



A prospective study of correlation between bite to needle time and acute kidney injury in snake bite

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Abstract

Background and objectives: A study of correlation between Bite to needle time and acute kidney injury in patients admitted with snake bite and systemic envenomation and an analysis of the outcome of these patients.

Materials and Methods: 100 cases admitted at Government Mohan Kumaramangalam Medical college Hospital, Salem, during the period April 2015 to March 2016, with clinical evidence of snake bite envenomation were included in the study after taking into account the inclusion and exclusion criteria. Out of the 100 cases, 56 were males and 44 were females. All the 100 cases were treated for snake envenomation and their laboratory work up and follow up data were collected and studied.

Results: 44% of Snake bite victims have developed Acute Kidney Injury. Delay in admission was strongly correlated with development of Severe AKI ($P < 0.0005$). Victims with co-morbidities are more prone to develop AKI and Complications in addition to time delay. Most of the patients with AKI (93%) had Cellulitis and Lymphadenopathy ($P < 0.05$). AKI is uncommon in Patients without coagulopathy. 80% of patients were required conservative management only. 90% of AKI Patients recovered completely ($P < 0.0005$). Only 6 patients of Stage 3 AKIN (24%) become dialysis dependent. 4 patients in AKIN 3 group (16%) died due to complications of AKI ($P < 0.0005$). People who were initiated on prompt medical therapy earlier and follow up showed signs of early recovery and favorable prognosis. This was also corroborated with the laboratory work up results of these patients.

Conclusion: Early admission to the hospital and early administration of Inj. ASV with adequate supportive therapy is important to prevent development severe Acute Kidney Injury and its complications. The morbidity and mortality is high if severe cellulitis is associated with prolonged coagulopathy.

Keywords: snake bite, ASV, acute kidney injury, hemotoxicity

Introduction

Snake-bites are the common cause of morbidity and mortality in tropical countries. Poorly informed rural populations often apply inappropriate first-aid measures and vital time is lost before the victim is transported to a treatment centre, where cost of treatment can constitute an additional hurdle. In India more than 20,00,000 snake bites are reported annually, of which 35,000 to 50,000 people die. Its public health importance has been largely ignored by medical science. Snake-bites are the common cause of morbidity and mortality in tropical countries. In India, there are 216 species of snakes, of which only four are venomous snakes (cobra, krait, Russell's viper and saw scaled viper). Snake venoms are rich in protein and peptide toxins that have specificity for a wide range of tissue receptors, making them clinically challenging and scientifically fascinating, especially for drug design. Although the full burden of human suffering attributable to snake bite remains obscure, hundreds of thousands of people are known to be envenomed and tens of thousands are killed or maimed by snakes every year. South Asia is the world's most heavily affected region, due to its high population density, widespread agricultural activities, numerous venomous snake species and lack of functional snake bite control programs. The deficiency of snake bite management in South Asia is multi-causal and requires joint collaborative

efforts from researchers, anti-venom manufacturers, policy makers, public health authorities and international funders.

Methodology

This study was done at Govt. Mohan Kumaramangalam Medical college hospital, Salem during a period between April 2015 to March 2016. This is a Prospective and observational study which had a sample size of 100 patients

Source of data

The study group included 100 patients admitted to GMKMC Salem with history of snake bite and who satisfied inclusion and exclusion criteria.

Method of collection of data

Patients were evaluated by taking a detailed history, clinical examination and laboratory investigations. A proforma was specially designed for data collection including all these.

Inclusion Criteria

1. History of Snake bite with signs of Envenomation
2. Progressive elevation of serum creatinine $> 0.3\text{mg/dl}$ from baseline, a percentage increase in the serum creatinine concentration of $> 50\%$ or oliguria of less than 0.5ml/kg/hr for more than 6hrs.

3. Age is more than 18 years.

Exclusion Criteria

1. Patients with Pre-existing Renal Diseases with history of Snake bite.
2. Extreme age groups - age more than 80 years
3. Patients with contracted kidneys with normal Renal Parameters with history of Snake bite.

All patients were subjected to the following investigations-Hb, PCV, Platelets, Urine complete, Blood Urea, Serum creatinine, USG abdomen & Pelvis, ECG

Procedure in Detail

Patients admitted in Emergency Room, GMKMCH with history of Snake bite were taken into the study. Some of the patients were initially treated in some hospitals and referred to our hospital with Acute Kidney injury also taken. Details regarding initial treatment, renal parameters have been collected.

Acute kidney injury was defined according to AKIN criteria. Patients were classified into 4 groups- NO AKI, AKIN 1, AKIN 2, and AKIN 3 by monitoring urine output hourly and Serum Creatinine. Patients were followed up from admission to discharge. If patients developed acute kidney injury means, they were transferred to Nephrology ward and continuous monitoring was done. CBC- Hb, PCV, and Platelet count was monitored daily. Renal parameters monitored twice daily. Patients were followed up till discharge.

Statistical Analysis

The study design was a prospective non interventional observational study. All data collected were noted using a structured proforma, including the investigations. Data was analysed using statistical package and SPSS structured software to find out the proportion of acute kidney injury among 100 patients, and their clinical profile and outcome of them.

Funding Agency: None.

Ethical Concerns: As per the institution protocol.

Consent: Informed consent was taken as per standard procedure that is followed in the institution.

Observations & results

The study was prospective, observational, non- interventional and follow up study. 100 patients were selected randomly who fulfils the criteria for the study. Following parameters were observed in our study.

82 patients were admitted in hospital before 6 hours, among them 50 patients did not develop AKI. 11 patients developed AKIN 1 and 4 patients developed AKIN 2 and 17 patients developed AKIN 3. Among patients admitted before 6 hours, 28 patients admitted immediately within one hour, among them 19 didn't develop AKI, but 5 people developed AKIN 3.

Table 1

Bite to needle time	NO AKI	AKIN 1	AKIN 2	AKIN 3	Total	Chi square	P
< 6 hrs	52	11	4	17	84	15.166 Df- 2	0.0005
6 – 12 hrs	4	1	2	4	11		
>12 hrs	0	0	1	4	5		

Table 2

AKIN staging	Bite to needle time												Total	Chi square	P
	<1 hr		1-2 hrs		2-3 hrs		3-4 hrs		4-5 hrs		5-6 hrs				
	N	%	N	%	N	%	N	%	N	%	N	%			
NO AKI	19	38	17	31	9	18	3	6	2	4	0	0	50	18.329 Df-15	0.045
AKIN1	4	36	3	28	2	18	2	18	0	0	0	0	11		
AKIN2	0	0	2	50	2	50	0	0	0	0	0	0	4		
AKIN3	5	31	6	38	1	6	1	6	2	13	2	6	16		
Total	28	34	28	34	14	18	6	7	4	5	2	2	82		

In 6-12 hours group, 5 people didn't develop AKI, but 5 peoples developed akin3. In more than 12 hours group, all developed severe AKI. Among 5 people, 4 developed stage 3 AKI and one developed stage 2 AKI.

So early admission sometimes may not prevent development of AKI. But delay in admission is definitely resulted in bad prognosis, sometimes death may occur in those patients.

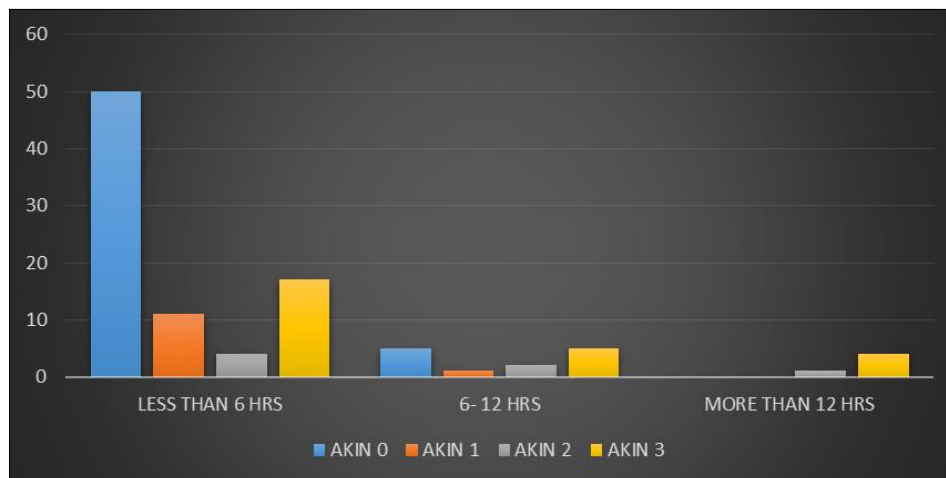


Fig 1: Bite to needle time to AKI

Discussion

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In more than 12 hours group, all developed severe AKI. Among 5 people, 4 developed stage 3 AKI and one developed stage 2 AKI.

In 2012, Jayantapaul *et al.* have done small study in Gujarat, Mean time in between snakebite and administration of ASV (minutes) 110.22 ± 7.60 was observed and mean patients developed acute kidney injury is 66.39 ± 4.36 ⁵⁹.

Suchithra N *et al.* stated in their study of Snakebite envenoming in Kerala, South India; "Those who received ASV early (bite to needle time < 6hrs) had more severe local envenoming than those who received ASV late (bite to needle time > 6 hrs), but latter group were more likely to suffer complication and those who received ASV late had a higher risk of developing acute renal failure"⁴⁸.

Sharma *et al.* Stated that median bite to hospital time was 9 hrs and delayed in admission was more prone to develop acute kidney injury.

Narvenkar K *et al.* found that Correlation between early administrations of anti-snake venom was beneficial in preventing development of acute kidney injury, however severe was the systemic envenomation⁴⁶.

"Early administration of antivenom has been demonstrated to completely reverse all clinical manifestations of snake envenomation. But some studies stated that the early administration of Inj.ASV cannot be too strongly emphasized to prevent development of AKI in snakebite patients." – UM.Natarajan *et al.*, SJAMS⁴².

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References

1. Bawaskar HS. Snake Bite Poisoning, Chapter 59, API text book of Medicine 2007: 349.

- Warrell DA. The clinical management of snake bites in the Southeast Asian region. South East Asian J Trop Med Public Health, 1999; 30:1-85.
- Sigerist HE. Causation and nature of disease, Homeric medicine, Religious medicine, Magico-religious medicine (Chapters), History of medicine, Oxford University Press, 1960; 1&2.
- David A Warrell. WHO Guidelines for the management of snake-bites For South East Asian Countries, 2010.
- Sakhuja V, Chugh KS. Renal lesions in snakebite. J Association of Physicians of India, 1989; 37(7):423-4.
- Sigerist HE. Causation and nature of disease, Homeric medicine, Religious medicine, Magico-religious medicine (Chapters), History of Medicine, Oxford University Press, 1961, 1&2.
- Manson - Bhar PH. Animal poisons, Mansons Tropical Diseases, 15th Edition, Cassel, London, 1960.
- Warrel DA. Injuries, envenoming, poisoning and allergic reactions caused by animals, Ed. Weatherall OJ., Ledingham J.G.G., Warrel D.A: Text Book of Medicine 3rd Edition, Oxford University Press, 1996, 1.
- Athappan G, Balaji MV, Navaneethan U. Acute renal failure in snake envenomation: a large prospective study. Saudi J Kidney Dis Transpl, 2008; 19(3):404-10.
- Seaton SA (Ed): Snake venoms and envenomation, New York Warel Dekker Inc. 1971.
- Hati AK, *et al.* Epidemiology of snake bite in the district of Burdan (West Bengal), J of Indian Medical Association, 1992; 90(6):145-7.
- Chug KS. Snakebite induced acute renal failure in India, Kidney International, 1989; 35:891-907.