



Clinical Profile and Prognostic Factors of Acute Kidney Injury Following Snake Bite

KEYWORDS

Clavicle, nutrient foramina, periosteal arteries, neurovascular foramina.

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ABSTRACT **INTRODUCTION:** Acute kidney injury (AKI) is an important cause of morbidity and mortality in snake bite patients, especially in tropical countries. This study was under taken to evaluate the clinical profile and prognostic factors of AKI in snake bite patients.

METHODS: this was a cross sectional hospital based study conducted at a tertiary care hospital. 100 consecutive patients of snake bite induced AKI were included. All patients received standard treatment including antsnake venom and hemodialysis. The pearson chi-square test was used to analyse parametric variables.

RESULTS: prevalence of AKI in snake bite was 11.02%. Common clinical manifestations were local cellulitis(100%), oliguria(81%), hematuria(70%), and bleeding tendencies(29%). Common laboratory findings were leucocytosis(60%), coagulopathy(34%) and thrombocytopenia (29%)

CONCLUSION: snake bite induced AKI has 18% mortality. Presence of coagulopathy, uremic encephalopathy and septicemia were found to be poor prognostic factors. Average bite to needle time was found to be lesser in patients who recovered.

INTRODUCTION

Snake bite is a common cause of morbidity and mortality in tropical countries. In many parts of southeast asian region, snake bite is a familiar occupational hazards of farmers, plantation workers and others, resulting in tens of thousands of deaths each year and innumerable cases of physical handicap.

In India, approximately 81,000 snake envenoming occur each year, which result in about 11,000 deaths. ⁽¹⁾However, these numbers may be a gross underestimation of the true burden of morbidity and mortality in snake bite victims. AKI is one of the most significant complications developing due to snake bite. AKI is most commonly associated with bites of Russell's viper and pit viper⁽²⁾.

The objectives of this study were to describe the clinical profile of the snake bite patients who developed AKI ; and to identify the poor prognostic factors in them.

MATERIALS AND METHODS

This is a hospital based cross sectional study conducted from Nov 2010 to Oct 2012 in medicine department of our institute. The approval from institutional ethical committee was obtained prior to starting the study.

INCLUSION CRITERIA

1. Definitive history of snake bite.
2. Clinical picture consistent with snake bite, as presence of fang marks

Or

Cellulitis

Or

Coagulopathy

Or

Neuroparalysis.

3. Presence of Acute Renal Failure, defined as an abrupt (within 48 hours) absolute increase in the serum creati-

nine concentration of ≥ 0.3 mg/dl from baseline value measured after admission to our hospital

Or

Elsewhere after snake bite, before referral to our hospital

Or

A percentage increase in the serum creatinine concentration of $\geq 50\%$ above baseline

Or

Oliguria of less than 0.5mL/kg per hour for more than six hours, serum creatinine more than 1.5mg/dl

EXCLUSION CRITERIA

1. Patients with pre-existent renal disease (serum creatinine > 1.5 mg/dL prior to snake bite

Or

2. Ultrasonography of abdomen suggestive of bilateral small kidney/loss of corticomedullary differentiation / obstructive nephropathy / other renal pathology)

3. Diagnosed cases of hypertension/diabetes mellitus Exposure to Nephrotoxic drug/toxin (based on history)

METHOD OF COLLECTION OF DATA

All the patients were subjected to detailed history and clinical examination. Evidence of bite by a poisonous snake included presence of fang marks consistent with a snake bite at the alleged site of bite; evidence of local toxicity in form of swelling, cellulitis, gangrene, ecchymosis, blisters, blebs, or bleeding at the site of bite and area proximal to it and evidence of coagulation disturbances in form of local or systemic bleeding. Bite to hospital time was calculated as time from snake bite, to the time when patient reached our hospital. Swelling at the site of bite was grad-

ed as follows:

Mild - localized to the site of bite

Moderate – involving more than half of involved limb

Severe – presence of extensive tissue necrosis or gangrene.

RESULTS

During the study period of 2 years, a total of 1141 patients were admitted with snake bite out of which 907 (79.4%) patients showed signs of envenomation, i.e., were due to poisonous snake bite, 100 (11.02%) patients developed AKI. Among these 100 cases of AKI, 52 (52%) patients required dialysis and 48 (48%) patients were managed conservatively. Of these 100 patients 18 (18%) expired and 82 (82%) patients survived. Thus overall mortality of snake bite included AKI is 18%

Of the 100 patients included in study, 63 (63%) were male and 37 (37%) were female. Maximum patients (59.94%) were between 20-50 years of age with mean age of 30.67. 59% patients were farm workers by occupation as shown in fig no.1. Most of the snake bites were observed in lower limbs (67%). The time lag between snake bite and hospitalization is shown in fig no.2. The clinical features of snakebite patients are shown in table 1. Swelling and local tenderness were most common clinical features, found in 100% patients. Total 28% patients needed platelet/FFP transfusion because of bleeding tendencies. The outcome of AKI in snake bite patients is shown in fig no 3. 81 patients (81%) recovered completely, 1 patient (1%) is dialysis dependant and 18 patients (18%) died.

Majority of patients i.e. 70% reported to hospital within 2-4 hours of snake bite. Fang marks were seen in 92% patients, oliguria was found in 81% patients. 1 patient developed compartment syndrome and required fasciotomy.

These 100 patients of snake bite induced AKI were further sub-divided into group A (discharged patients, n=82) and group B (expired patients, n=18). The comparison of different parameters of group A and group B is shown in table 2. Coagulopathy, uremic encephalopathy and septicemia were found to be statistically significant in group B patients. Similarly group B patients had longer bite to needle time as compared to group A. Also the ASV requirement in group B patients was significantly higher as compared to group A (as calculated by 20 minute whole blood clotting test).

DISCUSSION

Snake bite induced AKI represents an important health problem in India. Clinical manifestations include proteinuria, hematuria and pigmenturia. Nephropathy usually is caused by bites by snakes with hemotoxic or myotoxic venoms.⁽³⁾ The exact pathogenesis of AKI following snake bite is not well established. However, a number of factors contribute, viz, bleeding, hypotension, circulatory collapse, intravascular coagulation, microangiopathic hemolytic anaemia and direct nephrotoxicity of venom⁽⁴⁾.

In India the incidence of AKI following *E. carinatus* and Russell's viper bite is 13-32%⁽⁵⁾. In our study 11.02% snake bite victims developed AKI. Patil et al⁽⁶⁾ reported AKI in 20-48% cases of snake bite, whereas Ali et al⁽⁷⁾ observed that 17% cases of viper bite were complicated by AKI.

In the present study 59.94% patients were between 20-50 years of age, working outdoors and were at high risk of accidental snake bite. 63% patients were male in our study. A higher proportion of males affected by snake bite may be attributed to the fact that agriculture work is carried out predominantly by males, they travel wider and hence they are at risk of accidental exposure to snake bite. Similar male preponderance have been reported from by Bawaskar et al⁽⁸⁾. We observed that rural patients formed 59% of total study population. Study by Dharod et al⁽⁹⁾ reported 70% rural patients.

The bite to needle time varies depending on the availability of medical facilities and the settings in which the study has been done. Snake venom which is responsible for almost all the complications of snake bite, must be neutralized as soon as possible with ASV.

Mean bite to needle time in our study was 3.63 hours. As the study population had vasculotoxic snake bite and all cases had local cellulitis that might have alarmed the victim and relatives and explains for early reporting to the hospital. Athappan et al⁽¹⁰⁾ found that bite to needle time >2 hours (9 or 2.10, p=0.001) was an independent risk factor for the development of AKI.

The common clinical features in snake bite victims were swelling and tenderness, seen in 100% patients, followed by oliguria in 81% patients, hematuria in 70% patients and complete anuria in 1% patient. In the study by Patil et al⁽¹¹⁾ similar findings reported.

The extent of cellulitis depends on various factors like then amount of venom injected into victims body, the type of snake, the delay in receiving ASV and application of any harmful local measures. Moderate to severe cellulitis and swelling can accommodate many liters of extravasated blood, leading to hypovolemic shock.

Active bleeding in the form of hematuria, epistaxis, hematemesis and melaena was seen in 28% patients in our study. All of them had deranged coagulation profile in the form of prolongation of bleeding time, clotting time and prothrombin time along with low platelet count. These patients were given platelet transfusion and fresh frozen plasma according to need. Suchithra et al⁽¹²⁾ found that abnormal coagulation profile was seen in 142 cases, 103 of these had severe coagulopathy. DIC is a major factor associated with snake bite resulting in AKI. Also platelet count is reduced both due to consumptive coagulopathy and direct toxic effects of snake venom on platelets.

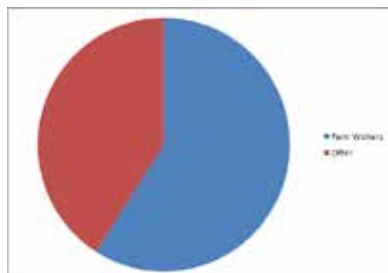
The study population was further classified into two groups as per the clinical outcome- group A (discharge) and group B (death). Various parameters were compared between two groups. Coagulopathy, uremic encephalopathy, septicemia, bite to needle time and need of total ASV doses found to be statistically significant factors present in group B.

CONCLUSION

This study concludes that AKI occurred in 11.02% victims of snake bite, more common in rural population, males more frequently affected, common clinical manifestations included cellulitis and oliguria. The overall mortality of snake bite induced AKI was

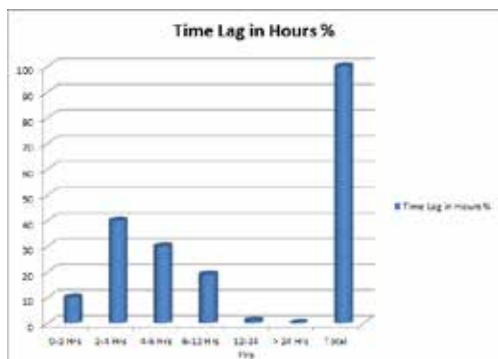
Presence of coagulopathy, septicemia, uremic encephalopathy and long bite to needle time were found to be poor prognostic factors.

**FIG NO. 1
OCCUPATION OF PATIENTS**



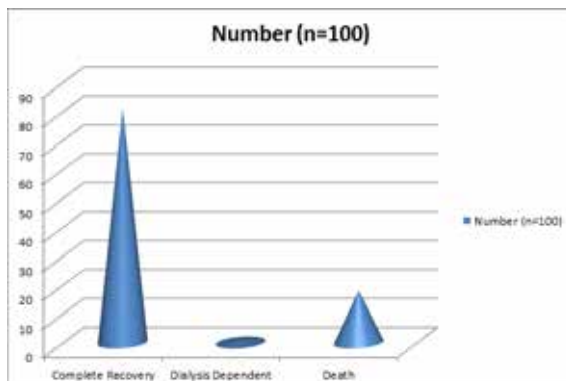
Majority of the patients are farm workers with 59%.

**FIG NO. 2
SHOWING TIME LAG IN HOSPITALIZATION OF PATIENTS**



Majority of patients reported within 2-4 hours and next between 4-6 hours.

**FIG NO. 3
SHOWING OUTCOME OF ACUTE RENAL FAILURE IN SNAKE BITE PATIENTS**



Out of 100 patients 81% recovered completely, 1% remains dialysis dependent and 18% patients died.

**TABLE NO. 1
SHOWING CLINICAL FEATURES OF SNAKEBITE PATIENTS**

Presenting Complaints	Male (n=63)	Female (n=37)	Total (n=100)	
	No.	No.	No.	%
Pallor	6	7	13	13.00
Fang Marks	59	33	92	92.00
Swelling	63	37	100	100.00
Tenderness	63	37	100	100.00
Bleeding Manifestation	15	14	29	29.00

Hypotension	4	8	12	12.00
Oliguria	49	32	81	81.00
Anuria	1	0	1	1.00
Hematuria	43	27	70	70.00

**TABLE 2 -
COMPARISON BETWEEN GROUP "A" (DISCHARGE) AND GROUP "B" (DEATH)**

S.N.	PARAMETER	GROUP "A" DISCHARGE n=82	GROUP "B" DEATH n=18	p-VALUE
1	Extensive cellulitis	22	6	0.57
2	Coagulopathy	23	11	0.012
3	Uremic Encephalopathy	21	12	0.0017
4	Hyperkalemia	19	2	0.34
5	Septicemia	42	16	0.0034
6	Bite to needle time in hours	46 ± 3.4	4.4 ± 3.4	
7	ASV Doses	16.11 ± 8.06	24.12 ± 1.68	

Different parameters in above table were compared between the two groups and presence of Coagulopathy, uremic encephalopathy, Septicemia showed significant "p" values, were found to be poor prognostic factors.

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