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Cardio logical manifestations of snake bite: Experience at our tertiary care hospital

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Abstract
In the present study, Cardiological Manifestations in snakebite 100 freshly admitted patients, - males and –females during the time period of August 2018 to July 2019 to the Department of Medicine S.C.B MCH CUTTACK with definite history of snakebite were included. Maximum snake bites are found in the age group of 4th decade followed by 3rd and 5th decade. less incidence of snakebite in extreme age group. Majority of snakebites (58%) were during the night. Most patients (64%) were belongs to rural areas. The common manifestations in vasculotoxic snakebite were local swelling, pain and bleeding (77.8%) followed by vomiting (22.2%), lymphadenopathy (18.5%), bleeding diathesis (11.1%) and pain abdomen (7.4%). The common manifestations in in neurotoxic bite were ptosis (100%), followed by dysphagia (93.3%), myalgia (33.3%), ophthalmoplegia (33.3%), respiratory paralysis (26.7%) and pain abdomen (6.7%). Among the 100 patients the common clinical cardiological findings were tachycardia (53.3%), hypertension (22.2%), bradycardia (13.3%) and shock (20%).
Cardiac enzymes like CK-MB (>25IU/L) were raised in (63%) in vasculotoxic and 40% in neurotoxic snakebite. Troponin T (>14pg/dl) were raised in 63% of vasculotoxic and 33.3% in neurotoxic snakebite. Significant difference was found among male and female patients in the rise of CK-MB (P=0.000). Significant difference was found among males and females in the rise of Troponin (p=0.000). Thus significant difference was found in rise of CK-MB (p=0.000) and Troponin T (p=0.000) levels among vasculotoxic neurotoxic and NE groups. Like previous studies, the present study of snakebite shows cardiological involvement in various types of snakebites. Cardiac involvement should be kept in mind especially in severely envenomed patients. ECG and cardiac enzymes can be used as tools for monitoring myocardial damage in snakebites.

Keywords: Snake bite, Cardiac enzymes, Poison, ECG, Cobra

Introduction
Snakes have object of awe and curiosity in all lands. They have been associated with mysticism and object of fear. Snake bite is a common and frequently devastating environmental and occupational disease especially in rural areas and tropical developing countries.
In tropical countries snake bite is an occupational hazard of herders, hunters and farmers. Invasion of snake habitats by people has led to increase in incidence of snakebites. 3500 species of snakes inhabit the world out of which 500-600 are belongs to the four families of venomous snakes and only 200 species have caused morbidity and mortality in humans. India is inhabited by 62 species of venomous snakes [1-5].
Recent estimates indicate somewhere between 1-2 million and 5.5 million snake bites worldwide. Each year with 4, 21, 000-18, 41, 000 envenomation and 20,000-94,000 death. Such wide-ranging estimates reflects the challenge of collecting accurate data in the regions, further research is necessary to determine the actual impact of venomous snake bites and the specific anti-venoms needed in terms of both quantity and spectrum of coverage [6-8].
In India the death rate is 4.1/100000 with annual death of 45,900 (40,000-50,900). Peak age group is 15-29 year. 23% death occurs only in healthcare facility M:F = 1.4:1 and 97% mortality in rural areas [10].
The common venomous snake in India are Najanaja (common cobra). Bungarus Caeruleus (Krait). Bungarus Fasciatus (Banded Krait) Russell's viper (Daboia Russell). Echis Carinatus (saw scaled viper), sea snakes yellow bellied sea snake and barked snake). In Kerala, around

104 species are known of which 37 are poisonous. In Odisha 80 species of snakes are found, out of which 17 are venomous.

Snake venom is probably the oldest known poison to mankind and has been described in ancient mechanical books and myths. Snake venom is one of the most potent animal venoms. It has a very complex heterogeneous composition containing enzymes, the digestive hydrolases, hyaluronidase and activators or inactivators of physiological processes which includes L-aminoacidoxidose, phospholipase A2, phosphomonoesterase, 5'-nueuotidose, DNA ase, Non-nucleosidase and peptidases. Also contains non-enzymatic proteins, polypeptides. Among non-enzymatic proteins, hemorrhagin, Neurotoxins, Cardiotoxins are importance. haemorrhage are present mainly in Echis carinatus. Hemorrhages shock and acute rural failure are the main causes of death in cases of Elapide bite. Cardiotoxicity also seen in many cases dying of severe viper bite. The clinical picture is usually dominated by neurological, Hematological and vascular damage.

Cardiotoxicity may occur in the form of sudden hypotension, cardiac arrhythmia, myocardial infarction and may rarely contribute to morbidity and mortality. Changes in Electrocardiogram mainly of ST segment and T-wave, ST segment depression QRS prolongation and AV-conduction defects may be seen rarely. T-wave abnormalities are the most common manifestation of myocardial involvement. ECG changes are usually transient but when persistent they are attributed to direct myocardial damage due to the toxin. Coronary Angiogram showed normal coronaries expect in case where segmental contraction of coronaries was present. A case of 2nd degree AV block has been reported. In addition to this there may be pulmonary edema and alteration in enzyme like serum aspartate (SGOT) and creatine phosphokinase. The current study has been carried out to evaluate the various cvardiological manifestations in snake bite cases in Odisha.

Material and Methods

It is hospital based cross sectional study. The study comprised of 100 consecutive patients who were from various parts of Odisha, first admitted to the Department of General Medicine SCB Medical College, Cuttack with definite history of snake bite and came to the hospital within first 24 hours of bite during the period of study august 2018 - July 2019.

Detailed history, clinical examinations and laboratory evaluation were done and noted in the predesigned perfoma. Blood samples were collected on the 1st day of admission, aseptically with a single prick from a peripheral vein without tying a tourniquet. Informed consent were taken in all cases. ECG recording were done 6 hourly on 1st, 2nd and 3rd day and abnormal findings were noted.CK-MB, Troponin T levels were estimated within 24 hours by Electrochemiluminescence method. Patient were divided into neurotoxic [N] vasculo toxic [V] and non-envenomed [NE] groups.

Data were collected on 100 cases of snake bites. These data were scrutinize, codified and entered into IBM SPSS Statistics 24.0, SPSS south Asia Pvt. Ltd. The data were analysed with specific biostatistics-tests according to the data.

Results

With a view to achieving the aim and objectives of the study data were collected on 100 cases of snake bite admitted into the medicine IPD of SCB MCH CUTTACK as per the protocol of the study. The analysis and along with interpretations are presented in three sections. The 1st section deals with the demographic profile of cases, the 2nd one analyses pattern of snake bite and 3rd one clinical and cardiological manifestations of snake bite. The mean age of cases of snake bite was 41.96 ±13.0 years. The median age was 43.5 years with inter quartile range 34.0-51.0.This implied a quarter of the cases are below 34 years age and a quarter above 51 years age. According to the distribution of age group maximum snake bite occurred in the 40-49 years of age followed by 30-39 years and 50-59 years age group [table 5.3 and Fig.5.3].that is the people in active age group from 30-59 years have higher risk of snake bite with a share of 74% cases. According to our sample viper is the most common species involving in the snake bite [Table 5.7 and Fig. 5.7] with a share of 64%. The krait and cobra have a share of 16% and 12% respectively where other constitutes 8% only (Table 1).

Table 1: Different species of snakes involved

Snake Category	No.	%
Viper	64	64
Krait	16	16
Cobra	12	12
Others	8	8
Total	100	100

It is found that out of 100 cases of snake bite 54 are present systemic and local manifestation of this kind of snake bite. The most common manifestations of was local swelling, pain and bleeding [77.8%] followed by vomiting [22.2%]. Lymphadenopathy [18.5%]. Among 18.5% cases there was no symptoms. Even though they have admitted into the hospital on the account of snake bite.

There were 30 cases of neurotoxic snake bite the ptosis was the universal symptom occurring in all cases. There is found by dysphagia which occurred among 28 [93.3%] cases. The other common symptom are myalgia, opthalmoplegia occurring among 33.3% cases each. Respiratory paralysis was observed in 8% cases [Table 2].

Table 2: Manifestation in Neurotoxic snake bite

Symptoms		No.	%
Ptosis	Present	30	100
Dysphagia	Present	28	93.3
Myalgia	Present	10	33.3
Ophthalmoplegia	Present	10	33.3
Respiratory Paralysis	Present	8	26.7
Pain abdomen	Present	2	6.7
	Total	30	100

Table 3 clinical and cardiological findings according to different type of snake bite. Among the neurotoxic group Tachycardia was found found among 53.3% cases followed by shock among 20% cases. Bradycardia has found among 4 [13.3%] cases.40 [74.1%] cases were asymptomatic. In the vasculotoxic group hypertension and tachycardia were observed among 12 [22.2%] case each. In the non-envenomed group the most cases [62.5%] were asymptomatic.

Hypertension is more significantly associated with vasculotoxic group [p=0.031]. Tachycardia is more significantly associated with neurotoxic group [p=0.014]. Shock is significantly associated with neurotoxic cases [p=0.001]. Asymptomatic cases were significant in vassculotoxic group [p=0.000].Bradycardia did not have any significant in any type of snake bite (Table 3).

Table 3: Comparison of clinical cardio logical findings among types of Snake bite

Clinical findings	Neurotoxic N=30		Vasculotoxic N=54		Non Envenomed N=16		p value
	No.	%	No.	%	No.	%	
Hypertension	2	6.7	12	22.2	0	0	0.031
Tachycardia	16	53.3	12	22.2	6	37.5	0.014
Bradycardia	4	13.3	2	3.7	2	12.5	0.166
Shock	6	20	0	0	0	0	0.001
No Findings	8	26.7	40	74.1	10	62.5	0.000

#Fisher's Exact test

Electro cardiographic findings

Electro cardiographic findings among types of snake bite have been analysed in Table 4 and graphically compared in Fig5.11.Among the neurotoxic snake bite sinus tachycardia is the most common findings with 53.3% cases followed by Twave inversion in 20% cases. Among the vasculotoxic snake bite T wave inversion and sinus tachycardia are the 1st and 2nd most common finding with 25.9% and 22.2% respectively. In the non-envonomed group sinus tachycardia is the common findings in 6[37.5%] cases.

T wave inversion is found in 20% cases among neurotoxic, 25.4% vasculotoxic and zero case among non-envenomed. However the differences lightly missed text of statistically significance with p-value 0.07.Thus sinus tachycardia is significantly associated with neurotoxic type of snake bite [p=0.014].Normal ECG also significantly high in neurotoxic group [p=0.025].

The CK-MB enzyme is raised in 63% of vasculotoxic cases and 40% neurotoxic cases and NE cases. Thus raised level of CK-MB enzyme IS significantly associated with vasculotoxic snake bite found by neurotoxic snake bite [p=0.000].The TROPONIN T enzyme also has high proportion of raised enzyme in vasculotoxic group [63%] followed by neurotoxic [33.3%]. Not a single case of raised troponin is found in NE cases. Thus exhibiting significant association between raised enzymes and type of snake bite. [p=0.000] [Table 4].

Table 4: Comparison of raised levels of Cardiac Enzyme among types of snake bite

Enzymes		Neurotoxic		Vasculotoxic		Non Envenome		p value
		No.	%	No.	%	No.	%	
CK - MB	> 25	12	40	34	63	0	0	0.000
	<= 25	18	60	20	37	16	100	
Troponin T	> 14	10	33.3	34	63	0	0	0.000
	<= 14	20	66.7	20	37	16	100	
	Total	30	100	54	100	16	100	

*Pearson Chi-square Test

Table 5Present median and quartiles of cardiac enzymes in 3 times of snake bite. The median and inter quartile range of CK-MB was highest for vasculotoxic snake bite followed by neurotoxic one. The median and quartiles values of NE group were lowest [p= 0.000]. Similarly median and quartiles values are vasculotoxic group of troponin T were found to be highest and that of NE found to be lowest [p = 0.000]

Table 5: Comparison of cardiac enzyme in different types of snake bite

cardiac enzyme	Percentile		Type of Snake bite			p value
			Neurotoxic (N=30)	Vasculotoxic (N=54)	Non Envenomed(N=16)	
CK - MB	Q1	25	18	21	7.25	0.000
	Q2	50	24	31	11	
	Q3	75	35	38	15.75	
Troponin	Q1	25	7	11	6	0.000
	Q2	50	11	25	8.5	
	Q3	75	22	56	10.75	

Krukal Wallis Test

Discussion

The present study has brought out many interesting findings on the demographic profile,pattern of snakebite and clinical and electrocardiographic, enzymatic and echocardiographic changes in various types of snakebite that are reported in the tertiary care centre SCB MCH CUTTACK which has a feeding population across the state. This findings needs to be validated in the context of related literature and studies conducted in different time and space. Besides the academic and clinical aspects of findings needs to be discussed.

The present study review that the most incidence of snakebite are occurring in the age group of 30-49yr.Besides there are also significant proportion of snakebite in 50-59yrs.Thus it shows the working age population is more risk for snakebites which was in contrast to the observations made by of Russel *et al.* (1979) [11] and Bhalla *et al.* [114] who showed that majority of bites occurred in the age group of 15-30 years. Working population suffered more from snakebite.

The present study review that the most of snakebite are occurring during nocturnal that is 58% and 42% are diurinal. This was accordance with Bhalla *et al.* [12] and Viramani and Dutt [13].

The number of male snakebite case was 56 where as the number of female snakebite case was 44. M:F ratio was 1.27:1.This was similar to findings of Ahuja and Singh[14] and Bhat *et al.* [15], Lahori *et al.* (1981) [16], Nigam *et al.* (1974) [17], Saini *et al.* (1984) [18], Kulkarni and Anees (1994) [19]

and Hansdak *et al*. (1998) [20]. Male prepordance may be due to involvement in outdoor activities.

Rural people suffered more snakebite with 64% as the more snakes are inhibit in rural areas as the people are more exposed to their activities in the agricultural sectors. This study correlates with the study of Bhat RN [15] and Kularatna SAM [21]. This shows that snakebite remains a major public health problem inrural population.

The majority of snakebites were in rainy season that is the proportion of snakebite was highest in August (28%) followed by july (24%) and September (20%). The rainy season from july to september accounts for 72% of snakebite. This is due to the fact that in monsoon season and rainfall forces snakes to venture out of them water-filled pitys and there increased hunan activity in fields at this period as it is the sowing season. A similar trend was observed by Viramani SK and Dutt OP [13]. Whereas Gupta *et al*. [22] in Jammu reported that majority of the bites occurred in summer and rainy season.

In this study the clinical cardiological findings were found in our study were among neurotoxic group sinus tachycardia was (53.3%) cases followed by shock among 20% cases. Bradycardia has found among 13.3% cases.40% cases were asymptomatic. In the vasculotoxic group Hypertension and Tachycardia were found 22% cases each. In the NE group the most cases 62.5% were asymptomatic. Hypertension was more significantly associated with vasculotoxic group (p=0.031). Tachycardia was more significantly associated with neurotoxic group (p=0.014). Bradycardia did not had any significant in any group of snakebite. Shock significantly associated with neurotoxic group (p=0.001). Asymptomatic cases were significant in vasculotoxic group (p=0.000). Out of which tachycardia (53.3%) was most prevalent which was in accordance with Warrel *et al.* [23]. He made observations on E. carinatus bite and noted tachycardiain 43% cases and Nayak *et al*. [24] who found tachycardia in 36.7% cases, bradycardia in 10%, hypertension in 6.7% and hypotension in 16.7%.

The ECG findings among the neurotoxic snakebite sinus Tachycardia is the most common findings with 53.3% cases followed by T wave inversion in 20% cases. Among the vasculotoxic snakebite T wave inversion and sinus tachycardia were the 1st and 2nd most common findings with 25.9% and 22.2% cases respectively. In the NE group sinus tachycardia was the common findings in 37.5% cases. T wave inversion was found in 20% cases among neurotoxic, 25.4% in vasculotoxic and 0 case among NE. However the difference slightly missed text of statistically significance with p –value 0.07.Thus sinus tachycardia was significantly associated with neurotoxic type of snakebite (p=0.014). Normal ECG also was significantly high in neurotoxic group (p=0.025). Nayak *et al*. [24] had documented ECG abnormalities which included sinus tachycardia arrhythmia, bradycardia, tall T waves and abnormalities suggestive of myocardial ischemia, non-specific T wave abnormalities and atrioventricular blocks. In a study done by Laloo and others ECG abnormalities such as septal T wave inversions, sinus bradycardia, rarely AV block were observed following viper bite.[25] Abbas *et al*[26] documented T wave abnormalities are the most common manifestation oy myocardial involvement, although ST segment depression, QRS prolongation and AV conduction defects may also be seen rarely.

In the current study there were rise in those cases of snakebite cases who showed the signs of envenomation. There were significant difference in the rise of cardiac enzymes such as CK-MB (p=0.000) and Troponin T (p=0.000) among neurotoxic, vasculotoxic and non-envenomed groups. The vasculotoxic group (63%) had maximum rise in cardiac enzymes followed by the neurotoxic groups (40%).CK-MB was raised (>25IU/L) in 54.5% females and 46.4% of males.This difference was statistically no significant association between male and females (p=0.923).Similarly the raised level of Troponin T did not have significant association between male and female (p=0.795).

The findings were in accordance with Cupo *et al*. [27] who observed that the CK-MB values are raised in patients with envenomation and Lan Hai *et al*. [28] who found raised cardiac enzymes in 87.8% of 124 cases cobra bite and 79.4% of 86 cases bite by Trimeresurus stejnegri. Lallo *et al*. [60] showed Creatine kinase was elevated in 25 out of 51 patients and Troponin T elevation in 2 cases out of 24 cases [28]. This was in contrast to Abbas *et al*. [26] who found significant rise in the paralytic group.

However Echocardiography was normal in all these patients which indicated that although snake venom had effect on the cardiovascular system it did not leave behind any permanent damage to the cardiac musculature which was in agreement with Abbas *et al.* [26].

Conclusions

In this study which was conducted in S.C.B MCH CUTTACK which is a tertiary centre in odisha where snakebite patients come from various Districts, we found cardiac involvement as evidenced by the elinical findings, ECG changes and raised cardiac enzymes. However there were no cases of acute myocardial infarction, myocarditis or life threatening arrhythmias.

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