Section: Forensic Medicine and Pathology

Original Research Article

STUDY OF KIDNEY CHANGES IN SNAKE BITE CASES AUTOPSIED IN A TERTIARY CARE HOSPITAL – AN AUTOPSY BASED CROSS SECTIONAL STUDY

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ABSTRACT

Background: Snake bite is an acute life threatening medical emergency and preventable public health hazard. It is more common in rural areas. In India about 2,00,000 bites per year of which nearly 10,000 to 15,000 ends in death. Proper understanding and early recognition of the toxicity will prevent the deaths.[1]30,000 species of snake world wide. 500 species are Venomous. 52 Venomous species are found in Indian subcontinent. About 70% of snakebites are by non-poisonous snakes. 30 – 40% of venomous snakebites cause no symptoms or signs (dry bite). **Venomous snakes: Elapidae** – Common Cobra, King Cobra, Common Krait, Banded Krait, Mamba. **Viperidae** – Russell's Viper, Saw-scaled Viper, Hump nosed Pit viper, Bamboo pit viper. **Hydrophobidae** – Sea snakes. The big four snakes are cobra - predominantly neurotoxic. Common krait predominantly neurotoxic. Russell's viper predominantly hemotoxic. Saw-scaled viper predominantly hemotoxic.[2] Snake venom is the toxic saliva secreted by modified parotid glands, and is a clear, amber - colored fluid. It is the most complex of all poisons, containing more than 20 components. The enzymes present in snake venom are proteases, collagenases, hyaluronidase, phospholipase, metallo-proteinases, arginine-ester hydrolase, endogenases, thrombogenic enzymes and autocoids. Hyaluronidase – allows rapid spread of venom through subcutaneous tissue. Phospholipase A2 – acts on RBC membrane and causes hemolysis, promotes muscle necrosis, Thrombogenic enzymes – promote formation of weak fibrin clot, activates plasmin results in consumptive coagulopathy.[3]The principle effects of envenomation are on the nervous system, kidneys, heart, lungs, liver, blood coagulation, vascular endothelium and local effects at the site of bite.[4]

INTRODUCTION

Acute kidney injury is an important complication of snake bite. It is a major cause for mortality. Acute kidney injury is common after bites from myotoxic or hemotoxic snakes. Tubular necrosis, cortical necrosis, interstitial nephritis, glomerulonephritis and vasculitis are the renal pathological changes. Hemodynamic changes caused by vasoactive mediators, cytokines and direct nephrotoxicity account for development of nephropathy. Acute kidney injury is caused by haemorrhage, hypotension, disseminated intravascular coagulation, intravascular hemolysis and rhabdomyolysis which further leads to renal ischemia. The incidence of acute kidney injury caused by these snakes varies from 5% to 29%. It dependsupon the species of snake and severity of envenomation. The onset of acute kidney injury is from few hours to 96 hours after the bite.[5] The duration of acute kidney injury after snake bite ranges from 2 to 3 weeks. Tubular necrosis is an important pathological correlate of acute kidney injury[6]. Prolonged acute kidney injury with oligoanuria after snakebite is an indicative of cortical necrosis or acute tubular necrosis associated with interstitial nephritis or extracapillary glomerulonephritis[7]. The severity and extent of the disease depends upon the chemical composition of the venom and timely medical intervention[8]. There are very few studies done on the Study of kidney changes in persons died of snake bites. Hence the present study on kidney changes in snake bite cases autopsied at Govt. Medical College, Karur is taken up.

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MATERIALSANDMETHODS

Study Design: Present study is a cross sectional study of snake bites cases dead bodies autopsied at the Department of Forensic Medicine and Toxicology, Govt. Medical College, Karur during the period from January 2024 to December 2025. All the data related to the snake bite death cases were analysed, paying particular attention to demographics to make a comprehensive study. Standard autopsy protocol was followed and relevant samples/viscera were subjected to chemical analysis & histopathological examination of kidneys is undertaken in all cases. Exclusion criteria were bite from other animals, negative histories, decomposed bodies and cases with pre-existing renal diseases. A standard form was used to collect information from materials.

RESULTS

Table1: Sex ratio of snakebite cases

Total no of snake bite cases	Males	Females
17	9	8
100%	53%	47%

Table 2: Age wise distribution of snakebite cases

Age group in years	No of cases		Total	Percentage of total cases
	Male	Female		
0 - 30	0	0	0	0%
31 – 40	2	2	4	26%
41 – 50	1	2	3	18%
51 – 60	1	3	4	26%
61 – 70	4	1	5	29%
71 – 80	1	0	1	1%
>80	0	0	0	0%

Table 3: Timing of snake bite, type of snake, hospital death or brought dead, Kidney changes

Timing	Type	Victim status while snake bite/bite mark location	Hospital death or Brought dead	HD means duration of survival before death after snake bite	Kidney Changes
03.00 PM	Common krait	Farm work/ Left index finger	HD	3 hours 20 minutes	No
01.00AM	Common krait	Sleeping in home/ Left gluteal region	HD	1 hours 40 minutes	Yes
03.30AM	Common krait	Sleeping outside home/ Right thigh front	HD	11 hours 45 minutes	Yes
05.00AM	Common cobra	Using restroom in home/ Front of left leg	BD	-	Yes
06.00AM	Common krait	While walking near farm	BD	-	Yes
07.00 PM	Common krait	Sleeping in home/ Back of left foot	BD	-	Yes
08.00AM	Russell's Viper	Picking corn stalks/ Inner aspect of left ankle	HD	1 hours 50 minutes	Yes
05.30AM	Russell's Viper	Going to garden/ Left foot	BD	-	Yes
08.15AM	Saw scaled viper	Garden work/ Left foot 3rd toe	HD	5 days 1 hour	Yes
07.00AM	Common cobra	Cutting grass/ Left index finger	HD	1 hour 40 minutes	Yes
07.00PM	Common cobra	Using restroom in open land/ Inner aspect of left foot	BD	-	Yes
08.30AM	Saw scaled viper	Working in farm/ Right little toe	BD	-	Yes
09.00PM	Russell's Viper	Putting grass to cow/ Left foot	HD	46 hours 8 minutes	Yes
04.15AM	Russell's Viper	While sleeping/ Left upper limb	HD	26 hours 45 minutes	Yes
11.30AM	Saw scaled viper	In Farm/ Right foot	HD	28 hours 20 minutes	Yes
08.00PM	Common cobra	Working in farm/ Outer aspect of right heel	HD	25 hours 30 minutes	Yes
06.40PM	Russell's Viper	Walking in farm/ Left foot	HD	13 hours 23 minutes	Yes

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Table 4: Local findings in Snake bite cases

Local finding	No. of Cases			
	Male	Female	Total	Percentage
Edema	2	1	3	25%
Cellulitis	3	2	5	41%
Gangrene	0	1	1	9%
Regional lymphadenopathy	2	1	3	25%

Table 5: Histopathological findings in kidney in Snake bite cases

Glomeruli	No. of cases in Common Cobra	No. of cases in Common Krait	No. of cases in Russell's Viper	No. of cases in Saw scaled viper
Necrosed tubules	1			
Chronic inflammatory cells		1		
Acute tubular necrosis	2	1	3	2
Coagulative necrosis			1	2
Interstitial hemorrhage	1	1		

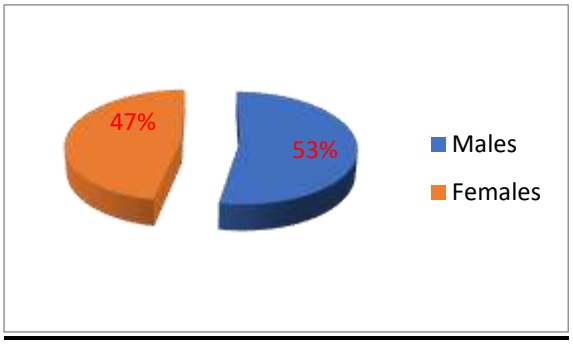

Table No.1& above Pie chart shows sex ratio of snake bite cases. In that 17 snake bite cases dead bodies 9 cases (53%) were males and 8 cases (47%) were females. This shows the more number of male sex cases in the snake bite dead bodies.

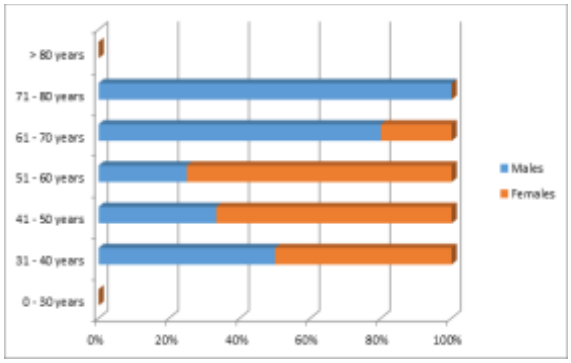

Table No.2 & above bar diagram shows age wise distribution of snake bite cases. More number of cases in the age group of 61 – 70 years 29% of total cases. Next to it in the age group of 31 – 40 years & 51 – 60 years 26% of total cases each. Next to it in the age group of 41– 50 years 18% of total cases. Least number of cases in the age group of 71– 80 year 1% of total cases. Nil cases in the age group of 0 - 30 years & more than 80 years. Most of the cases were found to be working age group in rural population. Men are more common in snake bite compared to woman. More number of working men in Karur district can be reason for such reason.

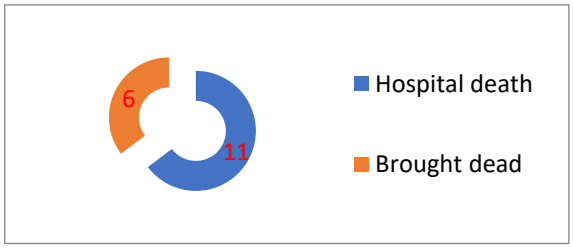

Table No.3 & above chart shows place of Timing of snake bite, type of snake, victim status while snake bite/bite mark location, hospital death or brought dead, Hospital death means duration of survival before death after snake bite, Kidney changes in snake bite cases. Almost in 16 cases out of 17 cases kidney changes were noted. The kidney changes noted were acute tubular necrosis, coagulative necrosis, congested blood vessels, Congested renal glomeruli and chronic inflammatory cells.

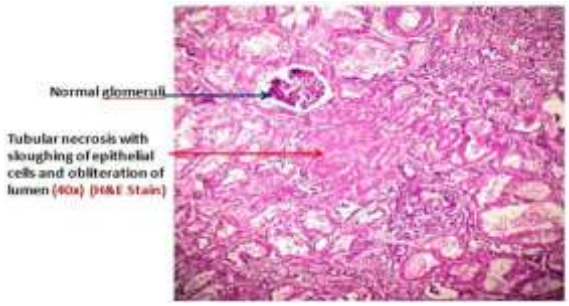

Figure 1: Pictomicrograph of tubular necrosis with sloughing of epithelial cells and obliteration of lumen

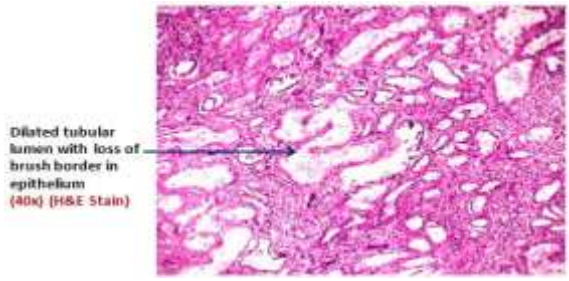

Figure 2: Pictomicrograph of dilated tubular lumen with loss of brush border in epithelium

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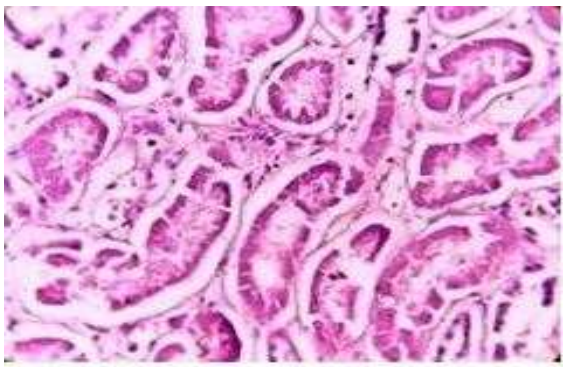

Figure 3: Pictomicrograph of tubules with coagulative necrosis of lining epithelial cells

DISCUSSION

Snake bites have the highest incidence in Asia and represent an important health problem. Proteinuria, hematuria, pigmenturia and renal failure are the important clinical renal manifestations. Snakes with hemotoxic or myotoxic venoms cause nephropathy. Viperidae group cause acute renal failure. It is also caused by sea snakes and the colubridae group, but the substantial proportion of these cases result from viper bites. The incidence of acute renal failure following poisonous snakes varies from 13 to 22% following Echiscarinatus or Russell's viper bite[9]. Acute kidney injury is an indication for ASV. In living persons, we can do dialysis for acute kidney injury. However, in a study made by Raab and Kaiser snake venom has been shown to have a direct cytotoxic effect to renal tubular cells. Hauler and Brazil in a study attributed renal tubular lesions partly to the effect of lysolecithin formed by phospholipase activity. It is thus possible that renal failure might also be due to the direct nephrotoxic effect of the venom.[10]

In the present study, out of 17 cases of snake bite, age group commonly involved is 30 to 70 years. This was contrast to as study conducted by Vijay Balaji R, T. Selvaraj autopsy Study of Renal Lesions in Snake Bite Cases in which age group involved were 50 years and above.[11] This percentile differs from other studies such as Chugh et al where mean age of subjects was 33±10 years.Most affected being agricultural labourers, maximum fatality occurred at winter and during activity. Lower limb was the commonest site involved and majority of cases received anti snake venom, even though bite to ASV time is more. Among the local findings, local pain and swelling predominated. Histopathological study of kidney revealed that acute tubular necrosis, coagulative necrosis, congested blood vessels, Congested renal glomeruli and chronic inflammatory cells. Prevalence of acute kidney injury in our study was 94% which is very high compared to previous studies. Further monitoring of renal parameters even in neurotoxic snake bite and prompt dialysis should be done. Snake bite during activity predominated the snake bite during sleep. This is in contrast with Rupindersharma et al who demonstrated bite during sleep was more compared to bite during activity. The difference in numbers can be explained by the fact that neurotoxic bites especially Krait is most common during night and at indoors and it is predominant in North India. Lower limb was the commonest site of snake bite in our study followed by upper limb and abdomen. People accidentally step onto the snake during walking.

CONCLUSION

Snake bites are usual accidental. Homicide and suicide are rare. One case of homicide had been recently reported for insurance claim.

Avoidance of Snake bite: Snake bites more commonly involve lower limbs. Use of protective foot wears with boots, using stick to clear the grass before cutting, using stick beforehand while going in dark, using torch lights, avoid outdoor sleeping and sleeping on floor to prevent common krait snake bites.

Snake bite envenomation is a major public health problem in tropical countries. Acute kidney injury is an important complication and major cause of mortality in patients with snake bites. Although bites from all the venomous snakes are known to cause acute kidney injury, a substantial proportion of these cases results from viper bites. Exact pathogenesis of acute kidney injury following snake bite is not well established. The pathogenesis of renal lesions is multifactorial and has been attributed to the nephrotoxicity of venom, hypotension, circulatory collapse, and intravascular hemolysis with hemoglobinuria, myoglobulinuria, disseminated intravascular coagulation, hemolytic uremic syndrome, sepsis, and other factors such as hypersensitivity to venomous or anti venomous protein. On pathological investigations two main renal lesions responsible for acute kidney injury are tubular necrosis and renal cortical necrosis.[12] This study concludes that acute kidney injury occurs in 94% victims of snake bite. The common manifestations include cellulitis, bleeding manifestations and gangrene at the bite site. The type of snakebite is an important factor in the development of acute kidney injury and the Russell's viper bite is more commonly associated with it.[13] The ASV therapy time, bite to renal insufficiency time and coagulation abnormalities were the major prognostic factors predicting the final outcomes. Dialysis and a supportive treatment appear to be the mainstay of the therapy in the cases which are complicated by renal failure. The indications for the dialysis in acute kidney injury include anuria of more than 48 hours, severe hyperkalemia which does not respond to the medical

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therapy, pulmonary oedema, severe acidosis and rising blood urea and serum creatinine.[14]

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