

## Original Research Article

# Study of clinical and epidemiological profile of poisonous snake bite in a tertiary centre in North Kerala

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## ABSTRACT

**Background:** Snakebites are well-known medical emergencies in many parts of the world, especially in rural areas. The incidence of snakebite mortality is particularly high in South-East Asia. Rational use of snake anti-venom can substantially reduce mortality and morbidity due to snakebites. Snake bite is an important health problem in India also especially in North Kerala which has an agricultural background. There is a lack of study regarding this topic in this area. North Kerala differs from other areas in the country as hump nosed pit viper bites are more common here due to its proximity to western Ghats where it .Anti snake venom is ineffective to bites by hump nosed pit viper. Authors objectives was to assess the clinical and epidemiological profile and outcome of poisonous snake bites.

**Methods:** Retrospective observational study done among patients with snake bite with envenomation admitted in Academy of Medical education, Pariyaram, Kannur, Kerala from January 2018 to September 2018.

**Results:** There were 90 cases of venomous snake bite during the study period. Of these males were predominant (70%). Majority were in the age group between 20 and 40. Majority of bites occurred in the months of June and July. Bite in the extremities were more common. Nine patients were brought 1 day after the bite. Snake identified most common was Russell's viper followed by pit viper. Majority of the systemic envenomation was hemotoxic 80 patients (85%).

**Conclusions:** The study stress the fact that snake bite is an important problem in North Kerala. The study also shows that delay in treatment is a major risk factor for morbidity. Hump nosed pit viper bites are more common in this area.

**Keywords:** Hemotoxic, Hump nosed pit viper, Neurotoxic, North Kerala, Russell's viper

## INTRODUCTION

Snake bite is a potentially life threatening complication in south East Asia especially in rural areas.<sup>1</sup> Epidemiological and clinical presentation varies in different countries and different geographical regions in same country as in India.<sup>2</sup>

Hemotoxic snake bites by vipers and neurotoxic snake bites from cobra and Krait are common in North Kerala. Pit vipers also cause hemotoxicity, but the mortality and

morbidity is significantly less compared to Russell's viper.<sup>3</sup> Local reaction with soft tissue necrosis are seen with cobra and viper but there is minimal local reaction with Krait bites.<sup>4</sup> The main neurotoxic clinical manifestations include ptosis, external ophthalmoplegia, dysphagia, dysphonia, weakness of facial muscles and respiratory muscles. Russell's viper cause hemotoxicity and nephro toxicity which is the main cause of mortality and morbidity in south India.<sup>5</sup> Pit viper envenomation are hemotoxic and can also rarely produce acute kidney injury.<sup>6</sup>

There is no simple rule for identifying a dangerous venomous snake. Snake can be identified if the snake is brought by the patient to the hospital or by clear photographs with mobile camera and clinical features also give the clues for clinical syndrome based identification.

Some harmless snakes have evolved to look almost identical to venomous ones. Examples are various species of *Lycodon*, which mimic the appearance of the kraits. However, some of the most notorious venomous snakes can be recognized by their size, shape, colour, and pattern of markings, behaviour and the sound they make when they feel threatened. For example, the defensive behaviour of the cobras is well known. They rear up, spread a hood, hiss and make repeated strikes towards the aggressor. Coloring can vary a lot. However, some patterns, like the large white, dark-rimmed annular (ring) spots of the Russell's vipers or the alternating black and yellow circumferential bands of the banded krait are distinctive. The blowing hiss of the Russell's viper and the grating rasp of the saw-scaled viper are warning and identifying sounds.

In many of the developed countries there are facilities to identify snake from snake's antigen from wound site swab, serum or urine by enzyme linked immunosorbent method (ELISA). This helps in treatment as patient need to be given the antivenom of that particular snake only rather than the cocktail of antivenom of different snake as practiced currently in India. This will help to reduce the hypersensitivity reactions to anti snake venom.

Quantity of venom injected is very variable, depending on the species and size of the snake, the mechanical efficiency of the bite, whether one or two fangs penetrated the skin and whether there were repeated strikes. Either because of mechanical inefficiency or the snake's control of venom discharge, a proportion of bites by venomous snakes does not result in the injection of sufficient venom to cause clinical effects. About 50% of bites by pit vipers and Russell's vipers, 30% of bites by cobras and 5%-10% of bites by saw-scaled vipers do not result in any symptoms or signs of envenoming.<sup>5</sup> Snakes do not exhaust their store of venom, even after several strikes, and they are no less venomous after eating their prey.

The incidence of snake-bites depends critically on the frequency of contact between snakes and humans. Except at times of flooding, snakes are elusive and reclusive and so contact with humans is likely only when humans move into the snakes' favored habitat (rice fields in the case of Russell's vipers and cobras; rubber and coffee plantations in the case of pit vipers) or when nocturnally active snakes are trodden upon by people walking along paths in the dark. Seasonal peaks of snake-bite incidence are usually associated with increases in agricultural activity or seasonal rains, perhaps coinciding with unusual movement and activity by snakes. Bites may be inflicted

in the home by peri-domestic species such as cobras (*Naja*) which may live in roof spaces or under the floor and by kraits (*Bungarus*) which enter human dwellings at night in search of their prey and may bite people who move in their sleep. The risk of envenoming after bites by venomous snakes varies with the species but is on an average only about 50%. Bites in which the fangs pierce the skin but no envenoming results are known as "dry bites". The explanation for dry bites is either mechanical inefficiency of the venom apparatus striking at an unnatural angle (or through clothing) or perhaps voluntary retention of venom by the snake.

Antivenom treatment for snake-bite was first introduced by Albert Calmette at the Institute Pasteur in Saigon in the 1890s. Antivenom is immunoglobulin usually pepsin-refined F(ab')<sub>2</sub> fragment of whole IgG purified from the plasma of a horse, mule or donkey (equine) or sheep (ovine) that has been immunized with the venoms of one or more species of snake.<sup>7</sup> Monovalent (monospecific) antivenom neutralizes the venom of only one species of snake. Polyvalent (polyspecific) antivenom neutralizes the venoms of several different species of snakes, usually the most important species, from a medical point of view, in a particular geographical area.<sup>8</sup> For example, the Indian antivenom manufacturers' polyvalent anti-snake venom serum is raised in horses using the venoms of the four most important venomous snakes in India (Indian cobra, *Naja naja*; Indian krait, *Bungarus caeruleus*; Russell's viper, *Daboia russelii*; saw-scaled viper, *Echis carinatus*), although the validity of the concept of "the big four" is increasingly challenged by the discovery that other species are also important in certain regions [e.g. *H. hypnale* in South-West India, *Trimeresurus malabaricus* in southern India; *Echis carinatus sochureki* in Rajasthan.<sup>9</sup> Antibodies raised against the venom of one species may have cross-neutralizing activity against other venoms, usually from closely related species. This is known as paraspecific activity. For example, the manufacturers of Haffkine polyvalent anti-snake venom serum claim that this antivenom also neutralizes venoms of two *Trimeresurus* species.

In many of the areas, especially rural, people go to quacks which cause delay in proper treatment and increase the morbidity and mortality.<sup>10</sup>

Objectives was to study the clinical and epidemiological profile and outcome of poisonous snake bite.

## METHODS

### *Study design*

A retrospective observational study in Academy of Medical education, Pariyaram, Kannur. All the patients admitted in Toxicology ICU and medical wards during the period January 2018 to September 2018 with poisonous snake bite.

### **Inclusion criteria**

Patients older than 13 years with a definite history of snake bite and developed features of envenomation.

### **Exclusion criteria**

Patients with no signs of envenomation after a period of observation, were excluded.

Detail of patients with snake bite with signs of envenomation were collected from the medical records section and these were entered in specifically designed proformas for evaluation. All details like time of bite, site of bite, time taken to reach hospital, occupation, past medical history, any treatment taken prior to coming to hospital awareness about preventive measures and need for early treatment. Prior treatment by non-medical personnel included incision and suction, herbal remedies which included asafetida, neem leaves, and garlic. Other unscientific methods used by nonmedical personnel were application of potassium permanganate and turmeric over the site of the bite. These irrational measures would delay the patient in seeking hospital attention. The species of snake was labelled only if the snake was brought along with the victim. Clinical features of venomous bites included regional (local) toxicity at the site of bite or systemic toxicity or both. Local toxicity consisted of pain, edema, bruising, blistering, cellulitis, bleeding, and complications like compartment syndrome, abscess formation, and gangrene. Systemic toxicity was defined by the presence of neurological features or hemostatic dysfunction. Drowsiness, paresthesia, ptosis, external ophthalmoplegia, paralysis of facial muscles, regurgitation through the nose, difficulty in swallowing secretions, and respiratory and generalized flaccid paralysis were manifestations of neurotoxicity. Hemotoxicity signs included spontaneous systemic bleeding, prolonged bleeding from recent wounds, fang marks, venipuncture sites, coagulopathy, and hemolysis.

Our hospital protocol followed WHO protocol. All patients bitten by a poisonous snake received polyvalent anti-snake venom (ASV) within 15 minutes of reaching the hospital, if they had clinical features of envenomation. The antivenom is a polyvalent one and would neutralize the venoms of the 4 major snakes of India (common cobra, common krait, Russell's viper, and saw-scaled viper). If they did not have features of envenomation at presentation, ASV was administered when the first sign of envenomation appeared. An initial dose of 10 vials of ASV was given for all snake bite patients with features of envenomation. Response to ASV was monitored clinically and by doing 20 minute whole blood clotting time (WBCT20). WBCT 20 was done for all patients every 30 minutes for first 3 hours and hourly after that. If the features of envenomation were persistent or if the WBCT20 was prolonged after 6 hours of first dose, a repeat dose of ASV was given. A maximum of 30 vials were given for hemotoxic snakebites and a

maximum of 20 vials were given for neurotoxic snakebites.

### **Statistical analysis**

Were done with mean, range, standard deviation and percentage.

## **RESULTS**

There were 90 cases of venomous snake bite during the study period of nine months. Of these males were predominant (70 %). Majority were in the age group between 20 and 40. Majority of bites occurred in the months of June and July. Bite in the extremities were more common. Nine patients were brought 1 day after the bite.

Snake identified most common was Russell's viper (32) followed by hump nosed pit viper (26). Majority of the systemic envenomation was hemotoxic 80 patients (85%).

There were 6 cases of krait bites and 2 cases of cobra bites. Bite marks were seen in a majority 90%.

Of the systemic manifestation hematuria was more common, 12 cases showed neurotoxic manifestations. The most common symptom was ptosis (10 patients) followed by double vision (4 patients) and dysphagia (2 patients). Neck muscle weakness was found in four patients. Weakness of limb and jaw muscles was detected in three and one cases respectively.

The evidence of recovery was seen as early as two hours after the infusion of antivenom in 8 patients with neurotoxicity. Complete recovery was noted within ten hours in 7 patients while the longest duration reported was 1 week, 4 patients developed respiratory muscle weakness necessitating mechanical ventilation. No patient with neuromuscular weakness had permanent sequelae.

Most of the patients with delayed presentation had more complications and required dialysis or ventilatory support, 10% of patients came within 1 hr of bite, 70 % came within 6 hrs.

In systemic bleeding manifestations, hematuria was the most common (32 patients) and bleeding gums in 18 patients. Hemoptysis was seen in 8 patients. Retinal hemorrhages were seen in 4 patients. Features of disseminated intravascular coagulation (DIC) were seen in 8, 3 patients had intracranial haemorrhage, 20 patients with hemotoxicity species could not be identified as they have not brought the snakes to hospital, 22 patients developed nephrotoxicity.

One patient with Russell's viper died due to cardiac arrhythmia, hemotoxicity and nephrotoxicity. The patient was admitted with cardiac arrest was resuscitated with severe residual hypoxic encephalopathy went into nephrotoxicity, hemotoxicity and expired due to multi

organ dysfunction. Six patient went in discharge against medical advice. Some of them were in critical stage but wanted to shift to other centres for various reasons and we could not get their follow up.

## DISCUSSION

In our study majority of the patients were male, probably due to their outdoor activity. Most of the bites occurred during June and July as it was monsoon time. Most of the patients reached treatment centre within first 6 hrs. Of time because of increased awareness among people. Also a nephrology backup with dialysis facility helped for better outcome.

Bites of hump nosed pit viper were common in our study. Hump nosed pit viper produced a prolonged coagulopathy. Majority of the victims were prey to hemotoxic snakes. It is to be emphasized that about one third of hemotoxic bites were due to the Hump nosed pit viper. Bites of the HNPV exhibit symptoms of local envenoming such as pain, swelling, hemorrhagic blistering, bruising, and regional lymphadenopathy. The systemic symptoms included headache, nausea, vomiting, and abdominal pain. HNV accounts for between 27 and 77% of venomous snakebites in Sri Lanka and south India.<sup>11</sup> In south India (Kerala), in the year 2007, *H. hypnale* was identified as a common and dangerous source.<sup>12</sup> The bites were common in our study due to the proximity of study area to Western Ghats which is the natural habitat for these species.

The coagulopathy observed in Russell's viper envenomation was significantly associated with low platelet count and clinical bleeding, suggesting venom-induced DIC as the mechanism. In our study, Russell's viper envenomation produced more severe complications and death than Hump nosed pit viper bites.

One patient with Russell's viper bite with hemotoxicity and renal failure with cardiac arrhythmia, was in cardiac arrest on reaching our hospital could not be saved.

Low mortality in the study may be because of increased awareness of people for early medical help, good transport means and roads to reach the hospital in time, availability of facilities like ventilatory support etc. . Also a nephrology backup with dialysis facility helped for better outcome.

## CONCLUSION

Study shows that snake bite is an important health hazard in north Kerala.

Hemotoxicity is much more common. Prevalence of hump nosed pit viper bites are more common compared to other parts of the country .Mortality is comparatively less compared to other regions.

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