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Original Research Article

Clinical profile and outcome of snake bite in children admitted in a tertiary care institute in the metropolitan city of Karnataka, India

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ABSTRACT

Background: Snake bite is a major medical and public health problem in tropical agricultural world. A high incidence of snake bite envenomation has been reported from rural India, many times the incidence is underestimated due to lack of epidemiological information. The present study analyses the age, mode of presentation, seasonal variation, clinical profile, management and outcome of patients with snake bite in below 18 years of age group of a metropolitan city, India.
Methods: This study is a retrospective single centre study conducted in government referral hospital in Bangalore from January 2016 to January 2020 including 53 patients, who presented with a history of snake bite. Clinical data about age, sex, clinical manifestations, complications, management and outcome were analysed.
Results: In our study including of 53 patients, maximum snake bites incidents were noted in age group of 6-10 years (47.16%) of the rural population with male predominance (83.01%). Most of the bites occurred during monsoon season (54.71%) in evening time. Bite marks were observed mainly on lower limbs in 71.69% of patients. Tourniquet was the commonly used first aid care (67.92%). Most of the bites were vasculotoxic in (75.47%) followed by neuroparalytic in 15 patients (9.43%) and maximum cases responded to 20 vials of ante venom. Mortality was nil.
Conclusions: Snake bite is a life-threatening emergency. The key in minimizing mortality and severe morbidity is aggressive management of sick patient and timely as well as judicious administration of ante snake venom. There is a requirement to sensitize the general public and healthcare personnel on preventive measures, emergency care and treatment of snake bites. The serious clinical features of snake bite warrant early referral and management in tertiary care centers.

Keyword: Snake Bite, Snake envenomation, Vasculotoxic, Neuroparalytic

INTRODUCTION

Snake envenomation is a preventable public health hazard often faced by the rural population in tropical and subtropical countries with heavy rainfall and humid climate. In many instances it is a life-threatening, time limiting medical emergency in rural parts of the world. The world health organization (WHO) estimates there are up to 1.8 million bites from venomous snakes annually worldwide, causing 20,000-90,000 deaths. In 2009, the WHO added snake bites to the list of neglected tropical diseases.[1]

There are more than 2000 species of snakes in the world and about 300 species are found in India out of which 52 are venomous. The venomous snakes found in India belong to three families *Elapidae*, *Viperidae* and *Hydrophinae*. The most common Indian elapids are Naja raja (Indian cobra), Indian krait, Russell's' viper and Saw scaled viper.[2]

Currently, treatment quality is highly varied, the high fatality is attributed to the non-availability of anti-venom (ASV), delayed and inappropriate administration of ASV, lack of standard protocol for management and non-availability intensive care facility [13]

In rural area, application of inappropriate first-aid measures and vital time is lost before the victim is transported to a tertiary centre, where cost of treatment can constitute an additional hurdle. Beyond 6 hours referral to specialised centres results in undesirable outcome.[13]

A huge burden of snake-bite found in India; hence, the findings of this study purposely enlighten people about the size of this problem and factors associated with outcome. Snake envenomation warrants high priority research due to its high mortality, high disability and substantial psychological morbidity.[3]

Most of the serious consequences of snake bites are entirely preventable by making safe and effective ante venoms more widely available and accessible.

METHODS

The present retrospective descriptive study, we have collected data about snake bite cases admitted to the referral hospital affiliated to Bangalore medical college and research institute, Bangalore, Karnataka. A total of 53 paediatrics cases below 18 years with history of snake bite from Jan 2016 to Jan 2020 were included in the study.

A detailed information about demographic parameters such as age, sex distribution, residence, site of bite and place of bite, type of snake if identified, etc., was obtained after written informed consent from legal guardian of each patients. Time interval to reach the health facility after snake bite and first aid received if any was asked to them. A thorough clinical examination was carried out in each case. Identification the type of snake bite was carried out by history and examination and with various photographs.

All poisonous snake bite was with signs of envenomation were treated with anti-snake venom.

Statistical analysis was conducted and discussed using the SPSS software, version 20 total numbers were calculated for different categorical variables, clinical features, treatment and outcome.

RESULTS

In our study total 53 paediatric patients up to 18 years of age, who reported to the hospital with history of snake bite were included.

In present study, 47.16% were in the age group of 6-10 years, followed by 39.62% of 11-18 years, minimum age was 2 years. Maximum cases with snake bite were Male children involved in 83.01%. The male to female ratio is 4.88:1, mainly due to outdoor activity (Table 1).

Table 1: Epidemiological and demographic parameters (n=53).

Parameters	Variables	N (%)
Age (year)	0-5	07 (13.20)
	6-10	25 (47.16)
	11-18	21 (39.62)
Gender	Male	44 (83.01)
	Female	9 (16.98)

29 cases (54.71%) of snake bites were found during the evening hours from 6 -12 pm, followed by early hours of the day (28.30%). Two cases had a snakebite post-midnight sleeping at her residence out of this one patient had bite on face (3.77%) (Table 2).

Table 2: Time of snake bite (n=53).

Time interval	N (%)
6 AM-12 PM	15 (28.30)
12-6 PM	07 (13.20)
6 PM-12 AM	29 (54.71)
12-6 AM	02 (3.77)

In our study 54.71% of the victims with snakebite were presented during monsoon season, 16.98% during summer and only 5.66% cases during December to January period. This seasonal variation with monsoon predominance is due to the flooding of the habitats of the snakes and their prey (Table 3).

Table 3: Snake bite season (n=53).

Season	N (%)
Spring (February to March)	5 (9.43)
Summer (April to June)	9 (16.98)
Monsoon (July to mid-September)	29 (54.71)
Autumn (September end to November)	7 (13.20)
December to January	3 (5.66)

In our study, 96.22% cases were from the village background and around 3.77% from urban/semi urban area. 96.22% of the snakebites occurred outside the house, of which nearly 28.30% occurred in the fields. Only 3.77% occurred inside the house.

Most of the snakebites occurred during playing outdoor, accounted for 64.15% of cases. This suggests accidental contact between the snake and patient (Table 4).

In this study maximum cases 69.81% were unknown bites due inability in identification of snakes or

nonpoisonous reasons, lack of knowledge or information about snakes by the attenders. Unidentified snake bites were treated accordingly based on clinical grounds and lab investigations. 2nd most common type of snake is vipers, which constitutes 26.41% (Table 5).

Table 4: Background area and working pattern during snake bite (n=53).

Parameters	Variables	N (%)
Rural urban incidents (n=53)	Rural	51 (96.22)
	Urban	2 (3.77)
Area of snake bite (n=53)	Outside House	51 (96.22)
	Inside House	02 (3.77)
Circumstances at the time of snake bite (n=53)	Working	05 (9.43)
	Playing	34 (64.15)
	Walking	12 (22.64)
	Sleeping	02 (3.77)

Table 5: Snakes identified (n=53).

Type	No. of cases
Vipers	14 (26.41)
Cobra	01 (1.88)
Krait	01 (1.88)
Unknown	37 (69.81)

Out of 53 patients 83.01% of them did not receive first aid, which suggests the lack of awareness about first aid in snakebite. The need of first-aid measure in snakebite is relatively unknown amongst the attenders. Those who have received first-aid, they had used, multiple first-aid measures like tourniquet in 67.92%, immobilization (24.52%) and application of herbs (7.54%). Fortunately, no patient presented with history of suction or incision at the site as a first aid method (Table 6).

Table 6: First aid received and method (n=53).

Variables	Methods	N (%)
First aid (n=53)	Received	9 (16.98)
	Not Received	44 (83.01)
First aid method (n=53)	Tourniquet	36 (67.92)
	Herbal medicine	04 (7.54)
	Immobilization	13 (24.52)
	Suction	0 (0)
	Incision	0 (0)

According to this study maximum patients were admitted within 12 hours of the bite (94.33%). Most of the cases were admitted within 6 hours of the bite accounting for 81.13% of the cases (Table 7).

Most of the snake bites (71.69%) occurred in the distal parts of the body of which 54.05% bites were seen in the feet. Only two cases (3.77%) were admitted with bite on face and abdomen (Table 8).

Table 7: Time interval between snakebite and admission (n=53).

Time (hours)	N (%)
0-6	43 (81.13)
7-12	07 (13.20)
13-24	02 (3.77)
>24	01 (1.88)

Table 8: Site of bite (n=53%).

Site	N (%)
Lower limb	38 (71.69)
Upper Limb	13 (24.52)
Other	02 (3.77)

In our study 45.28% of cases found to have fang marks. Tenderness and local swelling accounted for 37.73% and 26.41% respectively. Cellulitis was seen in 13.20% of the cases. Other manifestations like petechiae, necrosis and blebs were seen in 11.32% of the cases but none of them had lymphadenopathy. Many signs and symptoms were overlapping (Table 9).

Table 9: Local examination (n=53).

Local examination	N (%)
Fang Marks	24 (45.28)
Swelling	14 (26.41)
Cellulitis	07 (13.20)
Discoloration/ulceration	05 (9.43)
Tenderness	20 (37.73)
Bleeding/ecchymosis/petechial	02 (3.76)
Bleb/necrosis	04 (7.54)
Lymphadenopathy	0 (0)

We also noticed hematological manifestations and whole blood clotting time more than 20 minutes accounted for 75.47% of the cases. Only 9.43% cases were presented with neurological symptoms. These cases presented with combination of altered sensorium, ptosis, difficulty in breathing and difficulty in swallowing (Table 10).

Table 10: Systemic manifestations (n=53).

Manifestations	No. of cases (%)
Neurological manifestation	05 (9.43)
Hematological manifestation	40 (75.47)
Mixed	02 (3.77)
None	06 (11.32)

Out of total 53 cases, 47 cases (88.67%) required anti-venom. In 6 cases not given ASV.

Most 60.37% of the cases required 5-10 vials of ASV and 4 (7.54 %) cases were required more than 20 vials. 6 children were observed without anti-venom administration. Out of 47 cases that required ASV

administration, 32 cases (60.37%) developed reactions, off which most were early anaphylactic reaction (38.29%). None of the cases developed bronchospasm, hypotension. They were appropriately managed with steroids, anti-histamines and IV fluids with prior preparation. None of them required any ventilator support (Table 11).

Table 11: Number of ASV given on admission and reaction (n=53).

Variables	No. of ASV	N (%)
Number of ASV given (n=53)	5-10 vials	32 (60.37)
	>10-20 vials	11 (20.75)
	>20 vials	4 (7.54)
	Not given	06 (11.32)
Reaction to ASV (n=47)	Early/anaphylactic	18 (38.29)
	Pyrogenic	14 (29.78)
	Late (serum sickness)	0

In most of the cases the duration of hospital stay was less than 7 days (69.81%). Two patients developed complications required surgical intervention stayed more than two weeks. Fortunately, there was no mortality in this study group (Table 12).

Table 12: Duration of hospital stay and outcome (n=53).

Duration of stay (Days)	N (%)
<7	37 (69.81)
8-14	14 (26.41)
>14	02 (3.77)
Death	00 (0)

DISCUSSION

Total out of 53 patients presented with history of snake bite to department of pediatrics in teaching hospital in Bangalore has been analyzed in systematic way. As per govt. of India snake bite guidelines patient on arrival to hospital treated with first aid measures and started the treatment according to history and clinical manifestation. Priority treatment and PICU treatment initiated for the needy patients.

Prominent age group in our study majority of snake bite victims were in the age group 6-10 years (47%) followed by adolescents (40%) and 83% males were affected than females (17%) due to their outdoor activities. These demographic parameters were in accordance with previous many studies Karunanayake et al (48%) was also mentioned the common age group 6-12 years with male predominance (54%).[4-5] Another study Kshirsagar and Jarwani et al (60.49%) study also supports males in age group more than 5 years (89%).[4-6]

In the present data the victims were bitten during day time, mainly during evening time in 54.71 % of patients, which is comparable to Halesha et al where most of the bites occurred during the day time (70.5%), similar findings were confirmed in other published studies.[7]

In current study 54.71% of the cases were reported during monsoon period. In study by Shrestha also suggest peak incidence of poisoning (71%) was observed during the months of June-September. Another study Mohapatra et al also mentioned monsoon months of June to September is the most common season of snakebite.[8,9]

In this study, 96% cases were from the village background and around 4% from urban area, 96.22% were occurred outside the house. Most of the bites while they are playing (64.15%) followed by walking (22.64%), 3.77% cases occurred inside the house while they are sleeping. Similar findings were reported in literature.[9-12]

In this study most common type of snakes in identified snake species were vasculotoxic, which constitutes 26.41% followed by 1.88% krait. Maximum cases 69.81% were unknown bites due inability in identification of snakes or nonpoisonous reasons, lack of knowledge or information about snakes by the attenders. Unidentified snake bites were treated accordingly based on clinical grounds and lab investigations. These findings were similar to that observed in Bawaskar et al studies, which were done in Maharashtra.[13]

According to the results of our study, only 16.98% people received first aid treatment and the majority of subjects had been subjected to tourniquets (67.92%) and immobilization (24.52%) as a first aid method respectively. Reassurance and immobilization have been followed in 80% and 24.52% cases respectively. Tourniquets have been reportedly used in 90 and 98% of victims in Nepal and Bangladesh respectively.[7,12,14]

Fortunately, suction and incisions were not been made in any of the patients in our study similar to the accepted first aid measures compared to the findings from Nepal, Bangladesh and India.[7,14] We noticed that 81.13% of the patients had reached hospital before 6 hours of bite. Similar study by Bhelkar et al from Nagpur only 54.49% subjects reached the tertiary care hospital within 1-6 hours following the bite.[15] This delay in their arrival could be attributed to the poor transportation facility, lack of awareness of the hazards of snakebite, an unrelenting belief in the traditional system of medicines and the patients' ignorance, which had contributed to a substantial increase in the morbidity and the mortality.[7]

According to our study 71.69% of the snakebites occurred in the distal parts of the body of which 54.05% bites were seen in the feet. Only two cases (3.77%) were admitted with bite on face and abdomen. In the present study the victims sustaining bites in the region of lower limbs is consistent with studies done by Maduwage et al and in 2018 Ochola et al noted in study 75% snake bites were in the lower limb area.[5,16,17]

According to findings of our study, 45.28% of cases found to have fang marks. Tenderness and local swelling accounted for 37.73 and 26.41% respectively. Cellulitis was seen in 13.20% of the cases. Other manifestations like petechiae, necrosis and blebs were seen in 11.32% of the cases but none of them had lymphadenopathy. Many signs and symptoms were overlapping. In Haleesh et al study tenderness swellings and bleeding were the prominent local manifestation cellulitis was commonest complication (39.0%), Mehta et al mentions the significant local swelling features in vasculotoxic snake bites.[7,18]

We also noticed hematological manifestations and WBCT more than 20 minutes accounted for 75.47% of the cases. Only 9.43% cases were presented with neurological symptoms. These cases presented with combination of altered sensorium, ptosis, difficulty in breathing and difficulty in swallowing. These findings were similar to that which were observed in studies by Jayakrishnan et al where features of hemotoxicity, neurotoxicity and combined toxicity occurred in 68 (47%), 39 (26.9%) and 9 (6%) children, respectively. One more study was done in Maharashtra also supports our findings.[14,19,20]

Out of total 53 cases, 47 cases (88.67%) required anti-venom. In 6 cases not given ASV. Most 60.37% of the cases required 5-10 vials of ASV which is comparable to Kumaravel and Stone et al. A study where, 68% of children were successfully treated with 10 vials of ASV. 4 (7.54%) cases were required more than 20 vials. 6 children were observed without antivenom administration. Similar observations by Stone et al mentioned typical hypersensitivity reactions to antivenom occurred in 64% patients, satisfying criteria for a diagnosis of anaphylaxis in 48%. Pyrogenic reactions were observed in 27% patients.[21,22]

The mortality rate in our study was nil. In another study done by Lahori et al the mortality was 3%. The mortality rates were depending on various circumstances and geographical factors in many studies. Might be due to non-availability of medical facilities in remote rural areas, poor transport facilities to the hospital and also due to valuable time lost by giving traditional medicines.[23,24]

In 69.81% patient's duration of stay was less than a week. Compared to our study in Omogbai et al study 433 patients of snake bite with a mean duration of stay in hospital were of 5.7±5.1 days.[18,25]

CONCLUSION

Snake envenomation is a common life-threatening emergency due to accidental contacts in our country. Compared to adults, children with snake bite have higher morbidity and mortality like consumptive coagulopathy, renal failure and respiratory failure, which can be minimized by timely diagnosis, hospitalization, appropriate treatment, close monitoring and management of complications.

Emphasis should be given to follow a standard management protocol in children. Proper awareness regarding the need, type and usefulness of first-aid measures has to be inculcated in the general rural population. All cases should be managed by a standard protocol. The ASV in snake bite is a magic drug should be used judiciously and in appropriate doses in all indicated cases of poisonous snakebites. Ant venom administration may be postponed or even not indicated for victims of snake bite presenting no manifestations of local or systemic envenoming.

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