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A STUDY OF CLINICAL PROFILE AND PREDICTORS OF POOR OUTCOME IN SNAKE BITE INDUCED ACUTE KIDNEY INJURY.

Emergency Medicine

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KEYWORDS

INTRODUCTION

Snakebite is a significant cause of morbidity and mortality in tropical countries like India. The World Health Organization estimates that 5 million people are bitten by poisonous snakes each year, resulting in 2.5 million envenomation's, 1,00,000 deaths, and 3,00,000 amputations [1]. Asia and Sub-Saharan Africa account for the majority of snakebite-induced deaths, with India having the highest mortality rate, estimated between 35,000 to 50,000 per annum. [2]

There are two important families of venomous snakes in south-east Asia: Elapidae and Viperidae. Medically important snakes in India include the Russell's viper, Cobra, Common Krait, and Saw scaled viper. Despite the availability of anti-snake venom, many snakebite victims succumb to complications due to delayed medical care and the use of traditional remedies. [3]

The main causes of acute kidney injury (AKI) in snakebite victims include septicemia, hypotension, disseminated intravascular coagulation (DIC), direct nephrotoxicity from venom, acute tubular necrosis, acute interstitial nephritis, and cortical necrosis. While AKI is usually reversible, acute cortical necrosis can lead to incomplete recovery and dialysis dependence. [4] Early hospital care and administration of anti-snake venom (ASV) significantly improve clinical outcomes.

Considering the prevalence of snakebite and its complications this study was designed with the main purpose to analyze the clinical profile and predictors of poor outcome of AKI in snake bite patients.

Objectives

- To describe the demographic characteristics (age, gender) of patients presenting with snake bite induced AKI.
- To document the clinical manifestations and laboratory findings associated with snake bite induced AKI.
- To identify independent predictors (clinical, biochemical, and demographic factors) associated with outcome.

Study Design- Prospective observational study.

Study Setting - Tertiary Care Centre, Emergency Medicine Department (EMD) at Government Medical College, Miraj, Maharashtra, INDIA.

Study Duration – 6 Months.

Study Group - Patients with a definitive history of snake bite attending to the Tertiary Care Centre, EMD at Government Medical College, Miraj, Maharashtra, INDIA.

Inclusion Criteria

- Patients with a definitive history of snake bite attending to the Department of Emergency Medicine.
- The presence of AKI which is defined as an abrupt (within 48hrs), absolute increase in serum creatinine ≥0.3 mg/dL from baseline value or a percentage increase in serum creatinine concentration of ≥50% above the baseline.
- Oliguria: - Urine output less than 0.5mL/Kg per hour for more than 6 hours, or serum creatinine more than 1.5mg/dL.

Exclusion Criteria

- The patients with a pre-existent renal disease (serum creatinine of >1.5 mg/dL prior to the snake bite or ultrasonography of the abdomen which was suggestive of bilateral shrunken kidneys / loss of the corticomedullary differentiation /obstructive nephropathy/ other renal pathologies).
- Exposure to nephrotoxic drugs/ toxins were excluded from the study.

Method Of Study

Patients were selected following the application of strict inclusion and exclusion criteria, and subsequently stratified based on gender and age. A meticulous clinical examination was conducted for all selected cases, leading to their classification into AKI and Non-AKI groups, determined by both clinical assessment and biochemical parameters.

Further evaluation included comprehensive laboratory investigations tailored to each patient, encompassing:

- Whole blood clotting time
- Complete blood count
- Renal function tests
- Liver function tests
- Coagulation profile
- Serum electrolyte analysis
- Chest X-ray
- Abdominal ultrasonography
- Urinalysis

Upon arrival at the EMD, a 20-minute whole blood clotting time test (WBCT) and PT/INR was promptly performed for all patients. Additionally, all patients received tetanus toxoid as a standard protocol.

For patients exhibiting hematotoxicity/vasculotoxicity 3 cycles of 10 vials of polyvalent ASV diluted in 400mL of normal saline, infused over a duration of 1 hour each with adequate fluid resuscitation. In case of Neurotoxicity, 2 cycles of 10 vials of polyvalent ASV diluted in 400mL of normal saline, infused over a duration of 1 hour each with cycles of Glycopyrrolate and Neostigmine were administered. A repeat 20-minute WBCT was conducted after 6 hours to assess treatment response.

In cases where indicated by clinical findings, transfusions of blood products such as fresh frozen plasma (FFP) were administered. Two patients necessitated haemodialysis, which was promptly provided.

Patients were closely monitored throughout their hospital stay and followed up until discharge, ensuring comprehensive management and care continuity.

RESULTS

Table 1: - Demographic characteristics of study subjects.

Demographic profile	AKI (14)	Non-AKI cases (58)
Age	46.5 ±11.5	36.0 ± 10.25
Male	10 (71.42%)	35 (60.34%)
Female	4 (28.57%)	23 (39.65%)

During the study period, a total of 72 patients were admitted for snake bite, of which 58 patients showed signs of envenomation, 14 patients were diagnosed to have AKI due to snake bite with an incidence of 19.44% of total snakebite patients. Of the 14 AKI patients included in study, male predominance (71.42%) was observed as compared to

females (28.57%). Similarly, of 58 non-AKI patients' male predominance was observed (60.34%) as compared to females (39.65%). The mean age of AKI and Non-AKI patients was found to be 46.5 ± 11.5 and 36.0 ± 10.25 respectively (Table1).

Table 2: - Distribution of patients based on clinical profile.

Characteristics	AKI (n=14)	Non-AKI (n=58)
Cellulitis	13(92.85%)	37(63%)
Regional lymphadenopathy	10(71.42%)	16(27.58%)
Bleeding manifestation	5(35.71%)	8(13.79%)
Hypotension	3(21.42%)	1(1.72%)
Septicemia	12(85.71%)	7(12.06%)

Cellulitis, septicemia, regional lymphadenopathy and bleeding manifestations were seen in both the groups. In patients of snake bite with AKI Group, cellulitis was noted in 92.85% of the patients followed by septicemia (85.71%), regional lymphadenopathy (71.42%). Whereas in Non-AKI group, cellulitis was noted in 63% of the patients followed by regional lymphadenopathy (27.58%) and septicemia observed in 12.06% of the patients. Bleeding manifestation was observed in 35.71% and 13.79% in AKI and Non-AKI patients respectively. Hypotension was noted in 21.42% in AKI patients and 1.72% in Non-AKI patients. The duration of hospital stay, more than 1 week was noted in 86% of AKI patients and less than 1 week in Non-AKI patients. This shows, the patients who developed AKI required more days in the hospital than Non-AKI group, which suggested the morbidity which was associated with it.

The incidences of cellulitis, bleeding manifestation, regional lymphadenopathy, hypotension, septicemia was significantly more in the AKI group, which was statistically significant as compared to those in the Non-AKI group (Table 2).

Table 3: - Showing comparison of outcome of patients in AKI group

Characteristics	Survived (n=12)	Died (n=2)
Age (years)	36.5 ±9.5	44.5 ±10.5
Male (%)	75% (9)	50% (1)
Female (%)	25% (3)	50% (1)
Cellulitis	11 (91.66%)	2 (100%)
Regional lymphadenopathy	8 (70.83%)	2(100%)
Bleeding manifestation	04 (29.2%)	01 (50%)
Hypotension	01 (8.33%)	01(50%)
Septicemia	10 (71.42%)	01(50%)

The results showing comparison of outcome of patients in AKI group is represented in Table 3. Results revealed that with regards to AKI patients, the mean age of the patients who survived was found to be 36.5 ± 9.5 and there were 70.83% male patients. The incidence of cellulitis was found to be 91.66% followed by septicemia (71.42%) regional lymphadenopathy (70.83%), bleeding manifestation (29.2%), hypotension (8.33%).

While with regards to AKI patients the mean age of the patients who died was found to be 44.5 ± 10.5 and there were 75 % male patients. The incidence of cellulitis among the patients who died was found to be 100%, hypotension (50%), septicemia (50%), regional lymphadenopathy (100%), bleeding manifestation (50%). The comparison between the AKI patients who survived and those who died showed a significant difference with regard to septicemia and hypotension.

DISCUSSION.

Snake bite is an important cause of AKI worldwide especially in tropical countries like India. It is mainly an occupational hazard. Snake bite causing AKI and related fatalities are mainly seen in monsoon season in India and worldwide.[3,9,10] About 5% to 29% of the patients develop AKI following snake bite.[5-7]While some researchers reported that about 8%-45% adults, and 46% of children develop AKI following snake bite.[5-7,11]A number of factors contribute to the development of AKI, like bleeding, hypotension, intravascular hemolysis, disseminated intravascular coagulation, microangiopathic hemolytic anemia and the direct nephrotoxicity of venom.[12]An incidence of 18.1% was noted in a study from India.[13]In our study, incidence of AKI was 19.44 % of total snakebite patients.

In accordance with our study findings Bhat et al., had also reported that 80% of the cases occurred in age group of 20-40 years. In our study we have noted snake bite induced AKI in 13.88% of the males and 5.55% in females. Our findings are in accordance with the findings of Mukhopadhyay et al., Sharma et al., and Patil et al. [15-16-17] In this study Males were affected more often than the females since they may constitute the working majority who are actively engaged in farming and other outdoor activities. This study also showed predominantly the younger population were involved (20-40 years of age), probably due to their more ambulant nature.[14-18]

The earliest symptoms seen in the patients of viper bite are pain and swelling at the bitten part. cellulitis and regional lymphadenopathy can be bedside indicators of the amount of toxin which is released by the snake bite. Previous studies have noted cellulitis in 39%- 98.7%.[12-15] We have observed cellulitis in 92.85% of AKI group which is similar to other studies.

In our study, 32.14% of the patients among AKI group, developed bleeding manifestations, which was less than the number in the study which was conducted by Chugh (60-65%).[4]We have observed mortality in 2(14.28%) snakebite patients with AKI. Studies in literature reported mortality among snake bite induced AKI patients as 4(9.52%),7 (14.6%),16(15.3%) and none in another study.[16] Important reasons which contribute to increased mortality were delay in transport, lack of availability of ASV in peripheral hospitals and inappropriate first-aid measures [3,12,17]

CONCLUSION

AKI is a common and serious complication of snake bites, occurring in up to 19.44% of cases. The main predictors of AKI are: Delay in receiving anti-venom treatment (bite to hospital time), Hypotension, Coagulopathy (bleeding disorders), Rhabdomyolysis (muscle breakdown). Other common manifestations include cellulitis, lymphadenopathy, bleeding, and gangrene at the bite site.

Dialysis and supportive care are the mainstays of treatment. However, even with recovery, around one-third of patients develop long-term complications like chronic kidney disease and hypertension. Early recovery of kidney function is associated with better preservation of glomerular filtration rate in the long run.

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