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Research Article

SPECTRUM OF SNAKE BITES AND SHORT TERM OUTCOMES OF SNAKE ENVENOMATION: EXPERIENCE OF A TERTIARY CARE CENTER IN EASTERN INDIA

Moloy Kanti Makhal[1]., Avinandan Banerjee[2]., Smita Subhash Divyaveer[3]*., Amlan Kanti Biswas[4] and Sanchaita Bala[5]

[1]Department of General Medicine, R.G.Kar Medial College, Kolkata, West Bengal
[2]CMRI Hospital, Kolkata
[3]Department of Nephrology, Post Graduate Institute of Medical Education and Research, Chandigarh
[4]Department of General Medicine, Kolkata, West Bengal
[5]ESI-PGIMSR & ESIC Medical College, JOKA, Kolkata, West Bengal

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Snake Bite, Neurotoxic Envenomation, AKI, Dialysis.

A B S T R A C T

Background: Snake envenomation is global health problem particularly in tropics. Few data exist regarding overall spectrum of snake bites and the outcomes of snake envenomation from eastern India.

Materials and methods: Objective: to observe and analyze the various presentations of snake bite cases and to study the short term outcomes of complications of snake envenomation.

Design and Participants: Single center prospective observational study of snake bite cases admitted at a tertiary health care center from June 2013 to May 2014. All patients more than 18 years of age, admitted with snake bite in R.G.Kar Medical College during this period were included. Outcome: 1)Complete recovery: no residual organ dysfunction; 2)Partial recovery: no dialysis dependence, improved renal function at discharge but not to baseline level at the time of discharge; 3)dialysis dependent at discharge; 4)Death.

Results: Total 74 cases were enrolled. Majority of cases presented to hospital between 0-6 hours of bite (63.52%). Non-poisonous snake bites (n=26, 35.13%) were more common than poisonous snake bites (n=48, 64.87%). Neurological manifestations were seen in 9 (34.61%) and AKI was seen in 11 (42.30%) out of the 26 poisonous snake bite cases. Most cases of AKI were in stage 3 or RIFLE -F stage at diagnosis. Cellulitis and regional lymphadenopathy were associated with AKI significantly (p values of 0.000 and 0.002 respectively). All neurotoxic envenomation cases had complete recovery at discharge. Of these 2 (22.22%) cases were complicated by sepsis. Outcome of AKI patients was relatively poor, with complete recovery on discharge was seen in 5 (45.45%), partial recovery without dialysis dependence in 4 (36.36%) and dialysis dependence in 1(9.09%) of the cases. 1death occurred in AKI with sepsis group.

Conclusion: Neurotoxic envenomation generally have good prognosis if managed early. Vasculotoxic envenomation, however is portends poorer prognosis with complete recovery in less than half cases.

INTRODUCTION

Snake envenomations are an important global health problem. The world health organization (WHO) estimates that there are approximately 125,000 deaths out of 2,500,000 poisonous snake bites worldwide[1] every year of which India accounts for 30,000-50,000 deaths[2]. Different parts of India have reported variable incidences [4,5,6,7,8]. Earlier community based study from eastern India reported an incidence of 0.16% and death rate of 10.09 %.

Corresponding author:* **Smita Subhash Divyaveer
Department of Nephrology, Post Graduate Institute of Medical Education and Research, Chandigarh

An alarmingly large proportion of patients(65.47%) went to the traditional healers[9] which can cause delay in initiation of therapy or even death before appropriate treatment could be given. These studies also highlight the possible under reporting of true incidences and deaths due to snake envenomation. It is increasingly being recognized that acute kidney injury has long term consequences and this has reported in context of snake envenomation as well[10]. The geographical distribution of the different species of snake may result in variable responses to anti snake venom[11,12]. Most of the bitten being males in the age group of 20 to 30 years, the economic burden in terms of loss of labor and productivity and that due to increased burden of

chronic kidney disease are likely to be significant. The referral practices may be a reflection of awareness in population and peripheral health care centers, though not accurately This study was planned to observe and analyze the spectrum of snake bites and factors, if any, to identify the patients at high risk of complications and poor outcomes.

MATERIALS AND METHODS

Study design: single center prospective observational study from June 2013 to May 2014.All patients more than 18 years of age, admitted with snake bite in R.G.Kar Medical College from 1st June,2013 to 31st May,2014 were included in the study. Poisonous snake bite were defined as those with definite history of snake bite or fang marks with evidence of atleast one of hematological, neurological, renal involvement or shock. Patients were followed up until discharge or death. Outcomes at the time of discharge swere noted as follows:

1. Complete recovery: no residual organ dysfunction.
2. Partial recovery: no dialysis dependence, improved renal function at discharge but not to baseline level at the time of discharge.
3. Dialysis dependent at discharge.
4. Death

Those with pre-existing chronic kidney disease and/or neurological disorder or unwilling to participate in the study were excluded. Before commencement of the study, due clearance from institutional ethics committee was taken.

Data collected included detail history taking, appropriate investigations including complete blood count including platelet count,20 minutes whole blood clotting time (WBCT), Prothrombin time, Activated partial thromboplastin time, Serum urea, creatinine, Sodium, Potassium, Routine examination of urine and imaging if indicated.

KDIGO and RIFLE criteria were used to define AKI[13].Snake anti venom was given as per the Indian guidelines for snake bite management[14]. Supportive care included fluids, vasopressors, antibiotics, surgical debridement, renal replacement therapy, ventilatory support were given if thought necessary by the treating physician.

Data collected was analyzed using statistical software SPSS version 17 and Epi Info Version 6 is used and different statistical methods such as Independent sample t test, Chi square test and Fisher's exact test.

RESULTS

Total number of 74 snake bite cases was admitted during one year in R.G.Kar Medical College & Hospital, Kolkata. Among them 26 cases were due to poisonous snake bites and 48 were non-poisonous snake bites. Among 74 cases of snake bites, 48(64.86%) were male and 26(35.14%) were female. Age distribution range was 13 to 71 years. The age and sex distribution were as shown in figure 1.There was higher incidence of bite on lower extremity n= 65(87.84%) than upper extremity n=9 (12.16%), most of the bites were non-poisonousn=48 (64.87%). Most of the poisonous bites occurred from 6 am to 6 pm, n=16 (61.53%) while the non-poisonous ones often occurred between 6pm and 6 am (n=29; 60.41%).38.46% (n=10) patients with poisononus bites presented to the hospital within 6 hours, and 80.46% (n=23) presented within 24 hours. Of the 26 poisonous snake bites only 26.92% (n=7) received Antivemon within 2 hours of snake bite. Among the non-poisonous snake bites 37 cases (77.08%) presented within 6 hours and 47 cases (97.91%) presented within 24 hours. Local manifestations observed were pain (88.46%), Cellulitis (53.84%), regional lymphadenopathy (23.07%), blisters (19.23 %).As expected the mean urea and creatinine levels were higher in those with poisonous snake bite, however leukocytosis was observed in many of those with non-poisonous snake bite (table 1).9 cases (34.61%) presented with neurological signs/symptoms in the form of ptosis (34.61%), drowsiness (30.76%), dysphagia (15.38%), ophthalmoplegia (15.38%), difficulty in speech (11.53%) and respiratory paralysis (7.69%). 11(42.30%) patients had AKI while 6 (23.07%) had neither. Hematuria was the most common bleeding manifestation (50%).

Table 1 lab parameters

Laboratory parameters	Poisonous snake bites	Non-poisonous snake bites
	Mean ± SD	Mean ± SD
Haemoglobin(gm%)	11.84 ± 1.94	12.39 ± 2.04
Total count (cells per cmm)	10623.07 ± 3970.92	10066.66 ± 6504.44
Urea(mg/dl)	49.56 ± 33.279	29.93 ± 8.22
Creatinine(mg/dl)	1.88 ± 1.51	0.79 ± 0.16
Serum Sodium(meq/dl)	137.19 ± 5.45	138.36 ± 5.24
Serum Potassium(meq/dl)	3.80 ± 0.52	3.96 ± 0.37

Acute kidney injury (AKI) was observed in 11(42.30%) of the total poisonous snake bite cases. The RIFLE staging has been shown in figure 2A. Of these, hypotension (27.27%), bleeding manifestations (81.81%), cellulitis (100%), regional lymphadenopathy (54.54%) were more often present in those who presented with AKI. Bleeding manifestations, cellulitis and regional lymphadenpathy significantly associated with AKI compared to the cases without acute kidney injury, p values being 0.014. 0.000 and 0.002 respectively.

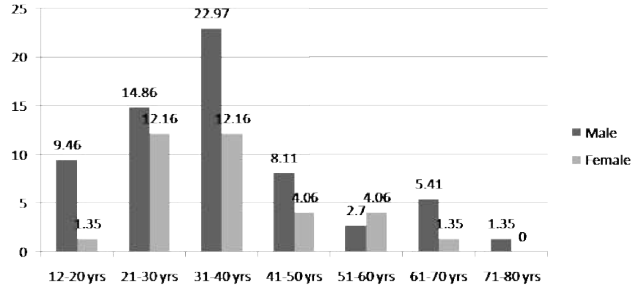

Figure 1 Distribution of cases by their age and gender (numbers indicating % of total snake bite cases)

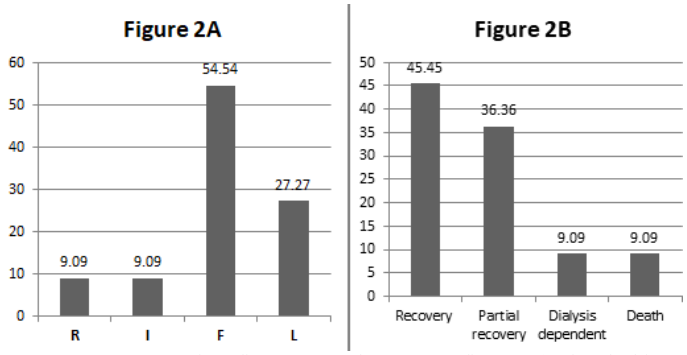

Figure 2 RIFLE staging (figure 2A) and outcomes (figure 2B) of snake bite acute kidney injury (AKI) patients. (numbers indicate percentage of total AKI cases). Abbreviation: R= Risk, I= Injury, F= Failure, L=loss stage of AKI

The average hospital stay of those with AKI was 12.45 days. Of all the AKI patients those with hypotension at presentation

had a prolonged stay (more than average) compared to those cases which did not have hypotension, p value being 0.024.
There was no significant difference with respect to mean age of patients or time interval between snake bite and administration of snake anti venom and duration of AKI (0.078). The average number of snake anti venom vials administered in AKI patients was 15.

Outcomes as shown for AKI patients in figure 2B, about 50% patients did not recover completely (Stage E has not been shown as patients were not followed up for 3 months). Sepsis complicated the course of 4(36.36%) of AKI cases. One patient died in the AKI group with sepsis. This was in contrast to neurotoxic snake bite cases where at the time discharge all patients had complete recovery. The course of 2(22.22%) of neurotoxic snake bite patients was complicated by sepsis. All of these were on mechanical ventilation.

DISCUSSION

Snake envenomation is more common in young males, mostly in lower limbs which is likely due to the outdoor exposure of this population in rural parts of eastern India. These findings of our study are similar to most studies in other parts of India[8,15,16]. Snake bites occurred more often in daytime. In those who had snake bite in night time, identification of the species of snake is difficult. Use of monovalent form of snake anti venom has been suggested and is practised in some parts of the world. However in most circumstances, as observed in our study, it is not feasible due to difficult identification of species. Though a significant large percentage of patients presented to the hospital within 6 hours of snake bite, this cannot be extrapolated to the community especially the remote and rural areas which are likely to differ in statistics. Increased awareness of complications of snake bite and its effective therapy could have been an important reason for early referrals.
Non poisonous snake bites were more common than poisonous snake bites. This is despite the fact that the study was conducted in a tertiary care and referral center. This reinforces the current recommendation for management of snake bite to avoid the use of snake antivenom indiscriminately.

Neurotoxic snake bite cases presented with ptosis and drowsiness most commonly. Ptosis has been reported as the commonest sign in neurotoxic envenomations[15,18]. All the cases recovered at the time of discharge and the most common complication that occurred in the ward course was sepsis occurring only the cases that required ventilator support.

Bleeding manifestation were common, most frequent being hematuria. This is in unison with findings of other studies[15].

AKI following snake bite was observed in about 40% of all the poisonous snake bite cases. Other studies from India have reported a variable incidence of AKI ranging from 1.9 to 43.2%[19,20,21]. This wide range of incidence could be due the varied geographical distribution of the various species of snakes, dose of venom incurred by the affected patients, reporting and referral bias, sepsis complicating snake envenomation. While some studies have suggested the incidence of AKI more in the elderly, we did not find any correlation of age to the development of AKI. So also, the time interval between snake bite and administration of snake anti venom (ASV) did not have significant association with AKI. A series of 4 cases published from china also found benefit of early snake anti venom therapy. Previous Indian studies have reported benefit of early administration of ASV. The time to receiving Anti-venom however was somewhat dismal, as longer delay in therapy results in increased incidence of acute kidney injury and severity of acute kidney injury. This highlights the need of early initiation of Antivenom therapy even before referral to higher health care centers and thus the need for strengthening the peripheral primary health care system.

Cellulitis and regional lymphadenopathy were significantly associated with AKI. This is likely to be a reflection of larger dose of envenomation incurred by these patients. Factors reported to be associated with poor prognosis hemorrhage, hypotension,the time interval between snake bite and AVS administration, albuminuria[23,22,25,22,26]. In our study all patients who had hypotension developed AKI but this could not reach statistical significance owing to small numbers. Bleeding manifestations were present in all vasculotoxic snake bite and were not associated with AKI significantly. At diagnosis most patients were in the failure stage according to RIFLE staging or stage 3 KDIGO stage of AKI. This may be a reflection of the less common practice of using urine output criteria for defining stage of AKI. While not all AKI is preventable, early and prompt institution of resuscitation measures along with prompt and early ASV therapy are likely to prove helpful.

Outcomes of AKI cases were in stark contrast with those with neurotoxic envenomation. While all neurotoxic envenomation recovered fully, those with AKI had complete recovery in less than 50% of cases at the time of discharge. Hypotension, hemolysis, and DIC are likely to be important pathogeneticfactors, a direct cytotoxic effect of the venom on the kidney in producing ARF cannot be excluded[19]. A study of the renal biopsy of patients with no resolving AKI found acute tubular necrosis and acute cortical necrosis as the common findings, with acute interstitial nephritis (AIN) being a rare presentation. The AIN cases progressed to chronic kidney disease[27]. Though the study did not include long term follow up of these cases, data from other geographical parts of the world have shown incomplete recovery to be associated with high incidence of Chronic kidney disease[10]. Hence, the overall morbidity and impact of snake envenomation appears to be much larger than what has been reported in various studies. Some measures that can be taken to improve outcomes in snake envenomation include increasing awareness in population to seek evaluation and therapy at the earliest, wearing barrier protection (eg. gum boots in the areas of high incidence of snake bites), promoting studies of various species of snakes particular to geographical areas so that effective mono or polyvalent ASV can be manufactured and to make them available in remote geographical areas. Judicious use of ASV considering the shortage of its supply and importance of prompt resuscitation measures cannot be overemphasized. The patients who do not achieve complete recovery a long term follow up is essential to implement measures of retarding the progression of chronic kidney disease. Limitations of this study are small sample size, time interval from bite to administration of ASV estimation based on available history, albuminuria could not be estimated in AKI patients who were oligo-anuric (hence data not mentioned here), and short term follow up.

CONCLUSION

Snake envenomation is an important cause of morbidity and mortality in eastern India similar to many parts across the world. While the awareness in population appears to be increasing, the scenario may not be the same in remote and rural areas. Neurotoxic envenomation generally have good prognosis if managed early. Vasculotoxic envenomation, however is portends poorer prognosis with complete recovery in less than half of the cases. Most cases are diagnosed in failure stage of RIFLE (KDIGO stage 3). Those with partial recovery may progress to chronic kidney disease and long term follow up is essential in these cases.

Conflict of interests: None of the authors have any conflict of interest to declare.

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