

A Study on Albuminuria and Thrombocytopenia as Prognostic Indicators if Acute Kidney Injury in Hemotoxic Snake Bite

P. Renuga¹, P. Thirunavukarasu², R. Shanmugam³

¹Associate Professor, Department of General Medicine, Government Medical College Hospital, Virudhunagar

²Assistant Professor, Department of General Medicine, Government Medical College Hospital, Virudhunagar

³Postgraduate in DNB General Medicine, Department of General Medicine, Government Medical College Hospital, Virudhunagar

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Corresponding author: Dr P. Renuga

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Abstract

Background: Snake bite is one of the most avoidable reasons of death and the occurrence of snake bites is on a growing trend due to numerous elements. The gravest complication of snake bite is acute kidney injury and our study is to evaluate albuminuria and thrombocytopenia as early prognostic indicators of acute kidney injury in snake bite.

Methodology: A hundred patients who got admitted in the Department of General Medicine in District Head Quarters hospital & DNB Post Graduate Teaching Institute, Virudhunagar for a duration of 6 months from September 2019 to February 2021 with a history of snake bite were undertaken for study and they were monitored with blood urea, serum creatinine, urine albumin and platelet count and correlate with the factor which category of patients was moving ahead towards developing AKI and how identifying albuminuria and thrombocytopenia helps in the evaluation of progression of cases to AKI.

Conclusions: In patients with snake bite, patients who had albuminuria and thrombocytopenia are associated with the development of acute kidney injury.

Keywords: Thrombocytopenia, Albuminuria, Snakebite.

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Introduction

Venomous snakebites are a significant medical issue in India. 52 species of poisonous snakes found in our country. Major poisonous snakes belong to Elapidae & Viperidae clans. The WHO has projected that nearly 1, 25,000 deaths occur among 2, 50,000 venomous snake bites globally per year [1]. Snakebite was noted predominantly in the rural people of India, with male preponderance (Males: Female: 4:1) [2].

This may be due to most people are having an agriculture-based occupation in India.

Still, these statistics may not show the true problem of sickness and mortality in snake bite sufferers. Incursion of the snake's territory by large numbers of public may also be followed by an augmented occurrence of snakebite.

Four type of snakes namely, common cobra, Russell's viper, saw-scaled viper and common krait are highly poisonous and is accountable for most of the lethal bites in India. Russell's viper is the major reason of snakebite leading to augmented morbidity and mortality due to Acute Kidney Injury

(AKI), prevalence of AKI is 5-30%. Acute Tubular Necrosis seen in 70-80% of AKI [3] 25% of cases develop Acute Cortical Necrosis, which can progress to CKD. Oxidative stress (OS) ends up in the alteration of protein either straight through the oxidation of amino acid residues by reactive oxygen species (ROS) or indirectly by an augmented production of reactive carbonyl species.

Even though augmented CS and protein alteration has been widely researched in both hyperglycaemic and corticotrophin-releasing factor and numerous cases of AKI. Proteins injury due to OS and CS in AKI has not been defined well in previous studies. Researches have shown that even when ASV is given before 1-2 hours after the bite, it was unable to avoid AKI in few cases. Paul *et al* has found that haematuria and albuminuria was related with the progress to acute kidney injury.

Many studies [4-8] have found that the bleeding tendencies in the snake bite as a good concomitant aspect in the incidence of Acute Kidney injury. This study was taken on to conclude the prognostic indicators of developing AKI following hemotoxic snake bite. Also to correlate the association of albuminuria and the development of AKI and to associate the relation of thrombocytopenia and development of AKI and also morbidity and mortality due to AKI.

Materials and Methodology

This study was done in Department of General Medicine in District Head Quarters hospital & DNB Post Graduate Teaching Institute, Virudhunagar as a Cross-sectional study. About hundred Patients with a history of hemotoxic snake bite and with evidence of envenomation attending Emergency Department from September 2019 to February 2021 were included in the study.

Whereas Known Hypertensive & Diabetes mellitus, history of chronic NSAID intake, Pre-existing renal disease were excluded. If platelet count is < 1.5 lakhs/cc was considered as Thrombocytopenia, Albumin 1 + & more were clubbed together as 'Albuminuria Present' group. Informed consent will be taken from all the patients. Ethical approval was obtained from Institutional ethical committee.

Statistical Analysis

Data was coded and analysed using IBM-SPSS, version 22.0 software. Descriptive analysis for all the variables was expressed in frequency and proportions. Bivariate analysis using Chi square test was done.

Results

Among 100 study participants, majority of the participants were in 51-60 yrs age group (21%), 20% of study participants fall under 31-40 and 41-50 age group. In that 66 (66%) study participants were males and 34 (34%) participants were females. Among our study participants it was seen that 82 (82%) participants don't have acute kidney injury whereas 18 (18%) participants have acute kidney injury.

In our study population 51% had albuminuria. Thrombocytopenia has found to be present in 30 (30%) study participants out of 100 participants. Among 100 study participants, 81 (81%) participants don't had symptom of bleeding while 19 (19%) participants experienced bleeding symptom, 61 (61%) participants out of 100 study participants had cellulitis while 39 (39%) of them doesn't had cellulitis.

Among our study population, Saw scaled viper snake bite accounts for the maximum frequency 51% (n=51). The snake bite by Russel's viper was seen in 48% (n=48). Pit viper bite was the one with least frequency of 1% (n=1).

Table 1: Association between AKI and Thrombocytopenia

Thrombocytopenia	Acute kidney injury		Total	P value
	Present	Absent		
Present	16 (88.8%)	14 (17.1%)	30	0.001
Absent	2 (11.1%)	68 (82.9%)	70	
Albuminuria	Acute kidney injury		Total	P value
	Present	Absent		
Present	18 (35.2%)	33 (64.7%)	51	0.001
Absent	0 (0%)	49 (100%)	49	
Cellulitis	Acute kidney injury		Total	P value
	Present	Absent		
Present	14 (23%)	47 (77%)	61	0.087
Absent	04 (10.3%)	35 (89.7%)	39	

Participants who had thrombocytopenia was found to have higher rates of AKI when matched with participants who don't have thrombocytopenia and this correlation was significant statistically.

The presence of AKI among the study participants who had albuminuria is higher when compared with the study participants who don't have albuminuria and the difference was statistically significant.

Table 1 also shows that acute kidney injury is more common in participants who had cellulitis when compared with the study participants who doesn't had cellulitis. When evaluated is was not significant statistically

Table 2: Association between AKI and Snakes types

Types of snakes	Acute kidney injury		Total	P value
	Present	Absent		
Russel's viper	06 (12.5%)	42 (87.5%)	48	0.32
Saw scaled	12 (23.5%)	39 (76.5%)	51	
Pit viper	0 (0%)	01 (100%)	01	

The AKI is higher in participants with saw scaled snake bite and lower in participants with Pit viper bite which was statistically insignificant. Acute kidney injury was higher in participants who had bleeding when compared with the participants who don't had bleeding and this was significant statistically. The presence of AKI is higher in the participants who had urine albumin value more than 2+ and lower in participants with trace albumin value and this relation was also statistically significant.

Discussion

The current study was conducted on patients of both sex, with history of

hemotoxic snake bite and with evidence of envenomation admitted in District Head Quarters Hospital, Virudhunagar during September 2019 to February 2021 in 100 patients

The mean age among our study population is 41.5 years and most frequently in 41 to 60 year age group. Patients who developed AKI were higher in age between 41 to 60 years with mean age of 48.1 years. Study participants who had AKI were in higher age group with mean age of 48.1 years. Chugh KS *et al* [9] Pinho F M *et al* [4] Naqvi R *et al* [10] and Mukhopadhyay P [11] *et al* established that the mean age in snake bite ranges from 24 - 43 years.

Our study outcome also proposed that increased age group was not only linked to the incidence of AKI but also to mortality. The augmented occurrence in older age was likewise proved by study done by Athappan *et al* [5]. The tendency of older people developing AKI can also be linked to age associated progressive structural and functional worsening, which comprise deterioration in glomerular filtration rate and renal blood flow, loss of renal parenchymal mass, hyalinization of afferent arterioles, and enlargement of glomerular arterioles, sclerotic glomeruli and tubule-interstitial fibrosis.

Among our patients, the men have the greater incidences of snake bite than the woman. This is due to the fact that, being a man, the likelihood of going to work outdoor is greater than the woman and hence the probabilities of accidental bite from the snake is more in males. Male to female ratio is 3:1.5 in our study. Studies conducted by Pinho F M *et al* [4] Naqvi R *et al* [5]. Mukhopadhyay P *et al* [6]. Athappan G *et al* [5] identified comparable interpretation that the snake bite is greater in men than the women.

In our study among 18 AKI patients, 10 (55.6%) were men and 8 (44.4%) were women. It was 70.11% vs 29.89% in a study by Mrudul *et al* [14].

The most frequent type of snake bite among our patients is Saw scaled viper followed by Russell's viper. The occurrence of acute Kidney Injury due to Russell's viper bite has been projected to be 12.5%, and the occurrence of acute Kidney Injury following Saw scaled viper bite seems to be around 23.5%. Russell's viper, common krait, cobra and saw scaled Viper comprises the major four Snakes which are accountable for nearly all of the snake bites in India. This is in similar with the research done by N. Suchitra *et al* [6].

Cellulitis and bleeding propensities are the more frequent complication witnessed in the snake bite in addition to AKI. Among

our patients 61% patients developed cellulitis while 39% of patients did not develop cellulitis. This is comparable to study led by Athappan G *et al* [5]. Among our study population, it was found that 22.9% of patients with local cellulitis developed AKI. With a p value of 0.107 there was no statistically significant relation. In contrast to our study 92% patients with AKI who had cellulitis in study done by Mrudul *et al* [14].

In our study, 19% of patients had bleeding while 81% did not develop bleeding signs. This ratio is a little more than the occurrence perceived in study done by Athappan G *et al*⁵ (22.7%). In one another work done by Suchitra *et al*⁶ the bleeding propensities observed was considerably related with the development of Acute Kidney Injury. The bleeding tendency depends on features like type of snake envenomation, quantity of toxin inoculated and presence of other co-morbidities.

It was identified that 42.1% of patients with bleeding developed AKI. It has a p value of 0.002, which is statistically significant. In study by Mrudul *et al* [14], it was bit higher with 81%. In a study done by Sharma *et al* [8] 27 out of 52 viper bite cases with bleeding abnormalities developed AKI. Study by Paul *et al* displayed 47.95% patients presented with bleeding diathesis.

Tushar *et al* [15] found bleeding signs in 22.8% with AKI. In a study done by Vinay *et al*¹⁶ 44 (69.84%) patients had bleeding diathesis in those who developed AKI while only 14 (10.22%) of patients had bleeding manifestation in those who did not develop AKI with a significant p value of less than 0.001.

The incidence of AKI in our study was 18; Dialysis was necessary in one patient. The remaining 17 patients improved their renal functions entirely with conventional management. The mortality rate witnessed in our study due to hemotoxic snake bite was 0%. This was proven in a study done in 2010 as by Shubhanker *et al* [17]. This is

mainly because of quick administration of ASV in tertiary care hospital and patients reaching early to the hospital.

In AKI group of 18 patients, the mean platelet count was 1.00 ± 0.37 Lakhs/cc. In Non AKI group of 82 patients it was 2.34 ± 0.81 Lakhs/cc. Hence, the mean platelet count of AKI patients had blood picture of thrombocytopenia and is statistically lower than the mean platelet count of Non AKI group.

In our study Albuminuria was present in 51 patients. This shows the toxin-induced collapse of the renal filtration barrier. However, this outcome is more valuable in follow-up of these patients as persistent albuminuria can aid as an indicator of residual renal dysfunction after rescue from acute renal failure. In few studies it was prominent that hemotoxic viper bite with local and systemic hemorrhagic signs suggestive of coagulopathy or thrombocytopenia symbolized the most frequent clinical signs related with higher renal ischemia and development of renal failure

Conclusion

In patients with snake bite, Albuminuria and thrombocytopenia are related with development of acute kidney injury, Presence of thrombocytopenia can foresee the development of Acute Kidney Injury at the earlier stage. Presence of albuminuria can also envisage the incidence of acute kidney Injury at the earlier stage. Hence assessment of clinical signs of envenomation and the renal status of hemotoxic snake bite patients both at admission and during hospital stay is suggested to identify AKI patients at earliest which enable monitoring of AKI severity, and predict patient prognosis.

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