VOLUME - 11, ISSUE - 12, DECEMBER - 2022 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

General Medicine

A STUDY OF INCIDENCE OF ACUTE KIDNEY INJURY IN SNAKE BITE

Dr. Bhuvaneshwari B Post Graduate, General Medicine, Rajah Muthiah Medical College, Chidambaram, Tamilnadu.

Dr. Umarani R* Professor, General Medicine, Rajah Muthiah Medical College, Chidambaram, Tamilnadu. *Corresponding Author

ABSTRACT

Background Snakebite is one of the commonest occupational hazards in our country, especially among the rural population. It leads to a multitude of complications starting from localized cellulitis to even death. AKI is a significant as well as an under reported complication in patients of snake bite which has a tremendous impact on the final outcome. The unfavourable outcome in snake envenomation can be predicted early with the development of AKI. In this study, we wanted to assess the clinical profile of snakebite patients and determine the incidence of AKI in patients of snakebite.

Aim

1. To study the incidence of acute kidney injury in patients following snake bite.
2. To study the clinical and renal profile in patients following snake bite with AKI.

Study Design This was a prospective observational study conducted in a teaching hospital over a period of 12 months. **Materials And Methods** The study included 100 patients of snakebite admitted in the Department of Medicine, Rajah Muthiah Medical College & Hospital done over duration of 12 months. The various data regarding clinical features of the patients, serum creatinine levels, other blood parameters of the patients selected for participation in the study were analysed using simple statistical methods. **Results** Majority of the snakebite victims were males. 30 % (N = 30) of the cases developed AKI. The mortality in patients of snakebite developing AKI was 25 % (n = 4). **Conclusion** From our study we conclude that, the most common manifestation of snake bite was cellulitis (95%) followed by regional lymphadenopathy (60%). The incidence of acute kidney injury in snake bite patient was 30% (N=30). Abnormal coagulation profile was present in 36.6% (N=11) patients with acute kidney injury. Bite to needle time more than 6 hours, oliguria, bleeding manifestations have significant association with acute kidney injury. Snakebite envenomation is associated with a considerable burden of AKI in the developing countries especially among the rural population. Prompt initiation of aggressive treatment improves the final outcome.

KEYWORDS : Acute kidney injury, coagulopathy, snake bite envenomation.

INTRODUCTION

Snake bite is a serious occupational health hazard particularly in rural populations. More than 2,700 species of snakes are recognized, but only about 450 of these have front fangs capable of injecting venom during the bite. In tropical countries snake bite is an important cause of morbidity and mortality, resulting in tens of thousands of deaths each year and innumerable cases of chronic physical handicap.[1]

In India, a large proportion of snake bites occur when people are working barefoot in the fields or while walking at night. Every year 40,000 to 50,000 people die of poisonous snake bite in India.[2] Several educational and preventive actions should be taken in order to protect farm workers, who are the main victims of such environmental hazards.[3] In 2017, WHO included snake bite envenomation in the priority list of neglected tropical disease and plan a strategy aiming to reduce the numbers of deaths by 50% and serious disability by 2030.[4] There are two important groups (families) of venomous snakes in Southeast Asia - Elapidae and Viperidae have short permanently erect fangs. This family includes the cobra, king cobra, kraits, coral snakes and the sea snakes. Viperidae have long fangs which are normally folded up against the upper jaw but, when the snake strikes gets erected. There are two subgroups, the typical vipers (Viperidae) and the pit vipers (Crotalinae).[5]

Fig.1: Four Venomous Snakes in India

Snake venom causes neurotoxicity, acute renal failure and coagulopathy. Acute renal failure is mainly caused by Viperidae family. Such renal failure, usually due to acute tubular necrosis, is frequently reversible. If bilateral cortical necrosis occurs, the prognosis of renal recovery is bad.[6] Snake venom is well known to cause toxic damage to the kidneys. The clinical renal manifestations vary from mild proteinuria, haematuria, pigmenturia to acute renal failure. Bites by haemotoxic snakes and myotoxic snakes are the common causes of renal involvement especially acute renal failure. The possible mechanism of ARF are prolonged hypotension, Disseminated intravascular coagulation, intravascular hemolysis and myoglobinuria. Renal failure should be prevented. Specific antivenom treatment is important and this is usually given before renal failure sets in. Maintenance of good urine flow is important. Either peritoneal dialysis or haemodialysis is lifesaving.[7]

MATERIALS AND METHOD

Inclusion Criteria

1. Definitive history of snake bite
2. Clinical picture consistent with snake bite, as presence of fang marks, cellulitis, coagulopathy, neuroparalysis.
3. Age >12 years.
4. Presence of Acute Kidney Injury, defined as an

a. Abrupt (within 48 hrs) absolute increase in the serum creatinine concentration of ≥0.3mg/dl from baseline value measured after admission to hospital.
b. Serum creatinine more than 1.5 mg/dl.
c. Oliguria of <0.5ml/kg/hr for more than 6 hrs.
d. Urine output less than 400ml/day.

Exclusion Criteria

1. Patient with known case of Chronic Renal Failure.
2. Patient with co-morbidities such as diabetes mellitus and systemic hypertension.

3. Patients on nephrotoxic drugs.
4. Patients who had intramuscular injection one week before snake bite.
5. Patients not willing to give consent.

Diagnostic Criteria

Akin Criteria (acute Kidney Injury Network)

	Serum creatinine criteria	Urine output
Stage 1	Increase in serum creatinine ≥0.3md/dl (≥26.4µmol/l) or increase to ≥150% to 200% (1.5 fold to 2 fold) from baseline	<0.5 ml/kg/h for >6 h
Stage 2	Increase to >200% to 300% (>2 fold to 3 fold) from baseline	<0.5 ml/kg/h for >12 h
Stage 3	Increase in serum creatinine to >300% (>3 fold) from baseline, or serum creatinine ≥4.0mg/dl (≥354µmol/l) with acute increase of atleast 0.5mg/dl	<0.3ml/kg/hr for 24 hours, or anuria for 12 hours

RESULTS

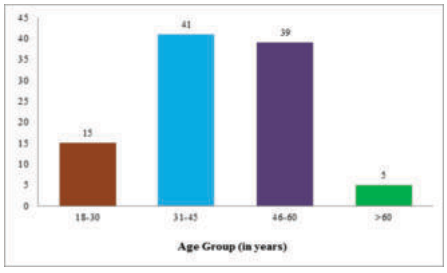

Fig.2: Age Distribution among study Participants

The total number of participants included 100 in this study and the common age group was between 31 and 45 years (N=41, 41%) followed by 46 to 60 years (N=39, 39%). The mean age among the participants was 44.53 ± 11.07 years. The minimum age was 18 years and maximum age was 65 years.

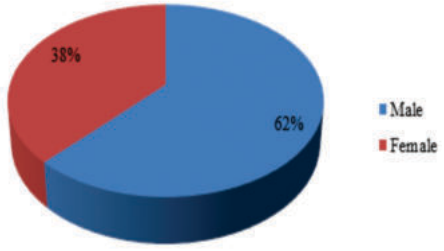

Fig 3: Pie chart showing gender distribution

Among 100 patients, 62(62%) were males and 38(38%) were females.

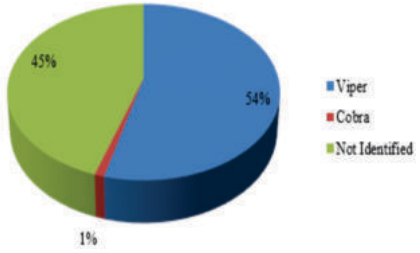

Fig 4: Pie chart showing distribution according to identification of snake

In our study about 54 (54%) of study participants, the snake was identified to be viper and in 1 (1%) participant it was cobra. Snake was not identified in 45 (45%) of study participants.

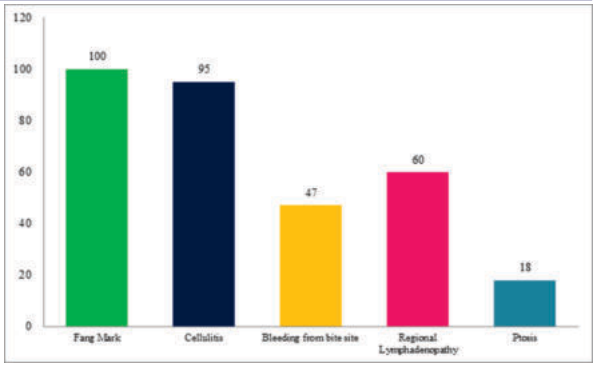

Fig 5: Bar chart showing distribution of clinical manifestations

All the participants had fang marks (N=100, 100%), 95 (95%) had cellulitis, 60 (60%) had regional lymphadenopathy, 47 (47%) had bleeding from bite site and 18 (18%) had ptosis.

Table 5: Wbct Estimation In Study Participants

WBCT in minutes	Total	Percentage
< 20	19	19
>20	81	81

Table 6: Mean blood urea levels among the study participants over time

Duration	Minimum	Maximum	Mean	SD	P value compared to baseline
Baseline	20	66	33.89	8.14	-
24 hours	22	114	39.90	14.61	0.001*
48 hours	20	99	39.16	13.25	0.001*
72 hours	21	80	36.57	11.63	0.003*

*Statistically significant.

The mean blood urea level at the base line was 33.89±8.14. Around 24 hours, the mean increased to 39.90±14.61 and then decreased to 39.16±13.25 around 48 hours. By 72 hours the blood urea levels further decreased to 36.57±11.63. The change was statistically significant at 36, 48 hours and at 72 hours.

Table 7: Mean serum creatinine levels among the study participants over time

Duration	Minimum	Maximum	Mean	SD	P value compared to baseline
Baseline	0.3	2.5	0.93	0.34	-
24 hours	0.6	5.2	1.26	0.88	0.001*
48 hours	0.5	4.2	1.12	0.57	0.001*
72 hours	0.6	3.2	0.99	0.43	0.005*

*Statistically significant.

The mean blood urea level at the base line was 0.93±0.34. Around 24 hours, the mean increased to 1.26±0.88 and then decreased to 1.12±0.57 around 48 hours. By 72 hours the blood urea levels further decreased to 0.99±0.43. The change was statistically significant at 36, 48 hours and 72 hours, when compared to baseline.

Table 8: Mean urine output levels among the study participants over time

Duration	Minimum	Maximum	Mean	SD	P value compared to baseline
0-6 hrs	100	850	365.60	163.61	-
24 hours	820	3500	1579.20	655.13	0.001*
48 hours	1000	3000	2019.27	594.42	0.001*
72 hours	1200	3500	2248.96	481.01	0.001*

*Statistically significant.

The mean urine output level at 0-6 hrs was 365.60±163.61 ml. Around 24 hours, the mean increased to 1579.20±655.13 ml and then again increased to 2019.27±594.42 ml around 48 hours. By 72 hours the mean urine output level had further increased to 2248.96±481.01 ml. The change was statistically significant at 36, 48 hours and 72 hours, when compared to baseline.

Table 9: Association between different variables and AKI

Variables		Acute kidney injury				X2	P value
		Present		Absent			
		N	%	N	%		
Bite to needle time (in hours)	0-2	0	0	12	17.1	26.64	0.001*
	3-6	14	46.7	51	72.9		
	7-12	12	40	7	10		
	>12	4	13.3	0	0		
Identification of snake	Known	17	56.7	38	54.3	0.048	0.826
	unknown	13	43.3	32	45.7		
Reduced urine Output	Present	20	66.7	19	27.1	13.78	0.001*
	Absent	10	33.3	51	72.9		
Cellulitis	Present	30	100	65	92.9	2.25	0.133
	Absent	0	0	5	7.1		
Regional Lymphadenopathy	Present	22	73.3	38	54.3	3.17	0.075
	Absent	8	26.7	32	45.7		

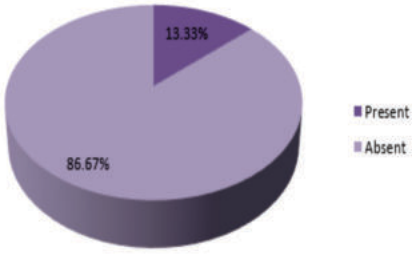

Fig 10: Pie Chart Showing Need For Haemodialysis Among Study Participants With Acute Kidney Injury

Out of 30 patients with acute kidney injury, only 4(13.33%) participants required haemodialysis, the remaining 26(86.67%) participants did not required hemodialysis.

DISCUSSION

In our study, it was found out the minimum age of the person with snake bite was 18 years old and maximum age was 65 years old & the mean age of the patients were 44.53 ± 11.07 years. The commonest age group was 31 to 45 years (N=41, 41%), followed by the age group of 46 to 60 years (N=39, 39%). In our study that male patients (N=62, 62%) outnumbered the female patients (n=38, 38%).

In our study lower extremities were the common bitten part (N=91, 91%) than upper extremity (N=9, 9%). These results were comparable to the study conducted by Suresh Kanna et al.[8] where 70% participants had snake bite over lower extremity.

In our study the mean bite to needle time was 5.21±2.96 hrs. 65% had bite to needle time of 3 to 6hrs, the minimum was 1 hr and the maximum was 16hrs. When the bite to needle time was more than 6 hours, there was 5 times increased risk of developing acute kidney injury than those with bite to needle time of less than 6 hours. This significant association was relatable to the study conducted by Singh RR et al.[9]

Cellulitis was found to be the most common manifestation (N=95, 95%) followed by regional lymphadenopathy (N=60, 60%). These results were consistent with study conducted by Suresh kanna et al.[8] and Nagnath R et al.[10]

In our study 100% participants who developed acute kidney injury has bleeding manifestations which was similar to study conducted by Suresh Kanna et al,[8] and higher than study conducted by Chugh KS.[11]

In our study oliguria was observed in 30(100%) participants with AKI, which was similar to the study conducted by suresh kanna et al.[8] (N=43,100%), Out of 30 participants with acute kidney injury, 30(100%) had cellulitis, 22(73.3%) had regional lymphadenopathy, 21(70%) had bleeding from bite site, 12(40%) had ptosis, 20(66.7%) had reduced urine output, 20(66.7%) had bleeding from the gums, 4(13%) had vomiting. Significant association was present between reduced urine output, bleeding manifestations, vomiting, ptosis and acute kidney injury.

Among the participants with reduced urine output and bleeding from gums, there were was 3 times increased risk of developing acute kidney injury. Whole blood clotting time was more than 20 minutes in 81% (N=81) of participants and less than 20 minutes in 19% of participants.

Coagulation profile was abnormal in participants with acute kidney injury. Out of 30 participants with acute kidney injury 100% has whole blood clotting time more than 20 minutes, 36.6% had elevated INR and APTT. This results was comparable to study conducted by Mittal BV et al.[12] where 73.17% had abnormal coagulation profile.

Cellulitis feature was found to be more common in patients with acute kidney injury. Similarly regional lymphadenopathy, abnormal coagulation profile, number of ASV vial used increases as severity of acute kidney injury increases.

Summary

- A prospective observational study was conducted among 100 patients with snake envenomation in Rajah Muthiah Medical College and Hospital for 12 months.
- The majority of patients was in the age group of 31-45 years (mean age = 44) with male preponderance 62%.
- The lower extremities were the common bitten part.
- 54% of snake bite were due to viper as identified by the patients.
- In our study the most common presentation was cellulitis (95%) followed by regional lymphadenopathy (60%).
- The incidence of acute kidney injury in snake bite patient was 30% (N=30), of which 19 patients had AKI stage 1, 7 patients had AKI stage 2, 4 patients had AKI stage 3.
- Abnormal coagulation profile was present in 36.6% (N=11) patients with acute kidney injury. Bite to needle time more than 6 hours have significant association with acute kidney injury.
- Clinical manifestation like oliguria, bleeding manifestations have significant association with acute kidney injury.
- The requirement of RRT in cases of snakebites induced AKI in the study was 13.33% (N=4).
- Snake envenomation leading to acute kidney injury is a major health issue due to delayed care. Early administration of anti-snake venom can reduce mortality by preventing the development of acute kidney injury.

Limitations Of The Study

- Identification of snake was not possible in all cases.
- All the data collected and results were limited to single geographic locality.

REFERENCES

1. Warrell DA. Injuries, envenoming, poisoning, and allergic reactions caused by animal. In: Warrell DA, Cox TN, Firth JD, Benz J Jr, editors. Oxford Textbook of Medicine. Oxford: Oxford University Press; 2003. p. 923-45.
2. Mohapatra B, Warrell DA, Suraweera W, Bhatia P, Dhingra N, Jotkar RM, et al. (2011) Snakebite Mortality in India: A Nationally Representative Mortality Survey. PLoS Negl Trop Dis 5(4): e101.

3. Lívia SR, Glória Elisa MF, Carla CP, Emmanuel BA. Acute Kidney Injury Caused by Bothrops Snake Venom. Nephron Clin Pract 2011;119:131-7.
4. World Health Organization (WHO) Snakebite envenoming - A strategy for prevention and control. WHO Neglected tropical diseases/Snakebites reference number: 9789241515641. [August 1, 2019];WHO Press. 2019c.
5. Warrell DA. WHO/SEARO Guidelines for the clinical management of snakebite in the Southeast Asian Region. SE Asian J Trop Med Pub Hlth 1999;30:1-85.
6. Kardong KV. The evolution of venom apparatus in snake from Colbrids, Viperids and Elapids. Mem Inst Butantan 1982;46:105-18.
7. Sitprija V. Snakebite Nephrology. Asian Pacific Society of Nephrology. 2006;11:442- 8.
8. Dr. Suresh Kanna Singaram, 2 Dr. Elanchezhian JA, 3 Dr. Balamurugan Subbiah, 4 Dr. Shankar Radhakrishnan Incidence of acute kidney injury, International Journal of Medical and Health Research ISSN: 2454-9142 www.medicalsciencejournal.com Volume 4; Issue 1; January 2018.
9. 9. Singh RR, Uraiya D, Kumar A, Tripathi N. Early demographic and clinical predictors of developing acute kidney injury in snake bite patients: A retrospective controlled study from an Indian tertiary care hospital in North Eastern Uttar Pradesh India. Indian J Crit Care Med 2016;20:404-8.
10. Dr.Nagnath Redewad, Dr.S.D.Bhaisare, et al. Management and outcome study bite cases in central India. Scholars Journal of Applied Medical Sciences (SJAMS), 2014;2(1D):435-441.
11. Chugh KS, Aikat BK, Sharma BK, Dash SC, Mathew T, Das KC: Acute renal failure following snake bite. Am J Trop Med Hyg 24:692—697, 1975.
12. Mittal BV. Acute renal failure following poisonous snake bite. J Postgrad Med 1994;40:123.