

Clinico-epidemiological profile of snake bite in children - A descriptive study

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ABSTRACT

Background: Snakebite is one of the important causes of occupational hazard in our country. The state of Bihar has the third largest number of snakebite deaths in India. **Objective:** Our aim was to study the clinical profile, seasonal pattern, complications and outcome in patients of snake bite in pediatric age group. **Materials and Methods:** This was a record-based retrospective study conducted at Sri Krishna Medical College, Muzaffarpur. Data were collected for patients admitted between 1 July 2015 and 30 June 2016. Patients were included if they had a history of snakebite or unknown bites. **Results:** There were 51 males (60%) and 34 females (40%) out of 85 patients studied. Among them, 50 patients had krait bite, 25 patients had Cobra bite, 2 patients had viper bite, and in 8 patients snake was not identified. Majority of the snake bites were in the lower limbs (80.0%). The highest number of cases occurred during June-October month (42%). Mortality in our study was 6%. The most common symptom detected was pain abdomen (80%), ptosis/ophthalmoplegia (82.35%), altered sensorium (29.41%), and respiratory difficulty (35.29%). **Conclusions:** Common krait (*Bungarus caeruleus*) accounted for the highest number of venomous bites. Lower limb was the most common bitten site. Victims were from a rural background, and most of them were bitten indoors and during the night time. Identification, timely diagnosis and early administration of anti-snake venom will certainly aid to curb mortality in snake bite.

Key words: Children, Krait, Neuroparalytic, Snake bite

Snake is legless, cold blooded reptiles found every part of the world except the Arctic, New Zealand, and Ireland [1]. It has been estimated that 5 million snake bite cases occur worldwide every year, causing about 100,000 deaths [2]. India is reported to have the highest number of snake bites (81,000) and deaths (11,000) per year [3]. However, the geographical distribution and statistics are variable in the country due to gross under-reporting, resulting in massive statistical disparity. Estimates of death due to snake bite range widely from 1300 to 50,000. Worldwide, roughly 3000 known species of snake are found, and only 15% are considered dangerous to humans [2,4]. In India, there are 13 known species that are poisonous and of these four, namely, common cobra (*Naja naja*), Russell's viper (*Daboia russelii*), saw-scaled viper (*Echis carinatus*), and common krait (*Bungarus caeruleus*) are highly venomous and responsible for most of the poisonous bites in India [5]. Snake bite is most common in the school age children, adolescent and young adults. It accounts for 3% of all deaths in children of ages 5-14 years. Bihar is one of the high snake bite prevalence states of India besides Andhra Pradesh, Kerala, West Bengal, and Maharashtra [6]. An estimated 4500 deaths occur due to snake bites in Bihar which may be attributed to poor population, illiteracy and poor health services [7,8]. This retrospective, the descriptive study aims to ascertain ages, mode of presentation, complications and outcome in patients of snake bite in pediatric age group in a rural set up.

MATERIALS AND METHODS

This is a retrospective, descriptive study conducted in the Paediatric Department of Sri Krishna Medical College, Bihar, India. All the patients, who admitted with an alleged history of snake bite from July 2014 to June 2016 and received anti-snake venom (ASV) for its treatment, were included in the study. Clinical data about age, sex, clinical manifestations, complications and outcome were obtained from case records and were analyzed. 85 patients of both sexes aged 0-14 years having snake bite were included in the study. Patients with a doubtful history of snake bite but with the definite acute onset of signs and symptoms of local or systemic envenomation were also included in the study. Exclusion criteria include bites due to other poisonous creatures and doubtful cases of snake bite where no definite history or acute onset sign and symptoms of envenomation.

The following data were collected on a pre-designed, structured pro forma: History of snake bite, symptoms, time of bite, and interval between bite and presentation to the hospital, general examination as well as detailed central nervous system, cardiovascular system, and respiratory rate, and per abdomen examination findings. Routine and specific investigations done in all cases were also recorded including hemoglobin, total leukocyte count, differential count, platelet count, peripheral smear for signs of hemolysis, kidney function tests, urine examination (protein,

blood, hemoglobin, and myoglobin), bleeding time and clotting time (CT), and 20 min whole blood CT. Specific investigations include arterial blood gases, serum electrolyte, prothrombin time (PT), activated PT, and electrocardiography.

ASV dosing was based on the quantity of particular venom (in mg, dry weight) that can be neutralized by each milliliter of ASV. In India, each ml of polyvalent ASV is supposed to neutralize 0.6 mg of Indian cobra venom, 0.6 mg of Russell viper venom, 0.45 mg of common krait venom, and 0.45 mg of saw-scaled viper venom [9]. Skin testing was done before ASV administration. Initial dosage was 5 vials for mild, 10 vials for moderate and 15 vials for severe envenomation administered as an intravenous infusion and later on, as per the WHO protocol [10]. Neostigmine along with atropine was administered to all the patients with neuroparalysis till reversal of neurotoxic manifestations.

Patients developing severe cellulitis were received appropriate antibiotics and anti-inflammatory agents and referred to surgeons for necessary treatment. Data were also collected for the complications during hospital study, blood transfusion, ventilator support and dialysis, if required. Conditions at the time of discharge were noted. Study outcome was noted as discharge or death. The SPSS 16.0 statistical software was used for data analysis.

RESULTS

Snake bite was most common (75%) in the age group 8-14 years, followed by the 5-7 year age group (25%). Among 85 snake bite patients, 55 (64.70%) were male and 30 (35.29%) were female, ratio being 2:1. Most of the snake bites (49, 57.65%) were seen during July-September, which coincides with the rainy season in Bihar, followed by 21 (24.70%) cases during October-December. 39.1% of all snake bites occurred between 5 pm and 10 pm, with the highest frequency between 7 pm and 8 pm. Bites occurred on a lower limb in 42 (49.41%) cases and an upper limb in 6 (7.05%) cases. Less common sites were the trunk in 1 (1.17%) and other parts such as the neck or buttock in 1 (1.17%) cases. In this study, 70.5% of cases were from rural areas and 29.5% from urban areas.

Fang marks were present in 42% of the patients, but evidence of fang marks was obscured by incisions or burn marks in 7% and absent in 34% cases. The majority had poisonous snake bite (58%), of which majority were neurotoxic (82%). In our study cohort, mortality was 5 (5.8%). Deaths occurred in patients who had presented >8 h after the bite and all deaths occurred within 6 h from admission to the hospital. The majority had hospital stay for <3 days (51%). Snake bite mortality was higher in cases from rural areas (12%) than the urban areas (4%). The fatality rate was much higher (8.8%) in females than the males (3.7%).

Complete data on victim's activity at the time of snake bite and on locations, where victims were bitten are recorded in Table 1. Additional information was collected from the 39 victims who were sleeping at the time they were bitten. 19 children were sleeping on the floor and 15 on a bed. 55.3% of the bites occur in and around the house. 31.76% of bites occurred in fields and

jungles. Of the 85 cases, 38 (32.94%) were referred from other health-care centres (mostly rural), while 47 (55.29%) were admitted directly to our hospital. All the referred cases received tetanus toxoid before admission to this hospital. Some cases also received antibiotic treatment and ASV.

A total of 30 children (35.29%) did not see what bit them, but they came to the hospital because they thought it was most likely a snake. 34 (40%) had seen a snake bite them, but could not identify the type of snake. 21 (24.70%) parents made an attempt to identify the type of snake. Of the identified snakes, 50 claimed to have been bitten by a Krait, 25 by a Cobra, 2 by viper. The bite marks varied in appearance from clearly noticeable single and double puncture wounds to scratches and non-appreciable marks in the fatal case of Krait bite where localized redness only could be appreciated. Bites by Krait produce very fine punctures similar to that made by the injection needle, without any local swelling.

Local edema was present in all patients presenting with vasculotoxic snake bites, but cellulitis was present in only 4 (8%) patients. Bleeding from various sites, i.e., hematuria, hematemesis and gum bleeding was observed in vasculotoxic bites. Among the neuroparalytic bites, 68 (80%) patients presented with abdominal pain which was the main presenting complaint. 70 (82.35%) patients developed ptosis in 6 h from the time of presentation, and 30 (35.29%) patients developed respiratory distress, and 2 (2.3%) developed respiratory failure for which they had to be given artificial ventilation (Table 2).

The prognosis for snake bite cases depends on various factors in addition to their treatment, including first aid immediately after the bite, early initiation of appropriate treatment, and the type of envenomation. In this study, 33 (38.82%) snake bite cases received first aid in the form of a tourniquet or incision over the bite or sucking on the bite. The mortality among those who received first aid before coming to the hospital was less (3.1%) than among those who did not receive first aid (9.2%). This difference is statistically significant ($\chi^2=95.36$, $df=1$, $p<0.01$). Mortality was higher (8.4%) in cases where the time interval between the bite and initiation of treatment was >6 h than those who received treatment within 6 h (4.4%). These findings were statistically significant ($\chi^2=29.11$, $df=1$, $p<0.01$).

DISCUSSION

In this study, snake bite was most common (64.8%) in the 8-14 year age group, followed by the 5-17-year-old age group (31.7%), and these two groups constituted a total of 95%. Children over 5 years are at risk of snake bite because they are involved more in outdoor games. Older children in rural areas are given the responsibility of carrying out outdoor activities such as grass cutting, cattle grazing, and firewood collection. Thus, making them an exposed age group for snake bite as seen in our study. Our findings were similar to the findings of the previous studies [11]. In this study, a majority (59%) of the snake bites were located in and around houses. Many other studies have similar finding [12-14]. In this study, only 31.76% of victims were bitten in fields and jungles, which suggest

Table 1: Activity and location at the time of snake bite

Walking/running	16	30.58
House work	10	11.76
Sleeping	10	11.76
Playing	8	9.41
Toilet in the field	7	8.23
Fishing	2	2.35
Moving bricks/object	1	1.17
Opening/closing doors	1	1.17
Putting hand in a hole	1	1.17
Sitting in temple during puja	1	1.17
Others*	15	17.64
Field and jungle	27	31.76
Outside house in closed vicinity	24	28.24
Inside house	23	27.06
Road and pavement	5	5.88
Water bodies	3	3.54
Others (school, temple)	1	1.17
Not recorded	2	2.35
Total	85	100

*Others: Include getting off a bed - 4, getting or putting on shoes - 2, killing or removing snake - 3, putting hand in or closing rat holes - 3, catching a mouse, working, and bike riding all 1 each

Table 2: Symptomatology

Symptoms	Number of patients (%)
Local edema	7 (8.23)
Pain	14 (16.47)
Cellulitis	7 (8.23)
Hematuria	2 (2.35)
Ptosis/ophthalmoplegia	70 (82.35)
Respiratory distress	30 (35.29)
Pain abdomen	68 (80)
Vomiting	17 (20)
Altered sensorium	25 (29.41)

snake bites to be primarily a rural hazard affecting both males and females, not just an occupational hazard affecting males. The high incidence of bites in and around the house may also be attributed to overcrowded houses, which often do not have clear demarcations between the kitchen, food store room, and bedroom. Without these clear boundaries, food and grain storage facilities, which entice rodents, can be in close proximity to sleeping areas.

To prevent snakes, the natural predator of rodents, from entering the home, it is important to keep food as inaccessible to rodents as possible. In addition, environmental management, including the construction of buffer zones between the fields/jungle and housing areas, can decrease the likelihood of snakes encroaching on residential areas. The higher incidence in boys could be due to boys more involved in outdoor activities and risky behavior [6,15,16]. Most of the snake bites (57.65%) were seen in the months of July-September, which coincides with the rainy season in this region. During the rainy season, rainwater floods their burrows and snakes then try to take shelter near

human dwellings, which increases the chances of snakes feeling threatened or startled or provoked by human beings, and biting them in defense.

In our study, the distribution of snake bite cases in different quarters of the year was uneven, and this characteristic pattern has also been reported in other studies [17-20]. Snake bites are more common on the lower extremities due to accidental stampede while walking or playing in the dark [11]. We found that 71 (83.5%) patients had bite marks on the lower limbs. Many studies observed the same finding [9,11,15]. Children are very curious and have the habit to explore various holes and crevices which may be the hiding places of snakes. This explains the 12% bite marks on the upper limbs [21].

Majority of the victims suffered neurotoxic envenomation which is characteristic feature of krait and cobra bite. The common krait is a nocturnally active, terrestrial snake which lives close to human dwellings; it creeps into houses over the ground or through the roof and exhibits arboreal tendencies [22-24]. Similar to our studies, it has also been observed by others that the bites occur at night while the victims are asleep [22-24]. While asleep, humans may be bitten either due to accidental handling or rolling over the snake, or exposed parts of the human body might be misidentified as prey. Abdominal pain is an important and unexplained symptom observed in the present study and mentioned by other authors [25,26]. Cobra also causes neurotoxic envenomation but their habitat is usually in the fields, and they bite men working in fields.

Fang marks were not seen in 32.2% of patients despite positive history. This could be because most of the patients were victims of Krait. Kraits have pin point teeth, and even scratch can cause envenomation. Further, as there is generally no inflammation in Krait bite so the identification of scratch mark might have been missed [27]. Neurotoxic bites, "without tissue damage," occur more frequently at night, and this frequency matches the habits of the common Krait that usually hunts between midnight and 6 am. Conversely, the neurotoxic bites with tissue damage, consistent with cobra bites, are more likely to occur in the daytime. The case fatality rate was much higher (8.8%) in females than in males (3.7%), which is similar to another report [11]. In India, owing to gender bias, male health care is often considered more important than that for females.

The prognosis for snake bites depends on factors besides hospital treatment: Whether first aid is given immediately after the bite, early initiation of appropriate treatment, and the type of venom. In our study, mortality among those who received first aid before coming to the hospital was lower (3.1%) than among those who did not receive first aid (9.2%). Mortality was higher (8.4%) in cases where the time interval between the bite and initiation of treatment was more than 6 h, and lower (4.4%) among those who received treatment within 6 h. The limitation of the study was that it was a hospital-based study and its retrospective nature. However, the strengths of this retrospective study outnumbered the limitations. It identified the common type of snake bite, critical months, critical period, and the factors that influence the outcome of the victims.

CONCLUSION

Snake bite is thus an important and serious medical problem in many parts of India, mainly the rural areas of Muzaffarpur where this study was conducted. It is a rural hazard in Northern Bihar, not just an occupational hazard. A significant number of venomous bites occurred indoors while sleeping; therefore, sleeping on beds with well tucked in mosquito nets may help prevent snakebites. Early diagnosis with a high index of suspicion (Krait bite), appropriate treatment, and close monitoring of children for the development of complications and its prompt management can reduce the mortality.

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