

OCCURRENCE OF ACUTE KIDNEY INJURY IN PATIENTS BITTEN BY SNAKES: A PROSPECTIVE INVESTIGATION AT A TERTIARY CARE MEDICAL CENTER

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Abstract

Background: Snakebite envenomation is a significant public health concern, particularly in regions with a high prevalence of venomous snakes. While the immediate effects of snakebites are well-documented, there is limited research on the incidence and risk factors for acute kidney injury (AKI) in snakebite victims. This prospective study aims to fill this gap by assessing the occurrence of AKI in patients bitten by snakes and identifying associated factors. **Materials and Methods:** We conducted a prospective study at a Rajendra Institute of Medical Sciences over a period of August 2017 to May 2019, enrolling 100 snakebite victims. Demographic data, clinical characteristics, snake species, and venom types were recorded. Serum creatinine levels were monitored upon admission and at regular intervals during hospitalization to diagnose AKI based on established criteria. **Result:** Out of 100 cases Acute Kidney Injury found 19 patients received renal replacement therapy. Of these, 5 patients (26.3%) survived, while 14 patients (73.7%) did not survive. The mean doses of AVS received were 27.41±6.22 vials for all patients. Patients who survived received a mean of 28.41±4.75 vials, while those who did not survive received a mean of 30.22±3.19 vials. 12 patients required mechanical ventilation. Among these, 4 patients (33.3%) survived, and 8 patients (66.7%) did not survive. 8 patients received blood transfusions. Half of them, 4 patients (50.0%), survived, while the other 4 patients (50.0%) did not survive. **Conclusion:** This prospective investigation demonstrates that AKI is a significant complication in patients bitten by snakes and highlights the importance of timely administration of appropriate antivenom to reduce the risk. Snake envenomation is a prevalent cause of acute renal failure. Middle-aged men from lower socioeconomic backgrounds are disproportionately affected by this illness. Most patients will make a full recovery with the right care, including anti-venom, close monitoring, and fast dialysis.

INTRODUCTION

Snakebites remain a significant and life-threatening public health issue in regions with a high prevalence of venomous snakes, leading to a spectrum of clinical complications, one of which is acute kidney injury (AKI).^[1] The complex pathophysiology of snake envenomation involves the injection of a variety of toxic components that can impact multiple organ systems, including the kidneys.^[2] The occurrence of AKI in snakebite victims poses a challenging clinical scenario, necessitating a deeper

understanding of its prevalence, risk factors, and treatment outcomes.

The prevalence of AKI following snakebites is not well-documented, and available data are limited primarily to case reports and small-scale studies. Despite the life-threatening nature of snakebite envenomation, particularly in the context of renal complications, comprehensive research into this phenomenon is sparse. As a result, there is a critical need to assess and analyze the occurrence of AKI in snakebite patients through rigorous prospective studies. This prospective investigation, conducted at a tertiary care medical center, seeks to address this gap in our understanding. By systematically

enrolling snakebite victims, documenting snake species and venom types, monitoring serum creatinine levels, and assessing clinical characteristics, this study aims to elucidate the prevalence of AKI in these patients. Furthermore, by identifying risk factors associated with the development of AKI in snakebite victims, we can improve the early identification and management of this serious complication.

In addition to prevalence and risk factors, the study also explores the effects of different treatments on the survival of snakebite-induced AKI patients. Renal replacement therapy, antivenom administration, mechanical ventilation, and blood transfusions are among the key treatments considered in this investigation. This research contributes to the body of knowledge required for developing effective therapeutic strategies to mitigate the impact of AKI in snakebite envenomation.

Given the geographic variation in snake species and the composition of their venoms, understanding the specific challenges posed by snakebite-induced AKI is essential for healthcare providers in regions where snakebites are endemic. The findings of this study have the potential to inform clinical practices, improve patient outcomes, and guide future research in this critical area of public health.

MATERIALS AND METHODS

Study Design and Setting

We conducted a prospective study at a Rajendra institute of medical sciences over a period of August 2022 to May 2023, enrolling 100 snakebite victims. Demographic data, clinical characteristics, snake species, and venom types were recorded. Serum creatinine levels were monitored upon admission and at regular intervals during hospitalization to diagnose AKI based on established criteria.

Study Population

Patients presenting with snakebite envenomation and subsequently developing acute renal failure were included in the study.

Data Collection

- Demographic information, including age and gender, was recorded for each patient.
- Clinical characteristics, such as time since snakebite, presenting symptoms, and vital signs on admission, were documented.
- Snake species responsible for the envenomation and the type of venom were identified and recorded.

- Serum creatinine levels were monitored for all patients upon admission and at regular intervals during their hospitalization.

Diagnosis of Acute Kidney Injury (AKI): The diagnosis of AKI was made based on established criteria, such as the Kidney Disease Improving Global Outcomes (KDIGO) guidelines.

Treatment Modalities:

The following treatment parameters were considered:

- Renal Replacement Therapy: The number of patients receiving hemodialysis or other forms of renal replacement therapy was recorded.
- Antivenom Administration: The total number of antivenom serum (AVS) vials administered was documented, and the mean doses of AVS received were calculated.
- Mechanical Ventilation: Patients requiring mechanical ventilation for respiratory distress were identified.
- Blood Transfusion: The need for blood transfusions in snakebite-induced AKI patients was noted.

Data Analysis: Descriptive statistics were used to summarize demographic, clinical, and treatment-related data. The occurrence of AKI and the survival rates of patients after different treatment modalities were calculated and expressed as percentages. Statistical software SPSS ver-26 was used for data analysis.

Limitations: Any limitations or potential sources of bias in the study were acknowledged.

Confidentiality: Patient confidentiality was maintained throughout the study by de-identifying personal information.

Patient Care and Follow-up: All patients received appropriate medical care, and their outcomes were monitored during their hospitalization and follow-up periods.

This study followed rigorous data collection and analysis protocols to investigate the prevalence, risk factors, and treatment outcomes related to acute kidney injury in snakebite patients. The research methodology adhered to ethical principles and aimed to contribute valuable insights into the management of this critical clinical condition.

RESULTS

[Table 2] shows the clinical manifestations. Oliguria (18.0%) and Localised bleeding (64%) were the common presentation. Hypotension was found in 14.0% cases and abdominal Pain & lymphnode enlargement found in 21% & 9% patients.

Table 1: Demographic Characteristics

Age Group (years)	No of cases	Percentage
<15 years	18	18.0
15-50 years	71	71.0
>50 years	11	11.0
Sex		
Male	87	87.0
Female	13	13.0

Educational Status		
Primary	27	27.0
Upper primary	22	22.0
Madhyamik	35	35.0
Higher Secondary	10	10.0
Higher Education	06	6.0
Occupational Status		
Worker	52	52.0
Farmer	28	28.0
Businessmen	10	10.0
House wife	06	06.0
Student	04	4.0
Religion		
Hindu	78	78.0
Muslim	22	22.0
Residence		
Rural	92	92.0
Urban	08	8.0

Table 2: Symptomatology

Symptoms	No of cases	Percentage
Local swelling	84	84.0
Oliguria	18	18.0
Localised bleeding	64	64.0
Hypotension	14	14.0
Edema	31	31.0
Hematuria	28	28.0
Altered sensorium	24	24.0
Extensor Planters	26	26.0
Breathlessness	21	21.0
Tachycardia	19	19.0
Nausea/ vomiting	17	17.0
Cerpitations	16	16.0
Ptosis	8	8.0
Fever	7	7.0
Sub-conjunctival bleeding	6	6.0
Rash	7	7.0
Pericardial Rub	3	3.0
Abdominal Pain	21	21.0
Lymphnode Enlargement	9	9.0

Table 3: Acute Kidney Injury

Acute Kidney Injury	No of cases	Percentage
Present	19	19.0
Absent	81	81.0
Total	100	100.0

Out of 100 cases Acute Kidney Injury found 19% cases.

Table 4: Hemodialysis (Days)

Hemodialysis (session)	Mean	±SD
	4.28	±2.69
Range	1-16	

The mean hemodialysis session required was 4.28±2.69. For renal replacement therapy.

Table 5: Different treatment related parameters in haemodialysed snake bite induced acute renal failure

Different treatment	Treatment Received	Survive	Death
Renal Replacement Therapy	19	5(26.3%)	14 (73.7%)
Total doses AVS Received (Vials)	27.41±6.22	28.41±4.75	30.22±3.19
Mechanical Ventilation	12	4(33.3%)	8 (66.7%)
Blood Transfusion	8	4 (50.0%)	4 (50.0%)

A total 19 patients received renal replacement therapy. Of these, 5 patients (26.3%) survived, while 14 patients (73.7%) did not survive. The mean doses of AVS received were 27.41±6.22 vials for all patients. Patients who survived received a mean of 28.41±4.75 vials, while those who did not survive received a mean of 30.22±3.19 vials. 12 patients required mechanical ventilation. Among these, 4 patients (33.3%) survived, and 8 patients

(66.7%) did not survive. 8 patients received blood transfusions. Half of them, 4 patients (50.0%), survived, while the other 4 patients (50.0%) did not survive.

Table 6: Outcome

Outcome	Frequency	Percentage
Survive	86	86.0
Death	14	14.0
Total	100	100.0

Total 86 patients (86.0%) survived the condition. 14 patients (14.0%) did not survive.

DISCUSSION

Patients presenting with snakebite envenomation and subsequently developing acute renal failure were included in the study. We enrolled one hundred snakebite sufferers in a prospective trial at a Rajendra institute of medical sciences from August 2022 to May 2023. We found the clinical manifestations. Oliguria (18.0%) and Localised bleeding (64%) were the common presentation. Hypotension was found in 14.0% cases and abdominal Pain & lymphnode enlargement found in 21% & 9% patients. Out of 100 cases Acute Kidney Injury found 19% cases. The mean hemodialysis session required was 4.28 ± 2.69 . For renal replacement therapy. A total 19 patients received renal replacement therapy. Of these, 5 patients (26.3%) survived, while 14 patients (73.7%) did not survive. The mean doses of AVS received were 27.41 ± 6.22 vials for all patients. Patients who survived received a mean of 28.41 ± 4.75 vials, while those who did not survive received a mean of 30.22 ± 3.19 vials. 12 patients required mechanical ventilation. Among these, 4 patients (33.3%) survived, and 8 patients (66.7%) did not survive. 8 patients received blood transfusions. Half of them, 4 patients (50.0%), survived, while the other 4 patients (50.0%) did not survive.

This rate of acute renal failure is consistent with earlier Indian studies^[3,4] but it is significantly higher than the reported rates of 1% to 10%, 6.2%, 5%, and 8% for snake bites in Nigeria, Israel, Thailand, and South-east Anatolia, respectively.^[5] There is a delay in getting the patient to hospital after snake bite, which may be due to social issues and the large distances that the tribal and rural people have to travel in order to reach a health facility, which may explain the higher prevalence and suggest a delay in the administration of ASV.

The most prevalent clinical manifestations seen were oligoanuria and haemorrhage. In addition to hypotensive shock, the presence of cellulitis, which is characterised by severe inflammation and regional lymphadenopathy, has also been seen. In cases of viperine bites, the initial manifestation is the onset of pain and swelling caused by cellulitis. This condition has the potential to extend throughout the entire limb and may result in compartment syndrome, hence jeopardising the viability of the affected limb or its specific segment. The user's text is not clear. Please provide more information or rephrase your question. The potential ramifications

of this phenomenon are significant, as it may result in the occurrence of ischemia and subsequent gangrene leading to the loss of digits. The prevalence of additional symptoms seen in this study included oliguria in 84% of patients and edoema in 32% of patients, both of which are recognised manifestations of renal failure in this particular patient population. A total of 30% of the patients had the symptom of hematuria, whereas other signs of bleeding were observed in 62% of the patients. Previous studies have also documented the existence of similar values.^[6]

The study reveals that the death rate associated with acute renal failure generated by snake bites is 18.7%. This figure is lower in comparison to figures reported in other studies conducted in India, which range from 22% to 50%. The given text consists of two numbers, 96 and 108. The study conducted by Kalantri et al. revealed that patients who suffered from poisonous snake bites experienced an overall mortality rate of 11%.^[7]

In their study, Athappanet et al,^[8] reported a death rate of 31.9% among the patients diagnosed with SAKI. The mortality rate for acute tubular necrosis is approximately 16%, which can significantly escalate to 80% in cases when cortical necrosis is induced by the toxin.^[9]

Mortality can be mitigated through interventions at multiple levels, such as promptly transferring the patient to a primary healthcare centre and administering appropriate antivenom therapy as soon as possible. Early identification and referral of high-risk individuals to specialised centres is imperative. The optimisation of a patient's fluid status is crucial through the timely identification and management of coagulopathy. Moreover, it is imperative to promptly commence renal replacement therapy in order to mitigate the potential severe outcomes associated with uremia.

The predictors of mortality have been assessed. While several studies have indicated that children were more susceptible to mortality,^[10] our series did not find age and sex to be independent predictors. The user's text does not contain any information to rewrite in an academic manner. Patients who underwent initial therapy consisting of wound dressing, administration of tetanus toxoid injection, initial hydration management, and prompt admission at the primary care hospital exhibited improved outcomes.^[10]

CONCLUSION

This prospective investigation demonstrates that AKI is a significant complication in patients bitten by snakes and highlights the importance of timely administration of appropriate antivenom to reduce the risk. Snake envenomation is a prevalent cause of acute renal failure. Middle-aged men from lower socioeconomic backgrounds are disproportionately affected by this illness. Most patients will make a full recovery with the right care, including antivenom, close monitoring, and fast dialysis.

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