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Research Article

A retrospective study of snake bite envenomation in a tertiary care teaching hospital in Southern India

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ABSTRACT

Background: Snake bite is an important occupational and rural hazard because India has always been a land of poisonous snakes. In southern India common poisonous snakes are Russell's viper, Cobra, Krait and Saw Scaled Viper. It is a fact that despite of significant morbidity and mortality, very little attention is paid by the clinicians to this occupational hazard. The objective of the present study was undertaken with the objectives of assessing poisonous snake envenomation, ASV use, Dosage of ASV and clinical outcomes in snake bite victims.
Methods: This is a Retrospective study of snakebite victims from November 2013 to April 2015 in a tertiary care teaching hospital in Tamil-Nadu.
Results: A Total of 82 cases were studied in our hospital. Out of these 82 Poisonous bites, 42 (51.22%) cases were viper bites, 20 (24.39%) cases were unidentified poisonous bites, 16 (19.51%) cases were Krait, and 4 (4.88%) cases were Cobra. Coagulopathy, cellulitis, wound infection, renal failure and respiratory paralysis were the common complications. Average dose of ASV administered range from 8.57 (± 0.98) to 20.78 (± 4.18) Vials. An increase in mortality, ASV dose and complications were directly proportional to the Bite to ASV Administration time.
Conclusions: Delay in hospitalization is associated with poor prognosis and increased mortality rate due to complications. There is an emergent need of awareness among the community for avoidance of traditional form of treatment and delay in early medical interventions.

Keywords: Snake bite, Envenomation, Antisnake venom, Severity, Hemotoxicity

INTRODUCTION

Snake bite is a major public health problem in rural areas of India. Snake bite is recognized as neglected tropical disease by World Health Organization.[1] In India every year, around 200,000 people are bitten by snakes, of which 35,000-50,000 succumb to death due to envenomation. There are about 52 species of poisonous snakes in India.[2,3] Of these, the 4 major poisonous species are cobras or Naja naja, krait or Bungarus caeruleus, Russell's viper or Daboia russelli, saw-scaled viper or Echis carinatu.[4] Snake bite is a medical emergency. Based on clinical manifestations, it is classified into neurotoxic, hemotoxic, and myotoxic syndromes.[5]

METHODS

This study is a Retrospective study done at our hospital, a Tertiary care teaching hospital in the Kancheepuram district of Tamil Nadu. Study period is 18 months extending from November 2013 to April 2015. All patients who were bitten by snake were admitted and observed for signs of envenomation. Patients with clinical features of envenomation were included in the study. Species of snake was identified by relevant history from

patients and witnesses. Patient was followed up until their stay in hospital and following data collected – age, sex, snake species, whole blood clotting time, prothrombin time, Serum creatinine, time duration between snake bite and administration of anti-snake venom (ASV), number of ASV vials used, Number of days in hospital, type of toxicity, complications – cellulitis, coagulopathy, acute renal failure, respiratory paralysis, sepsis and death. Written consent was obtained from all patients. Degree of severity was classified into Mild, Moderate, Severe based on local signs, systemic signs and coagulation abnormalities.[6] Mild - Local Swelling, erythema, or ecchymosis confined to site of bite, early evidence of systemic signs or symptoms, mild abnormalities in coagulation profile.

Moderate - swelling, erythema or ecchymosis that spreads beyond site of bite. Symptoms such as nausea/vomiting, signs like hypotension, perioral paresthesias, myokymia. Significant abnormality in coagulation profile without major bleeding.

Severe - Rapid swelling, erythema, or ecchymosis that involves whole body part. Markedly severe signs or symptoms (hypotension [systolic < 80 mm Hg], altered sensorium, tachycardia, tachypnea, and respiratory distress) bleeding with abnormality in coagulation profile. ASV is a sterile preparation containing equine immunoglobulin fragments F (ab') 2 freeze-dried powder when reconstituted to 10 ml of sterile water for injections I.P. supplied along with the vial, each 1 ml has capacity of specifically neutralizing the venom of these species of snake: −0.60 mg of dried Indian Cobra (Naja naja) venom, 0.45 mg of dried Common Krait (Bungarus Caeruleus) venom, 0.60 mg of dried Russell's viper (Dabioa russelli) venom, and 0.45 mg of dried Saw – scaled Viper (Echis carinatus) venom.[7]

These equine immunoglobulin and their derivatives are obtained from serum of healthy equines immunized against venoms of the above species of snakes. The primary outcome was the severity of the snakebite as per grading and death. The secondary outcomes assessed were the dose of ASV administered and the duration of the hospital stay.

Epi info software package for Windows used for analyzing the data.[8]

RESULTS

During the study period, 108 cases of snake bite were admitted to the hospital. Out of these 108 cases, 82 cases were poisonous bites. Rest of the 26 cases was observed for 24 hours they were nonpoisonous and dry bites hence discharged. Among 82 cases, 64 (78.05%) cases were male and 18 (21.95%) cases were female. Male: Female ratio was 4:1.Age of the patients was in the range of 14 - 65 years. Majority of the cases were in the age 30 to 50 years (53.66%) (Table 1).

Table 1: Age Distribution.

Age	Frequency	Percentage
< 30 Yrs.	30	36.59%
30-50 Yrs.	44	53.66%
> 50 Yrs.	8	9.76%
Total	82	100.00%

Snakes were identified from history from the patients and also by direct inspection if patients had brought the snake with them. For 20 cases, we were unable to identify the species, hence classified as 'unknown' poisonous snakes. Most common species identified was viper which constituted 51.22 % (Table 2).

Table 2: Species Specific Incidence Rate.

Species	Frequency	Percentage
Cobra	4	4.88%
Krait	16	19.51%
Unknown	20	24.39%
Viper	42	51.22%
Total	82	100.00%

Severity of envenomation

Snake envenomation is classified into Mild, Moderate, Severe based on local signs, systemic signs and coagulation abnormalities.[6] Majority of the patients had Moderate to Severe envenomation (91.45%).Most of the cases occurred during the month of July to December (50.46%). Most of the bites were during the day time (80.45%) and on the lower limbs (80.24%).

Table 3: Toxicity Profile.

Toxicity	Cases
Hemotoxicity	58 (70.73%)
Neurotoxicity	20 (24.39%)
Both Hemotoxicity And Neurotoxicity	4 (4.87%)

Based on the symptoms, signs, and laboratory parameters, we attempted to identify the species of the snake and found viper as the most common species identified in 51.22 % of the cases (Table 2).

Hemotoxic (Defined as whole blood clotting time >20 mins, Prolongation of PT, INR, and APTT, Reversal of envenomation considered with normalization of PT, INR, and APTT).

Hemotoxic envenomation observed in 58 (70.73%) cases and neurotoxic nature of envenomation were observed in 20 (24.39%) cases and whereas 4 (4.87%) cases had both hemotoxic and neurotoxic manifestations (Table 3).

Table 4: Clinical manifestations of snake bite.

Local Manifestations Of All Snake Bites (82)	
Pain And Tenderness	52 (63.14%)
Swelling	46 (56.09%)
Blisters	25 (30.48%)
Local Lymphadenopathy	22 (26.82%)
Ulceration	18 (21.95%)
Haemotoxic Manifestations Viper Bite (42)	
Pain And Swelling In The Bite Site	37(88.09%).
Bleeding From The Site Of The Bite	36 (85.71%)
Cellulitis	35 (83.33%)
Ecchymosis	18 (42.85%)
Gastrointestinal Bleeding	12 (28.57%)
Haematuria	14 (33.33%)
Epistaxis	8 (19.04%)
Haemoptysis	6 (14.28%)
Intracranial Bleeding	1 (2.38%)
Clinical Features Of Neurotoxic Snake Bites (20)	
Ptosis	18 (90%)
Respiratory Paralysis	16 (80%)
Bulbar Weakness	14 (70%)
Ophthalmoplegia	8 (40%)
Limb Weakness	6 (30%)
Coma	3 (15%)

Viper bite was characterized by severe local reactions. Pain and swelling at the bite site were the common symptoms seen in 37 cases (88%). Bleeding from the bite wounds was seen in 36 (85.71%) patients. Cellulitis and Coagulopathy were the common complications seen in 35 (83.33 %) and 32 (76.19 %) patients, respectively. Renal failure occurred in 13 (30.95 %).

Other complications were sepsis due to wound infection in 14 cases (33.33%), and acute respiratory distress syndrome (ARDS) in 2 (4.76 %) cases (Table 4 & 5). In neurotoxic snake bite, 18 cases developed ptosis, 16 cases developed respiratory paralysis, 14 cases developed bulbar weakness, 8 were ophthalmologic, 6 developed limb weakness and one had coma (Table 4).

Out of 20 neurotoxic bites, Cobra and Krait envenomation contributed maximum of 16 cases and viper had minimum of 4 cases. In unidentified snakes 13 (65%) cases developed cellulitis and 10 (50%) cases developed coagulopathy.

Out of 82 poisonous bites 7 (8.53%) developed signs of Mild envenomation, 66 (80.48%) cases were moderate and 9 (10.97%) severe envenomation (Table 6). Of the 7 cases of Mild envenomation, ASV was administered within 3 hours of bite. Average no ASV administered was 8.57 (± 0.98) vials and all the cases were discharged within 3 days hospital stay without any mortality. Of the 66 Cases of Moderate envenomation, ASV administered within 4.86 (± 4.4) hours of bite and average no of ASV vials administered was 12.68 (± 5.09) and cases discharged within 4.91 (± 4.33) days of hospital stay without any mortality.

In 9 severe cases of envenomation, average time of ASV administered was in 12.33 (±6.32) hours of bite and average no ASV vials given was 20.78 (±4.18).Out of 9 cases of severe envenomation, 4 (44.44%) patients died despite of intensive treatment. (Table 6 & 7).

Out of 82 patients, 48 developed cellulitis (58.54%), 51 developed coagulopathy (62.20%), 13 cases developed sepsis (15.85%), 12 cases developed acute renal failure (14.63%), 16 cases developed respiratory paralysis (19.51%), 4 patients died (4.88%) (Table 5).

Table 5: Severity of envenomation and time of administration and dose of ASV.

Characters	Mild	Moderate	Severe
Total No Cases	7 (8.53%)	66(80.48)	9(10.97%)
Avg. Bite To ASV Administration time (Hrs.)	2.71(±0.76)	4.86(±4.4)	12.33(±6.32)
Average Prothrombin Time (Sec)	12.43±0.76)	45.26(± 11.23)	46.25(±14.54)
Avg. no of ASV Vials	8.57 (±0.98)	12.68(±5.09)	20.78(±4.18)
Avg. hospital stay (Days)	2.71(±0.76)	4.91(±4.33)	14.56(±8.29)
Mortality (No Of Cases)	0	0	4

Study outcome

A native form of treatment was associated with an increased risk of mortality. Of the 11 patients who received traditional forms of treatment, 9 (81.81%) had severe envenomation and 4 (36.36%) has expired. Delay in admission to hospital was significantly longer for cases with severe envenomation. Severity grade was found to be increased with corresponding increase in 'bite to ASV administration time.' Mortality rate was higher in patients

with delayed presentation (12 – 24 hours) than early presentation (<6 hours); P value was significant (<0.01) (Table 7). All the 4 viper bites death cases were intensively treated for average period of 10 days and died because of Wound infection, Sepsis and Multi organ failure. 66 cases of moderate envenomation reached the hospital within 6 hours and cases monitored intensively, administered timely ASV, thereby all the cases survived despite of complications.

Table 6: Complications of snake bite.

Complications	Total (82)	Percentage %
Cellulitis	48	58.54%
Coagulopathy	51	62.20%
Sepsis	13	15.85%
Acute Renal Failure	12	14.63%
Respiratory Paralysis	16	19.51%
Death	4	4.88%

Table 7: Bite to ASV administration time.

Bite To ASV Administration Time In Hrs.	Severity (No Of Cases)			Total	No of Deaths
	Mild	Moderate	Severe		
< 6 Hrs.	7	51	2	60	0
6-12hrs	0	7	4	11	0
12-24 Hrs.	0	8	3	11	4
Total	7	66	9	82	4

Table 8: Summary of species – specific manifestations of Indian snake envenomation.

Snake Species	Signs and Symptoms
Russell's Viper(Debora Russelli)	Local Inflammation ,Laboratory And / Or Clinical Evidence Of Coagulopathy Blisters And Necrosis, Renal Failure, Ards, Cardio–Respiratory Features.
Krait (Bungarus Caeruleus)	Ptosis, Bulbar Weakness, Respiratory Paralysis, Mild Local Signs
Cobra (Naja Naja)	Local Symptoms / Signs Of Inflammation, Ophthalmic Signs, Respiratory Paralysis And Neurological Manifestations
Saw Scaled Viper (Echis Carinatus)	Local Symptoms / Signs Of Inflammations, Laboratory And/ Or Clinical Evidence Of Coagulopathy, Renal Failure, Cardio Respiratory Manifestations

DISCUSSION

The present study was carried out on 82 cases of snake bite envenomation. Most cases of envenomation were males because of their life styles involving farming and field work .snake bite is a greatest threat to agricultural workers. We observed the incidence of most of the cases during the month of July to December,[9] which is the monsoon period with agricultural activity, and also the time of increased activity of snakes as they come out of their shelters.

Most cases of envenomation were seen with viper snakebite followed by krait and cobra species, proportion of mortality was highest with viper followed by krait and cobra species. This indicates that our study showed kancheepuram district in southern India is more prevalent for viper snakes envenomation than other snakes. Distribution of variety of snake species in a given geographic region is dependent on various environmental and climatic conditions including rainfall, vegetation altitude, etc.[10]

Hemotoxicity was the commonest snakebite manifestation, attributable to the prevalence of viper snakes, followed by neurotoxicity of cobra and krait bites. Simultaneous neurotoxic and hemotoxic manifestations in patients were attributable to viper envenomation.[11] Severe local reactions observed among viper envenomation, Swelling and pain at the site of the bite were the common symptoms among the patients with viper bite.[12-14] Cellulitis and coagulopathy were the most

common complications. Acute renal failure due to tubular injury by snake venom, Hemoglobinuria, Rhabdomyolysis, Circulatory failure, and Renal micro thrombi formation causing acute tubular necrosis.[15,16,17] The rationale for the use of ASV is well defined; doses required in different types of envenomation situation vary greatly and are subject to the severity and the snake species associated.[18]

In our study, the Severity increased as the time delay from the occurrence of bite to ASV administration i.e., 'Bite to ASV time' increased. Severity also found to be in direct proportional with bite to ASV time, the duration of hospital stay, the mean effective neutralizing dose of ASV, the time taken for normalization of coagulation abnormalities as well as the mortality.

Hence, an early and adequate institution of ASV is Beneficial in preventing complications.[19] As observed with viper, in cobra envenomation also, the severity increased as the bite to ASV time increased. Patients, who presented late, resulted in delayed administration of ASV and required more intensive therapies like mechanical ventilator support.

Krait bites are usually painless with mild local symptoms. Victims might not have recognized the bite and/or have not been sufficiently compelled to seek treatment immediately; resulted in delayed ASV administration and higher mortality.[4] Patients with traditional treatments care were at a higher risk of complications and mortality. Native treatment is a classic cause of delay, which exposes the patient to aggressive or dangerous intervention.[18]

Thus, there is an emergent need to spread awareness among the community for avoidance of any delay and native treatment in snakebite.

CONCLUSION

To summarize, Initial consultation with native treatment providers, delayed ASV administration were the determinants of poor outcome in our study. Majority of snake bites resulted from hemotoxic viper snakebites and presented with severe envenomation. Viper envenomation was also associated with significant local reaction and systemic features due to coagulopathy.[12,13,14] The presence of neurological symptoms and signs with absence of local reaction, favors a diagnosis of krait envenomation. Avoidance of consultation with native treatment providers as well as prompt medical interventions can reduce both the morbidity and mortality in snakebite patients.

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