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Acute Kidney Injury in Snake Bite Cases – A Cross-Sectional Study

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Abstract

According to WHO estimates about 5 million people are bitten each year by poisonous snakes which results in 2.5 million envenomations, at least 100000 deaths, and 300000 amputations and other permanent disabilities. The majority of snakebite induced deaths occur in Asia and Sub-Saharan Africa. Out of 30 patients included in this study, 17 were males and 13 were females, most of the cases belong to 21 to 40 year age group followed by 41-60 year age group, bite mark was seen in 24 cases in lower limb and 6 cases in the upper limb, the snake identified as krait bites in 10 cases, cobra bites in 8cases and viper bites in 6 cases, Mean levels of blood urea at baseline, at 24 hours, on 2nd day and 3rd day were 63.01 mg/dl, 85.92 mg/dl, 76.26 mg/dl and 62.83 mg/dl respectively, Mean levels Serum Creatinine at baseline, at 24 hours, on 2nd day and on 3rd day were 2.22 mg/dl, 3.12 mg/dl, 2.74 mg/dl and 2.62 mg/dl respectively and 28 patients included in the study had elevated serum creatinine kinase levels with a mean of 260.00 U/L.

Keywords: Acute Kidney Injury; Snake Bite

Introduction

According to WHO estimates about 5 million people are bitten each year by poisonous snakes which results in 2.5 million envenomations, at least 100000 deaths, and 300000 amputations and other permanent disabilities. The majority of snakebite induced deaths occur in Asia and Sub-Saharan Africa. The mortality due to venomous snakebite in India is estimated between 35000-50000 per annum, which is the highest in the world. The mortality due to venomous snakebite in India continues to be high due to various social, economic, and cultural reasons [1,2]. Snakebite is a common and frequently devastating environmental and occupational disease, especially in rural areas of developing countries in tropical regions. Clinical manifestations depend on the dose of venom injected, bite to needle time, potency, and adequacy of anti-venom. Envenomation may cause a very wide variety of complex effects, ranging from insignificant lesions at the site of the bite, to extensive local necrosis, and life-threatening systemic effects of disseminated intravascular coagulation, acute kidney injury, acute respiratory distress syndrome, septicemia and sudden cardiac death from arrhythmia. Isoenzyme of the phospholipase PLA2 in snake venom is responsible for systemic manifestations of local capillary damage, tissue necrosis, and anticoagulant action. The complex clinical syndrome is characterized by hypotension, kidney injury, bleeding, and pituitary failure [3,4].

Improving Global Outcomes (KDIGO) definition and staging criteria have facilitated the early diagnosis of AKI, but the prognostic utility of these classification schemas in snakebite-related AKI is not known. The majority of outcome data are limited to in-hospital outcomes. Capillary leak syndrome (CLS), characterized by the generalized vascular leak and significant fluid accumulation in the third space, is a unique complication following ***D. russelii*** envenomation that contributes to mortality. However, very few reports on the impact of CLS on outcomes have been published to date and there is limited literature regarding the predictors of progression to chronic kidney disease (CKD) following envenomation-related AKI. This study aims to identify the in-hospital outcomes and long-term changes in kidney function that follow hemotoxic envenomation.

Objective

1. To study the clinical profile of renal involvement in snake bite patients

Methodology

Source of Data

Patients with a history of snakebite who getting admitted at Adichunchnagiri Institute of Medical Sciences, Hospital, Mysore during the period of January 2015 to December 2019.

Method of Collection of Data

Sample size: 30

Sampling method: a cross-sectional study

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 fewer than 0.5 ml/kg/hr for more than 6hours.

Exclusion Criteria

. Patients with pre-existing renal diseases with a history of snakebite.

. Patients with risk factors for developing the renal disease with a history of snakebite. (diabetes, hypertension, connective tissue diseases, chronic infection).

Results

Table 1: Age & Sex wise distribution of Cases

Age group	Male	Female	Total
< 20 years	02	01	**03**
21-40 years	08	05	**13**
1-60 years	06	06	**12**
<60 years	01	01	**02**
Total	**17**	**13**	**30**

Out of 30 patients included in this study, 17 were males and 13 were females, most of the cases belong to 21 to 40 year age group followed by 41-60 year age group.

Table 2: Distribution of Cases based on Site of snake bite

Site of snake bite	Number of cases
Upper limbs	06
Lower limbs	24
Total	**30**

Out of 30 snakebite cases, bite mark was seen in 24 cases in lower limb and 6 cases in the upper limb.

Table 3: Distribution of cases based on the type of snake

Identification of snake	Number of patients	%
Not identified	06	20
Identified		
Krait	10	33.3
Cobra	08	26.7
Viper	06	20
Total	**50**	**100.0**

Among 30 snake bites, the snake identified as krait bites in 10 cases, cobra bites in 8 cases, and viper bites in 6 cases.

Table 4: Levels of Blood urea of patients studied

Blood urea	Min - Max	Mean ± SD
Baseline	15.00-198.00	63.01±40.99
24 hours	29.00-192.00	85.92±42.75
2nd day	22.00-188.00	76.26±40.69
3rd day	17.00-196.00	62.83±42.45

Mean levels of blood urea at baseline, at 24 hours, on 2nd day and 3rd day were 63.01 mg/dl, 85.92 mg/dl, 76.26 mg/dl, and 62.83 mg/dl respectively.

Table 5: Levels of Serum creatinine of patients studied

Serum creatinine	Min - Max	Mean ± SD
Baseline	0.30-20.00	2.22±3.23
24 hours	0.90-21.00	3.12±3.34
2nd day	0.60-21.00	2.74±3.82
3rd day	0.60-18.00	2.62±3.44

Mean levels Serum Creatinine at baseline, at 24 hours, on 2nd day and on 3rd day were 2.22 mg/dl, 3.12 mg/dl, 2.74 mg/dl, and 2.62 mg/dl respectively.

Table 6: Creatine kinase of patients studied

Creatine kinase	Number of patients	%
Normal (Male: 25-90 U/L; Female 10-70 U/L)	2	6.7
Raised (Male >90 U/L; Female >70 U/L)	28	93.3
Total	30	100.0

28 patients included in the study had elevated serum creatinine kinase levels with a mean of 260.00 U/L.

Discussion

Out of 30 patients included in this study, 17 were males and 13 were females, most of the cases belong to 21 to 40 year age group followed by 41-60 year age group, bite mark was seen in 24 cases in lower limb and 6 cases in the upper limb, the snake identified as krait bites in 10 cases, cobra bites in 8cases and viper bites in 6 cases, Mean levels of blood urea at baseline, at 24 hours, on 2nd day and 3rd day were 63.01 mg/dl, 85.92 mg/dl, 76.26 mg/dl and 62.83 mg/dl respectively, Mean levels Serum Creatinine at baseline, at 24 hours, on 2nd day and on 3rd day were 2.22 mg/dl, 3.12 mg/dl, 2.74 mg/dl and 2.62 mg/dl respectively and 28 patients included in the study had elevated serum creatinine kinase levels with a mean of 260.00 U/L.

Acute renal failure is mainly observed following bites by the Viperidae group but less with sea snakes and the Colubridae group. Most Indian patients are victims of Russell's viper or Echis carinatus bites, causing ARF [5].

Up to 90% of the approximately 1000 deadly snake bites occurring per annum are attributed to Russell's Viper which is also the 5thmost 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. cariatus bites and the incidence of ARF is 13-32% [6].

Renal failure is the major cause of bite in viper bite. The possible mechanism of ARF is prolonged hypotension, DIC, intravascular hemolysis, nephrotoxicity of renal, and myoglobinuria [7].

The renal lesions of clinical significance in envenomed patients are ATN and patchy or diffuse RCN. Glomerulonephritis, interstitial nephritis, and papillary necrosis have been reported in rare patients. Tubulointerstitial lesions, predominantly ATN, are observed in 70% to 80% of patients with AKI. Biopsies carried out early reveal morphological features of severe acute tubular injury with intratubular pigmented granular casts. Varying degree of acute tubulointerstitial nephritis and interstitial edema may be found. Late biopsies reveal regenerating tubular epithelium. A high proportion (91%) of patients subjected to kidney biopsy had ATN in our study. In addition, 41% of them had associated finding of mild to moderate AIN [8].

Conclusion

AKI resulting from snake envenomation is accompanied by a considerable risk of mortality. The greater the stage number of AKI, the poorer the outcome. The presence of CLS, hypotension, and respiratory failure are independent predictors of mortality. One-third of patients with AKI develop long-term complications like CKD, prehypertension, and hypertension on follow-up. Early recovery from AKI is associated with better preservation of GFR in the long-term.

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