

The Morbidity and Mortality Trends of Snake Bite Patients Attending a Tertiary Care Centre in Kumaon Region of Uttarakhand

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ABSTRACT

Background: Snake bite is particularly important health problem in hilly and rural setting of Indian populations. India has the highest number of deaths due to snake bites in the world, over 50000 people dying each year due to snake bite envenomation. **Aim and Objective:** To determine the morbidity and mortality trends of snakes bites and to study the clinical profile of the patients of snake bites attending our hospital. **Methods:** A 2-year hospital-based cross sectional observational study was conducted in the Department of General Medicine in a tertiary center of Kumaon region of Uttarakhand. A reliable detailed history from patients and relatives of the patients, full clinical and routine examinations were done. **Results:** During the period of 2 years, we studied 151 cases of the snake envenomation who met the inclusion criteria. Out of 151 patients 89 were male and 62 were female. It was seen that most of the patients were among the labourers (23.17%). Maximum patients were bitten in night time. It was observed that 37.08% of our patients were bitten on upper limb. In 21.85% patients, they were arrived with tourniquet in place. Out of 151 patients, 34 patients were required intensive care unit (ICU) care in our hospital. Predominance of non-toxic (49.00%) followed by neurotoxic (33.77%) and vasculotoxic (17.23%). In male, mortality was 5.62%. While correlating types of bite with outcome, 4 deaths were in neurotoxic snake bite group and 2 were in vasculotoxic snake bite group. The overall mortality was 3.97%. **Conclusion:** In our society, mostly in uneducated societies, there is sheer ignorance regarding snake bite and peoples have more faith in local customs and in traditional healers. Morbidity and mortality can be reduced by educating the society about first aid measures, timely treatment in ASV equipped hospitals and without any delay in seeking prompt medical aid or reaching a hospital and community health centres (CHCs).

Keywords: Snake bite, Morbidity, Mortality.

INTRODUCTION

Snake bite is particularly important health problem in hilly and rural setting of Indian populations, in this region peoples face a high morbidity and mortality due to poor access to health.^[1-4] WHO has identified the anti-snake venom as an essential drug, recommending its use in primary health facilities.^[5] Medically important snakes of India include the so called “Big 4”, that occurs throughout in India. These snakes are most commonly associated with snake bites resulting in significant morbidity and mortality^[6] are:

COBRA (*Naja naja*), KRAIT (*Bungarus caeruleus*),
RUSSEL’S VIPER (*Daboia russellii*),
SAW SCALLED VIPER (*Echis carinatus*)

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The annual death rate due to snake bite in India is estimated to be 4.1 per 100000 populations. India has the highest number of deaths due to snake bites in the world, over 50000 people dying each year due to snake bite envenomation,^[7] 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.

South Asia is the world’s most heavily affected region, due to its high population density, widespread agricultural activities, numerous venomous snake species and lack of functional snake bite control programs. Poorly informed rural populations often apply inappropriate first-aid measures and vital time is lost before the victim is transported to a treatment center, where cost of treatment can constitute an additional hurdle.^[8,9]

Snake-bite is an important occupational injury affecting farmers, plantation workers, herders, fishermen, restaurant workers and other food producers.^[10] There is a lack of public awareness, education, widespread myths and superstition

regarding snake-bite. Even now a large number of patients first went to the traditional healers which lead to significant delays in getting timely treatment.^[11, 12]

The foothills of the Kumaon region comprises of the Terai and Bhabar region which mainly has a forestry and agricultural belt. Eco rich vegetation due to long standing rainy season, abundant flora and fauna and scattered populations using paths traversing rural and forest makes people in these area's particularly prone to snake bites. The main purpose of this study in Kumaon region of Uttarakhand was to study morbidity and mortality trends of snake bites that were admitted in Government Medical College and associated Dr. Susheela Tiwari Hospital, Haldwani (Uttarakhand).

Aim and Objectives

Aim:

- To study of the morbidity and mortality trends of snake bite patients attending a tertiary care centre in Kumaon region of Uttarakhand.

Objectives:

- To determine the morbidity and mortality trends of snakes bites.
- To study the clinical profile of the patients of snake bites attending our hospital.

Inclusion criteria:

- All suspected cases with signs and symptoms suggestive of snake bite admitted in Medicine Department, Government Medical College and Dr. Sushila Tiwari Hospital, Haldwani, Uttarakhand.

Exclusion criteria:

All non-documented cases of snake bite, insect bite and other animal bites.

MATERIALS AND METHODS

The present study was carried out in The Department of Medicine, Government Medical College and Dr. Susheela Tiwari Government Hospital, Haldwani (Uttarakhand). Patients with documented evidence of snake bites were admitted through Casualty (emergency) / Medicine OPD.

Study Design:

Hospital Based Descriptive cross sectional observational study.

Study Setting:

All Medical wards in Dr. Susheela Tiwari Government Hospital, Haldwani, Uttarkhand, India. It receives patients from Kumaon region of Uttarakhand and adjacent areas of Uttar Pradesh and Nepal.

Study Periods:

From September 2017 to August 2019.

Sample Size:

A total 151 patients who were diagnosed with documented Snake bite were included in our study.

Methods:

1. The snake bite was confirmed either by a reliable detailed history from patients and relatives of the patients or by the presence of fang marks and many times the patient attendants came with dead or alive snake itself, sighting of snake, reported movement of snake in surroundings in recent days. A detailed clinical history regarding time of bite, time elapsed since bite, first aid measures, symptoms of envenomation and complications was taken at the time of presentation.
2. Full clinical examination was done for the signs and symptoms of envenomation. Vasculotoxicity was said to be present if the patient had a clotting time of more than 20 minutes with history of bleeding/ecchymotic patch, cellulitis/edema. Neurotoxicity was said to be present if the patient had any of the following findings after snake bite such as Ptosis, Difficulty in breathing and swallowing, pain or chocking in throat.
3. Routine examination
 - 20 minute whole blood clotting test (WBCT)
 - CBC
 - Hemoglobin (Hb)
 - Total leukocyte count (TLC)
 - Partial thromboplastine time (PT)
 - Activated partial thromboplastine time (APTT)
 - Biochemical examination
 - Serum Creatinine
 - Blood Urea
 - Serum Bilirubin
 - Serum Liver enzymes
 - Urine –routine/microscopy
 - X –ray chest – PA
4. Demographic characteristic of patient such as age, gender and area.
5. The end point of study is:
 - Regression of hematological / neurological manifestations.
 - Primary outcome was defined in the form of survival and non-survival

RESULTS

Table 1: Distribution of patient according to Age and Sex group

Age group (in years)	Male	Female	No. of patients	Percentage (%)
<20	9	7	16	10.59
21-30	24	22	46	30.46
31-40	22	13	35	23.17
41-50	19	11	30	19.86
51-60	5	3	8	5.29
>60	10	6	10	6.62
Total	89	62	151	100.00

Table 2: Distribution of patient characteristics

Variables	No. of patients (Total no of pt 151)	Percentage (%)	
Occupation	Businessman	1	0.06
	Farmer	29	19.20
	Housewife	39	25.82
	Labourer	35	23.17
	Serviceman	3	1.95
	Shopkeeper	4	2.64
	Student	26	17.21
	Unemployed	12	7.94
	Garden Worker	2	1.32
Region	Hilly	50	33.11
	Non hilly	101	66.89
Time Interval	<1hr	4	2.6
	1-4hr	99	65.56
	4-8hr	26	17.21
	8-12hr	1	0.07
	12-24hr	6	4.00
	>1day	15	9.93
Time of bite	00 – 6 AM	31	20.52
	6.00 AM – 12.00 PM	17	11.25
	1.00 PM – 6.00 PM	46	30.46
	6.00 PM – 00 AM	57	37.74
Site of Bite	Lower limb	85	56.29
	Upper limb	56	37.08
	Axial body	10	6.62
Clinical features	Difficulty in breathing	37	24.50
	Difficulty in swallowing	22	14.56
	Nausea & Vomiting	41	27.15
	Swelling	23	15.23
	Ptosis	36	23.84
	Pain in throat	9	5.96
	Abdominal pain	9	5.96
	Oliguria	12	7.94
	Cellulitis	17	11.25
	Drooling of saliva	6	3.97
No symptoms	54	35.76	
First aid	Grazed the wound with sharp blade	1	0.66
	Local practioners	4	2.64
	Nil	37	24.50
	Tourniquet	33	21.85

Table 3: Distribution of patients according to Supportive Treatment given

Supportive Treatment	Yes	No	No. of patients	Percentage (%)
Dialysis	12	138	12	1.94
Surgery	17	134	17	11.25
Ventilatory Support	22	128	22	14.56
ICU requirement	34	117	34	16.50
ASV requirement	75	76	75	49.67
Total			151	100.00

Table 4: Distribution of patients according Final outcome

Outcome	Male	Female	Neurotoxic	Vasculotoxic	Nontoxic	No. of patients	Percentage (%)
Survived	81	54	32	20	83	135	89.40
Expired	5	1	4	2	0	6	3.97
LAMA/DOPR	3	7	5	4	1	10	6.62
Total	89	62	41	26	84	151	100.00

DISCUSSION

During the period of 2 years, we studied 151 cases of the snake envenomation who met the inclusion criteria.

The demographic factors of our study were as follows:

The majority of patients in our study were in the age group of 21-30 years (30.46%). The mean age was 37.80 years [Table 1]. Kularatne et al,^[11] studied 210 patients with neurotoxic snake bite and majority

of patients were in age group of 10-30 years (52%). Sanjib et al,^[12] studied 143 patients, mean age being 32 years in their study.

In Rojnuckarin et al,^[13] study, 271 patients with vasculotoxic bite were studied, the mean age group being 32.79± 5.07 years in their study. Sharma et al,^[14] studied 142 snake bite cases, most being young patients with the mean age of 31.2 years. Kalantri et al,^[15] noted mean age of 32±13 years in their study in rural Maharashtra.

Our study had 58.94% male patients; most of them were in the young age group [Table 1]. 24 out of 89 (26.96%) males were in the age group of 21-30 years. Similarly there was a female clustering seen in age group of 21-30 years. Predominance of males over females in our study was borne out by other studies also. Kularatne et al,^[13] in their study had reported equal sex incidence. Sanjib et al,^[14] showed male predominance (60%) in their study. Rojnuckarin et al,^[15] had majority of male patients (59%) while Sharma,^[16] et al had a male to female ratio of 4.25:1. This difference could be explained by the fact that in age group of 21-30 years, where most of clustering of cases in both genders was seen, it would be expected that these people belonged to a working group

[Table 2] describes different characteristics of patients. It was seen that most of the patients were among the labourers (23.17%), agricultural farmers (19.20%) and students (17.21%), showed prevalence of snake bite cases involving outdoor activity. In the study, predominance of plain area (66.89%) was seen as compared to hilly areas (33.1%).

The maximum patients reported to hospital after 1-4 hr of snake bite and only 2.6% patients reported in less than 1 hr and 9.9% patient reported >1day after the snake bite. Maximum patients were bitten in night time between 6PM – 6AM. It was observed that 37.08% of our patients were bitten on upper limb, 56.29% on lower limb, 6.62% had bite on axial body. We did not notice fang marks in 8 (5.3%) patients. Upper limb bites, occurred in farmers, while bending over and working or while manually harvesting crops or doing some agricultural works in the fields. Axial body bites usually occurred during sleep. Sharma et al,^[16] reported 38% bites on lower limbs; upper limb bites in 47% and 14% axial bites. Kalantri et al,^[17] noted that 66% bites were on lower limb, rest being on upper limbs; no axial bites were reported in their study.

The majority of the patients had local complaints with difficulty in breathing and swallowing, ptosis, pain in throat, nausea and vomiting in case of neurotoxic snake bite and swelling, cellulitis and bleed from the wound in case of vasculotoxic snake bite. Many species, particularly the Krait and the Hump-nosed pit viper,^[18] are known for length of time it can take for symptoms to manifest. In their study, Kularatne et al,^[13] studied only neurotoxic snake bites; among them ptosis was seen in 70%, dyspnea was present in 68%, dysphasia in 64% and diplopia in 54% of cases (n=190). In the study by Sharma et al,^[16] local or systemic bleeding (60%) and ptosis (75%) were the presenting complaints in vasculotoxic and neurotoxic bites.

In 21.85% patients arrived with tourniquet in place and 24.50% of patients arrived to the hospital without having received first aid treatment. Sanjib et al,^[14] reported tourniquet use in 88% of their patients. Tourniquet increases the risk of ischemia,

necrosis and increase the risk of massive neurotoxic blockade when tourniquet released.^[19-23] They are not proven to be useful.^[24-26]

[Table 3] shows, out of 151 snake bite cases, 12 patients were required hemodialysis, 22 patients were required mechanical ventilation and 17 patients got fasciotomy done. Out of 151 patients, 34 patients were required intensive care unit (ICU) care in our hospital. The most of the patients (50.3%) were not required ASV.

[Table 4] shows the final outcome of snake bite cases. Our study showed predominance of non-toxic (49.00%) followed by neurotoxic (33.77%) and vasculotoxic (17.23%). Sanjib et al,^[14] had 72% neurotoxic bites in their study. Their study was conducted in Nepal, 27% of the bites being non-poisonous in their study. Sharma,^[16] et al had majority of neurotoxic snake bites (60.6%), their study area being north India. Kalantri et al,^[17] who based their study in rural Maharashtra (in Sevagram); found the incidence of vasculotoxic bite to be 84.27%.

It can be seen that out of 151 patients, 145 survived and 6 died. While correlating sex with outcome, our study showed improvement in 96.02% and fatal outcome in 3.98%. For females, improvement was noted in 98.38% and fatal outcome in 1.62%. In male, mortality was 5.62%. Kalantri et al,^[17] had a similar experience in their study. While correlating types of bite with outcome, 4 deaths were in neurotoxic snake bite group and 2 were in vasculotoxic snake bite group.

CONCLUSION

1. All primary health centers (PHCs) should be equipped with the facilities to render first aid measures and have the facility of trained medical personnel to promptly give ASV in indicated cases. All PHCs and CHCs should have the proper facility for adequate storage of ASV.
2. In our society, mostly in uneducated societies, there is sheer ignorance regarding snake bite and peoples have more faith in local customs and in traditional healers. Morbidity and mortality can be reduced by educating the society about first aid measures, timely treatment in ASV equipped hospitals and without any delay in seeking prompt medical aid or reaching a hospital and community health centres (CHCs).
3. It could be postulated that government health policy makers could devise means of providing adequate health care and facilities for rendering of ASV wherever needed at both PHCs and CHCs. Secondly adequate treatment and identification of snake bite symptomatology should be well taught at the entry level medical courses and all trained medical personnel should be able to manage snake bite cases adequately and confidently. This can go a long way in investigating the morbidity and mortality associated with snake bite patients.

Limitations of the Study

- As this study was conducted at a tertiary care reference centre, it did not reflect the true incidence of the snake bite in the community. In fact, the study skewed towards the more severe cases as the later were predominantly referred to this tertiary care reference centre.
- The descriptive nature of the study was recognized by the researchers. However, this study stimulates the need for further detailed analytical and longitudinal studies in this area.

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