Ambispective study of clinical picture, management practices and outcome of snake bite patients at tertiary care centre in Northern India

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Abstract

Background: Snakebite is a common but neglected public health problem of tropical & subtropical regions worldwide. This study was conducted to look into profile, first aid measures, management strategy and outcomes of snake bite patients. **Methods:** This was an ambispective study conducted in the Department of Medicine & Emergency Medicine at AIIMS, New Delhi from June 2011 to May 2017 and enrolled 54 patients. In retrospective part 33 case records of snake bite patients were retrieved and in prospective part 21 patients were recruited. All relevant information including demographic parameters, first aid measures, clinical and laboratory profile and outcomes were recorded in pre made proformas. All data were analysed using IBM Stata version 13 and Microsoft Excel 2011. **Results:** Majority of patients were male, and the mean age was 27.6 years. Maximum numbers of bites 34 (63%) happened in the rainy season and *Krait* was the most common culprit species. Neurological manifestations were most common (70.4%) followed by haematological. Most common complication was ventilatory failure (78.6%), and median dose of ASV was 20 vials. Forty-nine (90.7%) patients were discharged successfully. There was significant association of sepsis and shock with non survivors of snake bite with respective *P* values of 0.02 and 0.007. **Conclusion:** Neurotoxic snake bite (70.4%) was the most common type of envenomation. Most common complication was ventilatory failure and majority of patient (90.7%) successfully discharged. Sepsis and shock were significantly associated with non survivors of snake bite.

Keywords: Anti-snake venom, neurotoxic, respiratory failure, snake bite, tourniquet

Introduction

Snakebite is a common but neglected public health problem of tropical and subtropical regions worldwide. It is an environmental, occupational and climatic hazard particularly in rural areas. Its clinical spectrum varies from subtle symptoms to rapid clinical deterioration and death if timely intervention is not taken. Recent estimates indicate somewhere between 1.2 and 5.5 million snakebites worldwide each year with 421,000–1,841,000 envenomation and 20,000–94,000 deaths.[1] One nationally representative mortality study estimate that India had 1.2 million snakebite deaths (average 58,000/year) from 2000 to 2019 and about 70% occurred in eight higher burden states only.[2] Population suffered by snake bites varies in regard to their socio-economic status, occupation (farmers, plantation workers, herdsmen, fishermen, snake restaurant workers and other food producers), living area like rural/urban and living conditions.[3] Bite rates are highest in temperate and tropical regions and in rainy and post-rainy season.

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There are various venomous and non-venomous species of snakes worldwide. There are 236 species of snakes in India, most of them are non-poisonous. There are 13 species known to be poisonous, out of these only four species cause maximum poisonous bites. These four species are Cobra, Russel viper, Saw-scaled viper and common krait.[4] Most common poisonous snake among them is common Krait.[5]

Severity of snake bites depends on various factors likes patient demographic profile, species of snake, availability of health care facilities and anti-snake venom (ASV), delay in getting treatment and sometimes due to pitfalls in first aid guidelines and management. A significant proportion of patients are initially treated by traditional healers particularly in developing countries like India. This practice often leads to delayed presentation to modern health care facilities and institution of appropriate management. Majority of the cases who reaches to tertiary care centres are complicated. There are considerable variations in the presentation of snake bite patients in regard to clinical profile, severity of envenomation, availability of health care facilities, first aid measures, management strategies, etc., We observed at our centre that many patients of snake bite who presented to us were in advanced and complicated state. Some of the complicated cases were likely due to malpractices of first aid measures, unavailability of appropriate health care facilities especially in periphery etc., As there is lack of studies on these issues in snake bite patients in northern India, therefore we planned to conduct this study to know the profiles, various used first-aid measures, management strategies and final outcomes.

Methods

This was an ambispective study (retrospective combined with prospective) conducted in the Department of Medicine & Emergency Medicine at AIIMS, New Delhi after getting ethical clearance from institutional Ethics Committee. This study aimed to study the demographic, clinical and laboratory profile of snake bite patients presenting to Medicine Department & Emergency as well as to study the correlation of various first-aid measures, clinical parameters, laboratory abnormalities and management strategies with the final outcome in these patients. In retrospective part, we were able to retrieve 33 case records of snake bite patients from the Medical Record Department who were admitted in the new emergency, Medicine wards and ICU during the period 1st June, 2011 to 31st May, 2015. These case records were reviewed and patient's information in regards of their demographic profile, clinical and laboratory manifestations, received first aid measures, management at peripheral and higher centres and their final outcomes were recorded in proforma. However, we were not able to collect all desired information in all patients due to lacking the same in the case records. In prospective part, 21 snakebite patients, who were admitted at above mentioned places during the period from 1st June 2015 to 31st May 2017 were recruited after taking consent from patients or available closest relatives. These patients/relatives were interrogated and examined for detail history and clinical findings and desired information were

recorded. Subsequently they were followed till discharge or death and their management strategies and outcomes including need and dose of anti-snake venom (ASV), reaction to ASV, requirement of ventilator and blood products, duration of ventilator requirement and hospital stay, complete/partial recovery and death were recorded in proforma. In this study case records/patients who had history of snake bite, given by patient himself/relatives or patient having snake bite mark which was assessed by the doctor; were considered as a case of snake bite. Final outcomes considered in this study were complete recovery, recovery with disabilities or organ dysfunction and death.

Results are expressed as frequency and percentages. All analyses are performed using IBM Stata version 13 and Microsoft Excel 2011. The continuous variables are presented as means with standard deviations or medians with interquartile range depending upon underlying distribution. The categorical variables are presented as percentages for each category. The statistical association of each variable was assessed by Student's t tests, Mann Whitney U tests and Chi square tests as appropriate. A probability of $P < 0.05$ was considered statistically significant.

Results

Demographic and first-aid measures profile [Table 1]

A total of 54 patients were enrolled in this study out of which 33 in retrospective part while 21 in prospective one. Majority were male 44 (81.5%) and the mean age was 27.6 years, ranging from 15-60 years. Majority of patients 31 (57.4%) belongs to 20-30 years age group and same number of patients belonged to rural areas. Maximum patients had low educational status. Maximum bites were during indoor activity 29 (53.7%) and 31 (57.4%) patients were sleeping while they were bitten. Forty-one (75.9%) patients were bitten between 6 PM-6 AM and out of them 20 (37%) bites were happened only between 2 AM-6 AM. In 33 (71.7%) cases, snake was seen during the bite. Most common species of snake in cases where it was possible to interpret was Krait followed by Viper, Kobra and Russel. Maximum numbers of bite 34 (63%) happened in the rainy season during the months of July-September.

Tourniquet was applied in 17 (44%) patients. Median duration of tourniquet application was 90 minutes however in few patients it was very long up to 24 hours. Incision at the site of bite was given in 11 (20.4%) patients. Twenty-seven (50%) patients were treated at peripheral hospitals and five patients taken treatment from quacks. Median time from snake bite to contact with health care facility was 3.5 hrs (210 min) which ranged from 15 min to 96 hrs. Only 21 (53.85%) patients received ASV at periphery hospitals and 14 out of 18 patients who did not get ASV at peripheral hospitals because of non-availability of the same. Median duration between bite and ASV administration was 5.9 hrs which ranged from 2 to 154 hrs. Reaction to ASV occurred in 8 (15.7%) patients only.

Table 1: Demographic and First-aid profile of snake bite patients

Variable	Value
Age (yrs.)	27.6 (15-60)
Sex	
Male	44 (81.5%)
Female	10 (18.5%)
Living area	
Urban	23 (42.6%)
Rural	31 (57.4%)
Educational status	
Postgraduate	0 (0%)
Graduate	2 (3.7%)
Senior secondary	3 (5.6%)
Secondary	6 (11.1%)
Middle	5 (9.3%)
Primary	5 (9.3%)
Illiterate	3 (5.6%)
Not mentioned	30 (55.6%)
Place of bite	
Indoor	29 (53.7%)
Outdoor	25 (46.3%)
Activity at time of bite	
Sleeping	31 (57.4%)
Working	23 (42.6%)
Time of bite (/53)	
2am-6am	20 (37.7%)
6am-10am	2 (3.8%)
10am-2pm	5 (9.4%)
2 pm- 6pm	5 (9.4%)
6pm-10pm	10 (18.9%)
10pm-2am	11 (20.8%)
Snake seen (/46)	
Yes	33 (71.7%)
No	13 (28.3%)
Probable species of snake (/35)	
Non-specific	16 (45.7%)
Rattle	1 (2.9%)
Viper	6 (17.1%)
Krait	8 (22.9%)
Kobra	4 (11.4%)
Month of snake bite	
January-March	7 (13.0%)
April-June	8 (14.8%)
July-Sept	34 (63.0%)
Oct-Dec	5 (9.3%)
Tourniquet applied (/39)	
Yes	17 (43.6%)
No	22 (56.4%)
Duration of tourniquet application (/11)	Median-90 min (20 min to 24 h)
Incision given	
Yes	11 (20.4%)
No	32 (59.3%)
Not known	11 (20.4%)
Patient treated at periphery hospital	
Yes	27 (50%)
No	26 (48.2%)
Not known	1 (1.8%)
Patients seen by quacks (/21)	
Yes	5 (23.8%)
No	16 (76.2%)

Contd...

Table 1: Contd...

Variable	Value
Time between bite and contact to modern health care facility	3.5 h Median 15 min-96 h (range)
Patients received ASV at periphery (/39)	
Yes	21 (53.9%)
No	18 (46.1%)
Non-availability of ASV at periphery center (/18)	14 (77.8%)

Clinical and laboratory profile [Table 2]

Most common part of body bitten was upper limb in 22 (41.5%) patients. Bite marks were seen in 41 (82%) patients. Most common symptom complex was neurological in 38 (70.4%) patients followed by haematological 7 (13%). Most common symptom was drooping of eyelids 39 (72.2%) followed by difficulty in breathing 32 (59.3%).

Most common vital parameter abnormality was tachypnoea 19 (35.2%) followed by tachycardia 17 (31.5%) and hypertension 5 (9.3%). Forty-two (77.8%) patient had complications. Most common complication was ventilatory failure in 33 (78.6%) patients. In patients had complications, mechanical ventilator was required in 27 (64.3%). Out of 54 studied patients 51 (94.5%) patients received ASV and the median dose of ASV was 20 vials (10-46 vials). Thirty-seven (71.2%) patients received neostigmine.

Whole laboratory profile shown in Table 2 in which major abnormalities were elevated LDH (51.7%), haematuria (46.3%), leucocytosis (36.5%) and elevated whole blood clotting time (WBCT) >20 minutes (20%).

Outcomes

Forty-nine (90.7%) patients were discharged successfully with full recovery and 5 (9.3%) patients expired. Median length of hospital stay was 120 hrs (ranged 3.5-562 hrs) [Table 2]. When association was analysed between complications and application of tourniquet and incision at bite site; there were more complications in the presence of these variables although not statistically significant [Table 3]. Analysis of adverse outcome of death with application of tourniquet, incision at bite site, and consultation with quacks, not getting treatment & ASV at peripheral hospital did not reveal any statistically significant association [Table 4]. Duration of hospitalization and other variables like duration of tourniquet, duration between bite and contact to health care facility & duration between bite and ASV administration did not show significant association [Table 5]. Our study revealed novel finding of significant association of sepsis and shock with non-survivors of snake bite with respective *P* values of 0.02 & 0.007 [Table 6].

Discussion

Snake bite is a major often neglected health problem in India particularly of rural areas. In our study majority victims of snake

Table 2: Clinical, laboratory profile and outcome of snake bite patients

Variables	Results
Part of body bitten (/53)	
Lower limb	19 (35.9%)
Trunk	8 (15.1%)
Upper limb	22 (41.5%)
Neck	2 (3.8%)
Head	2 (3.8%)
Bite mark (/50)	
Yes	41 (82%)
No	9 (18%)
Symptoms	
Neurological	38 (70.4%)
Hematological	7 (13%)
Myotoxic	1 (1.7%)
Gastro-intestinal	1 (1.7%)
Others	4 (7.4%)
No symptoms	2 (3.7%)
Combination of features	8 (14.8%)
Vital parameters at admission	
Normal	21 (38.9%)
Tachycardia	17 (31.5%)
Hypotension	3 (5.6%)
Hypertension	5 (9.3%)
Hypopnea	1 (1.9%)
Tachypnea	19 (35.2%)
Cyanosis	2 (3.7%)
Complications	
Yes	42 (77.8%)
No	12 (22.2%)
Type of complications (/42)	
Ventilatory pump failure	33 (78.6%)
Hemorrhagic manifestations	6 (14.3%)
Disseminated intravascular coagulation	2 (4.8%)
Pneumonia	2 (4.8%)
Acute Kidney injury	6 (14.3%)
Shock	2 (4.8%)
Sepsis	3 (7.1%)
Ventilator requirement (/42)	27 (64.3%)
Blood or blood product transfusion (/42)	7 (16.7%)
Patients received ASV (/54)	51 (94.4%)
Dose of ASV received (Vials)	20 (median), 10-46 (range)
Duration between bite and ASV administration (/51)	5.9 hrs. (median) 2-154 hrs. (range)
Reactions to ASV (/51)	
No	43 (84.3%)
Yes	8 (15.7%)
Patients receiving neostigmine (/42)	37 (71.2%)
Urine examination abnormality (/53)	
Hematuria	25 (46.3%)
Proteinuria	10 (18.5%)
Glycosuria	1 (1.9%)
Pyuria	3 (5.6%)
Whole blood clotting time (WBCT) derangement (/35)	
Yes	7 (20%)
No	28 (80%)
Elevated International normalized ratio (INR) (/50)	
Yes	9 (18%)
No	41 (82%)

Contd...

Table 2: Contd...

Variables	Results
CPK (/27)	
Normal	10 (37%)
Elevated	17 (57%)
LDH (/29)	
Normal	15 (51.7%)
Elevated	14 (48.3%)
Deranged liver function test (/50)	13 (26%)
Urea/Creatinine (/51)	
Elevated	5 (9.8%)
Normal	46 (90.2%)
Complete blood count	
Anemia	6 (11.5%)
Erythrocytosis (RBC count >5.5 Lacs/mm^3)	1 (1.9%)
Leucopenia (TLC <4000/mm^3)	2 (3.9%)
Leukocytosis (TLC >11000/mm^3)	19 (3.7%)
Thrombocytopenia (Platelet count <1 Lacs/mm^3)	8 (15.4%)
Final outcome	
Discharged	49 (90.7%)
Death	5 (9.3%)
Length of stay in hospital	5 days (median) 3.5 h-23 days (range)

bite were male i.e., 44 (81.5%) and the median age of patients was 27.6 years, ranging from 15 to 60 years. It may be because of males and younger people are more engaged in outdoor activities. Majority of patients 31 (57.4%) belongs to rural areas and were low in educational status. This might be due to more involvement of rural and less educated people in farming and labouring which have more risks to encounter with snakes. These observations are like other various studies.[5-7] Forty-one (75.9%) patients were bitten between 6:00 PM and 6:00 AM and out of them 20 (37%) bites were happened only between 2:00 AM-6:00 AM. This might be due to as snakes usually come out from their habitats in night-time as well as they are less visible in night. Maximum bites were during indoor activities 29 (53.7%) and 31 (57.4%) patients were sleeping while they were bitten. These observations are in contrast with observations seen in other many studies in which most cases of snake bites were in outdoor activity settings.[8-11] One study from Bihar[12] (India) showed near equal ratios of patients while sleeping, playing and other outdoor activities 30.2%, 30.2% and 27.9%, respectively. In our study 31 (57.4%) patients were sleeping while they were bitten; out of these two were sleeping at construction site & others were at their home in night-time. This fact conveys that closing of the doors with proper sealing of the probable paths of snake into the home should be done before going to sleep.

In 33 (71.7%) cases of bites snake was seen during the event. Most common species of snake in cases where it was possible to interpret from the description by the patients/relatives was Krait followed by Viper, Kobra and Russel. This observation is similar to study conducted in West Bengal where 66% bites were by common krait.[13] Maximum numbers of bite, i.e., 34 (63%) happened in the rainy season during the months of July-September which is the monsoon time when snakes come out from their hidden habitats. This observation is similar to other studies.[5-8]

Application of tourniquets and giving incision are still persisting as first aid measures which were 44% and 20.4% respectively in our study. This revealed that people are still not aware about the potential harms of these measures. Application of pressure bandage or tourniquets was also seen in about 25% cases of snake bites in the study conducted by KG Sajeeth Kumar *et al.*[6] and 90-98% in others.[14,15] People still seeking treatment from quacks (24%) and wasting valuable time of treatment. Patients seek health care facility late which was 3.5 hrs (Median) after the bite which might be due to lack of awareness of current first aid measure strategies and belief in quacks as well as lack of transportation facilities in rural areas. Similar types of results were seen in one study in which 38% patients were seen by traditional healers on first contact and took 60 minutes median time to reach health care facility.[16] As most of snake bite patients belongs to rural areas, and initially seen by primary care physicians so it becomes very pertinent for them to aware about these harmful first aid practice and discourage them and should contribute in saving valuable time. In our study only 50% patients were seen

at peripheral hospital before coming to us which reflect weaker peripheral health infrastructure or low faith of people in the peripheral hospitals. Majority of patients who were treated at peripheral hospitals did not get ASV due to non-availability of the same. This reflects the poor resources at these hospitals for the management of the snake bite patients. ASV is the backbone in management of these patients which was delayed about 6 hrs in this study.

Most common part of body bitten was upper limb in 22 (41.5%) patients followed by lower limb in 19 (35.9%) patients. This was similar to one study in which bites are more common in upper limbs (76%) than lower limbs (24%).[17] However, this was differing with many other studies[5,18-23] in which lower limb bite was the most common site of bite. This difference may be because majority of bites in our study occurred when patients were sleeping which allow equal opportunity to all parts of body to be bitten. A study conducted by Sakthivel Vaiyapuri *et al.*[18] revealed that 82% bites occurred in lower limb. Bite marks were seen in majority of 41 (82%) patients. Similarly, fangs marks were seen in 88% (1,320) of the cases in one study from South India.[6]

Most common symptom complex of patients was neurological in 38 (70.4%) patients followed by haematological in 7 (13%) patients. Similar results were seen in studies[20] conducted in India particularly northern India. One ambispective study conducted in Paediatric department in Himachal Pradesh (India) revealed neuroparalytic features in 32 (53.3%) children while 21 (35.0%) showed hematotoxic manifestations. Seven (11.6%) had features of neurohemotoxicity.[21] One study from Kerala (Southern India) showed hemotoxic bites (61%) as most common form followed by neurotoxic (34%).[6] This regional variation of symptom complex between northern and southern India is likely be due to as neurotoxic snakes (Krait/cobra) are more prevalent in northern India while hemotoxic are more prevalent in southern India.[24]

Most common symptom in our study was drooping of eyelids i.e., 39 (72.2%) followed by difficulty in breathing i.e., 32 (59.3%), difficulty in speech i.e., 31 (57.4%) and generalised paralysis i.e., 28 (51.9). One study conducted in north India revealed fright as most common symptoms (85%) followed by pain at local site (58%) swelling at local site (50%), ptosis (24%), difficulty in speech (22%) and difficulty in breathing (21%) and bleeding manifestation as haematuria only in (1.7%).[5] Study conducted by KG Sajeeth Kumar *et al.* revealed ptosis, ophthalmoplegia and blurred vision among neurotoxic bites while bleeding from the bite site, manifestations of coagulopathy and local pain and swelling were most common among hemotoxic. Of the systemic bleeding manifestations, haematuria was the most

Table 3: Association of occurrence of complications* with different variables

Variable	Complications		P
Incision given	Yes	No	0.882
No	8 (25%)	24 (75%)	
Yes	3 (27.27%)	8 (72.73%)	
Treated at periphery hospital	Yes	No	0.94
Yes	6 (22.2%)	21 (77.8%)	
No	6 (23.1%)	20 (76.9%)	
Tourniquet applied	Yes	No	0.387
No	5 (22.73%)	17 (77.77%)	
Yes	6 (35.29%)	11 (64.71%)	

Table 4: Association of adverse outcome of death with different management practices

Variable	Final Outcome		P
Tourniquet applied	Discharge	Death	0.785
No	20 (90.91%)	2 (9.09%)	
Yes	15 (88.24%)	2 (11.76%)	
Incision given	Discharge	Death	0.978
No	29 (90.6%)	3 (9.4%)	
Yes	10 (90.9%)	1 (9.1%)	
Patient treated at periphery hospital	Discharge	Death	0.67
Yes	24 (88.9%)	3 (11.1%)	
No	24 (72.3%)	2 (7.7%)	
Patient seen by quacks (/21)	Discharge	Death	0.2
Yes	16 (100%)	0 (0%)	
No	3 (60%)	2 (40%)	
Patient got ASV at periphery	Discharge	Death	0.643
No	17 (94.4%)	1 (5.6%)	
Yes	19 (90.5%)	2 (9.5%)	

Table 5: Association between duration of hospitalization and other variables (by Spearman's co-efficient correlation test)

Variables	Duration of tourniquet	Duration b/w bite and health care contact	Duration b/w bite and ASV administration
Correlation coefficient (P)	-0.31 (0.45)	-0.19 (0.65)	0.26 (0.53)

Table 6: Association of different complications with survivors and non survivors of snake bite

Complications		Final outcome		Fisher's exact (*P*)
		Survivors	Non-survivors	
Respiratory	Yes	29	4	0.638
failure	No	20	1	
Hemorrhagic	Yes	5	1	0.518
complications	No	44	4	
DIC	Yes	1	1	0.178
	No	48	4	
Pneumonia	Yes	2	0	1.0
	No	47	5	
AKI	Yes	4	1	0.397
	No	45	4	
Shock	Yes	0	2	0.007
	No	49	3	
Sepsis	Yes	1	2	0.02
	No	48	3	

common followed by bleeding gums, haemoptysis and retinal hemorrhages.6

Most common abnormality found in the vital parameters was tachypnoea i.e., 19 (35.2%) followed by tachycardia i.e., 17 (31.5%), hypertension i.e., 5 (9.3%) and hypotension i.e., 3 (5.6%). Forty-two (77.8%) patient had at least one complication. Most common complication was ventilatory failure in 33 (78.6%) patients as most common bites were neurotoxic in our study, followed by other complications like haemorrhagic manifestations and acute kidney injury in 6 (14.3%) patients each. In patients who had complications, respiratory support with mechanical ventilator was required in 27 (64.3%) and blood and its components were transfused in only 7 (16.7%) patients. Similar results were seen in one study from North India in paediatric population in which respiratory failure requiring mechanical ventilation (41.6%) was the most common complication followed by bleeding manifestations (haematuria) 28.3%, hypotension (28.3%) and acute kidney injury in 6.6% cases.[21] However study by Sajeet Kumar *et al.* revealed most common complication as coagulopathy (98%) and bleeding manifestations (58%), AKI requiring dialysis (10%), local tissue necrosis and gangrene (19.5%) acute respiratory distress (ARDS) 6.6% among hemotoxic snake bites while respiratory arrest requiring ventilator (18.6%) was most common complication among neurotoxic bites.[6]

Out of 54 studied patients 51 (94.5%) patients received ASV and the median dose of ASV was 20 vials which ranged from 10 to 46 vials. This dosage range were in concordance with other studies.[7,21,25] However, Sajeet Kumar *et al.*[6] used maximum 10 vials in neurotoxic and 20 vials in hemotoxic snake bites. A study conducted in Sri Lanka, revealed only 0.43% mortality when minimum 10 vials (100 ml) of ASV were given in the initial part of treatment.[26] Similarly another study concluded that it is good to administer initial doses more than 10 vials to patients with neurotoxic envenomation and it should be repeated every few hours, if there is no response up to a total of 30 vials.[27]

Seven (20%) patients had elevated whole blood clotting time >20 minutes and 9 had elevated INR (International normalized ratio) at the time of admission. Creatine phosphokinase (CPK) was elevated in 10 (37%) patients and lactate dehydrogenase (LDH) elevated in 15 (51.7%) patients. Most common abnormality in CBC was leucocytosis 19 (36.5%) followed by thrombocytopenia 8 (15.4%). Renal dysfunction in form of elevated urea & creatinine were present in 5 (9.8%) patients only. Thirty-nine (73.6%) patients had urinary abnormality out of which most common was haematuria in 25 (46.3%) patients followed by proteinuria in 10 (18.52%) patients.

Forty-nine (90.7%) patients were discharged successfully with full recovery and 5 (9.3%) patients expired. Death rate varies 3.78-30% in various studies.[12,13,24,25,28] A hospital based study conducted in paediatric population by Jayakrishnan MP, *et al.* showed similar results in which 15/145 (10.3%) patients were expired.[25] A survey conducted at South 24 Parganas District of West Bengal revealed 3.78% mortality due to snake bite.[13] Another population based survey in Bihar (India) showed adjusted snakebite mortality rate 4.4%.[13]

Median length of hospital stay was 5 days (120 hrs) which ranged from 3.5 hrs to 23.4 days [Table 2]. Prolonged hospital stay was seen in patients who had complications like respiratory failure and other organ dysfunctions. Duration of hospital stay was comparable with other studies in which it was 4 days.[24] When association was analysed between complications and application of tourniquet and incision at bite site; there were more complications in the presence of these variables although not statistically significant (P = 0.38 and 0.88, respectively) [Table 3].

Analysis of adverse outcome of death with application of tourniquet (p = 0.78), incision at bite site (p = 0.97), consultation with quacks (p = .20), not getting treatment and ASV at peripheral hospital (p = .67) did not reveal any statistically significant correlation [Table 4]. Similarly, a study in paediatric population observed used of tourniquet application in 11 out of 15 mortality cases although there was no statistical significance (P = .98).[25]

Duration of hospitalization and other variables like duration of tourniquet, duration between bite and contact to health care facility & duration between bite and ASV administration did not show significant association [Table 5]. Analysis of association of different complications with survivors and non survivors of snake bite revealed significant association of sepsis and shock with non-survivors with respective *P* values of 0.02 & 0.007, so health care professionals should give due attention to these patients. Other complications like respiratory failure, haemorrhagic complications, pneumonia AKI & DIC did not show any significant association while ARDS and acute liver failure were not present in any patient.

Conclusion

Snakebite occurred predominantly in rural areas, among younger males, in indoor settings when people were sleeping. Obsolete first aid measures like giving incision (20.4%) and application of tourniquet (43.6%) were still used. There is relative lack of ASV at peripheral health centres. Neurotoxic snake bite (70.4%) was the most common type of envenomation. Most common complication encountered was respiratory failure (70.6%). There were more complications in the presence of application of tourniquet and incision at bite site. Majority of patient (90.7%) successfully discharged. Sepsis and shock were significantly associated with non-survivors of snake bite with respective P values of 0.02 and 0.007 so health care professionals need to be extra-vigilant in care of these patients.

Acknowledgements

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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