



## STUDY ON THE CLINICO-EPIDEMIOLOGICAL PROFILE AND THE OUTCOME OF SNAKE BITE VICTIMS IN A RURAL HEALTH CENTRE IN KANCHEEPURAM DISTRICT, TAMILNADU.

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### ABSTRACT

Introduction : Snakebite is an acute medical emergency faced commonly by rural populations in tropical and subtropical countries with heavy rainfall and humid climate. Over 2,000 species of snakes are known worldwide, of which around 400 are poisonous. Elapidae, Viperidae, Hydrophiidae and Colubridae are the major group in which all of these poisonous snakes belongs to. Lot of things remains unknown about snakebites in India. There is a Knowledge gap still exist in the community about the poisonous snakes and their bites. The Indian government has recently adopted the World Health Organization reported that a huge proportion of injuries and death due to snake bites were due to unrecognized poisonous snakes. Aims and objectives: This study was carried out to describe the epidemiology, arrival delays, clinical patterns, complications, and the outcome of snakebites which were seen in rural health center of Kancheepuram district, Tamilnadu. Statistical analysis: Proportions. Results: A total of 164 cases of venomous snakebite cases were included in this study, who had reported to the rural health center from January 2013 to December 2013. In this study sample, a majority of snake bite victims were aged between 25-45 years with mean age is 28. Most of the cases were males (59.1%) compared to females(40.9%). A majority of the patients were leather workers (51.22%) and tanners (36.58%) and 64 patients (39.02%) were illiterates. The biting species was identified only in 130 cases and the commonest species was Russell's viper (68 cases), followed by cobra (42 cases) and common Krait (20 cases). The most frequently bitten site was the lower extremity (51.21%). The incidence of the complications like acute renal failure, gangrene at the bite area, DIC and ARDS were more in the subgroup of patients who presented to the hospital after a delay of >6 hours. No fatal outcome was reported in the victims who were admitted within 24 hours of the snake bite, thus suggesting the importance of an early specific treatment.

**KEY WORDS:** Anti Snake venom, Envenomation, Epidemiology, Snake-bite, India



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## INTRODUCTION

Snakebite is an acute medical emergency faced commonly by rural populations in tropical and subtropical countries with heavy rainfall and humid climate.<sup>1,2</sup> Over 2,000 species of snakes are known worldwide, of which around 400 are poisonous. These snakes belong to the families Elapidae, Viperidae, Hydrophiidae and Colubridae<sup>3</sup>. Every year, 50,000 Indians die in 2, 50,000 incidents of snake bite, despite the fact that India is not home for the largest number of venomous snakes in the world, nor is there a shortage of anti –snake venom in the country<sup>4</sup>. Lot of things remains unknown about snakebites in India. There is a Knowledge gap still exist in the community about the poisonous snakes and their bites. Some of the major snakes in India of medical importance in India are the Russell's viper (*Daboia russelii*), the saw-scaled viper (*Echis carinatus*), the Indian cobra (*Naja naja*) and the common krait (*Bungarus caeruleus*), which together are known as the 'Big Four'. However, other snakes such as the hump nosed pit-viper (*Hypnale hypnale*), the Levantine viper (*Macrovipera lebetina*) and others are highly toxic and some of the rural parts of India.<sup>5-8</sup> The Indian government has recently adopted the World Health Organization reported that a huge proportion of injuries and death due to snake bites were due to unrecognized poisonous snakes.<sup>9</sup> Most of the rural regions in India were equipped to treat the Big Four snake's bites only. The effectiveness of this antivenom against bite other than snakes of Big Four group is not clear. Furthermore, use of antivenom in cases where it is not effective or not needed (e.g. bite from a non venomous

snake) is both expensive and potentially dangerous to the victim because of the possibility of anaphylactic reactions. Thus there is a need for better diagnosis and develop newer treatments with improved efficacy and broad coverage of snakes with reduced side effects. Information about snakebite incidence is also lacking in the community. There is insufficient epidemiological data, particularly in the rural areas where snakebites are most common. Snakebite morbidity and mortality are generally considered to be under-reported, largely because all victims are not visiting the hospitals.<sup>10-11,3</sup>

## MATERIALS AND METHODS

This record based, retrospective, descriptive study was carried out at the Sree balaji medical college and hospital chrompet, Chennai ,Tamilnadu. The records of the snakebite victims who attended the hospital from January 2012 to December 2012 were obtained from the medical records department. This department uses the ICD-10 system for the classification of diseases. The data on the demographic factors, clinical features and complications, details of the treatment which was received and the outcome of the snake bite victims were recorded. The mortality was defined at necropsy and on the basis of the death certificates. The statistical analysis was conducted by using the Statistical Package for the Social Sciences, version 11.0 (SPSS Inc, Chicago, IL, USA).

**RESULTS****Table 1**  
**Demographic details**

<b>Factors</b>	<b>No. of. Patients</b>
<b>Gender distribution</b>	
Male	97(59.1%)
Female	67(40.9%)
<b>occupation</b>	
Leather workers	84(51.22%)
Tanners	60(36.58%)
House wife	14(8.53%)
Others	6(3.65%)
<b>Educational status</b>	
Illiterate	64(39.02%)
1-5 <sup>th</sup> std	58(35.36%)
6-8 <sup>th</sup> std	30(18.29%)
>8 <sup>th</sup> std	12(7.31%)
<b>Type of snake identified</b>	
Russell viper	68(41.46%)
Cobra	42(25.62%)
<b>Factors</b>	
<b>No. of. Patients</b>	
Common krait	20(12.19%)
Unidentified	34(20.73%)
<b>Site of bite</b>	
Lower limbs	84(51.21%)
Upper limbs	60(36.61%)
Head and face	10(6.09%)
Trunk	10(6.09%)
<b>Fang marks</b>	
Single	22(13.41%)
Double	110(67.07%)
>2	20(12.19%)
Scratches	12(7.31%)

**Table 2**  
**Time delay between bite and hospital admission**

<b>Time of delay</b>	
<1 hour	45(27.43%)
1-6hour	65(39.63%)
6-24hour	54(32.92%)
<b>Causes of delay in patients arrived &gt; 6hrs of bite(n=54)</b>	
Traditional healer	27
Poor transportation	14
Not aware of danger	10
Patient ignorance	3

**Table 3**  
**First aid received prior to hospital admission**

<b>Tourniquet</b>	<b>80(48.78%)</b>
Incision	36(21.95%)
Application of herbal medicine	18(10.97%)
Suction of venom from the bite site	9(5.48%)
Application of snake stone	6(3.65%)
No first aid	15(9.14%)

**Table 4**  
**Clinical features of Snake bite**

<b>Local manifestations of snake bites</b>	
Pain and tenderness	92
Swelling	92
Local rise of temperature	92
Blisters	34
Local lymphadenopathy	25
Discolouration	20
Ulceration	14
<b>Haematotoxic manifestations in 96 cases of viper bite</b>	
Bleeding from the site of bite	46(47.1%)
Cellulitis	38(36.6%)
Haematuria	28(29.2%)
Ecchymosis	24(25%)
Gastrointestinal bleeding	18(18.75%)
Haemoptysis	16(16.7%)
Intracranial bleeding	12(12.5%)
<b>Clinical features of neuroparalytic snake bites in 68cases</b>	
Ptosis	64(94.1%)
Ophthalmoplegia	62(91.1%)
Bulbar weakness	58(85.2%)
Respiratory paralysis	44(64.7%)
Paralysis of limbs	18(26.4%)
Loss of consciousness	8(11.8%)

**Table 5**  
**Complications observed following hospitalization**

Respiratory failure	36(21.9%)
Acute renal failure	32(19.5%)
Gangrene at the bite area	9(5.4%)
DIC	6(3.6%)
ARDS	3(1.8%)
Intracerebral haemorrhage	2(1.2%)

A total of 164 cases of venomous snakebite cases were included in this study, who had reported to the hospital from January 2013 to December 2013. In this study sample, a majority of snake bite victims were aged between 25-45 years with mean age is 28. The demographic profiles of the snake bite victims have been presented in (Table 1). Most of the cases were males (59.1%) compared to females (40.9%). A majority of the patients were leather workers (51.22%) and tanners (36.58%). In our study, 64 patients (39.02%) were illiterates. The biting species was identified only in 130 cases and the commonest species was Russell's viper (68 cases), followed by cobra (42 cases) and common Krait (20 cases). The most frequently bitten site has been the lower extremity (51.21%). Definitive fang marks were seen in 92.7% of the cases, double punctured fang marks were observed in a majority of the

cases (67.07%) and in 12 cases, scratch marks were present at the site of the bite. Only 27.43% of the snake bite victims could come to the hospital within one hour of the bite (Table 2). First aid measures were employed in a majority of the patients (n=149, 90.86%), while the other 15(9.14%) victims did not receive any first aid treatment. Applying tourniquet holds the major portion about (48.78%) followed by incision(21.95%), application of herbal medicine (10.97%), suction of venom from the bite site(5.48%) and application of snake stone(3.65%)(Table-3). Neuroparalytic features which are a hallmark of cobra and krait bites, were seen in 68 cases (42%) and the haematotoxic manifestations were attributable to viper bites in 96 cases (58%) (Table-4). Complications of snake bite were shown in (Table-5). Among the 68 cases with neuroparalysis, 36 cases developed

respiratory failure and they required to assist ventilation. With the ASV and ventilator support, all the patients recovered completely without any fatal outcome. Of the 96 cases with viper bites, 32 patients developed acute renal failure and of these, 21 patients required dialysis. The mean duration of the hospital stay was 7 days (range 1-26 days). The incidence of the complications like acute renal failure, gangrene at the bite area, DIC and ARDS were more in the subgroup of patients who presented to the hospital after a delay of >6 hours. No fatal outcome was reported in the victims who were admitted within 24 hours of the snake bite, thus suggesting the importance of an early specific treatment.

## DISCUSSION

In India, the poisonous snakes belong to the elapid family of the cobra and krait and to the viper family of the Russell's viper and the saw scaled viper. The envenomation which is attributable to the elapid bites causes paralysis of the ocular, bulbar, and the limb girdle muscles. The viper bites mainly because bleeding from the mucocutaneous sites, haemolysis, acute renal failure, and occasionally, shock.<sup>12</sup> Males are affected more often than the females, as they constitute the working majority who are actively engaged in leather industries, tanning industries and other outdoor activities. Our findings concurred with those of earlier studies.<sup>13,14</sup> In India, men are the dominant earning members of the family, working outdoors and sleeping in the working places. This could probably be the main cause of the male preponderance which was seen in our study. In our study, the study area was predominantly filled with leather factories, tanning industries the younger population was involved (18-36 years of age), probably due to their more ambulant nature. Snake bite may be termed as an occupational disease, leather workers, tanners, farmers, plantation workers, herdsmen, hunters or workers on the development sites are mostly affected.<sup>15</sup> Most of the human snakebites occur during the monsoon season, because of the flooding of the habitats of the snakes and their prey. It is the life cycle of the natural prey of these reptiles that govern their contact with humans. Study area was mostly engaged with leather

industries it accompanies with leather waste storage places which results for increased breeding for snakes. The breeding habits of frogs closely follow the monsoons and rats and mice are always in close proximity to human dwellings. In this study, 39.02% of the snakebite victims were illiterates and that 35.36% were educated below the primary school similar to Arshad Anjum et al.<sup>16</sup> (47.9%) Sharma SK, et al.<sup>17</sup> (75% in ARF and 19.5% in non ARF). The morbidity and the mortality were more in illiterates because of their ignorance regarding the importance of an early medical attention and wasting precious time by consulting traditional healers. About 32.9% of the patients had reached the hospital after a delay of 6 hours similar to Harshavardhana HS, et al<sup>18</sup> (26%) and Halesha B.R et al<sup>19</sup> (27.22%). This delay in their arrival could be attributed to the wrong belief approaching traditional healer, poor transportation facility, not aware of danger about the hazards of snakebite, resulting increase in the morbidity and the mortality. In this study, 83.4% of the patients had received first aid treatment for the bitten site that is, tourniquet similar to Harshavardhana HS et al<sup>18</sup> (90%) and 21.95% had incision and drainage, application of herbal medicine about 10.97% and suction about 5.48%, and application of snake stone 3.65%. These practices are not currently recommended because these practices results in delay the transport of the victims to a medical facility.<sup>20</sup> [17]. The use of tourniquets, which can increase the local complications by increasing the tissue anoxia and by triggering severe systemic envenoming right after their removal, has currently been strongly discouraged by most of the experts. Most of the snakebites in our study were haematotoxic (58%), followed by neuroparalytic (42%) ones. Among the haematotoxic snake bites, bleeding from the site of the bite was the main manifestation, followed by cellulitis, haematuria and ecchymosis, which were similar Sharma BD et al.,<sup>21</sup> However, study done by Saini RK et al.,<sup>22</sup> Sarangi A et al<sup>23</sup> found haematuria to be the most common manifestation. This difference in the haemorrhagic manifestations in the different studies is attributed to the subtle differences among the venoms of the viperine subspecies in different regions.<sup>24</sup> The neuroparalytic symptoms which were seen, in

the ascending order, were loss of consciousness (11.8%), paralysis of limbs(26.4%), respiratory paralysis(64.7%), bulbar weakness(85.2%), ophthalmoplegia (91.1%), ptosis (94.1%). The reported incidences of the neurological symptoms in 2 Sri Lankan studies on neuroparalytic snakebites were ,ptosis in 70%–85% cases, respiratory muscle weakness in 18%–45% cases, ophthalmoplegia in 53%–75% cases, and limb weakness in 27%–54% cases respectively.<sup>25,26</sup> In this study, the most common complication was respiratory failure(21.9%) followed by acute renal failure(19.5%), gangrene at the bite area(5.4%) and DIC(3.6%). The study showed that 19.5% of the patients had developed ARF, similar to Halesha BR et al<sup>19</sup> (15.5%) Saini et al.,<sup>27</sup> had reported that only 4% of the cases in their study (adults with snake bites) had developed it. The high mortality rate in India has been attributed to the geographical factors and a predominantly rural population that was dependent on agriculture as an occupation.

## CONCLUSION

The present study clearly showed that snake bites were more common in rural areas and among people who were engaged in leather and tanning industries . Most common

occurrences were during the monsoons. The lower limbs were affected the most and majority victims were males, mostly bitten by poisonous snakes. The available data on the epidemiology of snake bite in the Indian subcontinent are sparse. Most of the traditional methods for the first aid treatment of snake bite have been found to result in more harm than good. The immobilization and the prompt transport of the snake bite victims to the hospital, along with the prompt administration of ASV, remains the mainstay to reduce the morbidity and the mortality which are associated with snake bites.

## Recommendations

1. Primary health centres should be fully equipped with facilities to give first aid measures and administer anti-snake venom if required.
2. Snake bite is an occupational hazard and awareness among farmers and labourers regarding wearing of foot wears.
3. Government should try to inculcate knowledge to the general population, especially in rural areas, by the use of media etc. about this health problem and its management., early management and transfer to hospital is very important in reducing the morbidity and mortality associated with snake bite.

## REFERENCES

1. In: Progress in clinical medicine, second series, Ahuja, MMS. (editor). India: Heinemann, 1978; 136-79. Banerjee RN. Poisonous snakes and their venoms, symptomatology and treatment. In: progress in clinical medicine, second series, Ahuja, MMS (eds.), Heinemann, India, 1978, pp. 136-79.
2. Bhat RN. Viperine snake bite poisoning in Jammu. J Indian Medical Association, 63:383-92, (1974)
3. Al-Homrany M. Acute renal failure following snake bites: a case report and review of the literature. *Saudi J Kidney Dis Transpl*, 7:309-12, (1996)
4. Simpson ID, Norris RL. Snakes of medical importance in India: Is the Concept of the "Big 4" still relevant and useful? *Wilderness Environ Med*, 18:2-9. (2007)
5. Kochar DK, Tanwar PD, Norris RL, Sabir M, Nayak KC, et al. Rediscovery of severe saw-scaled viper (*Echis sochureki*) envenoming in the Thar desert region of Rajasthan, India. *Wilderness Environ Med*, 18: 75–85, (2007)
6. Simpson ID, Norris RL. Snakes of medical importance in India: is the concept of the "Big 4" still relevant and useful? *Wilderness Environ Med* 18: 2–9, (2007)
7. Sharma LR, Lal V, Simpson ID. Snakes of medical significance in India: the first reported case of envenoming by the Levantine viper (*Macrovipera lebetina*).

- Wilderness Environ Med, 19: 195–198, (2008)
8. Joseph JK, Simpson ID, Menon NC, Jose MP, Kulkarni KJ, et al. First authenticated cases of life-threatening envenoming by the hump-nosed pit viper (*Hypnale hypnale*) in India. *Trans R Soc Trop Med Hyg*, 101: 85–90, (2007)
  9. WHO. Progress in the characterization of venoms and standardization of antivenoms. *WHO Offset Publ*, 58: 1–44, (1981)
  10. Fox S, Rathuwithana AC, Kasturiratne A, Laloo DG, de Silva HJ. Underestimation of snakebite mortality by hospital statistics in the Monaragala District of Sri Lanka. *Trans R Soc Trop Med Hyg*, 100: 693–695, (2006)
  11. Alirol E, Sharma SK, Bawaskar HS, Kuch U, Chappuis F. Snake bite in South Asia: a review. *PLoS Negl Trop Dis*, 4(1):e603,(2010)
  12. Reid HA, Theakston ROG. The management of snake bite. *Bull World Health Organ*,61:885–95, (1986)
  13. Basu J, Majumdar G, Dutta A, et al. Acute renal failure following snake bites (viper). *J Assoc Physicians India*, 25:883-90, (1977)
  14. Bhat RN. Viperine snake bite poisoning in Jammu. *J Indian Med Assoc*, 63:383-92, (1974)
  15. Warrel DA. The WHO/SEARO guidelines for the clinical management of snake bite in the the Southern east Asian region. *SE Asian J Trop Med Pub Hlth*, 30:1-85,(1999)
  16. Anjum A, Husain M, Hanif SA, Ali SM, Beg M, et al. Epidemiological Profile of Snake Bite at Tertiary Care Hospital , North India.*J Forensic Res*, 3: 146, (2012)
  17. Sharma SK, Chappuis F, Jha N, Bovier PA, Loutan L, Koirala S. The impact of snake bites and the determinants of the fatal outcomes southeastern Nepal. *am. J. Trop. Med. Hyg*,71(2): 234–38, (2004)
  18. Harshavardhana H. S., Pasha I., Prabhu N. S., et.al. A study on Clinico-Epidemiological profile of snakebite patients in a tertiary care centre in Bangalore. *GJMEDPH*, 3 (2): (2014), Accessed on “05 February 2015. <http://www.gjmedph.org/uploads/O1-Vo3No2.pdf>
  19. Halesha B.R. et al, Clinico-Epidemiological Profile and Outcome of Snake Bite Victims. *Journal of Clinical and Diagnostic Research*, 7(1):122-126,(2013)
  20. Warrell DA. Guidelines for the management of snake-bites. In: *World Health Organization, Regional Office for Southern East Asia*, 2010,pp.1- 162
  21. Sharma BD. Indian poisonous snakes: an ecological and a clinical study. New Delhi: *Anmol Publications Pvt. Ltd*, 1-12, (2002)
  22. Saini RK, Sharma S, Singh S, Gupta VK, Pathania NS. Primary pathological fibrinolysis in saw-scaled (*Echis carinatus*) viper bites. *J Assoc Physicians India*,32:391-93, (1984)
  23. Sarangi A Jena I, Sahoo H, Das JP. A profile of snake bite poisoning with a special reference to the haematological, renal, neurological and the electrocardiographic abnormalities. *J Assoc Physicians India*,25:555-60,(1977)
  24. Warrel DA, Davidson NM, Greenwood BM, et al. Poisoning due to the bites of the saw- scaled or the carpet viper (*Echis carinatus*) in Nigeria. *Quart J Med*,181:33-62, (1977)
  25. Kularatne SAM. Common krait (*Bungarus coeruleus*) bite in Anuradhapura, Sri Lanka: a prospective clinical study, 1996–98. *Postgrad Med J*,78:276–80,(2002)
  26. Seneviratne U, Dissanayake S. The neurological manifestations of snake bite in Sri Lanka. *J Postgrad Med*,48:275–78,(2002)
  27. Saini RK, Sharma S, Singh S, Pathania NS. Snake bite poisoning. A preliminary report. *J Assoc Phys India*, 32:195-97,(1984).