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An Epidemiological Study of Venomous Snake Bites: A Hospital Based Analysis

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ABSTRACT

Background & Objectives: This study was carried out to describe epidemiology of snake bite cases which were seen in a tertiary care hospital of Ahmedabad region so that the data provided will help in estimating the envenoming in this region of India.

Methods: Total 50 cases of venomous snake bites were studied retrospectively. These patients were admitted in the Medicine Department of V.S. Hospital, Ahmedabad during the period from April 2008 to October 2009.

Results: Maximum number of cases (66 %) was belonging to the age group 15-34 years. Male are having twice the incidence compare to the female (M: F ratio 2.12:1). Maximum cases were from rural areas i.e. 72 %. In 66 % cases, snake bites occurred during night time. Most of the cases i.e. 82 % occurred during rainy season. Elapid snake bites leading to neurotoxicity is common followed by viperidae induced vasculotoxicity and acute renal failure.

Conclusions: Snakebite is an important medical emergency and causing significant morbidity and mortality of many young and active people, especially those involved in farming and plantation work. Public awareness regarding the simple preventive measures and pre-hospital management i.e. first aid and early hospitalization should be emphasized.

Key Words: Snake bite, Epidemiology, Venomous, Hospital based, Analysis

INTRODUCTION

In India 330 snake species exist. Of these 70 are venomous (40 land snakes, 30 sea snakes). Saw scaled viper, Russell's viper, Common cobra, and common krait are traditionally referred to as the "Big Four", because they are responsible for virtually all snake bites in India.[1]

Envenoming and deaths resulting from snake bites, however, are a particularly important public health problem in the rural tropics. Populations in these regions experience high morbidity and mortality because of poor access to health services, which are suboptimal, and, in some instances scarcity of anti-venom, which is the only specific treatment.[2]

Most snake bites are inflicted on the lower limbs of farmers, plantation workers, herdsmen and hunters. Seasonal peaks in the incidence of snake bite are associated with agriculture activities, such as ploughing, or to fluctuations in the activity or population of venomous snakes. Severe flooding by concentrating the human and snake populations, has given rise to epidemics of snake bite in Colombia, Pakistan, India, Bangladesh and Vietnam.[3]

Snake bite is an important cause of morbidity and mortality in India and it is estimated that about 35000-50000 snake bites are found to be fatal in a year. Death occurs from anywhere between 20 minutes to 6 hours after a bite from a colubrine snake (cobra, krait and sea snakes), and in 2-4 days

after a bite from a viperine snake. Cobra or krait may kill within hours if respiration is not supported / assisted.[4]

The poison secreted by the venomous snakes is of three types. First, the neurotoxic- acts primarily on motor nerve cells, second vasculotoxic- acts mainly on blood and blood vessels and third, myotoxic- acts mainly on muscles. Depending on the type of venom secreted, the poisonous snakes have been placed in three groups: 1. **Elapids** which secrete neurotoxic venom. The members of this group are cobra, king cobra, common krait and banded krait and the coral snakes. 2. **Vipers** which secrete vasculotoxic venom. They are Saw scaled viper, Russell's viper, Pit viper etc. 3. **Sea snakes** secrete myotoxic venom and are seen around sea coasts.[5]

Local reactions are extensive in viperine bite while minimal in elapid bite. Neurotoxic symptoms like staggering gait, loss of speech and deglutition, paralysis of tongue and larynx, hyper-salivation, ptosis, diplopia, blurring of vision followed by paralysis of respiratory muscles occurs in elapid bites like cobra and krait. In viperine bite, severe local reaction in the form of swelling, bruising, blisters, persistent bleeding occurs which spread around to involve the entire limb. In viperine bite, coaguability of blood is greatly decreased and hemorrhagic manifestations are prominent features. In sea snake bite, generalized rhabdomyolysis and renal failure are the main features.[1]

In all cases of snake bite or something bite, police shall be informed (medico-legal case). If death occurs, dead body shall be sent to the mortuary for medico-legal post-mortem examination.

AIMS & OBJECTIVES

The present study was carried out to study the epidemiological profile of hospitalized cases of venomous snakebites and also to study the clinical manifestations, complications and outcome of the patients of snake bite.

MATERIAL & METHODS

Total 50 cases of venomous snake bites were studied retrospectively. These patients were admitted in the medicine department of V.S. Hospital, Ahmedabad during the period from April 2008 to October 2009. Epidemiological profile of these cases and circumstances surrounding the snake bite were studied. Data were collected from their medical records including history and clinical examinations, investigations performed, treatment administered, and outcome.

Cases having clear history of snake bite and clinical manifestations of envenomation are included in this study. Only those patients admitted in the medicine department above the age of 15 years are included. Patient admitted in pediatric wards are excluded. Cases having history of something bite (no confirmative history of snake bite) were excluded.

In each case details regarding the age, sex, residential area, time of bite, site of bite, place of snake bite, time of hospitalization were noted. Findings of general, local and systemic examinations, and results of investigations were studied to categorize the envenomation in to neurotoxic or vasculotoxic.

Observed data are tabulated and plotted on the charts. These data are compared with the other research works having similar objectives.

RESULTS

Maximum number of cases (66%) was belonging to the age group 15-34 years. Male are having twice the incidence of venomous snake bites compare to the female (M: F ratio 2.12:1). Maximum cases were from rural areas i.e. 72 %. In 66 % cases, snake bites occurred during night time. Most of the cases i.e. 82 % occurred during rainy season. Maximum number of patients (68 %) had the site of bite in lower limb while 30 % were bitten over the upper limb. In only one case bite was present over left ear. Elapid snake bites leading to neurotoxicity is common followed by viperidae induced vasculotoxicity and acute renal failure. In the present study, 49 patients (98 %) were cured with treatment and discharged while 1 patient was died.

Table-1 shows that- Majority of the cases (66 %) are young adults between 15 and 34 years. Half cases (50 %) are involving young males of 15-34 years.

Table-2 shows that- Venomous snake bite is more common in rural areas. Majority of snake bites occurred at night hours. In more than half cases (52 %), fang marks are not visible. Majority (84 %) of the cases have reached the hospital within 12 hours of the snake bite. Neurotoxic envenomation (52 %) is most common followed by Vasculotoxicity (32%). In the present study, 49 patients (98 %) were cured with treatment and discharged while 1 patient was died.

Table-3 shows that- Venomous snake bites become major problem during rainy season between June and October (82 % cases).

Table-4 shows that- Lower limbs are involved in majority of the cases of venomous snake bites followed by upper limbs.

Table-1: Age group & Sex wise distribution of cases:

Age Group	Male	Female	Total Cases (%)
15-24	13	4	17 (34)
25-34	12	4	16 (32)
35-44	3	0	03 (6)
45-54	6	4	10 (20)
55-64	1	1	02 (4)
>65	1	1	02 (4)
Total	36	14	50 (100)

Table-2: Selected variables of the cases

Variables	Cases (n=50) (%)
Residential Area	
Rural	36 (72)
Urban	14 (28)
Time of bite	
Day time (6:00 am to 6:00 pm)	17 (34)
Night time (6:00 pm to 6:00 am)	33 (66)
Time Interval (Hours)	
0-6	31 (62)
7 – 12	11 (22)
12 – 24	06 (12)
>24	02 (4)
Fang Marks	
Present	24 (48)
Absent	26 (52)
Clinical Presentation	
Neurotoxicity	26 (52)
Hematotoxicity	16 (32)
Acute Renal Failure	8 (16)

Table-3: Month wise distribution of cases

Month	2008	2009	Total (%)
January	0	0	0
February	0	0	0
March	0	1	01 (2)
April	1	3	04 (8)
May	1	1	02 (4)
June	2	6	08 (16)
July	3	6	09 (18)
August	3	5	08 (16)
September	6	6	12 (24)
October	3	1	04 (8)
November	2	0	02 (4)
December	0	0	0
Total	21	29	50 (100)

Table-4: Distribution of cases according to bite site

Site of Bite	Right	Left	Total (%)
Arm	2	1	3 (6)
Forearm	1	0	1 (2)
Hand	8	3	11 (22)
Thigh	1	2	3 (6)
Leg	6	6	12 (24)
Foot	6	13	19 (38)
Other (Left Ear)	0	1	1 (2)
Total	24	26	50 (100)

DISCUSSION

Despite the scale of its effects on populations, snake bite has not received the attention it deserves from national and international health authorities, and may therefore be appropriately categorized as a neglected tropical disease which makes it harder for public health officials to optimize the prevention and treatment of snake bites in their respective countries. India is recognized as having the highest snake bite mortality in the world, with WHO estimates placing the numbers at 50,000 per annum.[2]

A total 3254 cases of venomous snake bite cases admitted in Victoria Hospital of Bangalore (Jan 2002 to December 2011) were studied by Dayananda K.S. et al. The majority of males and females were in the age group of 20-50 years. It was observed that there was more prevalence of snake bite cases in males compared to females of all age groups. More snake bites occurred during the months of May to October, during rainy season more cases were observed. Snake bites mostly occurred over the limbs (39 %) and it was observed 32 % in hands and 17 % in arms. The incidence of snake bite was observed in 78.1 % cases during day time. Maximum incidence was observed in rural areas (73.1 %).[2] Dayananda's observations are consistent with the findings of the present study.

A hospital based epidemiological study of snake bite was done in West Bengal by Sarkhel Suman et al and data over 5 years were collected from BPHCs and PHCs. Their findings are also consistent with our observations and they are as follows. The male to female ratio was 1.03. The majority of snake bite cases were within the age of 21-45 years. Snake bite and death rate is always high in rainy season. Maximum number (34 %) of snake bites were reported in the months of June to September.[6]

A total of 87 snakebites caused by venomous and nonvenomous species were recorded from January 1 to December 31, 2015, in NECTR. The snakebites were more common during the summer; sixty-five (75%) cases were reported during the summer months from May to October. All snakebites patients' ages ranged (2–64 years) with a median age of 30.4 years. Males were more prevalent than females irrespective of venomous or nonvenomous status. The sex distribution was 24 females (27.58%) and 63 males (73.41%). The male to female ratio was 2.66: 1. Most of the patients were males. Most snakebite occurs during summer, particularly in the evening. Two major groups of venomous Egyptian snakes were identified as Viperidae and Elapidae species based on characteristic systematic symptoms and laboratory findings. Descending paralysis, ptosis, and respiratory arrest were the most common snakebite neurotoxic syndrome attributed to bites of Elapidae species. Coagulopathy

was the common snakebite complications attributed to Viperidae species.[7]

Snake species were classified into three main categories based on clinical and laboratory findings i.e. Neurotoxic, Hematotoxic and Myotoxic.[8,9,10] (a) most snakebites, 56 of 87 cases (64.4%), were reported to be nonvenomous bites by nonvenomous species or dry bites, (b) twenty-one of 87 cases (24.13%) of snakebites were reported as venomous bites by Elapidae snakes (the cases presented with paralysis), and (c) ten of 87 cases (11.49%) were reported as venomous bites by Viperidae snakes (the cases presented with abnormal coagulation).[7]

India is a country known to the western population as a country of snake charmers and snake over centuries. Despite generation after generations some families in our country who play with snakes(snake charmers), we fail to protect the community from snake bite which requires at least education of the common people, how to protect themselves from snake bite as well as what to do after the bite has occurred. The estimated death in India is 50,000/ yr, an underestimate because of lack of proper registration of snakebite. The persons or population at risk of snakebite in our country is around 50 million people which may occur any time in the life.[11]

Most of the fatalities are due to the victim not reaching the hospital in time where definitive treatment can be administered. In addition community is also not well informed about the occupational risks and simple measures which can prevent the bite. It continues to adopt harmful first aid practices such as tourniquets, cutting and suction etc. Studies reveal that primary care doctors do not treat snakebite patients mainly due to lack of confidence.[12]

Time delay between the snakebite 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 as low as 2.6 % and if it is more than 24 hours the mortality rate will be around 13.5%. [13] In the present study, 49 patients (98 %) were cured with treatment and discharged while 1 patient was died. This patient was admitted in the hospital after a delay 27 hours. He was showing neurotoxic symptoms with drowsiness, breathlessness and weakness.

Few attempts have been made to examine the factors responsible for death in cases of bites by identified species of snakes. In a study of 46 cases of identified snake-bite in Thailand, the three species causing most deaths were Malayan krait (*Bungarus candidus*), Malayan pit viper (*Calloselasma rhodostoma*) and cobras (*Naja* species) (Looareesuwan et al., 1988). Factors identified as contributing to a fatal outcome included problems with antivenom use (inadequate dose or use of a monospecific antivenom of inappropriate specificity), delayed hospital treatment resulting from prolonged visits to traditional healers and problems with transportation, death on the way to hospital, inadequate artificial ventilation or failure to attempt such treatment, failure to treat hypovolemia in shocked patients, airway obstruction, complicating infections, and failure to observe patients closely after they were admitted to hospital.[14]

CONCLUSIONS

Following conclusions were drawn from the present study.

Maximum number of cases (66 %) were belong to the age group 15-34 years as the members of this age group are young, active and having maximum outdoor activity.

Male are having twice the incidence of venomous snake bites compare to the female (M: F ratio 2.12:1). This can be explained by the fact that male are main earning member of the Indian families and they are having higher outdoor activity than female.

Maximum number of patients of venomous snake bites was from rural areas i.e. 72 %. Rural areas are having favourable environmental conditions for the survival of snakes.

In 66 % cases, snake bites occurred during night time i.e. between 6:00 pm to 6:00 am. Most of the venomous snakes are having nocturnal habit of food searching. In rural areas people are having habit of sleeping on the floor due to poor socioeconomical condition. These are the main reasons for higher incidence of venomous snake bites during night time.

Most of the cases i.e. 82 % occurred during rainy season between June and October. The main reason is entry of water in to the snake burrow causing increase number of snakes on the ground.

Interestingly, in 52 % cases, no any fang marks were seen at the site of bite even though there was a clear history of snake bite along with clinical manifestations of envenomation. This indicates that fang marks at bite site do not give adequate clue regarding clinical manifestations or complications following snake bite.

Maximum number of patients (68 %) had the site of bite in lower limb while 30 % were bitten over the upper limb. In only one case (2 %) bite was present over left ear. There was no nay relation with bite site and clinical outcome.

Neurotoxicity was the commonest clinical manifestation found in 52 % cases followed by hematotoxicity in 32 % cases. Acute Renal Failure was found in 16 % cases. This indicates that Elapid snake bites are most common followed by viperidae.

Early diagnosis and early refer of the patient to the hospital where facilities like ASV, Mechanical Ventilation, blood components, and Hemodialysis available will improve the outcome of patient with snakebite.

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