged 20 WBCT and INR did not have statistically significant correlation with outcome (p value 0.080 and 0.616 respectively). The non-correlation of prolonged clotting and prothrombin time might be explained by the fact that anti-venom is usually administered promptly in these patients. Rojnuckarin et al[11] noted that prolonged clotting time and low platelet count correlated with worse outcome.

On correlating individual organ involvement with outcome (Table 2) neurotoxicity in form of respiratory paralysis, presence of acute kidney injury (AKI) and vasculotoxicity in form of Disseminated intravascular coagulation (DIC) seem to be significantly associated with outcome (p value≤0.001). Kalantri et al[15] noted the correlation of neurotoxicity and renal involvement as predictors of poor outcome. Kulratne et al[9] noted presence of acute respiratory distress syndrome (ARDS) as predictor of mortality in their study on neurotoxic snake bite. In our study, 13 patients required transfusion (p<0.001), 4 patients required inotropic support (p<0.001), 4 required hemodialysis (p=0.005) and 12 mechanical ventilation (p=0.001). The 2 patients that expired, required all 4 modalities of supportive treatments. They had a statistically significant correlation with poor outcome.

In our study total ASV requirement among Improved group (N=37) was 24.05 ± 19.9 whereas among Morbid group (N=25) it was 34.44 ± 23.7 and among expired group (N=2) it was 29.0 + 4.23.This difference was not statistically significant. (P > 0.05).Total ASV duration among Improved group (N=36) was 1.83 ± 0.8 days whereas among Morbid group (N=25) it was 2.96 ± 1.2 days and among expired group (N=2) it was 3.5 ± 2.1 days. This difference was statistically significant. (P < 0.001).There is no evidence that shows that low dose strategies,[18-20] and initial high dosage loading regimens[21] have any validity in India.

The correlation of timing of receiving 1st dose of ASV with outcome is shown in Table 4. In the improved group 65.9% (29/37) patients, 60% (15/25) in in morbid group had received ASV within first 4 hours. Both the expired patients received ASV after 4 hours and within 24 hours. In our study early administration of ASV was significantly associated with better outcome (p=0.016). Narvencar K et al[22] found a significant difference between early and late administration of Anti-snake venom in terms of mortality benefit. SSS score was calculated for

all patients. SSS was significantly associated with early recovery in vasculotoxic snake bite (p=0.03). Table 5 correlates SSS score with different types of bites. The SSS score amongst non-poisonous snake group was 2.15 ± 0.37 whereas among vasculotoxic, it was 7.71 ± 2.25 and in neurotoxic, it was 7.18 ± 1.79.This difference was statistically significant (P<0.05). The SSS score amongst improved was 4.76 ± 2.46 whereas among morbid, it was 8.48 ± 1.75 and amongst expired, it was 8.5 ± 0.707. This difference was statistically significant (P<0.05). Thus SSS can be used to predict outcome. A comparison of clinical features of various types of snakes was studied. A significant association between the type of snake and the occurrence of ptosis without respiratory paralysis, respiratory paralysis and INR is seen (p<0.05).Maximum cases of ptosis were observed among krait bites. Maximum cases of respiratory paralysis were observed among cobra and krait envenomation.[23,24] INR derangement on presentation was seen maximally in viper envenomation.[25,26] Acute kidney injury and 20WBCT did not have significant association with individual envenomation.

Conclusions

Early administration of ASV, within 4 hours, was significantly associated with better outcome. Neither the total amount of ASV (in vials) nor the total duration of ASV (in days) has a significant correlation with outcome. Patients requiring various supportive treatments i.e. transfusion, inotropes, hemodialysis and mechanical ventilation; had a statistically significant correlation with poor outcome. No Circumstantial (provoked bite) or Epidemiological (time, place, locality) factor had a statistically significant association with outcome or early recovery. SSS Score correlates significantly with outcome. Lower the score better the outcome. Higher the score poorer the outcome. SSS score was significantly associated with early recovery only in vasculotoxic snake bites (p=0.03). In our study, SSS score correlates significantly with different types of bites. Prediction of outcome by SSS score is statistically significant. Thus it can be used in all types of snake envenomation.

Limitations of the study

As this study was conducted at a tertiary care reference center, it does not reflect the true incidence of snakebite in the community. In fact, the study is skewed towards the more severe cases as the latter are predominantly referred to this tertiary care reference center.

Annexure: Snakebite Severity Score

Date	
Time	
Pulmonary symptoms	
No signs/symptoms	0
Dyspnea, minimal chest tightness, mild/ vague discomfort, respirations of 20-25 bpm	1
Moderate respiratory distress, 26-40 bpm	2
Cyanosis, air hunger, extreme tachypnea, or respiratory insufficiency/failure	3
Cardiovascular system	
No signs/symptoms	0
HR 100-125 BPM, palpitations, generalized weakness, benign dysrhythmia, or hypotension	1
HR 126-175 BPM, or hypotension with SBP >100 mmHg	2
HR >175 BPM, or hypotension with SBP <100 mmHg, malignant dysrhythmia, or cardiac arrest	3
Local wound	
No signs/syptoms	0
Pain, swelling, or ecchymosis within 5-7.5 cm of bite site	1
Pain, swelling, or ecchymosis involving less than half the extremity (7.5-50 cm from bite site)	2
Pain, swelling, or ecchymosis involving half to all of extremity (50-100 cm from bite site)	3
Pain, swelling, or ecchymosis extending beyond affected extremity (more than 100 cm of bite site)	4
Gastrointestinal system	
No signs/symptoms	0
Pain, tenesmus, or nausea	1
Vomiting or diarrhea	2
Repeated vomiting, diarrhea, hematemesis, or hematocheszia	3
Hematologic symptoms	
No signs/symptoms	0
Coagulation parameters slightly abnormal: PT <20 secs, PTT <50 secs, platelets 100-150 K/ mL, or fibrinogen 100-150 mcg/mL	1
Coagulation parameters abnormal: PT <20-25 secs, PTT <50-75 secs, platelets 50-100 K/mL, or fibrinogen 50-100 mcg/mL	2
Coagulation parameters abnormal: PT <50-100 secs, PTT <75-100 secs, platelets 20-50 K/mL, or fibrinogen <50 mcg/mL	3
Coagulation parameters markedly abnormal, with serious bleeding or the threat of spontaneous bleeding; unmeasureable PT or PTT, platelets <20 K/mL, undetectable fibrinogen, severe abnormalities of other laboratory values also fall into this category	4
Central nervous system	
No signs/symptoms	0
Minimal apprehension, headache, weakness, dizziness, chills, or paraesthesia	1
Moderate apprehension, headache, weakness, dizziness, chills, parathesias, confusion, or fasciculation in area of bite site	2
Severe confusion, lethargy, seizures, coma, psychosis, or generalized fasciculation	3
Total	

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