

Study of clinical profile and outcome of patients with snake envenomation at Bheri Hospital Nepal

Rajesh Kumar Mandal¹, Nirmal Shakya², Sanket Kumar Risal³, Kuldip Goit⁴

^{1,3}Consultant Physician, ²Chief Consultant Physician, Department of Internal Medicine, Bheri Hospital, Nepalgunj

⁴Consultant Pediatrician, Department of Pediatrics, Bheri Hospital, Nepalgunj, Nepal



This work is licensed under a Creative Commons Attribution 4.0 Unported License.

ABSTRACT

BACKGROUND

Snake bite is a public health problem in terai and inner terai of Nepal. It is a medical emergency leading to significant morbidity and mortality every year. This study aims to find the clinical profile and outcome of snake bite envenomation patients in Bheri Hospital Nepalgunj.

METHODS

This was a cross sectional, observational study from april 2021 to november 2021. Patients with history of snake bite and clinical features suggesting envenomation were enrolled in this study, their clinical data and outcome were recorded in Excel sheet and analyzed by SPSS 20.

RESULTS

A total of 58 cases of snake envenomation was admitted and managed, out of which 3 cases expired with case fatality of 5.17%. Krait and cobra were the common snake bites in this region. 84.48% of the snake bites occur inside houses and more than half 53.44% of the patients were bitten between 12am to 6am. The most common features of envenomation were ptosis, blurring of vision, swallowing difficulty, dysphonia, neck muscle weakness, epigastric pain and salivation. Majority of cases 96.55% was given 10 vials of Anti snake venom (ASV). Only 4 patients 6.89% needed ventilator assistance.

CONCLUSION

Mortality with snake bites can be minimized by strengthening the treatment centers and readily availability of ASV at such centers. Public awareness about snake bite, first aid, rapid transport to health facilities would be the key to success in reducing morbidity and mortality.

KEYWORDS: snake bite; envenomation; clinical profile; outcome

INTRODUCTION

Snakebite envenomation and its consequences are significant public health problem in the tropical regions throughout the world.¹ The majority of snake bites occur in rural areas in tropical and subtropical countries of Asia, Africa and America with a high fatality rate.² About 5.4 million snake bites occur each year, resulting in 1.8 to 2.7 million cases of envenoming (poisoning from snake bites). There are between 81,410 and 137,880 deaths and around three times as many amputations and other permanent disabilities each year.³

Envenoming affects women, children and farmers in poor rural communities in low- and middle-income countries.³

In Nepal, WHO estimates that 20'000 people are bitten by snakes each year, resulting in over 1000 deaths.⁴ So far, 89 snake species have been recorded in Nepal . Among this great diversity of snakes, we know with certainty of 17

*Corresponding Author |

Dr. Rajesh Kumar Mandal, Department of Internal Medicine, Bheri Hospital, Nepalgunj.

Email: rkmandal338@gmail.com, Phone: +977-9848042427

species of snake that are found in Nepal and have the front-fanged type of venom apparatus and thus are considered to be highly venomous and dangerous.⁵ The commonest poisonous snakes in the terai and inner terai regions of Nepal are Krait and Cobra.⁶ In Nepal, incidence of snake bite shows a distinct seasonal pattern closely related to rainfall and temperature, and snake bite is observed in all age groups, the large majorities (90%) are in males aged 11-50 years.⁷

Treatment for poisonous snakebite is divided into supportive care and antivenom administration. Krait venom blocks both the pre and postsynaptic receptors and needs prolonged mechanical respiration until their receptors are regenerated. Cobra venom blocks the postsynaptic receptors and needs more ASV and neostigmine.⁸ This study aims to find the socio demographic characteristics, common sign and symptoms of envenomation and the factors affecting the outcome of snake bite envenomation.

METHODS

This was a cross sectional observational study conducted at Bheri Hospital, Nepalgunj, Nepal in the Department of Emergency and Department of Medicine from April 2021 to November 2021. The proposal for the research was accepted by Nepal Health Research council (NHRC) Reg. No. 3088. All the patients visiting with a history of snake bite were admitted in the emergency and were kept on observation. The patients were observed for the signs and symptoms of envenomation. The diagnosis of snake bite was made by the history of the definite snake bite which was given by the patient or their relatives. Those cases where, snake was not seen or type of snake was not conformed were observed for the clinical manifestations. According to the symptoms and signs of envenomation, the snake bites were classified as neurotoxic or hemotoxic. Those not developing any symptoms at least after 8 hours were discharged to home. They were either non venomous or dry bites. Those developing envenomations were enrolled in this study. They were managed with polyvalent Anti snake venoms in the Emergency, ward and intensive care facility according to the severity of the clinical manifestations. The patient was observed and followed till discharge. The pre-formed proforma was filled for each patient. The data obtained was entered in the Microsoft Excel and descriptive statistics were calculated by Statistical Package for the Social Sciences (SPSS)20. Those data were represented in figures and tables.

RESULTS

A total of 58 cases of snake bite envenomation was recorded at Bheri hospital in the study period. Majority of the victims were young adults and middle aged between 20 to 40 years. Males were more vulnerable to snake bite

than females. Brahmin/ chhetri ethnic group accounted to be 50% of the cases. Nearly half of the patients were from Banke districts (27/58) followed by Bardiya district with 32.75%. Bajjnath municipality 9, Kohalpur 6, Dhuduwa 4, Nepalgunj 3, Khajura 2, Raptisonari 2 and Janaki 1 cases according to the distribution in local bodies. Agricultural workers seemed to be more affected than other groups with snake bite envenomation (Table 1).

Table 1: Socio-Demographic Characteristics of snake bite victims.

Age group	Number	Percentage (%)
0-10	2	3.44
10-20	12	20.68
20-30	18	31.03
30-40	11	18.96
40-50	5	8.62
50-60	3	5.17
60 Above	6	10.34
Gender		
Male	35	60.34
Female	23	39.65
Ethnic Group		
Dalit	5	8.62
Janjati	4	6.89
Tharu	9	15.51
Madhesi	7	12.06
Muslims	4	6.89
Brahmin/chhetri	29	50
District		
Banke	27	46.55
Bardiya	19	32.75
Kailali	7	12.06
Dang	5	8.62
Occupation		
Agriculture	31	53.44
student	16	27.58
service	5	8.62
others	6	10.34

The snake bites are seen between the months of may to october which coincides with the summer and rainy season (Figure 1).

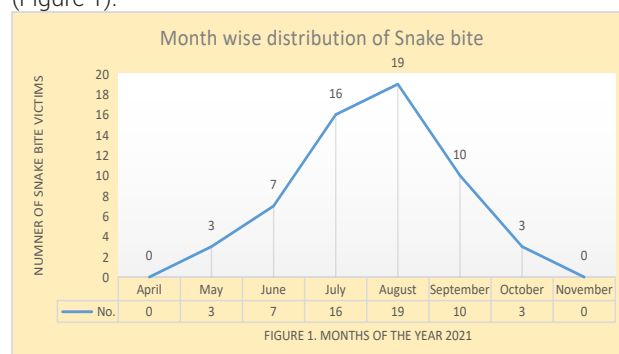


Table 2: Snake bite characteristics.

Type of Snake	Number	Percentage (%)
Krait	14	24.13
Cobra	4	6.89
Viper	1	1.72
Unknown neurotoxic	26	44.82
Snake seen but not identified	13	22.41
Fang marks Present	37	63.79
Snake Seen	32	55.17
Site of snake bite		
Upperlimb	16	27.58
Lower limb	16	27.58
Head,neck,trunk	5	8.62
Unknown	21	36.20
Location of bite		
House	49	84.48
Forest	2	3.44
Field	6	10.34
Garden	1	1.72
Time of Bite		
6am-12pm	12	20.68
12pm-6pm	4	6.89
6pm-12am	11	18.96
12am-6am	31	53.44

Table 2. shows: Krait was the most common snake which was identified. Fang marks were present in 63.79% of the cases. There was no disparity between upper or lower limb for snake bites. Most of the victims 84.48% were bitten inside the house and night time between 12am and 6am was the most active time for snake bites.

Around one fourth of the patients washed the bitten area with soap and water while 20.68% had tourniquet as first aid for snake bite. Most of the patients reached the hospital beyond one hour and ambulance and motorcycle were common modes of transportation for reaching hospital (table 3).

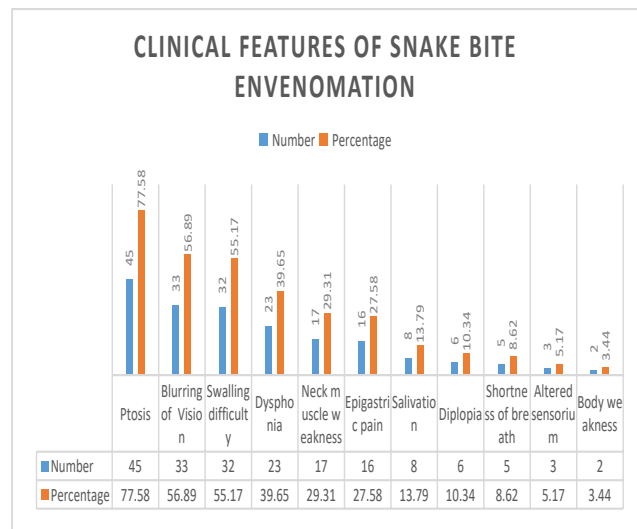
Table 3: First Aid and Hospitalization.

First Aid	Number	Percentage (%)
Tourniquet	12	20.68
Sucking	2	3.44
Soap/water	15	25.86
Incision	2	3.44
Traditional healer	7	12.06
Ayurvedic /herbs	5	8.62
None	15	25.86
Duration from Snake bite and hospital arrival		

Within 60min	8	13.79
1 to 4 hour	23	39.65
More than 4 hours	27	46.55
Mode of Transport of snake victims		
Ambulance	25	43.10
Motorcycle	17	29.31
Jeep/ private vehicle	7	12.06
Auto/Electric Rickshaw	5	8.62
Cycle	1	1.72

Ptosis, blurring of vision and swallowing difficulty were the most common clinical presentations of the snake bite (Figure 2).

Figure 2: Clinical features of snake bite envenomation.



The patients were admitted and the clinical diagnosis of snake envenomation was made according to the history of snake bite or clinical signs and features consisting of snake bites. Most of the patients were managed in Emergency and Medicine wards (89.65%). Six patients were admitted in intensive care and four of them were intubated and required ventilator assistance. Polyvalent Anti Snake Venoms were used for treatment. National Guidelines for snake bite management of Nepal and World Health Organization protocol was followed during the treatment. Majority of the cases required 10 vials of Anti snake venom. Most of the patients were discharged between 2 to 6 days. Around 95% of snake bite victims were able to go home after successful management while there was a case fatality of 5.17% (Table 4).

Table 4: Hospital stay and outcome.

Admission	Number	Percentage
-----------	--------	------------

Emergency/ Medicine Ward	52	89.65
Intensive Care	6	10.34
Ventilator Assistance	4	6.89
Anti Snake Venom Used		
0-10 vials	56	96.55
10-15 vials	2	3.44
>15 vials	0	
Duration of hospital stay in days		
<2	5	8.62
2-6	44	75.86
6-10	9	15.51
>10	0	0
Outcome of Patients		
Successfully Discharge to home	55	94.82
Expired	3	5.17

DISCUSSION

The study revealed that most of the snake bite victims 70.67% were in the age group 10 to 40. This finding was similar with several studies from Nepal.⁹⁻¹² A study from Bangladesh reported 10 to 19 years to be at highest risk group for snake envenomation. 10 to 40 age group being active in outdoor activities, job, fields. Male were predominantly affected than female with snake envenomation, this may be attributed to the fact that males being more active outdoors and in field activities. This finding was consistent with other studies across the country.^{2,10-12} However study by Pandey 2006 and Poudel et al. 2016 reported equal prevalence of snake envenomation in both male and female.^{13,14}

Half of the patients belong to brahmin and chhetri ethnicity followed by tharu and madhesi. This is due to the demographic distribution in this area where upper caste are predominant as well as referral cases from neighbouring districts. Similar finding are noted from study from the farwest region of Nepal.¹⁵ Most of the case are from Banke and Bardiya and few cases from Kailali and Dang. This is because this centre is the tertiary center with an ICU and ventilator facility. This study reports that most of the patients were agricultural workers which is supported by other studies as well.^{11,15-17} Snakes hide in the grass, bushes, firewood and people are vulnerable for bites when they encounter them. The snake bites occur from may to october with peak in july and august and then decline from september, these months correspond to the rainy season. Snakes habitats, holes are flooded by water and they hide in the houses, bushes, fields where they encounter humans.^{9,10,18}

Krait was the most prevalent snake among the identified

one, a larger number of snakes remain unidentified and unknown. This is due to the bite occurring during sleep or due to the lack of awareness among the general public about the type of snake. Krait was predominant in other study from the same center and other centers across Nepal.^{6,15,19} However other study from Western Nepal revealed green snake to be most prevalent.⁹ Most of the people was bitten during sleep or early morning between 12am to 6am in this study which is similar to the study done in India.^{6,20} Another study from western Nepal the maximum bites were between 5 to 7am which is also similar to our finding. Few studies report maximum bite during evening to midnight and day time respectively.^{2,18} The snakes during monsoon season find shelter in houses and garden where they can encounter humans. Moreover snakes hide in the bed, beddings, quilt where they get stamped by body parts and thus snake bite occur. Since the maximum bite had occurred during sleep both upper and lower limbs are equally bitten by snakes however other studies report maximum bites in lower limb.^{2,9,10,12} There are few studies where upper limb was found to be mostly bitten.^{14,19} Upper limb are mainly bitten when snakes are suddenly mishandled by hands during cutting grass, working in fields, putting hands in holes for fishing, collecting fire woods. Similarly feet are more involved by sudden stamping over the snake during walking or working. More than two third bite are within the house and mostly during sleep.⁶ This finding is contrast to other studies where most of the bite had taken place outdoors in fields or garden.^{8,11,16}

Around one fourth of the patients had tourniquet as first aid for snake bite. There were few cases of sucking wound, incision and consultation with traditional healers which was similar with the finding of other studies.^{12,16,21} Tourniquet leads to cellulitis and may lead to gangrene of the limbs. Though less than the other studies its a practice which should be discouraged and public awareness regarding first aid and early transfer of patients to hospitals should be done.^{11,16} The lapse for reaching hospital <4hours was around 40% which is similar to other studies.^{8,16} This due to the fact initially people go to traditional healers, take ayurvedic medicines and moreover delay in getting transport easily. A study from eastern Nepal has reported usefulness of motorcycle for transport of snake bite victims.²² In this study ambulance and motorcycle are used as transport measures in most of the cases.

Ptosis, blurring of vision, swallowing difficulty, dysphonia, epigastric pain ,diplopia, shortness of breath, altered sensorium and body weakness were the presenting symptoms and signs of envenomation. Ptosis was the most common presenting feature in most of the studies.^{2,8,17,19} Ptosis was followed by shortness of breath in these studies^{8,19} however in this study ptosis was swallowing difficulty. GI symptoms nausea, vomiting, pain abdomen and parotid

tenderness were predominant symptoms after ptosis in recently published study from farwest Nepal.¹⁵ Dysphagia, dysphonia, salivations, neck muscle weakness, blurring of vision were other common presentations.^{2,6,8,17,19} Most of the patients were successfully managed at wards, 6(10.34%) patients were admitted in intensive care unit and 4(6.89%) required ventilator assistance due to respiratory paralysis. These patients usually presented late due to delay while transferring and attending alternative measures for snake bite management including traditional healers or ayurvedic medications.

56(96.55%) patients required 10 Vials of ASV, This was consistent with the study where 86% patients received 10 vials of ASV.¹⁵ While a retrospective Study of Snakebites in Nawalpur Snakebite Treatment Centre, South-central Nepal reported an average of 16 ASV vials used for treatment of snake bite.¹⁷ With the improvement of intensive care and trained medical doctors and supporting staffs the unnecessary and over use of ASV can be prevented. Antivenom is generally in short supply in most parts of Africa and many parts of Asia.²³ ASV is imported from India, there was shortage of supply due to ban on export of ASV by Indian court in 2012.²⁴

The usual stay of snake bite patients in hospital was between 2 to 6 days with 75.86%, this was similar with that of another study with stay less than 5 days in 68.52%.¹⁹

The patients were managed according to the World health organisation and national guideline for management of snake bites. Around 95% of patients were successfully managed and were discharged. There was mortality of 3(5.17%) patients. The mortality was similar to other study with a mortality of 6.17%.⁸ It was greater than another study from Nepal.⁷ The mortality depends on the fact of early suspicion or recognition of snake bite, early transport to health facility, prevention of undue delay due to seeking traditional healers/ dhama/jhakri, and readily available of ASV, intensive care and ventilators for combatting respiratory paralysis.

CONCLUSIONS

Snake bite is a neglected public health issue in terai and inner terai of Nepal. The traditional practices, lack of awareness leads to delay in seeking hospital care which is responsible for morbidity and mortality. Early transfer and recognition of envenomation and prompt administration of ASV is the key to management of snake bite. Hospitals should have trained medical staff along with ICU and ventilators. Public awareness regarding snake bite, prevention, first aid and early transfer to hospital facilities should be done. Tourniquet application and seeking traditional healers/

dhama should be discouraged.

Conflicting Interest: None

REFERENCES

1. Chhabilal T. Magar, Kamal Devkota, Ranjana Gupta, Ram K. Shrestha, Sanjib K. Sharma, Deb P. Pandey, A hospital based epidemiological study of snakebite in Western Development Region, Nepal, *Toxicon*, Volume 69, 2013, Pages 98-102, <https://doi.org/10.1016/j.toxicon.2013.04.002>.
2. Hossain J, Biswas A, Rahman F, Mashreky S, Dalal K, Rahman A. Snakebite Epidemiology in Bangladesh—A National Community Based Health and Injury Survey. *Health*. 2016;08(05):479-486. <http://dx.doi.org/10.4236/health.2016.85051>
3. Snakebite envenoming [Internet]. Who.int. 2022 [cited 19 January 2022]. Available from: <https://www.who.int/news-room/fact-sheets/detail/snakebite-envenoming>
4. WHO (1987). *Wkly Epidemiol Rec* 42: 319–320
5. Sharma SK, Pandey DP, Tillack F, Chappuis F, Magar CT, Aliror E, et al (2013). Venomous snakes of Nepal: A photographic guide [Internet]. Lalitpur, Nepal: BP Koirala Institute of Health Sciences.
6. Mandal R K, Dangol B, K C R, Sonkar S. A Retrospective Study on Snake Bites in a Tertiary Care Center in Mid Western Nepal. *International Journal Of Advance Research And Innovative Ideas In Education* [Internet]. 2021 [Cited:]; 7(3):2650-2656. Available from: http://ijariie.com/AdminUploadPdf/A_Retrospective_Study_on_Snake_Bites_in_a_Tertiary_Care_Center_in_Mid_Western_Nepal_ljariie14619.pdf
7. Hansdak SG, Lallar KS, Pokharel P, Shyangwa P, Karki P, Koirala. A clinicoepidemiological study of snake bite in Nepal. *Trop Doct*. 1998; 28(4): 223-226.
8. Chaudhary MK, Gupta LK, Chand LB, Chaudhary R, Ranpal S. A prospective study on clinico-epidemiological profile and outcome in management of poisonous snake bite. *Int J Basic Clin Pharmacol* 2020;9:695-700
9. Karki, D., Sharma, B., Koirala, R., & Nagila, A. (2019). Epidemiology and Clinical Outcome of Snakebite in Western Nepal: A Retrospective Study. *Journal of Gandaki Medical College-Nepal*, 12(1), 53–57. <https://doi.org/10.3126/jgmcn.v12i1.22618>
10. B R Halesha, L Harshavardan, A J Lokesh, P K Channaveerappa, K B Venkatesh. A study on the clinico-epidemiological profile and the outcome of snake bite victims in a tertiary care centre in southern India. *J Clin Diagn Res*. 2013 Jan;7(1):122-6. doi: 10.7860/JCDR/2012/4842.2685.
11. Joshi H.S., Mahmood S.E., Joshi M.C., Shaifali I., & Srivastava P.C. (2012). Clinico-Epidemiological Profile of Snake Bite Cases in Western Nepal - . *TAF Preventive Medicine Bulletin*, 11, 57-62. DOI: 10.5455/pmb.20111023012020
12. Bajracharya, S., Joshi, R., & Shrestha, D. B. (2017). Clinical Spectrum and Outcome of Snake Bite Cases in Western Nepal. *Journal of Nepalgunj Medical College*, 15(2), 26–28.

<https://doi.org/10.3126/jngmc.v15i2.22839>

13. Pandey, D.P. (2006). Epidemiology of snake bites based on hospital survey in Chitwan and Nawalparasi districts. *Journal of Nepal Health Research Council* 4(2): 51–57.
14. Poudyal, V.P., K.M. Paudel, N.B. Rana & S. Adhikari (2016). A hospital based study on snake bite poisoning in adults in the western region of Nepal. *Journal of Chitwan Medical College* 6(3): 33–38; <https://doi.org/10.3126/jcmc.v6i3.16697>
15. Kamar SB, Khanal KK, Bhusal L, Amgain K, Puri S, Singh R. Profile and Outcome of Snake-bite Envenomation: in Far-western Province of Nepal: An Observational Hospital-based study. *Europasian J Med Sci.* . *Europasian J Med Sci.* 2020; 3(1): 40-46. <https://doi.org/10.46405/ejms.v2i2.00>
16. Singh A, Goel S, Singh A, Goel A, Chhoker V, Goel S et al. An epidemiological study of snakebites from rural Haryana. *International Journal of Advanced Medical and Health Research.* 2015;2(1):39. DOI: 10.4103/2349-4220.159142
17. Shrestha BR, et al. Retrospective Study of Snakebites in Nawalpur Snakebite Treatment Center, South-central Nepal. *Adv Clin Toxicol* 2018, 3(3): 000138
18. Bhelkar SM, Chilkar SD, More SM. Study of snake bite cases admitted in tertiary care hospital in Nagpur. *Int J Community Med Public Health* 2017;4:1597-602.
19. Paudel, V.. "Clinical Profile and Amount of Antisnake Venom Used in Admitted Cases of Snake Bite Envenomation in Bharatpur Hospital ICU." *Post-Graduate Medical Journal of NAMS* (2018):(2)7-11
20. Sharma N, Chauhan S, Faruqi S, Bhat P, Varma S. Snake envenomation in a north Indian hospital. *Emerg Med J.* 2005;22:118-20.
21. Chaudhary, S., Singh, S., Chaudhary, N., & Mahato, S. (2014). Snake-Bite in Nepal. *Journal of Universal College of Medical Sciences,* 2(3), 45–53. <https://doi.org/10.3126/jucms.v2i3.11829>
22. Sharma SK, Chappuis F, Jha N, Bovier PA, Loutan L, Koirala S, 2004. Impact of snake bites and determinants of fatal outcomes in southeastern Nepal. *Am J Trop Med Hyg* 71: 234–238. doi:10.4269/ajtmh.12-0750
23. Williams DJ. Snake bite: a global failure to act costs thousands of lives each year. *BMJ.* 2015 10 27;351:h5378. doi: <http://dx.doi.org/10.1136/bmj.h5378>
24. Shrestha B, Pandey D, Acharya K, Thapa-Magar C, Mohamed F, Isbister G. Effective, polyvalent, affordable antivenom needed to treat snakebite in Nepal. *Bulletin of the World Health Organization.* 2017;95(10):718-719. doi: <http://dx.doi.org/10.2471/BLT.17.195453>