

Profile and Outcome of Snake-bite Envenomation: in Far-western Province of Nepal: An Observational Hospital-based study

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ABSTRACT

Background: Snakebite is a well-known medical emergency and a cause of hospital admission with significant mortality in our country. So, this study aims to find out the status and outcome after the envenomation of snake bites in the Farwest Provincial hospital of Nepal.


Methods: This is a prospective observational study from 15th April 2018 to 14th April 2019. All the snake bites presented to the hospital were recorded and observed till discharge, death, or referral. Case management was done as per the WHO guideline 2016. Ethical permission was taken from the hospital and informed consent was taken from each participant. The data were entered in Microsoft Excel and analyzed using SPSS and data analysis was done with appropriate descriptive statistical tools.

Results: A total of 362 snakebites were admitted to the emergency department of this hospital during one year period, among them, 71% were non-poisonous, and the remaining 29% were poisonous. There were 17 deaths out of 362 snakebites with a case fatality rate of 12 %. Among poisonous snakebites, 36% were Krait. Major clinical features of envenoming were ptosis, nausea, vomiting, pain abdomen, parotid tenderness, numbness, blister, and bleeding in the bitten parts. 86% of poisonous bites were given 100ml vial of snake venom antiserum. Few cases required additional 10 vials (100ml) and 13.5% required mechanical ventilation support for respiratory paralysis. There was no mortality in the Intensive Care Unit and ward.

Conclusion: Snakebite is a seasonal life-threatening emergency public health problem in the Farwest Province of Nepal. There is high mortality of snake bites without intervention and excellent outcomes after proper intervention at the time were observed. Community awareness and strengthening health systems are major activities to be done to reduce the burden of Snakebites cases.

Keywords: complication; far western province, poisonous; snakebite, snake venom antiserum

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Article Info

Received: 12 December 2020;

Accepted: 14 March 2021;

Published Online: 14 March 2021

How to cite this article in Vancouver Style?

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.* 2021; 3(1): 40-46. <https://doi.org/10.46405/ejms.v2i2.00>

Disclaimer

Conflict of Interest: None Declared;

Source of Support: Nil

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INTRODUCTION

Snakebite is one of the most common occupational hazards causing life-threatening medical emergencies in Nepal. Community awareness, appropriate first aid, immediate transport, timely identification of envenoming, an adequate dose of snake venom antiserum, and instant addressing of complication management are the most important indicators of survival of the snakebite victims. World Health Organization concluded that, though the exact number of snake bites is unknown, an estimated 5.4 million people are bitten each year with up to 2.7 million envenomings worldwide.¹ Annual deaths by snakebite envenoming are around 81 000 to 138 000 people and around three times as many amputations and other permanent disabilities. Snakebite is a neglected public health problem and lastly prioritized causing significant morbidity and mortality worldwide and also in South East Asia region including Nepal.² Agricultural workers and children in rural areas with poor socioeconomic status are affected mostly.³ It is an important task to carryout prospective snakebite-related studies in different regions of the country to discover how to reduce morbidity and mortality.⁴ There are limited studies done on snakebite and envenoming around the world as well as in countries like Nepal. Emergency department data of snakebite records of the previous year of this hospital showed significant morbidity and mortality. This study will be helpful to know the magnitude of snakebite status and will help in making snakebite policy and management

Table 1: Indication of Snake Venom Antiserum

SN	Diagnostic Criteria	Characteristics
1	Haemotoxic	Hemostatic Abnormalities like spontaneous systemic bleeding, coagulopathy (positive non-clotting 20-minute whole blood clot test (20WBCT), International Normalized Ratio (INR) >1.2 or thrombocytopenia
2	Neurotoxicity	Neurotoxic Abnormalities like bilateral ptosis, external ophthalmoplegia, paralysis, etc.)
3	Cardiovascular	Cardiovascular abnormalities (hypotension, shock, cardiac arrhythmia, abnormal ECG)
4	Renal toxicity	Acute kidney injury (oliguria/anuria, rising blood creatinine/urea; haemoglobin/myoglobin-urea)
5	Muscle Toxicity	Generalized rhabdomyolysis.
6	Laocal toxicity	Local envenoming (local swelling, involving more than half bitten limb (in absence of tourniquet) within 48 hours of the bite, swelling after bites on digits, rapid extension of swelling beyond wrist/ankle within few hours of bites on hand/foot, enlarged tender lymph node draining bitten limb)

protocol. This study aims to find the burden of snake bites and outcome after antiserum in this center with the demographic pattern, and major clinical features of poisonous envenoming.

MATERIALS AND METHODS

This is a prospective observational study conducted in Seti Provincial Hospital, Dhangadhi, Kailai, Nepal, which is a secondary level hospital of Far Western Province from 15th April 2018 to 14th April 2019. All snakebite victims presented to the emergency department of Seti Provincial Hospital were enrolled in the study who fulfilled the inclusion criteria. A pre-tested semi-structured questionnaire was used for data collection and subsequent information was recorded till the endpoint of the study. History, examination, and relevant investigations were done to find out the poisonous snakebite envenoming and its complication. Airway, breathing, and circulation were secured at arrival to the emergency department. Snake Venom Antiserum (SVA) 10 vials (100ml) was given over an hour for envenoming snake bite and an additional 100 ml of SVA given after six hours if indicated as per WHO guideline 2016 (table 1).

Criteria for repetition of snake venom antiserum are persistence or recurrence of blood incoagulability after 6 hours or of bleeding after 1-2 hours and deteriorating neurotoxic or cardiovascular signs after 1 hour of Snake Venom Antiserum infusion.

Indications for intubation are 1. Imminent respiratory arrest (breathing is absent or inadequate), 2. Neck

muscle weakness with shallow respiration or paradoxical breathing, 3.Upper airway obstruction with stridor (secondary to anaphylaxis) 4.Oxygen saturation <90% (equivalent to PaO₂ <60 mmHg) despite high flow oxygen 5.Blood gas measurement showing respiratory acidosis (hypoxia PaO₂ < 60 mm Hg with PaCO₂ > 45 mmHg.

Injection adrenaline 0.5mg was made sure for the management of SVA anaphylaxis. Unconscious and intubated patients were transferred to ICU and uncomplicated or stable patients were admitted to the medical ward and discharged after recovery. Endpoints of this study were discharged, refer, left against medical advice and death.

Permission for the study was taken from the authority of Seti Provincial Hospital and written consent was taken from snakebite victims or guardians before enrolling in the study. The data were entered in Microsoft Excel and analyzed using SPSS and appropriate descriptive statistical analysis was done.

RESULTS

A total of 362 snakebite victims were included in this study. The victims of snake bites were from Brahmin/Chhetri (40%), Janajati (37%), Dalit (14.6%) and the remaining were from other minor ethnic groups including Tharu, and Muslim.Out of the 362 snake bite, 192 (51.3%) of the victims were from Kailali and 142 (40%) of the victims were from Kanchanpur district. All age groups were affected ranging from 2-74 years with a mean age of 27.67 with the most common age group between 20 to 30 years. Agricultural workers had the highest (57%) incidence of snake bites in comparison to other occupations (table 2).

Upper limb (43%) and lower limbs (45%) were almost equally affected, head and Neck (7.5 %) and other parts (4.5%) were the least attacked parts by the snake. Agricultural land (44.8%) and land around the house (32.6%) were the riskiest areas of snakebite following inside house (11.8%) and other (10.8%). Only 57 (15.8%) were able to visit this hospital within an hour, most of the victims 58.7 % (N=213) required one to four hours and the remaining 92 (25.5%) came after four hours. Motorbike 292 (80.7%) was the easily available and most commonly used transport method, 37 (10.2%) got the opportunity to use an ambulance and the remaining 33 (9.1%) came by bus, auto-rickshaw, etc (table 3).

The peak incidence of snakebite was seen in Junne

(n=70), July (n=82), and August (n=79), whereas November, December and January were the months of least incidence of snakebite (Figure 1). Nearly one-third (28.45%) were poisonous snake bite and the remaining were non-poisonous (figure 3).

Table 2: Baseline characteristics of snakebite victims (n=362)

Ethnic group	Number	Percentage
Dalit	53	14.6%
Janajati	134	37%
Madheshi	5	1.4%
Muslim	4	1.2%
Brahmin/Chhetri	145	40%
District-wise distribution		
Kailali	192	53.1%
Kanchanpur	146	40%
Dadheldhura	15	4.1%
Doti	9	2.5%
Age distribution		
Range	2-74	
Mean	27.67	
Most common age group	20-30	
Female Male Ratio	199:164 (1.21:1)	
Occupation		
Agricultural worker	208	57.5%
Student	58	16%
Service	34	9.4%
Others	32	8.8%

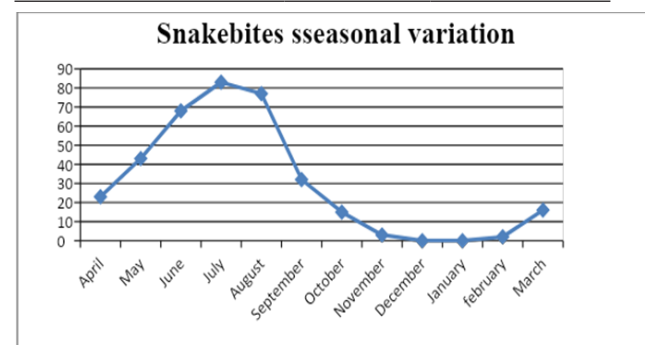


Figure 1: Seasonal Variation of Snake bites

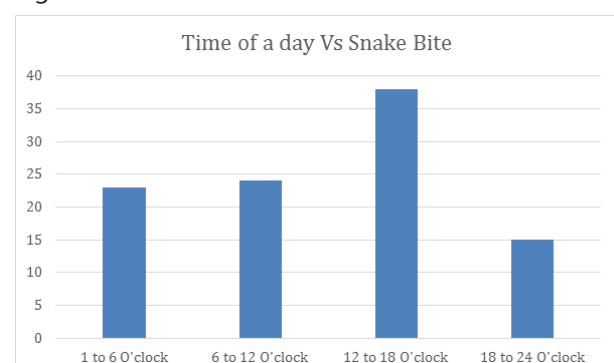


Figure 2: Variation of Snake bites within a day

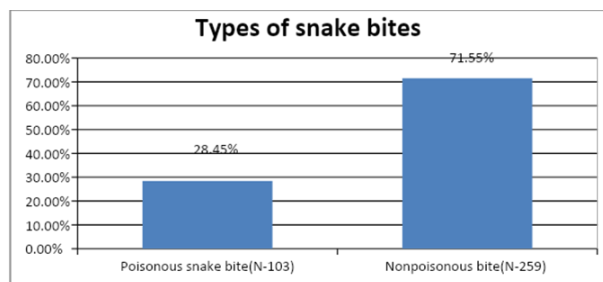


Figure 3: Snake bites according to the species
Krait was easily identified (N=37) snake, but more than 50% of poisonous snakes were unidentified. Identification based on the description of snake by victims and guardians somebody brought the snake to the hospital (table 4). Inappropriate use of tourniquet was 74.5%, and other bad and harmful practices were application of various herbal medication, incision drainage of blood from bitten site (table 5). Major and diagnostic clinical features were ptosis, bite marks and local swelling, pain abdomen, nausea vomiting, parotid

Table 3: Snakebite victims: site of the bite, places of bite, duration of hospital arrival, and mode of transport.

Site of snake bite	Number	Percent (%)
Lower limb	163	45%
Upper Limb	156	43%
Head and Neck	27	7.5%
Others	15	4.5%
Place of snake bite		
Agricultural land	162	44.8%
Around house	118	32.6%
Inside house	43	11.8%
Other	39	10.8%
Duration of snakebite and hospital arrival		
<1 hour	57	15.8%
1-4 hours	213	58.7%
>4 hours	92	25.5%
Mode of transport of snakebite victims		
Motorbike	292	80.7%
Ambulance	37	10.2%
Bus, auto-rickshaw, and others	33	9.1%

Table 4: Identification of snakes

Types of snakes	Number	Percentage (%)
Krait	37	36%
Cobra	6	5.8%
Viper	9	8.7%
Unknown	51	49.5%
Total	103	100%

tenderness. Serious and life-threatening features were convulsion and respiratory distress (table 6).

Among poisonous snake bites, the most common complication developed was respiratory paralysis 14.9 % (n=14) required the mechanical ventilation

Table 5: First aid/traditional healing practice

First aids	Number	%
Dangerous tourniquet	25	7%
Inappropriate use of tourniquet	259	71.45
Incision and suction	6	1.65
Herbal medicine	42	11.60
Dhami/Jhakri	29	8.00
Nothing	26	7.20

Table 6: Major clinical features of poisonous snake bites

Clinical features	N	Percent
Bilateral Ptosis	78	75.5%
Bite marks with abrasion only	68	66%
GI symptoms: Nausea/ Vomiting, and Pain abdomen	58	56.3%
Parotid tenderness	52	50.4%
Bite marks with Fangs	34	33%
Local bleeding with swelling/ bulla	19	18.4%
Respiratory paralysis	14	13.5%
Convulsions	2	1.9%

Table 7: Severe complications of poisonous snakebite

Severe complications	N	Percentage
Respiratory Paralysis	14	14.9%
Coma	9	9.5%
Sepsis and cellulitis	7	7.45%
Acute kidney injury	3	3.2%
Locked in Syndrome	2	2.1%
Intraabdominal hematoma	1	1.06%

support followed by coma 9.5 % (n=9) including two cases of locked-in syndrome, cellulitis with sepsis 7.45 % (n=7), acute kidney injury was 3.2 % (n=3) and one intra-abdominal hematoma (table 7). The average snake venom antiserum consumption is 11.75 vials (117.5 ml) (table 8).

Among 14 ventilated patients ten (71%) were extubated within 48 hours (figure 4).

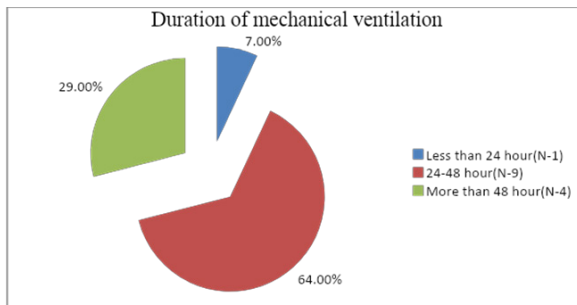


Figure 4: Duration of Mechanical Ventilation
Outcome of poisonous snake bites: There was a total of 103 poisonous snake bites with a case

Table 8: Dose of Snake Venom Antiserum:

Snake Venom Antiserum	N	Percent (%)
SVA 10 vial(100ml)	84	86.59%
SVA 10-20 vial(200ml)	10	10.30%
More than 20 vial(300ml)	9	3.09%

fatality rate of 16.5% (N=17), nine deaths (8.74%) were brought dead, eight deaths (8.2%) were after initiation of treatment in emergency. All the ICU and ward admitted patients recovered with no mortality after admission. Almost all deaths were due to neurotoxic envenoming.

DISCUSSION

Almost all ethnic groups of the population residing in this region are vulnerable to snake bite and Brahmin/Chhetri and Janajati are the major groups of the population affected in this study most likely due to the high proportion of these groups in the population. Large numbers of snakebite cases were from Kailali and Kanchanpur districts since they are densely populated areas and this hospital is within the center of Kailali and Kanchanpur. Most of the patients were agricultural workers by occupation and of the age group 20-30 years which was similar to the study done by Shrestha et al., the study of snakebite in Nawalpur snakebite treatment center, Netragunj, Sarlahi district, south-central Nepal.⁶ This study observed that the occurrence of bites is more common in males because of males predominance as foreign employers. Our findings were in contrast to the other study which showed that males and females were equally affected arguing that both are equally involved in field activities but our findings of male predominance were similar to the study done by Sharma et al. that showed 73% of male predominance in Eastern Nepal.^{7,8} Almost 90% bites occur during the rainy season (April–October), which corresponds to the peak in farming activities and hot season and the snakes come out of their shelter

due to increased humidity and temperature. This seasonal pattern of poisoning was seen in other different studies as well.^{9,10} Most common biting sites were the lower limb and upper limb which was about 88% in our study. This finding is comparable to other reports. This is likely because both the limbs are exposed and active parts of the body.^{11,12} Seventy percentage bites were nonpoisonous and remaining poisonous. Among poisonous bites, 36% (N=37) were krait, 9% (N=9) were viper and 6% (N=6) were cobra while the remaining were unknown. We found that knowledge and capacity of identification of snake are poor similar to Martins et al.¹³

Around 71% (N=270) of the victims presented to the hospital within four hours of the snake bite, 80% (N=292) came by motorbike which is easily available for transport. Still, 75% (N=284) people used inappropriate splint, incision, and sucking 1.65% (N=6), traditional practice such as Dhama, Baidhya, and herbal medicine 19% (N=71). These findings are suggestive of harmful practices in communities, also seen in Sharma et al.'s study.¹⁴

The commonest clinical finding in the present study was ptosis as it was taken as the gold standard for the confirmation of poisonous neurotoxic bite and start of snake venom antiserum. Here ptosis is an easily noticeable sign both by the visitors and the health workers. Respiratory paralysis was observed in 14% (N=14) of victims and almost all required ventilator support. After ventilator support, there were excellent results with zero mortality in ICU and ward which was in sharp contrast to the finding of other studies done in Nepal.¹⁵

This study followed the standard dose of SVA according to WHO guideline, 86.59% (N=84) of our victims were cured by 10 vials of SVA (100 ml Snake Venom Antiserum) but other studies have various range. The study done by Poudyal VP et al was a hospital-based study on snake bite poisoning in adults in the western region of Nepal that showed an average use of 19.6 SVA vials per case. Similarly, other different studies had found average use ranged from 12 to 24.⁷ vials per case but another study by Pandey DP et al had found that 4 to 98 vials of SVA were required per patient.¹⁶

The total case fatality rate observed in this study was 16.5% (N=17) with zero mortality in ICU/ward, but the range of mortality varied from 3 to 58% in various studies, and severe sepsis as well as amputation of limbs were found as complications of snake bite.^{17,18}

Limitation of this study: Some observational and

decision-making skills may vary in different clinicians during treatment for the snakebite victims. This study could not include all the snakebite victims of far western provinces.

CONCLUSION

Far western province categorically Terai region has significant victims of snake bites, mortality, and harmful traditional practice. Early identification and initiation of SVA for a poisonous bite and prompt ventilator support for respiratory paralysis bring the best outcome. Community empowerment and awareness, training for all levels of health workers, ensuring safe, effective treatment, increasing partnerships to related organizations, coordination, and adequate resources allocation, and strengthening health systems in all levels of government are the key activities for the prevention and better outcome of snakebites.

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