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Study On Profile Of Snake Bite Induced Acute Kidney Injury And Outcome.

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ABSTRACT

Snakebite deaths and disability are a major public health challenge in India. India has more than 300 species of snakes, of which 60 are labeled venomous or mildly venomous. India has the highest number of deaths because of snakebites in the world. Data regarding the actual number of SAKI and requiring HD and their complications are inadequate in our country. This study aimed to study the profile of snake bite-induced acute kidney injury in the Indian population. The study was conducted in the Department of General Medicine, Government Medical College, and Hospital, Namakkal, Tamil Nadu, India in the year 2022-2023. It was a carefully selected study on patients developing Acute Kidney Injury following snake bite. Patients were selected based on inclusion and exclusion criteria. The total number of 50 patients including both male and female were taken up for the study. A thorough physical examination was done to look for local and systemic features of envenomation. The site of the snake bite is examined for the presence of fang marks, cellulitis, bleeding from the site of the bite, local necrosis, blistering, gangrene, regional lymph node enlargement, and evidence of compartment syndrome. All Vital signs were looked for. Patients underwent physical examination daily. Pulse rate, Blood pressure, Urine output, Respiratory rate, and features of envenomation were monitored daily. Blood specimen was taken every day till discharge or death to measure sodium, potassium, urea, creatinine, bleeding time, clotting time, and platelets and for patients undergoing dialysis, pre-dialysis and post-dialysis Urea and Creatinine were measured for each cycle. In our study of the 50 patients, 23 presented with hypotension out of which 15 died and 8 survived. Of the remaining 27, only 4 patients died. In our study of 50 patients, 32 patients received early therapy (Bite to ASV < 6hrs) with polyvalent Anti Snake Venom out of which 5 died. Of the remaining 18 patients who received ASV>6hrs, 14 died and only 4 survived. Early therapy with ASV will reduce the mortality rate in patients with renal failure. Of the various factors we studied statistically significant associations have been found between hypotension, bleeding manifestation, early therapy with ASV, and mortality. In our study of 50 patients, 30 patients were treated with dialysis out of which only 7 died. The mortality rate in patients treated with dialysis is 14%. All patients had evidence of Renal involvement. All patients showed congested kidneys, which may be parenchymal, and or vascular. 4 patients showed definite Autopsy evidence of Acute Cortical Necrosis. The ASV therapy time, bite to renal insufficiency time and coagulation abnormalities were the major prognostic factors predicting the outcomes. Dialysis and supportive treatment appear to be the mainstay of the therapy in the cases which are complicated by renal failure. The indications for dialysis in AKI include anuria of more than 48 hours, severe hyperkalemia which does not respond to the medical therapy, pulmonary edema, severe acidosis, and rising blood urea and serum creatinine.

Keywords: Acute Kidney Injury, Snakebite, Dialysis

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INTRODUCTION

Snakes are a fascinating part of nature. Their color, movement, and secret habits make them more mysterious. India is home to some of the most poisonous snakes in the world, most of which are found in rural areas [1]. Snake bites cause substantial mortality and morbidity in India. A large proportion of snake bites occur when people are working barefoot in the fields, or while walking at night or early morning through fields or along roads [2]. Superstitions, wrong practices, and misconceptions handicap doctors who care primary attention [3]. Of 3000 species of snakes known to the world, in India, we have around 216 species, out of which 52 are known to be poisonous [4]. Our venomous species belong to two major families: Elapidae, and Viperidae. We observe Acute Renal Failure / Acute Kidney Injury in the majority of the cases.[5,6] The gravity, spectrum, and the outcome varies. Our study is to analyze Acute Renal Failure / Acute Kidney Injury in snake bites and to analyze various factors, influencing the outcome.

MATERIALS AND METHODS

The study was conducted in the Department of General Medicine, Government Medical College, and Hospital, Namakkal, Tamil Nadu, India in the year 2022-2023. It was a carefully selected study on patients developing Acute Kidney Injury following snake bite. Patients were selected based on inclusion and exclusion criteria. A total number of 50 patients including both male and female were taken up for the study.

Inclusion Criteria

Patients with snake bite, developing Acute Kidney Injury.

Exclusion Criteria

- Known Hypertensive and on treatment.
- Known Diabetic and on treatment
- Chronic history of NSAID intake
- History of renal disease.
- Previous Ultrasonogram evidence of chronic kidney disease.
- Contracted Kidneys by Abdominal Ultrasound.

A thorough physical examination was done to look for local and systemic features of envenomation. The site of the snake bite is examined for the presence of fang marks, cellulitis, bleeding from the site of the bite, local necrosis, blistering, gangrene, regional lymph node enlargement, and evidence of compartment syndrome. All Vital signs were looked for. Patients underwent physical examination daily. Pulse rate, Blood pressure, Urine output, Respiratory rate, and features of envenomation were monitored daily. Blood specimen was taken every day till discharge or death to measure sodium, potassium, urea, creatinine, bleeding time, clotting time, and platelets and for patients undergoing dialysis, pre-dialysis and post-dialysis Urea and Creatinine were measured for each cycle.

RESULTS

In our study of 50 patients, most of the patients were in the age group of 21- 50yrs (60%) In our study of 50 patients, there was a nearly equal distribution of males (54%) and females (46%).In our study out of the 50 patients, species of snake were identified in 30(60%) of the patients. All of the 30 were identified are Vipers out of which 22 (44%) were Russell viper and 8 (16%) were saw scaled viper. In our study of 50 patients, 31 patients survived and 19 patients died. The mortality rate was 38%. Increased mortality in our study was not a direct mortality, other factors influence the mortality. We assessed the various risk factors associated with adverse outcomes in patients with Acute Kidney Injury. In our study of 50 patients, 49 (98%) patients in our study had Cellulitis, out of which 19(38%) died. In our study of 50 patients, 9 patients (18%) presented with bleeding manifestations out of which 7 died. Of the remaining 41 (82%) patients without bleeding manifestations, 12 patients died. In our study of the 50 patients, 23 presented with hypotension out of which 15 died and 8 survived. Of the remaining 27, only 4 patients died. In our study of 50 patients, 32 patients received early therapy (Bite to ASV < 6hrs) with polyvalent Anti Snake Venom out of which 5 died. Of the remaining 18 patients who received ASV>6hrs, 14 died and only 4 survived. Early therapy with ASV will reduce the mortality rate in patients with renal

failure. Of the various factors we studied statistically significant associations have been found between hypotension, bleeding manifestation, early therapy with ASV, and mortality. In our study of 50 patients, 30 patients were treated with dialysis out of which only 7 died. The mortality rate in patients treated with dialysis is 14%. All patients had evidence of Renal involvement. All patients showed congested kidneys, which may be parenchymal, and or vascular. 4 patients showed definite Autopsy evidence of Acute Cortical Necrosis.

Table 1: Age Distribution

AGE	11-20	21-30	31-40	41-50	51-60	61-70
No.	8 (16%)	14 (28%)	7 (14%)	9 (18%)	6 (12%)	6 (12%)

Table 2: Various Species

Species	**No.**
Russell Viper	22 (44%)
Saw Scaled Viper	8 (16%)
Unidentified	20 (40%)

Table 3: Cellulitis

	Survived	Died
Cellulitis	30 (60%)	19 (38%)
No Cellulitis	1 (2%)	0 (0%)

Table 4: Bleeding Manifestation

Variable	Survived	Died
Bleeding Manifestation	2 (4%)	7 (14%)
No Bleeding Manifestation	29 (58%)	12 (24%)

Table 5: Blood Pressure

Variable	Survived	Died
Hypotension	8 (16%)	15 (30%)
Normal Blood Pressure	23 (46%)	4 (8%)

Table 6: ASV Therapy

Variable	Survived	Died
Bite to ASV > 6hrs	4 (8%)	14 (28%)
Bite to ASV <6hrs	27 (54%)	5 (10%)

Table 7: Laboratory Results Of The Study Patients

Parameters	**Mean ± SD**	**Range**
Hemoglobin (g/dL)	9.6 ± 2.6	3.8-16
WBC count (× 10^3/mm^3)	15 ± 7.4	4.8-47.9
Platelets (× 10^3/mm^3)	117 ± 58	18-230
Urea (mg/dL)	169 ± 75	54-440
Creatinine (mg/dL)	7.2 ± 4.2	1.6-19.2
Sodium (mEq/L)	134 ± 8.1	108-145
Potassium (mEq/L)	5 ± 0.8	3.2-7.2
Albumin (g/dL)	3.2 ± 0.4	2.5-4.1
Bilirubin (mg/dL)	1.4 ± 1.4	0.3-7.5
AST (U/L)	152 ± 296	16-1606
ALT (U/L)	106 ± 163	10-800

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Alk. phosph. (U/L)	93 ± 66	18-432
CK (U/L)	2072 ± 4287	24-22000
LDH (U/L)	1153 ± 1015	70-4705

Table 8: Frequency Of Various Hematological And Biochemical Disorders

Anemia Hb < 12 g/dL, *n* (%)	71 (80.7)
Leukocytosis, *n* (%)	66 (75)
Thrombocytopenia, *n* (%)	42 (47.7)
Hyperkalemia, *n* (%)	22 (25)
Severe metabolic acidosis, *n* (%)	35 (39.8)
Hepatic dysfunction, *n* (%)	36 (40.9)
Hypoalbuminemia, *n* (%)	54 (61.4)
Hemolysis, *n* (%)	75 (85.2)
Rhabdomyolysis, *n* (%)	60 (68.2)

Table 9: Complications In The Study Patients

Pneumonia/ARDS	8 (9.1)
Hypertension	8 (9.1)
Hypotension	4 (4.5)
Myocarditis	1 (1.1)
Myocardial infarction	1 (1.1)
Gastrointestinal bleed	11 (12.5)
DIC	8 (9.1)
Seizure/Encephalopathy	9 (10.2)
MOF	4 (4.5)

DISCUSSION

Snakebites have the highest incidence in Asia and they represent an important health problem. The exact pathogenesis of AKI following snake bites is not well established. However, several factors contribute to it, like bleeding, hypotension, circulatory collapse, intravascular hemolysis, disseminated intravascular coagulation, microangiopathic hemolytic anemia, and the direct nephrotoxicity of venom [7]. Males are affected more often than females, as they constitute the working majority who are actively engaged in farming and other outdoor activities. Our findings were concurrent with those of earlier studies. In our study, predominantly, the younger population was involved (20-40 years of age), probably due to their more ambulant nature. In our study, most of the victims who developed were bitten on the lower limbs (81.2%) [8]. This systematic review demonstrates that snake bite leading to acute kidney injury was a common condition all over India even though the distribution of snakes differs along the length and breadth of our country. The most common snake leading to AKI was the viper. Cellulitis was one of the independent risk factors which was related to the development of AKI in our study [9]. The earliest symptoms which are seen in patients of viper bite are pain and swelling at the bitten part. Regional lymphadenopathy was another significant independent factor that contributed to the development of AKI. Like cellulitis, gangrene at the bite area and regional lymphadenopathy can be bedside indicators of the amount of toxin that is released by the snake bite [10]. The majority of the patients recovered without the need for hemodialysis. In those requiring HD mortality was less. studies are prospective and retrospective or both, did not use a sample size calculation, were single center, and were underpowered. Only one study was conducted at two centers. retrospective studies suffered from a lack of proper data [11]. There is an urgent need for standardization in the way that AKI patients are assessed. Renal injury can result from envenoming by a range of snake species. Outcome measures in these studies have focused on acute renal injury; based on levels of serum creatinine and oliguria [12]. Internationally recognized criteria for the diagnosis of acute kidney injury are available, and these were adopted in two of the included studies. Although the need for Hemodialysis / renal replacement therapy (RRT) is crucial in the management of AKI, there is wide variation about the optimal timing for initiating and stopping this in acute kidney injury [13]. The patients who had visited the traditional healers had a higher incidence of developing AKI, which may be because of two reasons. Firstly, in this context, time had elapsed and the second being, the tying of tourniquets or other treatments which could have affected the

patients [14,15].

CONCLUSIONS

This study concludes that acute kidney injury occurs in 14.6% of victims of snake bite. The common manifestations include cellulitis, bleeding manifestations, and gangrene at the bite site. The type of snakebite is an important factor in the development of AKI and the Russell's viper bite is more commonly associated with it. The ASV therapy time, bite to renal insufficiency time and coagulation abnormalities were the major prognostic factors predicting the outcomes. Dialysis and supportive treatment appear to be the mainstay of the therapy in the cases which are complicated by renal failure. The indications for dialysis in AKI include anuria of more than 48 hours, severe hyperkalemia which does not respond to the medical therapy, pulmonary edema, severe acidosis, and rising blood urea and serum creatinine.

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