

**Original Article****Study of Epidemiology, Morphological and Histopathological Changes of Stomach and Kidneys in Poisonous Snake Bite**

Authors

**Dr Alakesh Halder<sup>1</sup>, Dr Niloy Kumar Das<sup>2</sup>, Dr Tumpa Mandal<sup>3</sup>  
Dr Ashok Kumar Samanta<sup>4</sup>**<sup>1</sup>Tutor, Department of Forensic Medicine, ESIC Medical College, Joka, Kolkata 700104<sup>2</sup>Assistant Professor Department of Pediatric Medicine, ESIC Medical College Joka, Kolkata – 700104<sup>3</sup>PGT Department of Forensic Medicine NRS Medical College & Hospital, Kolkata – 700014<sup>4</sup>Professor & HOD, Department of Forensic Medicine, ESIC Medical College Joka, Kolkata – 700104

Corresponding Author

**Dr Alakesh Halder, MD**

Sonarpur, Paschim Das Para Pin- 700 150, WB

Email: [dralakeshhalder@gmail.com](mailto:dralakeshhalder@gmail.com), Telephone: 9804642412 [Mobile]**Abstract**

Snakes have always managed to grab human attention and have been an object of fear since historic civilisation. Deaths due to poisonous snakebite are a significant health related problem especially the rural area in tropical countries. We investigated the renal and stomach changes at autopsy and histology of poisonous snake bites. Our study included the macroscopical and microscopical examination of stomach and kidneys of 53 cases of poisonous snake bite victims who were admitted to Nil Ratan Sircar Medical College, Kolkata as a result of development of acute renal failure following envenomation. In 100% cases vasculotoxic snake bite resulted in kidney congestion along with different types of hemorrhage. Only 44% cases of neurotoxic snake bite victims had kidney congestion in absence of any hemorrhage. vasculotoxic snake bite cases tubular necrosis was the commonest findings 89% followed by interstitial edema and glomerulonephritis both in 57% cases. Related to stomach findings out of 9 neurotoxic snake bite only 33% cases had congestion, 67% had nonspecific changes where as in all cases of vasculotoxic snake bite had congestion, 36% cases had patchy submucosal hemorrhage and 39% cases had diffuse submucosal hemorrhage.

**Keywords:** Snake Bite, Congestion, Sub mucosal hemorrhage, Tubular Necrosis, Autopsy.**Introduction**

Snake bite is a common medical emergency and occupational hazards more so in India where farming is a major source of employment. WHO has estimated that nearly 125000 deaths occurred among 250000 poisonous snake bite worldwide every year. India to have most envenoming in the world that is 81000 envenomings and 11000

deaths annually<sup>(1)</sup>. Renal involvement is well established<sup>(2)</sup>. Most Indians are victims of Russels Viper or Echis Carinatus bites which cause acute kidney injury.<sup>(3)</sup>

Most snake bites study in India deal with clinical and management aspects; there are only a few epidemiological studies in Eastern India<sup>(4)</sup>. The aim of our study is to analyse the epidemiological

details of fatal snake bite cases to find out the changes occurring in stomach and kidneys

### Materials and Methods

We conducted a prospective, descriptive, observant-ional cross sectional autopsy based study in association with the clinical records available from investigating agencies. The Hospital and mortuary-based study was carried out taking 53 cases of snake bite in a Medical College, from Kolkata from 1st April 2013 to 31st March 2014 after receiving ethical clearance from the institutional ethics committee.

All the dead bodies with the history of poisonous snake bite brought to NRSMCH for medicolegal autopsy were included in the present study. Decomposed bodies and subjects having preexisting pathology in kidneys were excluded. A detailed history of circumstances of snake bite and treatment were noted. The macroscopic and microscopic appearance of stomach and kidneys of the deceased were studied at pathology department of NRSMCH. Tabulation, data and statistical analysis was done in the department of Forensic Medicine in collaboration with the department of pathology at Microsoft Excel (version 2016).

### Results

In this study, there were 53 cases of death due to snake bite comprising 2.02% of all autopsies done at NRSMC&H morgue. Sex ratio was 2.1:1 (male : female). Mean age of subjects was  $33.8 \pm 17.34$  years, with a range of 67 years. 85% of subjects were from rural area. Incidence of snakebite was maximum in rainy season in the months of July, August and September 52% (28)

In 70 % cases, type of snake was identified. In 53% (15) cases vasculotoxic snake bite involved where as in 18% cases neuro-toxic snakebite was involved. In 54.7% (29) cases snake bite was in lowerlimb. 32% (17) were died within 1 to 3 days of the bite. Only 11% (6) were survived more than 7 days after the snakebite. Out of 9 victims of neurotoxic snake bite, 56% (5) died within first 24 hours of while rest succumbed within 3 days. Out

of 28 Viperine bites, only 18% (5) died within 1 day and the maximum fatality occurred between 1-3 days 36% (10). Among 16 victims of unidentified snakebite, 75% (12) died on the first day of bite and 1 patient succumbed after 7 days of treatment. The mean time interval between snake bite and initial treatment at the hospital was  $5.3 \pm 2.7$  hour for viper bite and for the neurotoxic bite it was  $7 \pm 3.6$  hour.

In neurotoxic snake bite, 78% (7) had extravasation of blood only and none had tissue involvement or blister formation. In cases of vasculotoxic snake bite, all cases had extravasation of blood and 43 % (12) had tissue involvement while 36% (10) had a blister as well.

Both kidneys were involved almost in the same frequency. Congestion of kidney was evident in 75% (40) victims. Macroscopic findings of kidney showed in Table 1.

All (100%) vasculotoxic snake bite resulted in kidney congestion along with different types of hemorrhage. Only 44% (4) cases of neurotoxic snake bite victims had kidney congestion in absence of any hemorrhage. This difference is statistically significant ( $p < 0.000$ ).

Histopathological findings were tabulated in Table 2. In vasculotoxic snake bite cases tubular necrosis was the commonest findings 89% (25), followed by interstitial edema and glomerulonephritis both occurred in same frequency (57%) and vascular sclerosis in 17% (5) cases. Among neurotoxic snake bite victims interstitial edema was the commonest findings 44% (4) followed by tubular necrosis in 33% (3) cases. There were no features of glomerulonephritis or vascular sclerosis

The macroscopic feature of stomach was depicted in Table 3. Out of 9 neurotoxic snake bite only 33% (3) had congestion, 67% (6) had nonspecific changes. None had any feature of hemorrhage. Where as in all cases of vasculotoxic snake bite had congestion, 36 % (10) cases had patchy submucosal hemorrhage and 39% (11) had the diffuse submucosal hemorrhage. Difference between two types of snake bite was statistically significant ( $p < 0.000$ )

**Table-1** Nature of snake bite and period of survivability

Duration After Snake Bite	Neurotoxic Snake Bite	Viper Snake Bite	Unidentified	Total
Less than 24 hours	5	5	12	22
1-3 days	4	10	3	17
3-7 days	0	8	0	8
More than 7 days	0	5	1	6
Total	9	28	16	53

**Table 2** Macroscopic findings of kidney

Findings	Number	Percentage (%)
Congestion only	16	30
Congestion with focal medullary hemorrhage	9	17
Congestion with patchy cortico medullary hemorrhage	11	20.8
Congestion with diffuse hemorrhage	4	7.5
Not related	4	7.5
Total	53	100

**Table 3** Histopathological appearance of kidney

Findings	Number	Percentage
Nothing specific	6	17
Tubular necrosis	36	67.9
Glomerulonephritis	21	39.6
Interstitial edema	28	52.8
Tubular degeneration	8	15.1
Vascular sclerosis	5	9.4
Others	12	33.9

## Discussion

In our study death due to snake bite comprising 2.02% of all autopsies done at NRSMCH Morgue. This percentage is less than those observed by Mohapatra B et al <sup>(5)</sup> in their study based in Andhra Pradesh (6.2%) or that in Burdwan District by Hati AK et al <sup>(6)</sup> where prevalence was 10.1%. This apparent reduction in prevalence may be due to the fact that the present study was conducted at urban tertiary Hospital.

Sex ratio 2.1:1(male:female) in our study. Similar observation was made in studies conducted by Hati AK et al in Burdwan <sup>(6)</sup>, Yogesh C et al in Bangalore <sup>(7)</sup>, Suchitra N et al <sup>(8)</sup> in Kerala. Males were more bitten by snakes due to more involvement in outdoor activities in compare to female.

Mean age of subjects was 33.8±17.34 years, with a range of 67 years. Similar findings were observed by Yogesh C et al <sup>(7)</sup>, Bhardwaj A et al <sup>(9)</sup> 85% of victims were from rural area. These findings are similar to that of Hansdak SG et al <sup>(10)</sup>, Lahori UC et al <sup>(11)</sup>. Rural people live in huts, mud houses. Waste material, dry cow dung, dry

firewood and firm tools are often Kept close to their houses. This encourages rats, mice and lizards which are the prey of snakes. It is routine practice to walk bare foot blindly in grass and crops, at times snakes are trodden. Snake bite like all other insect bites as a definite seasonal, as in our study maximum fatality occurred during the rainy season. Victims were lowest in winter. This finding is similar to that of Hansdak SG et al <sup>(10)</sup>, Lahori UC et al <sup>(11)</sup>, Yogesh C et al in Bangalore <sup>(7)</sup>. During rainy season rain water floods their burrows and snakes then try to take shelter near human dwellings, which increases chances of snakes feeling threatened or provoked by human beings and biting them in defence. Snake bite commonly occurred during dark hours of the day. Our study had the highest number of snake bite between 6 pm to 2 midnight followed by midnight to 6 am. Similar diurnal variation was also observed by Bawaskar HS et al <sup>(12)</sup>, Monteiro NP et al <sup>(13)</sup>. Least incidence occurred in between 12 noon to 6 pm because the snake is more nocturnal. In 30% cases of victims type of snake could not be identified. This may be because most snakebites occurred at night and it is not possible to identify the snake always.

In our study viper, bites were predominant. This is because in rural Bengal Viper tops the chart of the poisonous snake. This is unison with the studies of Hati AK et al in Burdwan <sup>(6)</sup>, Mukhopadhyay PP et al <sup>(14)</sup>. Lower limb was the commonest site of snake bite in our study followed by upper limb and abdomen. This was similar to findings of Yogesh C et al <sup>(7)</sup>, Kulkarni ML et al. People accidentally step on walking. Thus snake bite is more common in the lower limb.

We found kidney congestion was the most common macroscopic findings (75%). C Yogesh et al found congestion most common observation. <sup>(7)</sup>

In our study, acute tubular necrosis(ATN) was most common 68% followed by glomerulonephritis 40 %.A study by M Pal et al <sup>(16)</sup> from Kolkata found 100% acute tubular necrosis and glomerular lesions in 30 % cases. The difference in percentage of ATN was due to the fact that all

subjects in their study developed renal failure. In our study also 89% vasculotoxic snake bite victims who are usually developed renal failure had ATN compared to neurotoxic snakebite 33%.C Yogesh et al in their study found ischemic changes most common<sup>(7)</sup>

Most common findings in the stomach were congestion (77%); where in neurotoxic snake bite there was no hemorrhage,75% of vasculotoxic snake bite victim had stomach hemorrhage which was statistically significant.

### Conclusion

It can be said that this study, in spite of several limitations and time restraint, tried to focus on socio-demographic aspects of snake bite cases. A detailed analysis of several internal organs like kidneys and stomach with special emphasis on the Histopathological changes. To reduce the current prevalence of snake bite in India co-ordinated multidisciplinary approach, the infrastructure of the hospital, education of people, training of health care personnel and recent technological advancement in the society can be considered. The author hopes that this work will help in the showing of light on the current situation in India in this matter.

### Acknowledgements

Authors acknowledge the immense help received from the scholars whose articles are cited and included in references of this manuscript. The authors are also grateful to authors / editors / publishers of all those articles, journals and books from where the literature for this article has been reviewed and discussed.

**Sources of support in the form of grants :** Nil

### References

1. Kasturiratne A, Wickremasinghe AR, Silva N, Gunawardena NK, Pathmeswaran A, Premaratna R, The Global Burden of Snakebite: A Literature Analysis and Modelling Based on Regional Estimates of
2. Envenoming and Deaths. WHO. Available from:<http://www.dx.doi.org/10.1371/journal.pmed.0050218>.
3. Mittal BV. Acute renal failure following poisonous snake bite. *Journal of Postgraduate Medicine*. 1994;40(3):123-26.
4. Albright RC Jr. Acute renal failure; A practical update. *Mayo Clin Proc*2001; 76(1):67-74
5. Lal P, Dutta S, Rotti SB, Danabalan M, Kumar A. Epidemiological profile of snakebite cases admitted in JIPMER Hospital. *Indian Journal of Community Medicine* 2001;26(1):36-38
6. Mohapatra B, Warrell DA, Suraweera W, Bhatia P, Dhingra N, Jotkar RM et al. Snake bite mortality in India: A Nationally Representative Mortality Survey. *PLoS Negl Trop dis*.2011 Apr;5(4):e1018.
7. Hati AK, Mandal M, Mukherjee H. Epidemiology of snakebite in the district of Burdwan. *J of Indian Med Assoc* 1992; 90: 145-147.
8. Yogesh C, Satish K V. Study of Clinico-Pathological Profile of Renal Changes in Snake Bite Cases for a Period of 18 Months Reported to Victoria Hospital, Bangalore. *International Journal of Scientific and Research Publications*. 2004;8(4),p1-5
9. Suchitra N, Pappachan JM, Sujathan P. Snakebite envenoming in Kerala, South India: Clinical profile and factors involved in adverse outcomes. *Emerg Med J*. 2008;25:200-04.
10. Bhardwaj A, Sokhey J (1998). Snake bites in the hills of North India. *The National Medical Journal of India* 11(6) 264-265.
11. Hansdak SG, Lallar KS, Pokharel P, Shyangwa P, Karki P, Koirala S (1998). A clinico-epidemiological study of snake bite in Nepal. *Tropical Doctor* 28: 223-226
12. Lahori UC, Sharma DB, Gupta KB, Gupta AK (1981). Snake bite poisoning in

- children. *Indian Paediatrics* 18(3) 193 - 197.
12. Bawaskar HS, Bawaskar PH. Profile of snake envenoming in Western Maharashtra India. *Trans Roy Soc Trop Med Hyg.*2002;96:79-84.
13. Monteiro NP, Kanchan T, Bhagavath P, Pradeep Kumar G. Epidemiology of Cobra bite in Manipal, Southern India. *J Indian Acad Forensic Med.*2010;32(3):224-27.
14. Mukhopadhyay PP,et al. Pattern of Renal Pathology in Fatal envenomation by Indian Cobra. *J Indian Acad Forensic Med;*32(2): 132-135
15. Kulkarni ML, Anees S. Snake venom poisoning: experience with 633 cases. *Jof Indian Pediatrics.*1994 Oct;31(10):1239-43.99
16. M. Pal, A K. Maiti, U.B. Roychowdhury, S. Basak,B. Sukul. Renal Pathological Changes in Poisonous Snake Bite. *J Indian Acad Forensic Med, 2010;32(1):19-21 .*