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Acute kidney injury in snake bite patients: A prospective observational study in a tertiary care hospital Telangana India

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Abstract--Background: In India, large proportion of snake bites occur when people are working barefoot in fields or while walking at night. Objectives: To study i) clinical profile of renal involvement in snake bite patients. ii) in-hospital outcome of acute kidney injury in snake bite patients Methodology: Patients are classified into three stages of acute kidney injury proposed by Acute Kidney Injury Network which defines AKI as an abrupt increase in serum creatinine concentration of ≥ 0.3 mg/dl from baseline, a percentage increase in the serum creatinine concentration $\geq 50\%$ or oliguria of 0.5 ml/kg/hr > 6 hours. Results: Mean age of patients was 43.8 ± 12.63 years. Male to female ratio was 1.63:1 with male preponderance. Mean interval between snakebite and presentation to hospital was 15.37 hours. All snake bites were inflicted to lower limbs and 48% of snake bites were due to Viper as identified by patients. 98% patients presented with local signs of inflammation. 52% patients presented with coagulation abnormality and 60% with decreased urine output which were associated with increase severity of AKI and need for haemodialysis in 12% of patients. Conclusion: Common

manifestations of poisonous snake bite include cellulitis, abnormal Coagulation profile and decreased urine output.

Keywords---acute kidney injury, dialysis, snake bite, viper, oliguria.

Introduction

Snake bite poisoning is known to man since antiquity¹. Bite rates are highest in temperate and tropical regions where population subsist by manual agriculture². In India, a large proportion of snake bites occur when people are working barefoot in the fields or while walking at night¹⁰. Recent estimates indicate somewhere between 1.2 million and 5.5 million snakebites worldwide each year, with 421,000-1,841,000 envenomations and 20,000-94,000 deaths¹. Several educational and preventive actions should be taken in order to protect farm workers, who are the main victims of such accidents⁹. The complications related to kidneys are observed in majority of patients with poisonous snake bite¹¹. Such renal failure, usually due to acute tubular necrosis, is frequently reversible¹⁸. If bilateral cortical necrosis occurs, the prognosis of renal recovery is more grim⁸. The study is an attempt to study the clinical profile of snake bite patients and evaluation of acute kidney injury in them.

Materials and Methods

This study titled "Acute Kidney Injury in Snake Bite Patients: A Prospective observational study in a tertiary care hospital Telangana India" was carried out during the period of from december 2013 to march 2015. The study was conducted on 100 snake bite patients admitted during the above period in Osmania medical college and hospital, Hyderabad, India with an aim to evaluate clinical profile of renal involvement in snake bite patients and in-hospital outcome of acute kidney injury in snake bite patients.

Inclusion Criteria

1. History of snake bite with signs of envenomation.
2. Progressive elevation of serum creatinine >0.3 mg/dl from baseline.
3. A percentage increase in the serum creatinine concentration of >50%.
4. Oliguria of less than 0.5 ml/kg/hr for more than 6 hours

Exclusion Criteria

1. Patients with pre-existing renal diseases with History of snake bite.
2. Patients with risk factors for developing renal disease with history of snake bite. (diabetes, hypertension, connective tissue diseases, chronic infection)

Ethics

This study was approved by the Institutional Ethics Committee OMC, Hyderabad. An informed written consent was taken from all the patients involved in the study after explaining regarding the study.

Study Procedure

Data was be collected using a pretested proforma meeting the objectives of the study. Detailed history, physical examination and necessary investigations were undertaken. The purpose of the study was explained to the patient and informed consent was obtained. Using non-invasive methods acute kidney injury in snake bite patients who fulfil the inclusion criteria is assessed. Patients were classified into three stages of acute kidney injury proposed by Acute Kidney Injury Network⁷ which defines AKI as an “abrupt¹² (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 $\geq 50\%$ or oliguria of 0.5 ml/kg/hr > 6 hours. The course of acute kidney injury in three stages and need for renal replacement therapy is assessed¹³.

Results

In the present study, 100 cases of snake bite were selected on the basis of simple random sampling method from the OPD and medical wards at Osmania medical college and hospital who had developed snake bite induced AKI.

Table 1: Age distribution of patients

Age group (years)	Number of patients	Percentage(%)
18-30 years	24	24.0
31-40 years	14	14.0
41-50 years	32	32.0
51-60 years	26	26.0
>60 years	4	4.0
Total	100	100.0

Mean $\pm$ SD: 43.80 $\pm$ 12.63

Sixteen patients were in the age group of 41–50 years. Mean age was 43.8 years.

Table 2: Gender distribution of patients

Gender	Number of patients	Percentage (%)
Male	62	62.0
Female	38	38.0
Total	100	100.0

Out of 100 patients included in this study, 62 were males (62%) and 38 (38%) were Females.

Table 3: Snake bite site of patients studied

Snake bite site	Number of patients (n=100)	Percentage (%)
Side of bite		
Left side	64	64.0
Right	36	36.0
Site of bite		
Leg	40	40.0
Foot	38	38.0
Toe	10	10.0
Calf	8	8.0
Shin	4	4.0

All bites were to the lower limb. 64 patients (64%) of patients had snake bite to left lower limb.

Table 4: Identification of snake of patients studied

Identification of snake	Number of patients	Percentage (%)
Not identified	52	52.0
Identified		
Viper	46	46.0
Cobra	2	2.0
Total	100	100.0

Among 100 snake bites, only 46 (46%) had identified the snake as viperbites in 46 cases and cobra bite in 2 cases.

Table 5: Symptoms of snake bite patients

Symptoms	Number of patients (n=100)	Percentage (%)
Reduced urine output	60	60.0
Vomiting	38	38.0
Bleeding from bite site	32	32.0
Bleeding from the gums	18	18.0
Hematuria	14	14.0

Sixty (60%) patients presented with reduced urine output, 38 patients (38%) with vomiting, 32 (32%) with bleeding from gums and 14 (14%) presented with hematuria

Vital statistics of patients studied

Ten patients (10%) had tachycardia and 4 (4%) pulse was palpable. Systolic blood pressure (SBP) was ≤ 120 mmHg in 68 (68%) and >120 in 28(28%). Diastolic blood pressure (DBP) was ≤ 80 mmHg in 58 (58%) and >80 mmHg in 38 (38%). Blood pressure was not recordable in 4 patients.

Hematological parameters of patients studied

Laboratory data shows anemia with Hb <10 gm% in 54 (54%), Leukocytosis (Total count >11,000) in 16 (16%) and thrombocytopenia (platelet count <1.5lakh) in 26 (26%) patients.

Bleeding time of patients studied

Bleeding time was prolonged in 16 (16%) patients.

Levels of Blood urea of patients studied

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

Levels of Serum creatinine of patients studied

Mean levels Serum Creatinine at baseline at 24 hours(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.

USG abdomen of patients studied

USG abdomen was normal in 66(66%) patients and was abnormal kidney size 34 (34%) patients showing alteration in cortical echotexture with normal kidney size.

Urine output in ml/day of patients studied

Mean levels of urine at baseline, at 24 hours, 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).

Supportive treatment of patients studied

All patients received Intravenous fluid (IVF) and 96 patients (96%) received antibiotics as supportive treatment. 16 patients were transfused blood and blood products. 6 patients (6%) were transfused FFP, 8 (8%) were transfused whole blood and two patient received platelets transfusion.

Discussion

The mean age of patient in this study was 43.8+/- 12.63 years when compared to Paul JD et al³ where mean age of the patients was 37.45+/-1.64 years and Patil Bt⁴ where mean age of the patients was 35.77+/-14.92 years. Majority are males in this study (62 %) similar to Athappan G et al⁵ (62.6%) and Mittal BV and others (58.53%). 28% patients presented to hospital with a time lapse of > 12 hours in this study when compared to Patil BT et al where 42% patients had delayed presentation and Athappan et al 55%. Majority of the patients in both studies had oliguria (60% in present study vs 100 % in study by Athappan et al). 32 % of the patients in the present study had bleeding from bite site when compared to 20%

of patients in study by²⁰ Athappan et al. 18 % of patients in the present study had bleeding from gums when compared with 10 % of patients^{14,16} in study by Athappan et al. In both studies majority of the patients^{15,17,19} had signs of inflammation (98% in present study vs 98.7% in study by Athappan et al).

52 % patients had abnormal coagulation profile in this study when compared to Patil BT et al where 36.8% of patients had abnormal coagulation profile and in Mittal BV et al⁶ where 73.17% patients had abnormal coagulation profile. In this study, there was a delay in time to presentation to hospital (with a time lapse > 12 hours) in 28% of patients with a significant p value < 0.005 when compared to Athappan G et al where 55 % of patients presented to hospital with a delay of > 12 hours with a p < 0.0003. Majority of patients had increase in both mean creatinine and mean urea with a significant p < 0.001 in the present study. In present study 62% had applied tourniquet before coming to the hospital. Among 100 snake bites, only 48 (48 %) had identified the snake as viper bites in 46 cases and cobra bite in 2 case.

Ten patients (10%) had tachycardia and 4 (4%) pulse was not palpable. Systolic blood pressure (SBP) was < 120 mm Hg in 68 (68%) and > 120 in 28 (28%). Diastolic Blood Pressure (DBP) was < 80 mmHg in 58 (58%) and > 80 mm Hg in 38 (38%). Blood Pressure was not recordable in 4 patients. On local examination 98 (98%) had signs of inflammation, 94 (94%) had fang mark, 32 (32%) had bleeding from bite site and in 4 (4%) patients peripheral pulses not felt. Anemia with hemoglobin < 10 gm% in 54 (54%) Leukocytosis (Total count > 11,000) in 16 (16%) and thrombocytopenia (platelet count < 1.5 lakh) in 26 (26%) patients. Bleeding time was prolonged in 16 (16%) patients. Mean levels of blood urea at baseline, at 24 hours (p value < 0.01), 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 hours (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. All patients included in the study had elevated serum creatinine kinase levels with a mean of 266.58 U/L (Mean +SD : 266:58 + 122.53) PT – INR was prolonged (>1.2 seconds) in 34 (34%) patients and APTT was prolonged (> 28 seconds) in 88 (88%) of patients. USG abdomen was normal in 66 (66%) patients and was abnormal 34 (34%) patients showing alteration in cortical echotexture with normal kidney size. Mean levels of urine output at baseline, at 24 hours, on 2nd day and on 3rd day were 1205.40 mg/day, 1433.67 ml/day, 1742.29 ml/day and 1981 ml/day respectively with significant p value (<0.001). Forty patients (40%) received 11-20 vials of ASV and > 30 vials of ASV were given only for 4 patients. Among 100 patients 12 (12%) required hemodialysis. Out of 100 patients studied, 86 (86%) improved and 14 had a poor outcome. Among these 14, 8 patients developed Chronic Kidney Disease (CKD) and 6 patients succumb 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 snake bite (p-value 0.005) and alternative treatment taken before coming to the hospital (p value 0.01). Comparison of lab

parameters in good and poor outcome group shows significant p – value for PT – INR (0.020). Eighty four patients (84%) were in Stage I AKI, 4 (4%) were in Stage II and 12 (12%) patients were in Stage III AKI.

Conclusion

From the results it can be concluded that Common manifestations of poisonous snake bite include cellulitis, abnormal Coagulation profile and decreased urine output. Overall mortality due to snake bite induced AKI is 6%. Lapse of time in presenting to the hospital and abnormal coagulation profile are the predictors of poor outcome in snake bite induced acute kidney injury.

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