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A Study On Thrombocytopenia And Albuminuria As Predictors Of Acute Kidney Injury In Hemotoxic Snake Bite.

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Abstract

Background: Snake bite is one of the most preventable causes of deaths and the incidence of snake bite is on increasing trend due to various factors. The most serious complication of snake bite is AKI and my study is to assess thrombocytopenia and albuminuria as early predictors of AKI in snake bite.

Methodology: Hundred patients who got admitted in Department of General Medicine in District Head Quarters hospital & DNB Post Graduate Teaching Institute, Virudhunagar for the period of six months from September 2019 to February 2021 with history of snake bite were taken for study and they were followed with blood urea, serum creatinine urine albumin and platelet count and assess which subset of patients were progressing to AKI and how the detection of albuminuria and thrombocytopenia helps in assessment of progression of cases to AKI.

Conclusions: In patients with snake bite, Albuminuria and thrombocytopenia are associated with development of acute kidney injury.

Keywords: Thrombocytopenia, Albuminuria, Snake bite

Introduction

Venomous snakebites are an important medical problem in India. 52 species of poisonous snakes found in India. Major venomous snakes belong to Elapidae & Viperidae family .The World Health Organization has estimated that nearly 1, 25,000 deaths occur among 2, 50,000 poisonous snake bites worldwide every year, of which India accounts for 15,000 deaths[1]. Snake bite was noted pre-dominantly in the rural agricultural population of India, with male predominance (Males: Female: 4:1)[2].

These may be due to mostly people are having agriculture based occupation in India. However, these numbers may be a gross underestimation of the true burden morbidity and mortality in snake bite victims. Invasion of the snake's habitat by large numbers of people may also be followed by an increased incidence of snakebite.

13 known species that are venomous and of these four, namely common cobra (Naja naja), Russell's viper (Dabiola russelii), saw-scaled viper (Echis carinatus) and common krait (Bungarus caeruleus) are highly venomous and believed to be responsible for most of the poisonous bites in India. Russell's viper is the major cause of snakebite leading to increased morbidity and mortality due to Acute Kidney Injury (AKI), incidence 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) results in the modification of protein either directly through the

oxidation of amino acid residues by reactive oxygen species (ROS) or indirectly by an increased generation of reactive carbonyl species.

Although increased CS and protein modification has been extensively studied in both hyperglycemic and corticotrophin-releasing factor and many cases of AKI, proteins damage due to OS and CS in SAKI has not been described well in literature. Studies have shown that even when ASV is administered within 1-2 hours after the bite, it was incapable of preventing AKI. Paul et al has found that hematuria and albuminuria was associated with development of acute kidney injury.

Pinho F M et al, Athappan G et al N. Suchitra et al, G. Ali et al and Sharma et al[4-8] have found that the bleeding tendencies in the snake bite as the good associative factor in occurrence of Acute Kidney injury. This study was undertaken to determine the predictors of developing AKI following hemotoxic snake bite. Also to correlate the association of albuminuria and development of Acute Kidney Injury and to correlate the association of thrombocytopenia and development of Acute Kidney Injury also morbidity and mortality due to AKI.

Material 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 100 Patients with 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-exsisting renal disease were excluded. The patients with platelet count less than 1.5 lakhs/cc was taken as 'Thrombocytopenia Present', Albumin 1 Plus & more were clubbed together as 'Albuminuria Present' group. Informed consent will be taken from all the patients. Ethical approval was obtained from ethical review board.

Statistical Analysis:

Data was coded and analysed using Statistical Package for Social Sciences (IBM-SPSS), version 21.0 software. Descriptive analysis for all the variables was expressed in frequency and proportions. Bivariate analysis using Chi square test was done. The associations with the p value less than 0.05 considered significant.

Results:

Among 100 study participants, majority of the participants were in the age group of 51-60 years (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.

In our study of 100 subjects, the snake bite by Saw scaled viper snake 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 Acute kidney injury 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	
	Acute kidney injury			

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Albuminuria	Present	Absent	Total	P value
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 acute kidney injury when compared with participants who don't have thrombocytopenia and the difference was found to be statistically significant as shown in Table 1.

The presence of Acute Kidney Injury 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. The difference was found to be statistically in-significant.

Table 2. Association between Acute kidney injury 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 acute kidney injury is higher in the 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 the difference found was statistically significant. The presence of acute kidney injury is higher in the participants who had urine albumin value more than 2+ and lower in participants with trace albumin value and the difference was found to be 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 age group of the patients with hemotoxic snake bite in our study with highest frequency is between 41 to 60 years and mean age in 41.5 years. Patients who developed AKI were higher in age between 41 to 60 years with mean age of 48.1 years. Patients who developed AKI were higher in age between 41 to 60 years with mean age of 48.1 years. Studies conducted by Chugh KS et al[9] , Pinho F M et al [4], Naqvi R et al[10] and Mukhopadhyay P[11] et al found that the mean age in snake bite poisoning is varying from 24 years to 43 years.

Results suggested that older age was not only related to the occurrence of AKI but also to mortality. The increased incidence in older age was similarly noted by Athappan et al[5] and Singh et al[12]. Our study also

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has mean age of patients which snake bite under similar category to other study. The predisposition of older kidney to acute kidney injury can be related to age related progressive structural and functional deterioration, include decline in glomerular filtration rate and renal blood flow, loss of renal mass, hyalinization of afferent arterioles, and development of glomerular arterioles, sclerotic glomeruli and tubule-interstitial fibrosis.

In our study, the males have the higher frequencies of snake bite poisoning than the female. This could be due to the fact that, being a male gender, the probability of going to work outside the home is higher than the female and hence the chances of accidental bite from the snake is higher in males. Male to female ratio is 3:1.5. Studies conducted by Pinho F M et al[4] , Naqvi R et al[5] , Mukhopadhyay P et al[6] , Athappan G et al[5] found out the similar inference that the snake bite is higher in males than the females.

In our study among 18 AKI patients, 10 patients (55.6%) were males and 8 patients (44.4%) were females. It was 70.11% in male and 29.89% in female in study by Mrudul et al. [14]

The most common type of snake bite seen in our study is due to Saw scaled viper followed by Russell 's viper. The incidence of acute Kidney Injury following Russell's viper bite has been estimated to be 12.5%, and the prevalence of acute Kidney Injury following Saw scaled viper bite 23.5%. Russell's viper, common krait, cobra and saw scaled Viper constitutes the major four Snakes which are responsible for almost all of the snake bites in India. This is in concordance with the study conducted by N. Suchitra et al[6].

Cellulitis and bleeding tendencies are the more common complication observed in the snake bite besides Acute Kidney Injury. In our study, overall (100 subjects), 61% subjects developed cellulitis while 39% patient did not develop cellulitis. This proportion is similar to study conducted by Athappan G et al[5]. In our study it was found that 22.9% of patients with local cellulitis developed AKI. It has p value of 0.107, thus not significant.92% patients with AKI had cellulitis in study by Mrudul et al[14].

In our study, overall, 19% developed clinical bleeding while 81% did not develop the clinical bleeding manifestations. This proportion is slightly higher than the frequency observed in study conducted by Athappan G et al[5] (22.7%). In the studies conducted by N. Suchitra et al[6] the bleeding tendencies observed was significantly associated with the development of Acute Kidney Injury, similar to our study. The bleeding tendency depends on factors like type of snake envenomation, amount of toxin injected and presence of other co-morbidity contributes in large.

It was found that 42.1% of patients with clinical bleeding developed AKI. It has a p value of 0.002, which is highly significant. 82.76% patients had bleeding tendencies in study by Mrudul et al [14]. Sharma et al[8] found out that 27 out of 52 viper bite cases with hemostatic abnormalities developed AKI. Study by Paul et al showed 47.95% patients presented with hemostatic abnormalities.

Tushar et al[15] found bleeding manifestations in 22.8% with AKI. In Vinay et al[16] study AKI group of 44 (69.84%) patients had bleeding manifestation while only 14 (10.22%) of patients in NON-AKI group had bleeding manifestation with p value<0.001.

The prevalence of AKI in our study was 18% (n = 18); Dialysis was required in one patient. The remaining 17 patients recovered their renal functions completely with conservative management. The morality rate observed in our study due to hemotoxic snake bite was 0% there was less than 2000 patients expire for year in 2010 as indicated by Shubhanker et al[17]. this is due to easy to availability of ASV in tertiary care hospital and early reaching of patients to the hospital.

In AKI group with the sample of 18 subjects, the mean platelet count was 1.00 Lakhs/cc with the standard deviation of 0.37 Lakhs/cc. In Non AKI group with the sample of 82 subjects, the mean platelet count was 2.34 Lakhs/cc with the standard deviation of 0.81 Lakhs/cc. Hence, the mean platelet count of AKI group falls under thrombocytopenia category and is numerically lower than the mean platelet count of Non AKI group.

In our study Albuminuria was present in 51 patients. This shows the toxin- induced breakdown of the renal filtration barrier. However, this finding is more useful in follow-up of these patients as persistent

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albuminuria can serve as a marker of residual renal dysfunction after recovery from acute renal failure. In few studies it was noted that hemotoxic viper bite with local and systemic hemorrhagic manifestations indicative of coagulopathy or thrombocytopenia represented the most common clinical features associated with enhanced renal ischemia and development of renal failure

Conclusion:

In patients with snake bite, Albuminuria and thrombocytopenia are associated with development of acute kidney injury, Presence of thrombocytopenia can predict the occurrence of Acute Kidney Injury at the earlier stage. Presence of albuminuria can predict the occurrence of acute kidney Injury at the earlier stage. Being undoubtedly multifactorial, evaluation of clinical manifestations of envenomation and the renal status of hemotoxic bite victims both at baseline and during hospital stay is recommended to allow identification of AKI patients, enable monitoring of AKI severity, and predict patient outcome.

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