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Clinical Characteristics and Treatment Approach of Snakebites at a Tertiary Care Facility in Pokhara, Nepal: A Retrospective Analysis

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Abstract:

Introduction: Snakebite is a medical emergency resulting in significant morbidity and mortality globally. Snakebite, in Nepal presents a complicated medical situation, characterized by unique clinical features, treatment approaches, and outcomes. Therefore, there is an increasing demand for scholarly research into the effective care and management of snakebites in Nepal. This retrospective study aims to analyze the clinical characteristics, treatment approach and outcome of snakebites at a tertiary care facility in Pokhara, Nepal.

Materials and Methods: Medical records of snakebite patients admitted to the tertiary care facility for a period of one year (August 30, 2018 to August 30, 2019) were retrospectively reviewed. Data on demographics, clinical features, and treatment approaches were collected and analyzed.

Results: A total of 247 snakebite cases were included in the study. The results of clinical presentation revealed that the majority of cases (61.5%) had no fang marks. Similarly, majority of patients had cellulitis (68.4%), pain and swelling (29.1%), change in skin color (22.7%), and vesicles and bullae (2.0%). Neurological symptoms were not present in any cases (100.0%). 72.5% of patients experienced no bleeding, while 19.8% exhibited external bleeding and 7.7% had internal bleeding. Fresh frozen plasma was administered among 94 (38.1%) of snakebite patients admitted to the hospital. Hospital stays were brief, with 79.4% of patients staying less than 5 days with only 19.0% being referral cases. The findings of treatment approach indicated that anti-snake venom was not used in any reported cases. Finally, the outcome showed improving condition in all the cases with no use of anti -venom.

Conclusions: This retrospective analysis provides insights into the clinical characteristics and treatment patterns of snakebites, highlighting patterns and areas for further investigation and improvement in treatment protocols particularly the use of anti-snake venom.

Keywords
Clinical characteristics, retrospective study, snakebite, tertiary care facility, treatment approach

INTRODUCTION

Snakebite is a serious but neglected public health issue in many tropical and subtropical regions of the world. [1-4] An estimated 5.4 million people suffer from snakebites annually, resulting in 2.7 million envenoming, 138,000 fatalities, and more than 400,000 cases of permanent disabilities [1]. Most deaths occur in South Asia and Africa [2-4]. Snakebite has also emerged as a critical medical emergency in Nepal [2-4]. with the highest snakebite mortality rates in South Asia [5]. Every year, around 40,000 snakebite cases are reported resulting in nearly 3000 deaths in Nepal. This is evident in the earlier studies that around 17 snake species are venomous among 89 snake species found in Nepal, mostly belonging to the Elapidae and Viperidae families [2,4-7]. Similarly, snakebites envenoming is also prevalent in the hills and mountains of western Nepal. [6,8-10] However, despite having an extensive study on snakebite, the data on envenoming in hills and mountains of western Nepal is scarce [8-11].

A retrospective study in Nepal examined snakebite poisoning in children admitted to a hospital emergency department between 2004 and 2010 (246 cases, ages up to 14). All children experienced neurological symptoms where the fatality rate stayed high at 28.2%. [11]. Another study (April 2018 - April 2019) at Nepal's Far West Provincial Hospital examined snakebite cases which resulted that the case fatality rate significantly improved to 4.7% (17 deaths), likely due to following the WHO's 2016 snakebite guidelines [12]. Another study (October 2015 - October 2016) in eastern Nepal (Itahari) investigated snakebite cases in children under 18. Only 7.1% of cases required anti-venom treatment, suggesting that not all snakebites in this region are venomous [13].

Furthermore, a study in the western region of Nepal explored snakebite occurrences using data from ten treatment centres (June 2011 - February 2012). While over 6,900 snakebites were reported between 2008-2010, only 9% (640 cases) were classified as venomous and required anti-venom treatment. A concerning finding was the high case fatality rate of 13%, highlighting the severity of snakebite envenoming in this region [14]. Additionally, a study at Bheri Hospital in Nepalgunj, Nepal (May-November 2020) examined snakebite cases. Over six months, 107 people were admitted for snakebite envenoming. Krait bites were the most common cause with neurological symptoms. The use of Polyvalent Anti-Snake Venom (ASV) with an average dose of 8.75 vials resulted in a high success rate (96%), with only 4 fatalities (3.7%) [15].

Despite the existing burden of snakebites, people are not aware about the correct ways to manage them and were still attending traditional healers as a means of treatment [16].

The prevalence of snakebite in Nepal has not been extensively researched particularly in hills and mountains of the Western region of Nepal. This retrospective study seeks to analyze the clinical characteristics, treatment patterns, and outcomes of snakebite patients at a tertiary care facility in Pokhara, a western part of Nepal. By understanding the epidemiology and clinical course of snakebites, the study aims to inform clinical practice and contribute to the development of effective strategies for the prevention and management of snakebite envenomation.

MATERIALS AND METHODS

Study design and setting:

This study employed a retrospective design and was conducted at Manipal Teaching Hospital, a major referral hospital located in Pokhara, Nepal. The hospital serves a diverse population from Pokhara and its surrounding regions and provides specialized care for various medical and surgical conditions [17], including snakebite envenomation [18].

Participants, sample size and sampling technique

All the snakebite cases admitted in Manipal Teaching Hospital between August 2018- August 2019 were included where all the data was extracted from the Medical Record Department of the hospital.

Patients admitted with a confirmed snakebite diagnosis were included in the study. Patients admitted with a doubtful case of snakebite were excluded from the study.

Data collection procedure and study variables

Data was collected using a proforma which consisted of five parts. Part I included demographic profile of the patients such as age, sex; snakebite features (time of snakebite, body site of the snakebite, and type of snake species). Part II included clinical presentation (local and neurological symptoms, bleeding symptoms). Part III included treatment details (first-aid, use of anti-snake venom). Part IV included laboratory testing and Part V included medications used.

Data was extracted from the Medical Record department by the Principal Investigator. At first the principal investigator reviewed the record book of Emergency Department of the period of August 2018-August 2019 from which the total number of snake bite cases and their hospital number was identified. Then with hospital number, the files of snake bite cases were taken from the Medical Record Department. Only ten files could be collected at a time for the review as per the hospital rules. As the information from the ten files were recorded in the proforma, it was then returned to fetch next ten file. It was then continued until all the snake bite cases were covered .

Statistical analysis and data management

Descriptive statistics were used to summarize the demographic characteristics, clinical presentation, treatment patterns, and medication prescribed for patients with snakebites. Categorical variables were reported as frequencies and percentages. The data were analyzed using SPSS version 26.0.

Ethical consideration

This study was approved by the Institutional Review Committee (IRC) of Manipal Teaching Hospital, Pokhara, Nepal (Ref. No. MEMG/IRC/268/GA). Patient confidentiality was maintained throughout the study, and all data were anonymized before analysis.

RESULTS

Table 1 presents the demographic characteristics of the patients. Out of 247 patients, most (71.3%) were between 16 and 55 years old. Interestingly, (21.5%) were both young adults (26-35 years old) and older adults (above 56) (23.9%). Women (54.3%) were more likely to be bitten by snakes than men (45.7%). The majority of cases (56.3%) came from the Kaski district, where the hospital is located. However, surrounding districts like Syangja (13.4%), Tanahun (10.5%), Baglung (8.5%), and Parbat (5.3%) also had snakebite victims seeking treatment, likely due to the proximity of the medical facility.

Table 1| Demographic profile of snakebite patients (n=247)

Characteristics	Frequency	Percent
Age Group		
Below 5	2	0.8
6 - 15	10	4
16 - 25	46	18.6
26 - 35	53	21.5
36 - 45	44	17.8
46 - 55	33	13.4
Above 56	59	23.9
Sex		
Male	113	45.7
Female	134	54.3
Address		
Kaski	139	56.3
Tanahun	26	10.5
Baglung	21	8.5
Parbat	13	5.3
Myagdi	10	4
Syangja	33	13.4
Gulmi	1	0.4
Nawalparasi	2	0.8
Bardiya	2	0.8

Table 2| Incidence of snakebite (n=247)

Characteristics	Frequency	Percentage
Timing of Snake bite		
Morning	67	27.1
Day	12	6.1
Evening	77	31.2
Night	88	35.6
Location of Bite		
Upper extremities	144	58.3
Lower extremities	82	33.2
Head	2	0.8
Both Extremities	19	7.7
Types of Snakes		
Green Snake	105	42.5
Cobra	0	0
Blind Snake	3	1.2
Others	44	17.8
Season of Snakebite		
Spring (March, April, May)	29	11.7
Summer (June, July, August)	125	50.6
Autumn (September, October, November)	93	37.7
Winter (December, January, February)	0	0

Table 2 outlines the key attributes of snakebite incidents observed among the 247 patients analyzed in this study. Most snakebites occurred at night (35.6%), followed by evening (31.2%). However, morning incidents were less frequent (27.1%). Predominantly, snakebites targeted the upper extremities (58.3%), likely because these areas are more exposed during activities that increase the risk of encountering snakes. Lower extremities were bitten less frequently (33.2%), and head bites were exceedingly rare (0.8%). Green snakes accounted for the highest number of bites (42.5%), while no cobra or krait bites were reported. A small proportion of bites were attributed to blind snakes (1.2%), and the remaining cases (17.8%) fell under the category of others, indicating an inability to identify the specific snake species involved. Most cases of snakebites occurred in summer (50.6%), and autumn (37.7%) seasons. Few cases were reported in the spring season (11.7%).

Table 3 depicts that the majority of cases (94.3%), a tourniquet was not applied. This challenges a common misconception about first aid for snake bites. Applying a tourniquet can be harmful and restrict blood flow unnecessarily. Local treatment was not given in most cases (96%). However, in a few cases (4.0%) cleaning of the wound and applying antiseptics were done. Most patients (79.35%) stayed less than 5 days in the hospital,

indicating successful treatment and recovery. A significant number of patients (19%) were referred to Manipal, which suggests either a lack of resources at the initial treatment facility or the need for specialist care. Only a small number of patients (2%) reported a prior history of snakebite.

Table 4 presents the clinical characteristics and laboratory findings of snakebite. The results revealed that fang mark was present in 95 (38.5%) snakebite victims admitted to the hospital whereas it was found absent in 152 cases (61.5%). The most common local symptom (68.4%) was cellulitis, a skin infection characterized by redness, swelling, and pain. Skin discoloration (22.7%) and pain/swelling (29.1%) were also frequently reported. However, gangrene, vesicles/bullae (blisters), and limb deformity were rarely observed. Whereas neurological symptoms were absent in all the cases (100.0%). The majority (72.5%) did not exhibit any bleeding symptoms. However, when bleeding occurred, it was more frequently external (19.8%) than internal (7.7%). Similarly, the results of a test called PT/INR, which measures blood clotting time. The PT/INR values among snakebite patients were deranged indicating need for fresh frozen plasma.

Table 5 illustrates the treatment modalities and medication used for snakebite patients. The data demonstrated that not a single case (0.0%) used Anti-snake venom. This could be due to bites might have been from non-venomous snakes. The findings also revealed a variety of medications used. Flucloxacillin (Fluclox) (92.3%) was the most commonly used antibiotic to prevent infection. The anti-inflammatory medications like Aciloc (62.3%), and Inflazyme (77.3%) were administered to reduce the swelling. Similarly, injections like tramadol (59.1%), and ondem (59.1%) were prescribed for relieving pain and nausea. Likewise, codopar was also used as a supplementary pain reliever. Moreover, Vitamin K was administered to hold blood clotting. In terms of blood products, no cases (0.0%) used whole blood transfusion. However, fresh frozen plasma (FFP) was used in only 38.1% of cases based on coagulation testing. Moreover, no cases of complexity (0.0%) were reported and all the patients (100.0%) were discharged from the hospital after improvement in the condition.

Table 3| Characteristics of snakebite incidences (n=247)

Characteristics	Frequency	Percentage
Tourniquet Apply		
Yes	14	5.7
No	233	94.3
Local Treatment		
Yes	10	4
No	237	96
Duration of Hospital Stay		
Lower than 5 days	196	79.35
More than 5 days	51	20.65
Referred to Manipal		
Yes	47	19
No	200	81
History of Snakebite		
Yes	5	2
No	242	98

Table 4| Clinical characteristics and laboratory findings of snakebites (n=247)

Characteristics	Frequency	Percentage
Fang Mark		
Present	95	38.5
Absent	152	61.5
Local Symptom Present		
Absent	27	10.9
Skin Color change	56	22.7
Cellulitis	169	68.4
Vesicles and bulla	5	2
Gangrene	0	0
Pain and swelling	72	29.1
Neurological Symptoms		
Absent	247	100.0
Respiratory paralysis	0	0
Ptosis	0	0
Limb atrexia	0	0
Other (Slurred voice)	0	0
Bleeding Symptom		
Internal	19	7.7
External	49	19.8
None	179	72.5
Total no. of PT/INR Done		
>5	199	80.6
5 - 10	41	16.6
>10	7	2.8

DISCUSSION

This retrospective study aims to analyze the clinical characteristics, treatment patterns, and outcomes of snakebite patients at a tertiary care facility in Pokhara, Nepal. The findings of the study demonstrated that out of 247 patients, most (71.3%) were between 16 and 55 years old comprising of young (26-35 years), and older adults (56 and above). which is in line with the earlier studies conducted in the western region of Nepal [8,9,13]. The study also revealed that women (54.3%) were more likely to be bitten by snakes than men

(45.7%) aligning with previous study [9]. However, the findings of this study is in contrast with an earlier study in India [19] indicating that the number of male snakebite patients was higher than female patients. Similarly, the majority of cases (56.3%) came from the Kaski district, where the hospital is located. However, surrounding districts like Syangja (13.4%), Tanahun (10.5%), Baglung (8.5%), and Parbat (5.3%) also had snakebite victims seeking treatment, likely due to the proximity of the medical facility which concurs with an earlier study [**9].**

Table 5| Treatment modalities of snakebites (n=247)

Characteristics	Frequency	Percentage
Use of Anti-snake Venom		
Used	0	0
Not Used	247	100
Medication Used		
Inj. Fluclox	228	92.3
Tab Aciloc	154	62.3
Inj. Inflazyme	191	77.3
Inj. Tramadol	146	59.1
Inj. Ondem	146	59.1
Tab Codopar	196	79.4
Vitamin K	110	44.5
Inj. Tranostat	49	19.8
Tab Chymoral Forte	56	22.7
Inj. Pantop	77	31.2
Inj. Vitamin K	110	44.5
Inj. Ceftriaxone	12	4.9
Use of Blood Products in the Course of Treatment		
Whole Blood	0	0.0
FFP (Fresh Frozen Plasma)	94	38.1
Outcome		
Complexity	0	0.0
Improved	247	100.0

The present study also demonstrated that most snakebites occurred at night (35.6%), followed by evening (31.2%) which is in line with earlier study in India [**19].** Most snakebites targeted the upper extremities (58.3%), likely because these areas are more exposed during activities that increase the risk of encountering snakes [12]. Lower extremities were bitten less frequently (33.2%), and head bites were exceedingly rare (0.8%) which is in contrast with previous studies [13,14,17,19]. Likewise, green snakes accounted for the highest number of bites (42.5%) [9] while no krait bites were reported which is in contrast with earlier study [14]. A small proportion of bites were attributed to blind snakes (1.2%), and the remaining cases (17.8%) fell under the category of others, indicating an inability to identify the specific snake species involved [6,14]. Most cases of snakebites occurred in summer (50.6%), and autumn (37.7%) seasons [12,14].

In the majority of cases (94.3%), a tourniquet was not applied. This challenges a common misconception about first aid for snake bites. Applying a tourniquet can be harmful and restrict blood flow unnecessarily [20]. However, the result is dissimilar to another prior study conducted in Nepal where the tourniquet was applied in most of the cases [21]. The results revealed that the fang mark was present in 95 (38.5%) snakebite victims admitted to the hospital aligning with an earlier study [9,22]. The most common local symptom (68.4%) is cellulitis, a skin infection characterized by redness, swelling, and pain aligned to a study conducted in India [23]. Skin discolouration (22.7%) and pain/swelling (29.1%) were also frequently reported similar to earlier studies in Nepal [8,13]. The majority (72.5%) did not exhibit any bleeding symptoms aligning with earlier studies in Nepal [8,9] indicating bleeding symptoms among snakebite patients among 6.7% and 4.2% respectively. The coagulation testing indicated the need for fresh frozen plasma (FFP) among 38.1% of patients having deranged PT/INR value which is similar to earlier studies [17, 21].

The study also demonstrated the treatment modalities and medication used for snakebite patients. The data demonstrated that not a single case (0.0%) used Anti-snake venom which is in line with the earlier study in Nepal [21]. This could be due to bites might have been from non-venomous snakes. The findings also revealed a variety of antibiotic medications used which is similar to a study conducted in the western region of Nepal [9]. In terms of blood products, no cases (0.0%) used whole blood transfusion. However, fresh frozen plasma (FFP) was used in only 38.1% of cases based on coagulation testing which is similar to an earlier study in Nepal [21]. Moreover, no cases of complexity (0.0%) were reported and all the patients (100.0%) were discharged from the hospital after improvement in the condition which is consistent with a prior study in Nepal [17].

Limitation: As the study was conducted in a single tertiary care center, the findings may not be generalizable to other institutions or broader populations.

CONCLUSION

Snakebite is a medical emergency in Nepal with the highest rate of morbidity and mortality. In this study,

there was no mortality and no use of anti-snake venom despite of the hematotoxic snake bites. This retrospective analysis provides insights into the clinical characteristics, treatment patterns, and outcomes of snakebites in the western region of Nepal, highlighting patterns and areas for further investigation and improvement in treatment protocols particularly the use of anti-snake venom.

ADDITIONAL INFORMATION AND DECLARATIONS

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Data Availability: Data will be available upon request to corresponding authors after valid reason.

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