STUDY OF ACUTE KIDNEY INJURY IN SNAKE BITE PATIENTS

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ABSTRACT

BACKGROUND

Snake venom is well known to cause toxic damage to the kidneys (Schreiner and Maher, 1965). This study is an attempt to evaluate the snakebite-induced Acute Kidney Injury (AKI).

MATERIALS AND METHODS

50 patients with snakebite-induced acute kidney injury were selected randomly and their clinical profile was assessed. Acute kidney injury was evaluated using noninvasive laboratory methods.

Inclusion Criteria- 1. History of snakebite; 2. Presence of AKI.

Exclusion Criteria- Pre-existing renal diseases, after establishing the diagnosis, patients were started on conservative treatment including ASV, blood/blood products and haemodialysis as required.

RESULTS

Out of 50 patients included in the study, majority of them were males (62%) with mean age of presentation 43.8 ± 12.63 years. The mean interval between snakebite and presentation to hospital was 15.37 hours. In them, 98% patients presented with local signs of inflammation, 52% of patients presented with coagulation abnormality and 60% with decreased urine output. Comparison between good outcome (recovered from AKI) and poor outcome (not recovered from AKI) shows significant p-value for 'lapse of time in hours' in presenting to the hospital after snakebite (p value 0.005) and 'alternative treatment taken' before coming to the hospital (p value 0.001).

CONCLUSION

Poisonous snakebites have common manifestations of cellulitis, abnormal coagulation profile and decreased urine output. Overall mortality due to snakebite-induced AKI is 6%. Patients who did not recover from AKI had lapse of time in presenting to the hospital and abnormal coagulation profile.

KEYWORDS

Snakebite, AKI, Snakebite-Induced AKI, Coagulation Profile, Lapse of Time, Decreased Urine Output.

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BACKGROUND

Snakebite poisoning is known to man since antiquity. Bite rates are highest in temperate and tropical regions where populations subsist by manual agriculture. In India, a large proportion of snakebites occur when people are working barefoot in the fields or while walking at night. Recent estimates indicate somewhere between 1.2 million and 5.5 million snakebites worldwide each year with 4,21,000-1,841,000 envenomation's and 20,000-94,000 deaths.[1] Several educational and preventive actions should be taken in order to protect farm workers who are the main victims of such accidents.[2] Snake venom is well known to cause toxic damage to the kidneys (Schreiner and Maher, 1965).[3]

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The possible mechanism of ARF are prolonged hypotension, DIC, intravascular haemolysis, nephrotoxicity of renal and myoglobinuria.[4] Published data suggest that the patient's age and body surface area, the snake's age, amount of inoculated venom, bite site and the time elapsed until antivenom treatment, all influence AKI prevalence.[2] Up to 90% of the approximately 1000 deadly snakebites occurring per annum are attributed to Russell's viper, which is also the 5th most common cause of ARF in Burma. In Thailand, 70% of ARF causes have been ascribed to Russell's viper envenomation. In India, ARF is mostly associated with Russell's viper and E. carinatus bites and the incidence of ARF is 13-32%.[5] Proteinuria, haematuria and acute renal failure are among the common clinical renal manifestations in snakebite.

The incidence of acute renal failure following poisonous snakes varies from 13-22% following E. carinatus or Russell's viper bite. In most cases, the renal failure is attributed to tubular necrosis and cortical necrosis, though necrotising interstitial and nephritic syndromes have also been reported.[6]

This study is an attempt to evaluate the snakebite-induced Acute Kidney Injury (AKI).

Source of Data- Patients with history of snakebite who fulfil the inclusion and exclusion criteria getting admitted at K.R. Hospital, Mysore Medical College and Hospital, Mysore, Karnataka, during the period of December 2010 to August 2012.

MATERIALS AND METHODS

Method of Collection of Data

Sample size- 50.
Sampling method- Simple random sampling.

Inclusion Criteria

1. History of snakebite with signs of envenomation.
2. Progressive elevation of serum creatinine >0.3 mg/dL from baseline, a percentage increase in the serum creatinine concentration of >50% or oliguria of less than 0.5 mL/kg/hr. for more than 6 hrs.

Exclusion Criteria

- Patients with pre-existing renal disease.
- Patients with risk factors for developing renal disease with history of snakebite (diabetes, hypertension, connective tissue diseases and chronic infection).

Data will be collected using a pretested proforma meeting, the objectives of the study, detailed history, physical examination and necessary investigations like-

1. Complete haemogram.
2. Whole blood clotting time.
3. Bleeding time.
4. Blood urea.
5. Serum creatinine.
6. Creatine kinase.
7. Prothrombin time.
8. Partial thromboplastin time.
9. USG abdomen.

The purpose of the study was explained to the patient and informed consent obtained.

Using noninvasive methods, acute kidney injury in snakebite patients who fulfil the inclusion criteria is assessed. Patients are classified into three stages of acute kidney injury proposed by acute kidney injury network, which defines AKI as an "abrupt (within 48 hours)" absolute increase in the serum creatinine concentration of ≥0.3 mg/dL from baseline, a percentage increase in the serum creatinine concentration ≥50% or oliguria of 0.5 mL/kg/hr. >6 hrs.

The course of acute kidney injury in three stages and need for renal replacement therapy is assessed.

In this study, descriptive statistical analysis has been used. Results on continuous measurements and results on categorical measurements are presented on mean ± SD (min-max) and in number (%), respectively. Significance is assessed at 5% level of significance. The following assumptions on data is made, assumptions-

1. Dependent variables should be normally distributed.
2. Samples drawn from the population should be random. Cases of the samples should be independent.

Chi-square/Fisher exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

RESULTS

Study Design- It is a prospective clinical study with 50 snakebite patients undertaken to study the acute kidney injury.

16 patients were in the age group of 41-50 years. Mean age was 43.8 years. Out of 50 patients included in this study, 31 were males (62%) and 19 (38%) were females. All snakebites were to the lower limb. 32 patients (64%) had snakebite to left lower limb. 18 (36%) patients presented to the hospital within 2-5 hours of snakebite. Only 7 patients presented after 24 hrs. of snakebite to the hospital. 62% had applied tourniquet before coming to the hospital.

Among 50 snakebites, only 24 (48%) had identified the snake as viper bites in 23 cases and cobra bite in 1 case. 30 (60%) patients presented with reduced urine output, 19 patients (38%) with vomiting, 16 (32%) with bleeding from gums and 7 (14%) presented with haematuria.

5 patients (10%) had tachycardia and 2 (4%) pulse was not palpable. Systolic Blood Pressure (SBP) was ≤120 mmHg in 34 (68%) and >120 in 14 (28%). Diastolic Blood Pressure (DBP) was ≤80 mmHg in 29 (58%) and >80 mmHg in 19 (38%). Blood pressure was not recordable in 2 patients.

On local examination, 49 (98%) had signs of inflammation, 47 (94%) had fang mark, 16 (32%) had bleeding from bite site and in 2 (4%) patients peripheral pulses not felt.

Laboratory data showed anaemia with Hb <10 gm% in 27 (54%), leucocytosis (total count >11,000) in 8 (16%) and thrombocytopenia (platelet count <1.5 lakh) in 13 (26%) patients. Whole Blood Clotting Time (WBCT) was >20 minutes in 35 (70%) patients. Bleeding time was prolonged in 8 (16%) patients.

Mean levels of blood urea at baseline, at 24 hrs. (p value <0.001), on 2nd day and 3rd day were 61.01 mg/dL, 81.92 mg/dL, 74.26 mg/dL and 64.83 mg/dL, respectively.

Mean levels serum creatinine at baseline, at 24 hrs. (p value <0.001), on 2nd day and on 3rd day were 2.32 mg/dL, 3.02 mg/dL, 2.94 mg/dL and 2.52 mg/dL, respectively.

PT/INR was prolonged (>1.2 seconds) in 17 (34%) patients and APTT was prolonged (>28 seconds) in 44 (88%) of patients. USG abdomen was normal in 33 (66%) patients and was abnormal in 17 (34%) patients showing alteration in cortical echotexture with normal kidney size.

Mean levels of urine output at baseline at 24 hrs., on 2nd day and on 3rd day were 1205.40 mL/day, 1433.67 mL/day, 1742.20 mL/day and 1981 mL/day respectively with significant p value (<0.001). 20 patients (40%) received 11-20 vials of ASV and ≥30 vials of ASV were given only for 2 patients.

All patients received Intravenous Fluid (IVF) and 48 patients (96%) received antibiotics as supportive treatment. 7 patients were transfused blood and blood products, 3 patients (6%) were transfused FFP, 4 (8%) were transfused whole blood and one patient received platelets transfusion.

Among 50 patients, 6 (12%) required haemodialysis. Out of 50 patients studied, 43 (86%) improved and 7 had a poor outcome. Among those 7, 4 patients developed Chronic Kidney Disease (CKD) and 3 patients succumbed to death.

Comparison between good outcome (recovered from AKI) and poor outcome (not recovered from AKI) shows significant p-value for 'lapse of time in hours' in presenting to the hospital after snakebite (p-value 0.005) and 'alternative treatment taken' before coming to the hospital (p-value 0.001) (Figure No. 1, 2, 3).

Patients who had poor outcome after snakebite-induced AKI presented with reduced urine output in 85.7%, vomiting in 57.1%, haematuria in 28.6% and signs of inflammation in 100% when compared to patients with good outcome without significant p-value.

Comparison of lab parameters in good and poor outcome group shows significant p-value for PT/INR (0.020).

42 patients (84%) were in stage I AKI, 2 (4%) were in stage II and 6 (12%) patients were in stage III AKI.

Symptoms	Athappan G and Others	Present Study
Reduced urine output	100%	60%
Bleeding from bite site	20%	32%
Bleeding from gums	10%	18%
Signs of inflammation	98.7%	98%

Table 1. Comparison of Symptoms with Other Studies

Studies	No. of Patients	%
Ptil BT and others	21	36.8%
Mittal BV and others	31	73.17%
Present study	26	52%

Table 2. Comparison of Abnormal Coagulation Profile with Other Studies

Studies	No. of Patients	%
Paul J Dasgupta and others	55	74%
Present study	35	70%

Table 3. Comparison of WBCT with Other Study

Variables	Athappan G and Others		Present Study	
	Percentage	p-value	Percentage	p-value
Signs of inflammation	98.7%	Not significant	98%	1.00
Lapse of time >12 hrs.	55%	0.0003	28%	0.005
Mean Cr in mg/dL	4.24	0.01	3.02	<0.001
Mean B. urea in mg/dL	100.65	0.01	81.92	<0.001

Table 4. Comparison Variables with Significant p-Value for the Development of Snakebite-Induced AKI with Other Study

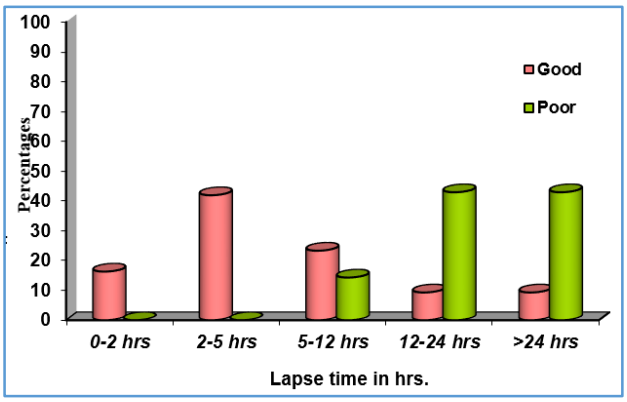

Figure 1. Comparison of Lapse of Time in Presenting to Hospital between Good and Poor Outcome Patients

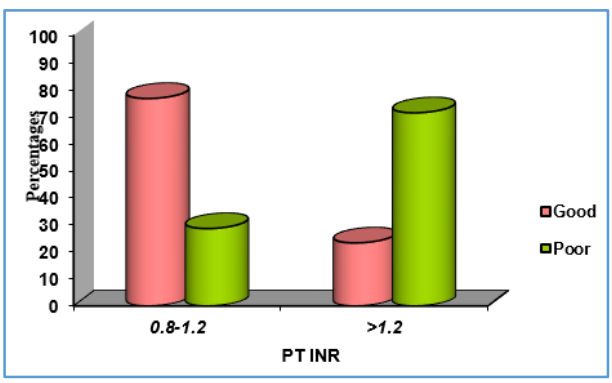

Figure 2. Comparison of PT/INR Value between Good and Poor Outcome Patients

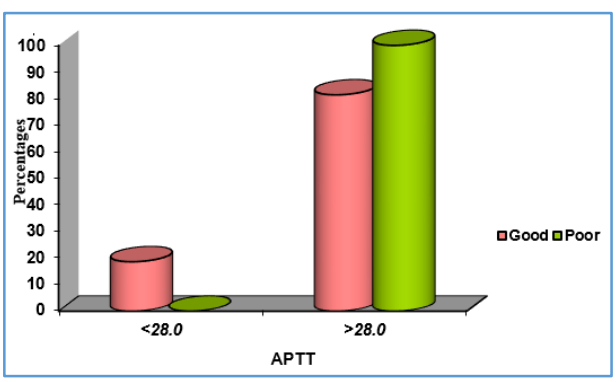

Figure 3. Comparison between APTT Value between Good and Poor Outcome Patients

DISCUSSION

In the present study, 50 cases were selected on the basis of simple random sampling method from the OPD and medical wards, K.R. Hospital, Mysore, who had developed snakebite-induced AKI. Study period is between December 2010 to August 2012.

The mean age of present study population was 43.8 ± 12.63 years, which is comparable to Paul J Dasgupta and others study.[7] In the present study, males account for 62%, which is comparable to other study groups mentioned above. Signs of inflammation in the present study were 98%, which was comparable with Athappan G and others study (Table 1).[8] Abnormal coagulation profile was observed in 52% patients, which was comparable with Mittal BV and others study (Table 2).[6] In present study, low platelet count

is not comparable with Patil BT and others study.[9] WBCT in present study is comparable with the study of Paul J Dasgupta and others (Table 3).[7]

Clinical variables like signs of inflammation, lapse of time of >12 hrs. In presenting to the Hospital, mean serum creatinine and mean blood urea elevations with significant p-value is comparable with Athappan G and others study (Table 4).[8]

SUMMARY

This study is a descriptive study of 50 randomly selected patients with snakebite-induced AKI. These patients were admitted to KR Hospital from December 2010 to August 2012.

In our study, mean age of patients studied was 43.8 ± 12.63 years. Male-to-female ratio was 1.63:1 with male preponderance. The mean interval between snakebite and presentation to KR Hospital was 15.37 hours. All snakebites were inflicted to lower limbs.

98% of patients presented with local signs of inflammation indicating the vasculotoxic nature of envenomation. 52% of patients presented with coagulation abnormality and 60% with decreased urine output, which were associated with increased severity of AKI and need for haemodialysis.

Only 26% of patients presented with thrombocytopenia, which was not associated with the severity of AKI.

Limitations of the Study

1. Sample size was small, i.e. only 50.
2. Identification of snake was not possible.
3. Follow up for chronic kidney disease was only for 1 month.

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