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Original Research Article

Clinical profile and prognostic indicators of neurotoxic snake bite in rural India

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ABSTRACT

Background: In rural India, snakebite is an occupational and environmental hazard. WHO listed snakebite as one of the neglected tropical diseases and in rural India it is underreported because of popular traditional methods of treatments and lack of healthcare facilities. This study is an attempt to look into the epidemiological, clinical and prognostic indicators of neurotoxic snake bite in rural India.
Methods: This study is a prospective, descriptive study of 25 neurotoxic snake bites admitted in our hospital from January to September 2019. Clinical factors like age, sex, clinical features, management and the outcome of patients are studied.
Results: Young males were common victims of snakebite in evening hours during monsoon season. All patients received traditional methods of treatment, and despite this 64% of our patients reported to the hospital within 6 hours after the bite. Overall, the mortality rate in this study was 12%. Poor outcome was also noted in cases who were having respiratory failure and needed artificial ventilation (30%). Mortality was 22.2% in patients where bite to admission time was greater than 6 hours as compared to 6.25% in patients where it was less than 6 hours.
Conclusions: Author concluded that a neurotoxic snake bite is a life-threatening emergency. In preventive measures, outdoor activities in dim lights during monsoon season should be restricted. Traditional treatments are still popular and trusted methods of treatment in rural India and these healers can be educated to recognize and refer immediately all neurotoxic bites to nearby medical facilities.

Keywords: Anti-Snake venom, Neurotoxic snake bite, Outcome, Respiratory failure, Rural india, Traditional treatment

INTRODUCTION

Snake bite is an environmental, occupational and climatic hazard in India. In one of his final essays, statesman and former United Nations secretary general Kofi Annan said, 'Snakebite is the most important tropical disease you've never heard of'. During the last years of his life, he advocated strongly for the World Health Organization (WHO) and the global community to give greater priority to this disease of poverty and its victim.[1] Despite its importance, there have been fewer proper clinical studies of snake-bite than of almost any other tropical disease. In India, on one hand, as per government data, there were 61,507 snake bite cases in total with 1,124 deaths in the year 2006, and in the year 2007 this figure increased to 76,948 snake bites with 1,359 deaths, while on the other hand studies claiming as high as 50,000 deaths each year have been published.[2] A high incidence of snakebite envenomation has been reported from rural India. Due to inadequate reporting, its incidence is underestimated.[3] A total of 216 species of snakes are present in India out of which 52 species are known to be poisonous.

In neurotoxic snake bite, because of skin penetration by snake fangs, there is usually local severe burning pain immediately after bite. This is followed by local swelling that may gradually progress to involve the whole limb occasionally. Depending upon the site of the bite, type of neurotoxic snake and amount of venom injected during a bite, the patient may have a variety of symptoms ranging from generalized symptoms like nausea, vomiting, abdominal pain to more specific neurotoxic symptoms. Early neurotoxic symptoms in the form of drowsiness, paraesthesia, ptosis, localized paralysis of facial muscles and later severe symptoms like flaccid paralysis, pooling of secretions in the respiratory tract are seen. This may lead to respiratory failure and other severe complications and sometimes death if not managed immediately.

First aid treatment in form of immobilizing the bitten part and immediate transportation of a patient to a nearby medical facility where Anti-Snake Venom (ASV) and other facilities are available should be the priority in every snake bite patient. All patients with neurotoxic features should receive ASV, and patients who are in respiratory failure, low conscious state or where there is a threat to airway patency, such patients may need intubation and sometimes artificial ventilation. In India, ASV serum is polyvalent against four common and dangerous venomous snakes namely Indian cobra, Indian viper, Russell's viper, and saw-scaled viper. However, with the discovery of other poisonous species the validity of the concept of big four is increasingly challenged.[4,5] A trail of anticholinergic drugs and then treatment with anticholinergic drugs if responsive is followed in neurotoxic snake bite in most setups worldwide.[6,7]

In rural India unfortunately because of popular traditional healers and lack of proper transportation facilities results in either delayed medical treatments or no treatment at all. The popular traditional methods like local incisions, sucking venom, tight tourniquets, herbal medicine and others are common in rural India. These have been found useless and sometimes dangerous to the snake bite patients. Also, most people visit tantriks, vaidyas, and ojhas in rural India. Apart from these factors lack anti-snake venom, inadequate or excessive dose, inadequate artificial ventilation or failure to attempt such treatment are some other reasons for fatal outcome in these patients.[8]

METHODS

This is a prospective descriptive study done in Oscar super specialty hospital Sonipat Haryana from January to September 2019.

Inclusion criteria

- All patients with a history of snakebite and who presented with features of neurotoxicity.
- Age greater than 12 years.
- Patients who received ASV were included in the study.
- Patients who belong to rural areas were included in this study.

Exclusion criteria

- Patients of snakebite who were having no symptoms or only local symptoms and other toxic snake bites.
- Age less than 12 years.
- Patients who belong to town or city.

As per protocol all patients were subjected to history and physical examination on admission. A minimum of ptosis was required to include patients in our study. All patients were managed in the intensive care unit of the hospital and Anti-snake venom was given to all patients. Depending upon the severity of symptoms 50 to 150 ml initial bolus dose was given as an infusion in normal saline over 1 hour intravenously after proper consent. Patients were examined clinically every 2 hourly and further doses of ASV were given accordingly. All patients received premedication with hydrocortisone and pheniramine. Besides this most of our patients received anticholinergic treatment. Patients with a complication like respiratory failure or encephalopathy were managed by intubation and artificial ventilation. Patients were subjected to basic investigations like complete blood count, renal function tests, electrolytes, urine for hematuria, bleeding and clotting time, 20minute whole blood clotting test and chest radiograph on admission and repeated if needed during admission. The endpoint of the study was death or complete recovery.

RESULTS

A total of 25 patients with a history of snakebite and neurotoxic features were admitted in our setup during this study period.

Table 1: Age distribution of patients.

Parameter	Min. age	Max. age	Mean	Standard deviation
Age	12	50	24.5	7

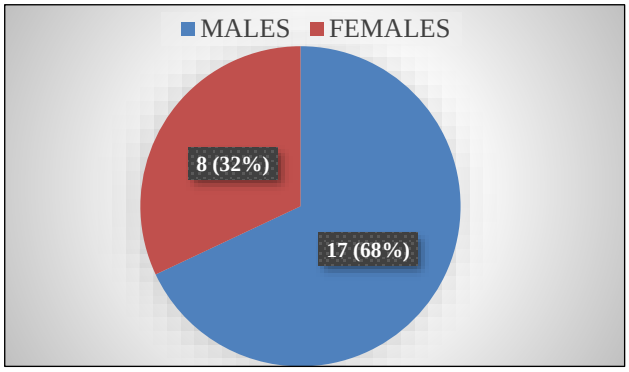

Figure 1: Gender distribution.

The mean age of patients was 24.5 years (SD 7) with the youngest of 12 years and the oldest of 50 years (Table 1).

Males outnumbered females with a total of 17 patients (68%) out of 25 were males (Figure 1).

Table 2: Epidemiological factors.

Parameter	Results N (%)
Location of bite	Fields:23(92%), home:2(8%)
Timing of bite	Evening:20(80%), Morning:4(16%), Late night:1(4%).
Site of bite	Lower limb:18(72%) Upper limb:6(24%) Ear:1(4%)
Season of bite	Monsoon:15(60%), Winter and summer:10(40%)
Average time from the bite to admission	5.2 hours.

The most common site of bite was lower limb in a total of 18 patients (72%) followed by upper limb in 6 patients (24%) and one patient (4%) was bitten on the left ear. 23 patients (92%) were bitten in fields while in 2 patients (8%) it was at home. The maximum number of bites (20 i.e. 80%) were from 6 pm to 12 am, rest were in the morning hours (4 i.e. 16%) and during late night (1 i.e. 4%). In this study, the average time from the bite to admission was 5.2 hours with the majority of patients 16(64%) admitted less than 6 hours after a bite. Author received the majority of patients 15(60%) during monsoon season (July to September) (Table 2).

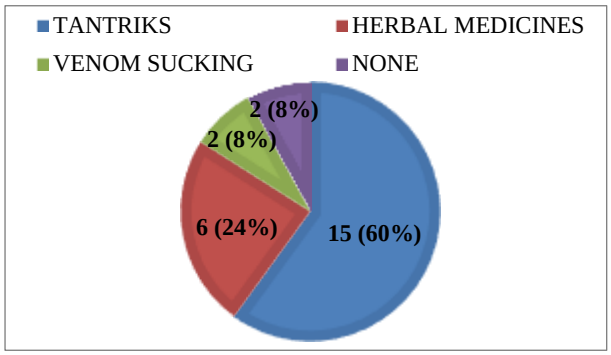

Figure 2: Traditional methods of treatment.

Table 3: Signs and symptoms.

Signs and symptoms	Number of patients n (%)
Pain and mild swelling	25(100%)
Ptosis	25(100%)
Diplopia and external ophthalmoplegia	22(88%)
Dysphagia and dysphonia	18(72%)
Flaccid paralysis	5(20%)
Coma and seizures	2(8%)

Traditional treatments were received by almost all patients 23(92%) and the most common method was by tantriks in about 15(60%) followed by herbal medicines in 6(24%) and in 2(8%) patients venom sucking was done by family members (Figure 2). Tourniquets were applied in 24 patients (96%) however none of them was complicated by ischemia of tied part.

Local swelling and pain at the site of the bite were present in all patients. The most common neurotoxic symptom was ptosis (100%) followed by diplopia and external ophthalmoplegia (88%). Dysphagia and dysphonia were complained by 72% of patients. 5(20%) patients were having flaccid paralysis. Loss of consciousness and seizures were present in 2 patients (8%) (Table 3).

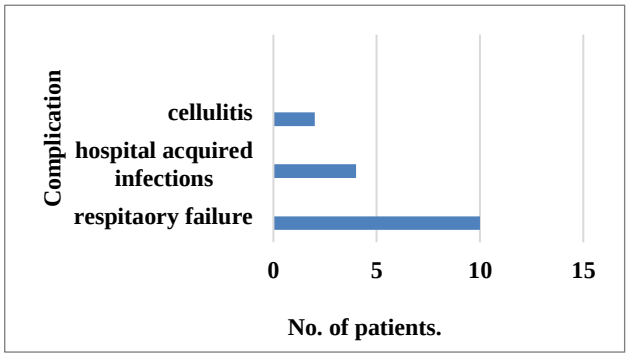

Figure 3: Complications in hospital.

As shown in Figure 3 Respiratory failure was the most common complication in 10(40%) patients followed by hospital-acquired infections in 4 patients (16%) and cellulitis at the site of bite in 2 patients (8%). On an average, 25 vials of ASV (250 ml) were received by each patient, with lowest of 50 ml and the highest of 600 ml. No patient developed a severe anaphylactic reaction to ASV.8 patients (32%) were intubated and managed with artificial ventilation. The average hospital stay in our patients was 5 days.

Table 4: Outcome of patients.

Parameter	Discharged in stable condition	Expired in hospital	Lama
Outcome	21(84%)	3(12%)	1(%)

Table 5: Bite to admission time and outcome.

Bite to admission time	Survived	Expired
Less than 6 hours	15(60%)	1(4%)
More than 6 hours	7(28%)	2(8%)

p value>0.05

The 3(12%) of our patients died in hospital, amongst which 2(8%) had cardiac arrest and died within 6 hours of admission and both had severe respiratory failure on

admission, one patient succumbed to hospital-acquired pneumonia on 8th day of admission. 21(84%) of our patients were discharged from hospital in stable condition with one patient left against medical advice however on follow-up after one week he was doing well (Table 4).

Out of 9 patients who were brought to hospital more than 6 hours after bite, death rate was 22.2% as compared to only 6.25% of death rate in another group, with bite to admission time of fewer than 6 hours (Table 5).

Table 6: Artificial ventilation and outcome.

Artificial ventilation	Survived	Expired
Received	5(20%)	3(12%)
Not received	17(68%)	0(0%)

p value>0.05

Amongst 8 patients who were intubated and received artificial ventilation during treatment, 3(37.5%) patients died as compared to no mortality in the rest of patients who were managed conservatively (Table 6).

DISCUSSION

Young males were the most common victims in this study as most of the outdoor activities like grass cutting, outdoor games and woodcutting are carried out mostly by males in rural India. As most of our patients were bitten in evening hours which highlights the fact that in rural India females mostly stay indoors during evening hours. Mohapatra et al, 2011, reported direct estimates from a national mortality survey of 1.1 million homes in 2001-03. The study found that young males aged 15 to 29 years were most victims in rural India.[9] Only two of our patients were bitten indoors while the rest of our patients were bitten outdoors mostly while working in fields. This was similar to other previous studies in other parts of India however in one study from Himachal Pradesh indoor bites were more common than outdoor bites.[10-12] This possibly explains different feeding habits of snakes in plain and hilly areas.

More exposed sites of the body were the commonly bitten sites as reported elsewhere.[13-14] Lower limbs were the most common site of bite in our patients followed by upper limbs as most patients were bitten while they were either working in fields or walking bare feet near the fields. Reid mentions that most of the bites in tropical countries were on lower extremities because victims are bitten while treading on or near the snake.[15] The maximum number of our patients were bitten during evening hours similar to other studies.[16] This can be explained by many reasons like most of our patients were outdoors during evening time, because of dim light more accidental encounters between snakes and humans, or possibly snakes are more active in evening hours because of hot climate during the daytime. Author received most cases in monsoon season highlighting the fact that during monsoons, because of heavy rains snakes move to more open places because of water collecting in fields. This distinct seasonal pattern with peaks in the warm and rainy months has been observed in other parts of the country.[17]

All of patients received traditional treatments mostly by tantriks and herbal medicine however what was different in this study that despite a strong belief in traditional treatment all patients visited nearby medical facilities for treatment. In a retrospective study conducted in one district of West Bengal by Majumder et al in 2014, only 22.19% of the snakebite victims attended the hospitals.[18] This is because even today most of the victims initially approach traditional healers for treatment and many are not even registered in the hospital. In another study by Singh et al reported only 20.25% of snake bite patients sought hospital care after consulting the traditional healers.[19]

Delayed transportation, lack of awareness of the hazards of snakebite and initial preference for alternative systems of medicine are the main reasons for the delay in seeking medical attention. The bite-to-treatment delay varies greatly in studies from different health care centers of India.[20,21] In this study, the average time from the bite to treatment was 5.2 hours with the majority of patients (64%) reporting the hospital in less than 6 hours. which compares closely with those observed by SAM Kularatne (7 hrs.).[22] In another study by Singh et al, it was less than 4 h in 55.69% of the cases and more than 12 h in 7.59% of the cases.[19]

The overall Death rate in this study was 12%. In another study by Mohapatra et al, it was 0.67 % however they included all patients of snake bites with majority of bites being non-poisonous and among poisonous bite neurotoxic were very few, however in some other studies mortality of neurotoxic snake bite was as high as 20%.[11,23.24] There was high mortality in cases who were admitted more than six hours after bite 22.2% as compared to 6.25% in cases less than 6 hours [x^2=1.39 p>0.05]. 32% of patients were intubated and managed by artificial ventilation. This was much lower as a comparison to another study done by Krishna sarin et al, from Puducherry where about 76.4% 0f patients required mechanical ventilation and all patients who expired in their study where those with a bite to admission time of greater than six hours, however, the majority of patients in their study were referred patients.[25] The mortality of patients was 37% in patients who were managed by artificial ventilation as compared to no mortality in other patients who were managed conservatively. This was statistically significant [x^2=7.24, p<0.05]. Respiratory failure is the main cause of mortality in other previous studies.[26-28] In this study mean total anti-snake venom dose was 250 ml and no serious antivenom reactions were noted in our patients. The mean total dose of anti-snake venom varies from 100 ml in a study by Sharma et al, to 500 ml in another study by Aggarwal et al.[29,30] As most of patients received anticholinergic medication this can probably explain the less total mean dose of anti-

snake venom as compared to other previous studies. Each of patients received steroids and antihistaminic premedication before receiving anti-snake venom, this can explain the absence of serious anti-snake venom reactions in this study.

CONCLUSION

Neurotoxic snake bite is a life-threatening emergency. Young males are common victims of neurotoxic snake bite in rural India. Evening hours during monsoon season is the most common time of neurotoxic snake bites. In preventive measures, outdoor activities in dim lights during monsoon season should be restricted. Traditional treatments are still popular and trusted methods of treatment in rural India and these healers can be educated to recognize and refer immediately all neurotoxic bites to nearby medical facilities where anti-snake venom and artificial ventilation facilities are available. All neurotoxic bites should receive anti-snake venom and early recognition of complications and timely intervention like intubation and artificial ventilation can decrease mortality and severe morbidity.

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