

Acute Kidney Injury in Snake bite - Indian scenario

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Acute Kidney injury (AKI) -previously known as acute renal failure (ARF) is characterized by the sudden impairment of kidney function resulting in the retention of nitrogenous & other waste products which are normally cleared by the kidneys. AKI is not a single disease but rather ,a designation for a heterogenous group of conditions that share common diagnostic features specifically ,an increase in the blood urea nitrogen(BUN) concentration and/or an increase in the plasma or serum creatinine(sCr) concentration ,often associated with a reduction in urine volume.¹

AKI complicates 5-7% of acute care hospital admissions & upto 30% admissions to intensive care unit ¹Many etiologies for AKI are region specific.

AKI has been reported in 5-30% of snake bites & it is preventable cause of AKI in India.

The total number of Snake bites has been estimated to be 54 million /year with 125345 deaths ,100000 of which were in Asia & 20000 in Africa ²

Bites by haematotoxic & myotoxic snakes are the common causes of renal involvement.

Viper bite accounts for the majority of snake bite induced AKI but is also reported with Krait & sea snake bites³

Snake venoms can cause cellular injury through enzymes, polypeptide toxins, cytokines & mediators ⁴ Phospholipase A2 is the principal constituent in Viper venom & it has damaging effect on mitochondria, vascular endothelium & membrane of red blood cells, leukocytes & platelets. Viper venom also contains

arginine ester hydrolases which increase capillary permeability & cause shift of fluid from the vascular to the interstitial space. Kininogenase is another constituent which mediates hypotension by the release of bradykinins.

Hyaluronidase contributes to tissue damage & hemorrhaging causes spontaneous bleeding³

The highly vascularized organ - the kidney is prone to venom toxicity.^{3,7}

All renal structures can be involved in Snake envenomation.

There is broad clinical spectrum of renal involvement in snake bite. Clinical manifestations vary from mild proteinuria, hematuria, pigmenturia to AKI/ARF⁴ The renal lesions of clinical significance in envenomed patients are acute tubular & patchy or diffuse cortical necrosis. Glomerulo nephritis, interstitial nephritis,& papillary necrosis & occasional cases of necrotizing arteritis of the interlobular arteries have been reported^{8,9,10}.

Clinicopathological correlation is reported in literature.¹¹ (**Table I**)

Since the multitude of mechanisms of ARF exist & there is varying histological involvement, the outcome of a patient cannot be determined by a single factor.

Incidence of AKI in Snake bite has been reported to be more in Asian countries including India. Prevalence of AKI in Snake bite was reported as 20.48% cases in one of the study from central India.¹² whereas other studies from Nigeria, Israel, Thailand and Southeast Anatolia has been found to be 1-10%, 6.2%, 5% and 8% respectively^{13, 14}. The higher prevalence probably suggests delay in taking the patient to hospital after snake bite, which may be related to social factors, and the long distances that the tribal and rural people have to travel before reaching a health facility as per author.

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Table I

Pathology	Clinical renal manifestation
Mesangiolytic	Normal renal function, normal urine finding, or haematuria
Mesangial proliferative glomerulonephritis	Normal renal function, normal urine finding or haematuria, or mild proteinuria, occasional heavy proteinuria with complete resolution
Diffuse proliferative glomerulonephritis	Mild renal failure, haematuria, proteinuria
Extracapillary proliferative glomerulonephritis (usually associated with tubular necrosis)	Severe renal failure and haematuria with prolonged clinical course
Vasculitis (usually associated with tubular necrosis)	Severe renal failure with prolonged clinical course
Tubular necrosis	Acute renal failure
Acute diffuse interstitial nephritis (usually associated with tubular necrosis)	Severe renal failure with prolonged clinical course
Cortical necrosis	Severe acute renal failure with residual damage or without recovery

Reported mortality of Snake bite induced AKI is 15.5%¹² while **Bansod et al (2012)** observed 19.05% mortality in his study. This is less as compared to estimates from other studies from India (22-50%)^{15,16,17} **Kalantri et al(2006)** reported an overall mortality of 11% in venomous snake bite patients.¹⁸ The mortality can be prevented by intervention at various levels, which include early transfer of the patient to a primary health care facility, where ASV should be administered at the earliest. The high risk patients should be identified early and referred to higher center. Patient's fluid status should be optimised, with early detection and treatment of coagulopathy. Further, renal replacement therapy should be initiated at the earliest to prevent serious consequences of uremia.

On renal replacement therapy Various authors have observed better outcome on haemodialysis as compared to peritoneal dialysis. Reported mortality of cases of AKI in snake bite on Hemodialysis is 7.4% as compared

to peritoneal dialysis 37.2% & 33.3% in another¹² suggesting Hemodialysis is better option as renal replacement therapy.³

Considering all this clinical data, Specific antivenom remains the main stay of treatment & it is usually given before renal failure/AKI sets in. Monovalent antivenoms are preferred. In India Polyvalent anti venom is available. Either peritoneal dialysis or haemodialysis is life saving & should be performed early & frequently. No other treatment for AKI due to snake bite is well established. Early management of Snake bite cases with ASV & adequate hydration can prevent acute renal injury due to Snake bite.

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