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Original Research Article

A prospective study on clinico-epidemiological profile and outcome in management of poisonous snake bite

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ABSTRACT

Background: Snake bite is a major health problem in Nepal. According to WHO, annual morbidity due to snake bite is 162 out of 100,000 people in Nepal. Aim of the study is to observe epidemiology, clinical features, and analysis of possible relationship between time delay in administration of anti-snake venom (ASV) and mortality.

Methods: This prospective observational study analyses the data of 81 patients admitted to the Lumbini zonal hospital, Butwal, Rupandehi, Nepal with history of snake bite between April to September, 2017.

Results: In this study 56% patients were female. Patients of age group (15-30) years were maximum (38.27%). The study showed that 50.61% of snake bites were occurred outside home. Most of patients (84%) were from the Terai region. Average no. of vials used per case was (28±10) vials. Most of victims of snake bite were from rural areas. In most of cases we found that prothrombin time was prolonged. It was found that most of patients 57% reach hospital before 4 hours of snake bite. The mean days of hospital stay was 6±2.86. Most of case of snake bite was unknown (62%). The mortality rate in this study was 6.17%.

Conclusions: There is a great need to improve in existing health care conditions for effective management of snake bite; it requires training of the personnel engaged in the emergency health care management, development of national guidelines based on the clinical trials, improving the distribution and easy availability of antivenom.

Keywords: Anti-snake venom, Krait, Poisonous snake, Snake bite

INTRODUCTION

Snake bite is a common medical emergency and major cause of hospital admissions. Snake bite is a life-threatening emergency and a high incidence of snake bite envenomation is reported from rural area. But due to inadequate epidemiological data the incidence is underestimated. Snakebite is an environmental hazard associated with significant morbidity and mortality.¹ When a person is bitten by a poisonous snake, venom is injected, causing localized symptoms of mild pain and edema and generalized ones including dyspnea, ptosis,

mental alteration, and tachycardia. In severe cases, patients develop acute renal failure, myocardial infarction, disseminated intravascular coagulation, and even death.² Treatment for poisonous snakebite is divided into supportive care and antivenom administration. Krait venom blocks both the pre and post synaptic receptors and need prolonged mechanical respiration until their receptors are regenerated. Cobra venom blocks the post synaptic receptors and needs more ASV and neostigmine.³ The oral flora of snake comprises a wide range of aerobic and anaerobic micro-organisms, especially the fecal Gram-negative rods, because their prey usually defecates while being ingested. Culture of

fangs, fang sheaths, and venom of various snakes such as vipers, rattle snakes and *Naja*, have shown heavy colonization with many bacteria, including members of *Enterobacteriaceae* including *Morganella spp.* and *Escherichia coli*, Group D *streptococci*, *Aeromonas spp.* and anaerobes such as *Clostridium spp.* so antibiotics were also used in treatment.⁴ Time delay between the snake bite envenomation and initiation of treatment with ASV has a great bearing on mortality rate. If the ASV treatment is initiated within 12 hours the mortality rate may be 2.6% and if it is more than 24 hours the mortality rate will be around 13.5%. Immediate and rapid transport of victims to a treatment center by motor cycle volunteers decreased the mortality rate and incidence of snakebite in southeastern Nepal.⁵

Rationale of study

Since ancient times, snakes have been worshipped, feared, or loathed. Unfortunately, snakes remain a painful reality in the daily life of millions of villagers. Indeed, although anti-venom is produced in sufficient quantities by several public and private manufacturers, most snake bite victims don't have access to quality care due to this reason both morbidity and mortality due to snake bites are high.⁶ Nepal is an agriculture based country which has vast agriculturally fertile Terai region with the hot climate and high seasonal rainfall. It also has high density of rodents, reptiles and amphibians flora which makes it an ideal habitat for snake to live and hibernate. Snake bite is an important occupational injury affecting farmers, plantation, workers, herders, fisherman, and snake restaurant workers. Open style habitation and practice of sleeping on the floor also expose to bite from nocturnal snake. It results in death or chronic disability to many persons of active younger age.⁷ Snake bite has high fatality due to various factor. There is a lack of public awareness, education, wide spread myths and superstition regarding snake bite which restricts patient in seeking proper treatment in anti-snake venom treatment center. Large number of patient's firsts go to traditional healers which leads to important significant delays in getting timely treatment.⁸ There is a number of victims who die after reaching the hospital because of inadequate treatment due to poor health infrastructure, wide species variation. Limited species of anti-snake venom, inexperience in handling such cases, unavailability of ventilator and work compliance with treatment protocols. Snake bite which is major cause of death in rural patients in developing countries, is neglected public health problem. Its incidence is usually underestimated because of lack of epidemiological data and therefore this study mainly focuses on clinico-epidemiological profile and outcome in management of poisonous snake bite.

Objectives

To study the clinico-epidemiological profile and outcome in management of poisonous snake bite and analysis of

possible relationship between time delay in administration of anti-snake venom and mortality.

METHODS

Study type

A prospective observational study was conducted for 6 months (April to September, 2017).

Study site

The study was conducted at Lumbini Zonal Hospital, Butwal, Rupandehi, Nepal. The data were taken from the in-patients who were visited to the hospital for the treatment of different snake bite cases during the study period.

Inclusion criteria

Inclusion criteria were male and female patients of any age.

Exclusion criteria

Exclusion criteria were those patients, who came with history of snakebite, but no definite fang marks and no symptoms, signs or evidence. Those patients were bitten by nonpoisonous snake or some other animals.

Study material

Patient profile form with details like name, age, sex, weight, address, economic status, occupation, site of bite, place of bite, date and time of bite, date of admission, name of snake bite, symptoms, first aid, laboratory data, therapy, discharge date, etc. Provision is given in the format to enter laboratory investigations, diagnosis made and number of drugs prescribed.

Statistical tool

The data recorded in encounter form was entered in microsoft excel 2013, SPSS and analyzed different parameters like mean, \pm SD.

RESULTS

All together 81 patients were included in this study. The highest incidence of snake bite was observed in patients with ages between (15-29) years followed by (30-44) years. The mean age of patients in our study was (30 \pm 18) years. Among them 36 were males and 45 were females. Maximum incidence of snake bites was in rural areas (91%). About 84% were from Terai regions. Most of bite occurs during outdoor activities (51.61). The bite occurs in lower limb (59.25%) in maximum cases. About 82.71% of patients uses tourniquet as first aid.

Table 1: Demographic profile of patients with snake bite.

S. no.		Number of patients (n=81)	% of patients	
1	Age (in years)	0-15	15	18.51
		15-30	31	38.27
		30-45	19	23.45
		45-60	9	11.11
		>60	7	8.64
2	Sex	Male	36	44.44
		Female	45	55.55
3	Area	Rural	74	91
		Urban	7	9
4	Geographical regions	Terai	68	84
		Hilly	13	16
5	Place of bite	Inside home	40	49.38
		Outside home	41	50.61
6	Site of bite	Upper limb	22	27.16
		Lower limb	48	59.25
		Others	11	13.58
7	Type of first aid used	Tourniquet	67	82.71
		Sucking of blood	3	3.7
		Dhami/Jhakari	4	4.9
		No any first aid	7	8.64
8	Economic status	Low	52	64.20
		Medium	29	35.80
		High	0	0
9	Name of snake bite	Krait	23	28.39
		Cobra	4	4.93
		Viper	4	4.93
		Unknown	50	61.72

Table 2: Clinical profile and outcome of snake bite patients.

S. no.		Number of patients (n=81)	% of patients	
1	Sign and symptoms	Pain	81	100
		Bleeding	8	9.81
		Ptosis	78	96.29
		Salvation	23	28.39
		Hemoptysis	3	3.70
		Blurred vision	45	55.55
		Dysphonia	49	60.49
		Swelling	40	49.38
		Dysphagia	41	50.61
		Sweating	20	24.69
		Vomiting	52	64.19
		Respiratory distress	61	75.30
		Paralysis	5	6.17
		Dry mouth	12	14.81
		Faint	2	2.46
		2	No of ASV vials used	>10
10-20	10			12.34
20-30	39			48.14
30-40	25			30.86
40-50	3			3.7
<50	1			1.23

Continued.

S. no.		Number of patients (n=81)	% of patients	
3	Time to reach hospital after bite	<4 hours	46	56.79
		4-8 hours	16	19.75
		8-12 hours	7	8.64
		12-16 hours	6	7.40
		>16 hours	6	7.40
4	Prothrombin time	≤19	23	29
		20-40	36	46
		40-60	8	10
		60-80	0	0
		80-100	0	0
	≥100	12	15	
5	Day of hospital stay	< 2	5	6
		2- 6	30	37
		6-10	36	44
		10-14	7	9
		>14	3	4
6	Outcome	Recovered	76	93.82
		Death	5	6.17

The highest number (52) of patients belongs to low economic status. The demographic profile of patients is given in (Table 1).

In this study pain (100%) was the most common clinical presentation followed by ptosis (96.29%) and respiratory distress (75.30%). The most of the patients (48.14%) was treated with 20-29 vials of ASV. The mean and SD of ASV vials used in patients was 28±10. Near about 56.79% of patients reach hospital after 3 hours of bite and 7.40% of patients after more than 16 hours of bite. 46% of patient shows prolongation of prothrombin time between 20-39 second and 15% of patient shows prolongation of prothrombin time more than 100 second. The maximum days of hospital stay was in between (6-9) days (44%) followed by 2-5 days (37%). Out of 81 patients 76 recovered and 5 patients died. The clinical profile and outcome of snake bite patients is given in (Table 2).

DISCUSSION

During our study, we collected 297 cases of snake bite. Out of them 212 patient cases were nonpoisonous and 85 cases were poisonous bite. Out of 85 patient cases 4 cases were referred to other hospital, so we included 81 poisonous snake bite cases in this study. In this study (14-44) years age group was the most commonly bitten age group, which was 61.72%. Other studies also reported similar type of observations.^{9,10} This may be due to (15-45) years age group is the most active in various outdoor an indoor occupation.

In our study, females (55.55%) were more prone to snake bite compared to males (44.44%). Other study also supported this observation.^{11,12} However this finding was opposite to many other studies.^{3,5,13} In this study,

incidence of snake bite was found more in rural area (91%) and least from urban area (9%). This finding was similar to other study.^{3,7,9,14} Dwelling conditions in rural areas of Nepal is more favorable for habitation of snakes and most people are engaged in agriculture work, which leads to more snake bites. Most patients visited are from Terai regions (84%) compared to hilly regions (16%). It is because due to Terai region's climate is more favorable for snake habitat. The incidence of snake bite is high in warmer regions where snakes are found abundantly and agriculture is the main occupation. In Nepal it is estimated that at least 1000 death occurs due to snake bite in Terai region each year.⁹ Out of 81 patients, inside home and outside shows almost similar number of snake bite.

In this study, 59.25% of bites occurred in lower limb and 27.16% of bites in upper limb. This finding is similar to other study of the 81 patients 67 patients applied tourniquet as the first aid.^{3,5,15,16} The use of tourniquets was almost universal.⁷ In this study 64% of patients have low economic status and 36% of patients have medium economic status. It may be due to poor housing and their surroundings. Other studies also reported similar results.^{3,14} In our study, most of cases of snake bite is unknown (62%) and among identified cases most of bite was from Krait (28%) and then followed by Cobra and Viper (5%). The majority of victim in this study could not identify the biting snake. This finding is similar to other study.^{3,8,17}

In this study, pain (100%) was the most common clinical presentation followed by ptosis (96.29), respiratory distress (75.30%), vomiting (64.19%), etc. This find is similar to other study.^{3,20} Clinical features of snake bite may vary according to the species responsible for the bite and the amount of venom injected in the body.⁷ The

commonest clinical features in the other study was ptosis as it was taken as the gold standard for the confirmation of poisonous neurotoxic bite and start of anti-snake venom.⁹ Out of 81 patients 39 patients were treated with 20-29 vials of ASV and 1 patient was treated with more than 50 vials of ASV. The average number of vials used in each patient was 28 ± 10 . The previous study suggests that the number of ASV used ranged from 10-38 vials with average of 24.37 vials.³ 1 vial contains 10 ml of ASV. ASV was administered depending upon the severity of envenomation, body size, body mass, age, amount of venom delivered during bite.⁵

In our study, 46 patients reach less than 4 hours of snake bite and 6 patients reach more than 16 hours of snake bite. 12.5% of patients were died who reach hospital between 4-7 hours and 50% of patients were died who reach hospital between 12-15 hours. Mean time to reach hospital after snake bite was 6 hours in this study. Anti-snake venom is more effective when used within 4 hours of the snake bite. This finding is quite similar to other previous study.^{3,11,17} The incidence of complication is directly proportional to duration of venom in the blood prior to neutralization by ASV.⁵ Antivenom cannot neutralize bound venom and can be effective only if given early enough to neutralize circulating venom before it binds to target sites.¹⁸

In this study it was found that prothrombin time was prolonged in case of snake bite. The normal prothrombin time is 12-16 seconds. The maximum patients (46%) show prothrombin time between (20-39) seconds and 15% of patients shows prolongation of prothrombin time more than 100 seconds. This finding is supported by other previous study.^{1,19} In our study we found that victim of hilly region shows more prolongation of prothrombin time i.e. more than 100 seconds. Most of victim of hilly region reported that they are bitten by Green Pit Viper. In all case of Viper bite prothrombin time prolongation was more than 100 seconds that suggests that Viper venom is hemotoxic. Coagulopathy is a significant cause of both morbidity and mortality in these patients either directly or indirectly.¹ The mean duration of hospital stay was (6 ± 2.86) days while 36 of the 81 patients needed 6-9 days of stay in hospital. This finding was similar to other study.²⁰

We found in this study that tetanus toxoid was most commonly used followed by antibiotics (mostly ceftriaxone) for therapeutic intervention. Other drugs include systemic corticosteroids, antihistamines, proton pump inhibitors, adrenaline, atropine, neostigmine, phenytoin, etc. Antivenom is the most effective treatment for snake bite envenomation, but the use of such immunoglobulins has the potential to cause anaphylaxis. As a result, prophylactic treatments including combinations of adrenaline, antihistamine and/or corticosteroids have been used concurrently with antivenom.^{21,22}

During this study, we found that the day rains the incidence of snake bite was increased. It may be due to during rainy days the holes were filled with water and snake becomes more aggressive they enter inside houses for shelter and in search of prey. Most of bite occur during night in our study. This study is supported by other previous study.^{7,23-25} In this study most patients suffer from secondary wound infection, i.e. cellulitis mostly in case of Cobra bite. This finding was supported by other study also.²⁶⁻²⁸ It is because the oral flora of snake comprises wide range of aerobic and anaerobic microorganisms.²⁶ The overall mortality rate in this study was 6.17%. Other study from Nepal reported 3.8% mortality rate.²⁹

CONCLUSION

Snake bite is still a major problem in Nepal, causing significant morbidity and mortality. There is gross disparity in the management and outcome of snake bite in different hospitals. There is a great need to improve in existing health care conditions for effective management of snake bite, it requires training of the personnel engaged in the emergency health care management, development of national guidelines based on the clinical trials, improving the distribution and easy availability of antivenom. Efforts are needed to develop studies on the epidemiology of snake bite and education of the population at risk. Identification of snake is essential to decide on the type of toxicity and method of treatment to be used. Development and manufacturing of anti-snake venom for local snakes is highly recommended.

Limitation

As the study was prospective it was totally depending on the patients and their care taker interview and medication chart. Most of patients and their care taker were uneducated so they do not know the medical term and they were unable to explain the exact cause and problem. Some of the patients were not cooperative and they did not fully support the study. Adverse effects of antivenom were not ascertained posing challenges during study. The result of this study was also affected by short duration, small sample size and seasonal variation of snake bite.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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