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Incidence of snake bite cases admitted in a tertiary care hospital in Bhubaneswar, Odisha

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Abstract
Background: In developing countries major portion of individuals bitten by snakes first consult traditional practitioners before visiting a medical centre and resulting delay in transportation leads to mortality. Present study planned to study clinical features and epidemiological factors in snake bite cases.
Methods: Hospital based cross sectional study was planned including all snake bite cases admitted during study period April 2017 to December 2018.
Results: Out of 156 snake bite patients, 66.04% subjects were from month of July to September (mean age 37.78 years). About 30.77% of study subjects sought traditional healer for medical care, which was found to be significant when compared with not seeking treatment (Chi square =4.74, df =1, P =0.029). Maximum study subject i.e. 52 (33.33%) received ASV within 1 hour. Only 85 (54.49%) subjects reached the tertiary care hospital within 1- 6 hours following the bite. Mortality was higher in urban area as compared to rural area (P =0.104). Death was higher who had bites on upper limb (11.67%) as compared to bite on lowers limb (2.08%) (P =0.012). Proportion death was higher among those who did not received first Aid measures or took herbal medicine (P =0.022). Mortality was significantly higher in study subjects with complications such as cellulitis and DIC (P =0.006).
Conclusions: Mortality among those who received first aid before coming to the hospital was lower (5.56%). Mortality was higher (6.25%) in cases where time interval between bite and initiation of treatment was more than 6 hours.

Keywords: Snake bite, ASV, Traditional healers

Introduction
Worldwide, Snakebite is an important and preventable health hazard in many tropical and subtropical countries. Globally, 421,000 envenomings and 20,000 deaths occur each year due to snake bite [1]. It is estimated that on average, nearly 200000 are bitten by snakes every year in India out of which 35,000-50,000 die annually and most of them were earning members of family (WHO Bulletin 2012) [2]. Its incidence India is usually underestimated because of lack of epidemiological data [3]. According to a new analysis, Snake bites cases are recently included in list of neglected tropical diseases drawn up by the World Health Organization and it could be the most neglected of all tropical diseases in the 21st century [4]. The majority of snakebites and consequent mortality is attributed to only 4 species in India, which includes King / Common Cobra (*Naja naja*), Russell's Viper (*Vipera rusellii*), Common Krait (*Bungarus caeruleus*), and Saw Scaled Viper (*Echis carinata*) [5]. Viper bites are more common than other poisonous snakebites in human beings [6]. The peak incidence of snakebite cases is reported during the paddy sowing and harvesting periods [7]. Use of ineffective first-aid treatment and delay in getting antivenom combined leads to systemic envenoming by the time they seek medical treatment [8]. It has been reported that in most developing countries major portion of the individuals bitten by snakes first consult traditional practitioners before visiting a medical centre and resulting delay in transportation leads to mortality. To substantiate the existing epidemiological gaps in snake bite cases, the present study is planned, which will help to adopt adequate preventive and control measures. Aim of study were to assess the clinical profile and outcome of snake bite cases admitted in tertiary care hospital in Nagpur and to study some epidemiological factors related to snake bite cases.

Methods

A hospital based observation study was planned at tertiary care hospital in Bhubaneswar after approval from the Institutional Ethics Committee was sought. All snake bite cases admitted in IMS and SUM hospital, Bhubaneswar from April 2017 to December 2018 were included in the study whereas Patients not willing to participate in the study were excluded. A pilot study was carried out on 50 cases of snake bites to test the Proforma. All snakebite cases are classified as medico-legal cases and should be admitted in emergency department. A total of 156 confirmed cases of snake bites were admitted during the study period. All patients of snake bite were admitted to intensive care unit and were monitored for at least 24 hours. Details history of snake bite was obtained from study subjects, their relatives and from case papers in predesigned proforma. Information on socio-demographic factors, clinical manifestations, health care seeking behavior, first aid taken, complications if any and outcome were collected. Diagnosis of envenomation is based on clinical manifestation. Venomous bites were defined by the presence of signs and symptoms of local and/or systemic toxicity. Local toxicity is defined as presence of a local reaction in the form of swelling, bleeding from fang marks and cellulites, or necrosis. Signs and symptoms of systemic toxicity are either neuroparalytic or haemostatic abnormalities such as bleeding from muco-cutaneous sites, any systemic bleeding, intravascular haemolysis, or a deranged laboratory coagulation profile anytime during hospital stay. A neuroparalytic syndrome included sensory or motor paralysis in the form of paresthesias, taste and smell abnormalities, ptosis, cranial nerve palsy, general flaccidity, or respiratory paralysis. Recovery from envenomation is defined by the resolution of local and systemic signs clinically and/or on laboratory investigations. Outcome measures are recorded as "Relieved" if there is relief of symptoms but patient didn`t get cured fully, "Cured" if the patient become free from symptoms and complications, "Expired" if cases died in due course of treatment and "LAMA" if cases left against medical advice. Data was analyzed using statistical software Epi Info 7. Association between two categorical variables was analyzed by using Chi -square test. P value <0.05 was considered to be statistically significant.

Results

A total 156 study subjects were admitted in hospital, 66.04% snake bite cases out of it were in the month of July to September, which corresponds to rainy season. There were 100 (64.10%) male and 56 (35.90%) female study subjects. Table 1 depicts mean age of the snake bite case was 37.78 years (SD 14, 12-72). Maximum subjects (28.84%) were in 21-30 age groups. Majority of study subjects (30.77%) were educated up to primary school or functional literate and whereas 26 (16.67%) study subjects were illiterate. As shown in Table 2, majority of subjects were unskilled 85 (54.49%), followed by clerk, shop owner, farm owner 36 (23.08%). Majority of them were engaged in agricultural work. Maximum study subject belonged to upper lower/IV class (43.60%) followed by lower middle/ III class (39.10%) and upper middle/II class (12.84%). Only 06 (3.84%) study subject belonged to upper/I class. 1 (0.64%) belonged to lower/V class (modified Kuppuswamy's classification) [9]. It was observed that 91 (58.33%) subjects had bite in daytime compared to 65 (41.67%) subjects had bites during the night time. Majority of the bites 75 (48.08%) occurred while working in the field, followed by 50 (32.04%) of the bites which occurred while walking in the field where as 16 (10.26) of the bites occurred during sleep. Lower limb was observed most common site of bites, 96 (61.54%) study subjects and in 55 (35.26%) study subjects snake bites on upper limb.

Table 3 showed, pain (98.08%) was the most common manifestation among cases, followed by swelling and local rise of temperature (64.74%), while neurological manifestations was in 33.97% (ptosis, respiratory paralysis, ophthalmoplegia, bulbar weakness, paralysis of limbs, loss of consciousness) and haematological manifestation was 55.13% (bleeding from site, cellulites, haematuria, ecchymosis, haemoptysis). In present study, fang marks were present in 149 (95.51%) of the subjects. Signs of envenomation were seen in 142 (92.03%) subjects, of which 117 (75%) subjects had systemic signs of envenomation and 25 (16.03%) subjects had local signs of envenomation. Only 14 (08.97%) subject had no signs of envenomation. Out of 156 study subjects 106 (67.95%) subjects used some first aid measure immediately following the bite and amongst it 84 (53.85%) subjects applied tourniquet. About 48 (30.77%) study subjects had sought a traditional healer before taking any type of definite medical care and which was found to be significant when compared with not seeking treatment from traditional healer (Chi square =4.74, df =1, P =0.029).

Table 1: Distribution of study subjects with respect to age and gender

Age group (years)	Study Subjects					
	Male		Female		Total	Percentage
	Number	Percentage	Number	Percentage	Number	
11-20	07	07.00	06	10.71	13	08.33
21-30	33	33.00	12	21.43	45	28.84
31-40	22	22.00	17	30.37	39	25.00
41-50	19	19.00	13	23.21	32	20.52
51-60	14	14.00	05	08.93	19	12.18
>60	05	5.00	03	05.35	08	05.13
Total	100	100.00	56	100.00	156	100.00

Table 2: Distribution of study subjects in respect to occupational status

Occupational status	Study subjects (n = 156)	
	Number	Percentage
Profession	00	0.00
Semi Profession	00	0.00
Clerk, Shop Owner, Farm Owner	36	23.08

Skilled Worker	03	01.92
Semi-Skilled Worker	10	06.41
Unskilled	85	54.49
Unemployed	02	01.28
Student	09	05.77
Homemaker	11	07.05

Table 3: Distribution of study subjects with clinical manifestations at time of admission

	Symptoms	**No.**	**%**
Clinical manifestations	Pain	153	98.08
	Swelling	101	64.74
	Local rise of temperature	101	64.74
General manifestation (n=156)	Nausea/Vomiting	49	31.41
	Blisters	32	20.51
	Lymphadenopathy	21	13.46
	Discoloration	18	11.54
	Ulceration	11	07.05
	Ptosis	41	77.36
	Respiratory paralysis	30	56.60
Neurological manifestation (n= 53)	Ophthalmoplegia	29	54.72
	Bulbar weakness	22	41.51
	Paralysis of limbs	17	32.08
	Loss of consciousness	14	26.42
	Bleeding from site of bite	87	97.75
	Cellulitis	82	92.13
	Haematuria	32	35.96
Hematological manifestation (n=89)	Ecchymosis	29	32.58
	Epistaxis	17	19.10
	Haemoptysis	12	13.48
	Gastrointestinal bleeding	03	3.37

Table 4 showed maximum study subject 52 (33.33%) received ASV within 1 hour following bite at all health institute and 59 (37.83%) study subject received ASV between 1-6 hours following bits whereas only 16 (10.26%) study subjects did not received ASV. Table 5 showed that majority of the subjects 85 (54.49%) reached the tertiary care hospital within 1-6 hours following the bite where proper dose, appropriate treatment and treatment of complication was done. There were 26 study subject sought treatment after 12 hours and amongst those the common reasons pursued were ignorance 10 (48.46%) on part of the study subjects and not perceived sense of danger 3 (11.54%). In about 13 (50%) subjects the reason for delay was time lost in between health care settings. Out of 156 subjects 112 subjects develop complication. Wound infection/ cellulites was seen in 75 (95% CI 58-76) subjects and was common complication to develop, followed by renal failure in 39 (95% CI 26-43), respiratory paralysis in 33 (95% CI 20 - 37), DIC in 4 (95% CI 00 - 08), sepsis in 3 (95% CI 00 - 06) and Gangrene at site of bite in 2 (95% CI 00 - 04) study subjects. In present study 71 (45.51%) study subjects were relieved and 75 (48.08%) were cured. Total 9 (5.77%) subjects died during treatment and 1 (0.64%) subject lost against medical advice (LAMA).

Table 6 showed outcome of the study subjects depending on place residence and it was observed that proportion of study subjects who died was higher in urban area as compared to rural area; however this difference was not statistically significant. (P=0.104).Proportion of study subjects died was higher among those who had bitten on upper limb or other part (11.67%) as compared to bite on lower limb (2.08). This difference of proportion was found to be statistically significant (X2 = 6.237, df =1, P =0.012).

Table 7 shows outcome of the study subjects depending on First aid measure received. Proportion of study subject who died was higher among those who did not receive first Aid measures or took herbal medicine as compared to those who received first Aid measures. This difference was found to be statistically significant (P =0.022).

Table 4: Distribution of study subjects depending on the earliest time antisnake venom received and health care facility

ASV received (in hours)	**Total**	
	No. of study subjects (n=156)	**%**
<1	52	33.33
1-6	59	37.83
7-12	12	07.69
13-18	07	04.49
19-24	05	03.20
>25	05	03.20
Not received	16	10.26

Table 5: Distribution of study subjects depending on the time taken in reaching to the tertiary care following the bite

Time taken (in hours)	**Study Subjects**	
	Number	**%**
<1	19	12.18
1-6	85	54.49
7-12	26	16.67
13-18	11	07.04
19-24	08	05.13
>25	07	04.49
Total	156	100.00

Table 6: Outcome of the study subjects with place of residence

Place of Residence	Outcome		Total (%)
	Died n (%)	Relieved / cured / lama n (%)	
Rural	07 (04.79)	139 (95.21)	146 (100.00)
Urban	02 (20.00)	8 (80.00)	10 (100.00)
Total	09 (05.77)	147 (94.23)	156 (100.00)

Table 7: Outcome of the study subjects with the type first aid measured received

Outcome			
First Aid Measure	Died n (%)	Relieved / cured / lama n (%)	Total (%)
Not received/ Herbal medicine	06 (12.00)	44 (88.00)	50 (100.00)
Received	03 (02.83)	103 (97.17)	106 (100.00)
Total	09 (05.77)	147 (94.23)	156 (100.00)

Table 8 showed mortality was significantly higher among study subjects with complications as cellulites and DIC (P =0.006; P =0.03) as compared to other complications in subjects.

Table 8: Outcome (mortality) of study subjects by the nature of complications developed following the bite

Complication	Study Subjects (n=112*)		Mortality (n=9※)		p value
	No.	%	Mortality	%	
Cellulites / Wound infection	75	66.96	2	2.67	0.006
Renal failure	39	34.82	5	12.82	0.27
Respiratory paralysis	33	29.46	4	12.12	0.44
DIC	04	03.57	2	50.00	0.03
Sepsis	03	02.67	1	33.33	0.22
Gangrene at site of bite	02	01.78	0	00.00	-

Discussion

Mean age of the present study subjects was 37.78±14 years in, which were similar to the findings of Mahmood *et al*., Rahman *et al*., Sharma *et al*. Kalantri *et al*. [10-13]. Maximum study subjects were 53.84%, predominantly the younger population was involved (20-40 years of age), probably due to their more ambulant nature which was similar to earlier reported [14-17]. In present study e-majority of snake bite cases (66.04%) occurred during month of July to September, which was similar to findings of Sharma *et al*., Sharma *et al*., Kalantri *et al*., Kshirsagar *et al*. [18, 19]. In present study, maximum study subject i.e. 68 (43.60%) belonged to upper lower/IV class followed by 61 (39.10%) belonging to lower middle/ III class, suggesting that the people with lower socio economic status tend to be involved in occupation that is at high risk for snake bites. Majority of study subject were from rural population 146 (93.59) whereas 10 (6.41%) were urban population. Out of urban study subject majority were from periurban area. Present study showed majority of the bites (58.33%) were seen during the day time, which was different from a study done by Rahman *et al*. where majority of the cases (36%) where seen during the night. Present study revealed that in 75 (48.08%) study subjects had bite while working in the field, followed by 50 (32.04%) study subjects had bite while walking in the field where as in 16 (10.26) study subjects bite occurred during sleeping which was similar with the results of studies by Sharma SK *et al*. and Rahman *et al*. Sharma *et al*. reported higher percentage of bite cases (60.6%) during sleep.

Most of study subjects were bitten on the lower limbs (61.54%) and mostly in the field during the day time 58.33% which was similar with the findings of Sharma *et al*., Bawaskar *et al*. Majority (73%) of study subjects in present study had signs of envenomation which were similar to the results of studies done by Singh *et al*. and Tan *et al*. [20] Logaraj *et al*. and Inamdar *et al*. reported lesser incidence of envenomation [21].

Most of the snakebites cases in present study were of haematotoxic (55.13%) and neuroparalytic (33.97%) cases. Among the haematotoxic snake bites, bleeding from the site of the bite was the main manifestation, followed by cellulitis, haematuria and ecchymosis, which were similar to that which was observed in studies which were done in Sharma *et al*. [22]. Traditional treatment was taken by 30.77% study subjects in present study which was similar with findings of Sharma *et al*., while Sloan *et al*. showed 80% study subjects sought traditional treatment following a bite [23]. In present study majority of the study subjects (69.23%) consulted peripheral health institution first which was similar to the results of a study done by Sharma *et al*. which reported 49% and Rahman *et al*. in Bangladesh showed 86% of cases sought a snake charmer first. In present study 45.51% study subjects had reached hospital after a delay of 6 hours which had contributed to a substantial increase in the morbidity and the mortality. Mahmood *et al*. and Sharma *et al*. reported 61%, 75% of ARF cases after snake bite respectively whereas present study observed 29.46% ARF after snake bite. Death after snake bite in present study was 5.77%. A variation 3%–10% in death number after snake bite were reported in various studies which were conducted by Kulkarni *et al*., Sharma *et al*., Inamdar *et al*. and Hati *et al*. [24, 25]. The high mortality rate in India has been attributed to the geographical factors and a predominantly rural population that was dependent on agriculture as an occupation.

Conclusion

Common age group was between 21-40 years involved in Snake bite (53.84%). Less number of study subject died (5.56%) who received first aid before coming to the hospital than among those who did not receive first aid (6.25%). Death number is more in study subjects who had history of

bite had upper limb (11.67%) than in history of bite in lower limbs (2.08%). Snake bite was seen more among rural adult male agricultural laborers and farmers during the period of rainy season from July to September. Being a hospital based study; it leads to underestimation of the exact number of cases occurring in the community. Study has limited generalizability.

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