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RETROSPECTIVE ANALYSIS OF SNAKE BITE VICTIMS ADMITTED IN INTENSIVE CARE UNIT OF A TERTIARY CARE HOSPITAL IN NORTH INDIA

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Abstract

Background:The neurotoxic snakes, cobra and krait, are most commonly found in the northern India. The incidence of snake bites increases drastically in the rainy months of July to September. Respiratory paralysis is the most common cause of mortality in snake bite venomation. It can be preventable by timely arrival at the hospital and timely administration of anti snake venom.

Material and methods

All the snake bite victims, 18 years and above, who presented in the medicine emergency with neurological signs and symptoms in the time period June 2023- may 2024 were screened by the researcher and data of those patients who were subsequently shifted in the ICU after management in the medicine emergency was recorded and further analysed for demographic, snake bite characteristics, hospital stay and ASV administration.

Results

Thirty patients (21.4%) met the inclusion criteria with the complete records and were included for the final study. 86.66% patients presented in the early morning hours between 12 am to 6 am Eighteen patients were male and twelve patients were female, with 56% patients in the age group ranging from 25-50 years. 80% of the patients presented in the monsoon months of July and August. Association between time taken to reach hospital and duration of mechanical ventilation and time to complete resolution of symptoms was noted and it was found to be highly significant ($p<0.05$)

Introduction:

Snake bite is a serious medical emergency, frequently encountered during the monsoon season. According to WHO, snake envenoming in India is on the priority list of neglected tropical diseases (NTDs) in June 2017. In India, 2-3 lakhs snake bite cases are reported annually with 1000-2500 deaths. Prominent venomous species have been labelled as the 'big four' that includes *Naja naja* (Cobra), *Bungarus caeruleus* (Krait), *Echiscarinatus* (saw-scaled viper), and *Daboia russelii* (Russell's viper).[1]

Snakes of family Elapidae are predominantly venomous causing neurotoxic features. The family includes, Cobra and krait, the neurotoxic snakes found most commonly in the northern India. They rest in termite mounts, brick piles, rat holes and even inside houses. Due to rainy season, the incidence of snake bites increases drastically. They mostly bite the victim indoors, in the night or in the early morning. Nine-five percent of the common krait and cobra bites in North India are documented in the month of July to September.

Mortality with snake bite is preventable when the victim reaches the hospital in time with no delay. Early diagnosis of the neuroparalysis and early administration of the anti-snake venom (ASV) prevents further complications by neutralizing the snake venom. Mortality in most of the cases is due to respiratory paralysis.

In this retrospective study, we present a study of the patients who presented with neurological signs and symptoms in the Intensive Care Unit of a tertiary care hospital in North India in the past year at varying time duration following the snake bite. The aim of this study is to focus on the identification of early neuroparalytic signs and symptoms of snake bite in North India along with the early administration of ASV, timely institution of ventilatory support and further supportive management.

Material and methods

The management of the snake bite victims was done in the 30 bedded modular intensive critical care unit of a tertiary care hospital in Northern India. The data was recorded retrospectively from the time of presentation in the medical emergency to the discharge from the critical care unit during the year June 2023-May 2024. The patients were admitted in the ICU after initial management in emergency unit.

The data was collected from the record register maintained by the sister incharge of the medicine emergency and the ICU. Confidentiality of the patients was maintained by not revealing their identity in terms of name, CR number allotted by the hospital and their date of birth.

All the snake bite victims, 18 years and above, who presented in the medicine emergency with neurological signs and symptoms in the stated time duration were screened by the researcher and data of only those patients who were subsequently shifted in the ICU after management in the medicine emergency was recorded and further analysed. All incomplete case records were excuded. The following parameters were recorded for analysis:

1. Number of patients admitted in ICU after snake bite

2. Demographic characteristics
- Age of the patient
- Gender of the patient
- Month of admission
- Time of snake bite
- Associated comorbidity

3. Snake bite characteristics
- Visible bite mark present or absent
- Site of bite mark (extremities/ central)
- Presenting symptoms of the patient

4. Hospital admission and course of stay
- Time taken to arrive at hospital
- Duration of mechanical ventilation if required
- Time to complete resolution of symptoms
- Mortality if any

5. ASV usage
- Time to first ASV from the time of bite
- Total dose of ASV received

Results

A total of 140 patients were registered at the institute with history of snake bite during the year June 2023-May 2024. Forty two patients (30%) were admitted in the ICU after initial management in the medical emergency following snake bite. Out of them 30 patients (21.4%) met the inclusion criteria with the complete records and were included for the final study.

Demographic characteristics

Most of the patients presented in the early morning hours between 12 am to 6 am (26 patients; 86.66%) (Fig 2). Eighteen patients were male and twelve patients were female, with maximum patients in the age group ranging from 25-50 years (17 patients; 56.7%) (Table 1 and Fig 1). 80% of the patients presented in the monsoon months of July and August which are the months of heavy rainfall and high humidity. Six patients had history of associated comorbidities mainly hypertension, diabetes mellitus and ischaemic heart disease.

Table I : Distribution of age

Age (years)	Frequency	Percentage
<25	5	16.7
25-50	17	56.7
>50	8	26.7
Total	30	100

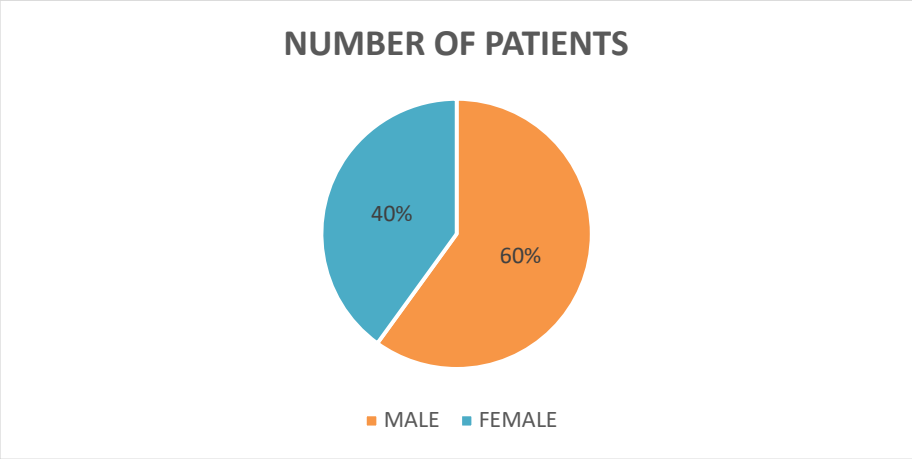

Fig 1: Distribution of gender

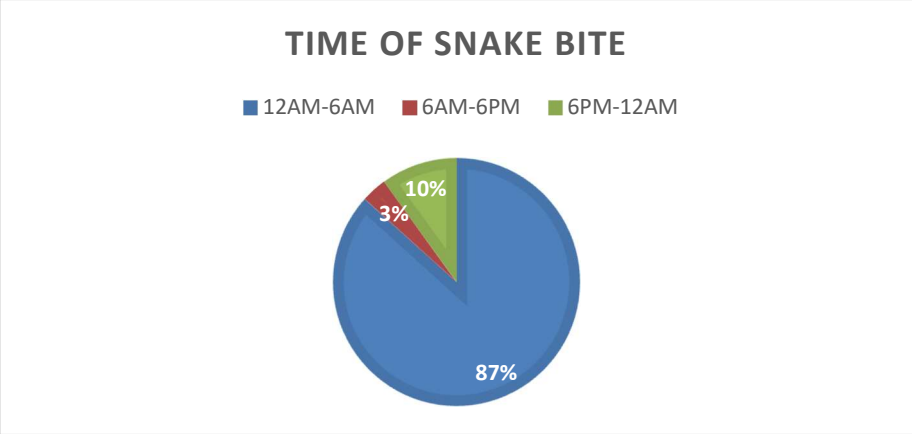

Fig 2: Distribution of patients with respect to time of snake bite

Snake bite characteristics

Bite mark was seen in 63.33% of the patients (19 patients), more often seen on the extremities (78.9% ; 15 patients) as compared to the central location (21.05% ; 4 patients). Ptosis was the most common sign present in all the snake bite patients. Other common signs which were found in snake bite patients included diplopia, dysphonia, dysphagia and dyspnoea (Fig 3).

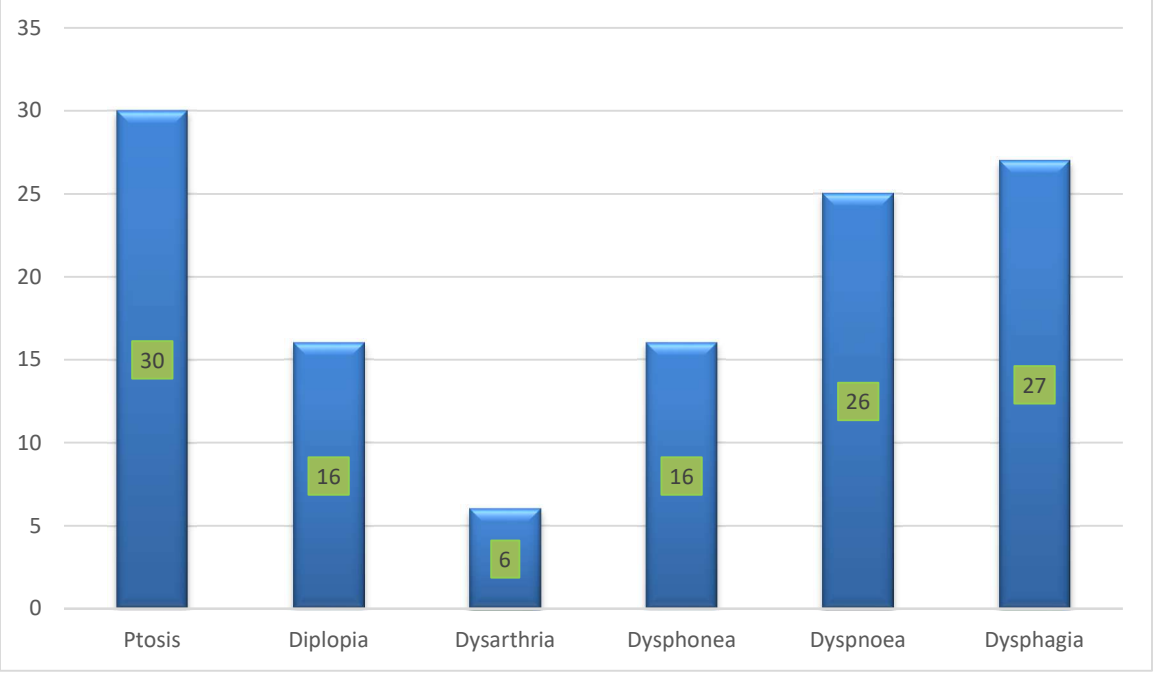

Fig 3: Presenting signs and symptoms of snake bite victims and number of patients

Hospital admission and course of stay

The time of reporting to the hospital after the snake bite varied from 2 hrs to 19 hrs by the patients (fig 4). Twenty four patients had complaint of breathlessness which progressed to paralysis of the respiratory muscles and were intubated and put on mechanical ventilation. The duration for mechanical ventilation varied from 23 hours to 9 days (fig 5)**.** Six patients did not require any mechanical ventilation and were managed by oxygen therapy with facemask. The time duration for complete resolution of the symptoms took an average of 43 hours (fig 6). Three patients expired after prolonged treatment in critical care unit.

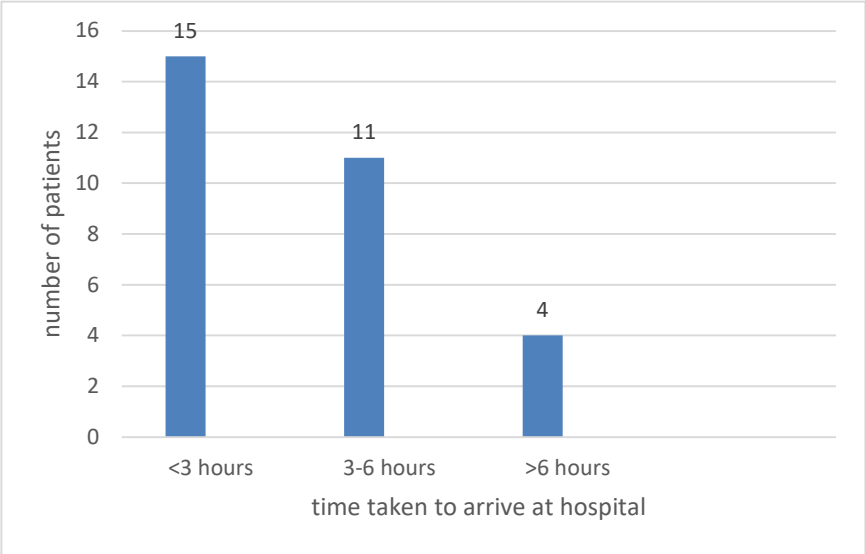

Fig 4 : Time taken to arrive at hospital after the snake bite

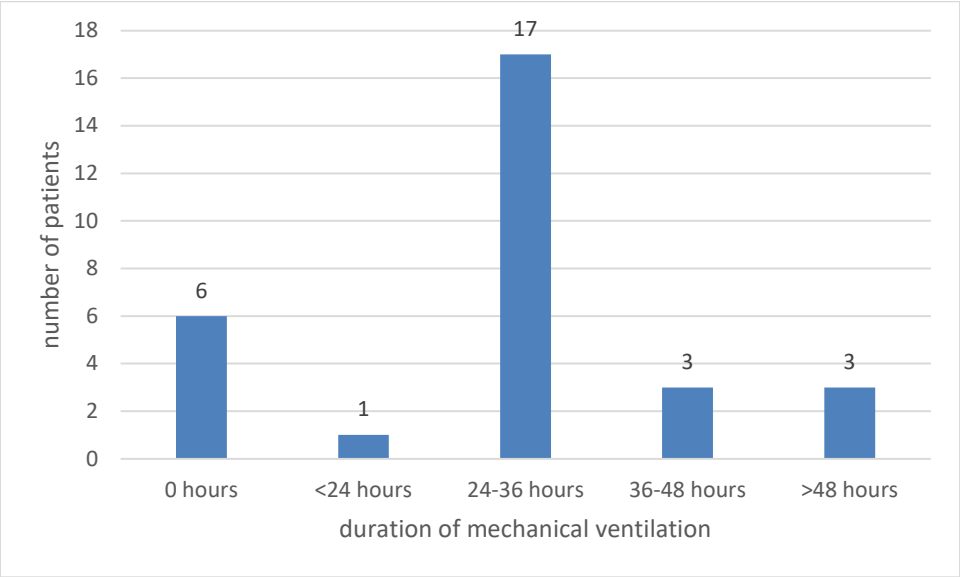

Fig 5: Duration of mechanical ventilation

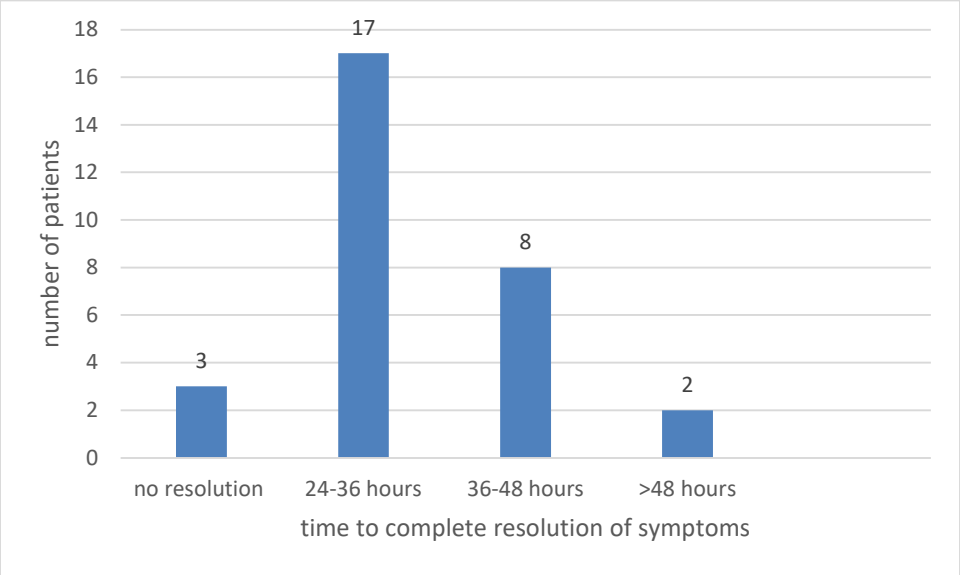

Fig 6: Time to complete resolution of symptoms

ASV usage

First dose of ASV i.e. 10 vials (100 ml) were administered in the emergency unit slowly over a duration of one hour in all patients. The mean ASV received by all patients was 35 vials. The time

to first ASV administration varied from 2 hours to 20 hours (fig 7). One patient received her first ASV after 20 hours as she had another hospital admission prior presenting to our institute where no ASV was administered. She was the only patient who received intubated from another hospital.

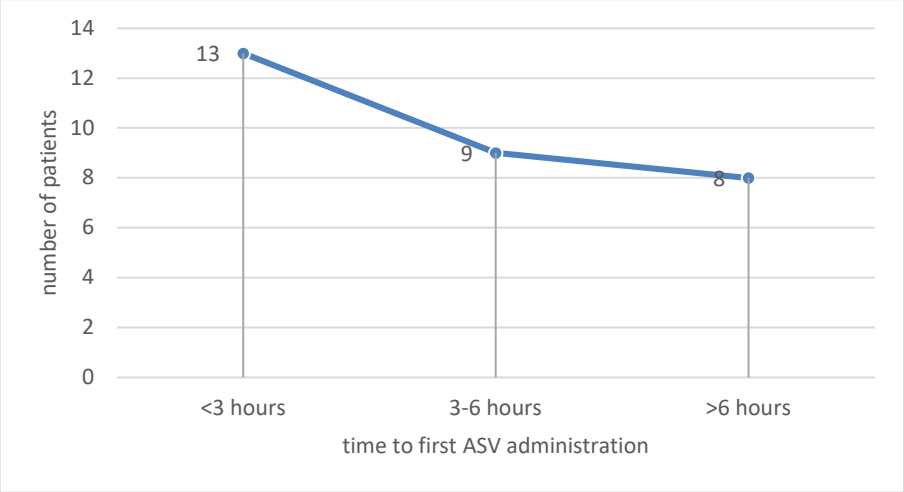

Fig 7: Time to first ASV administration from the time of snake bite

Association between time taken to hospital and time to resolution of symptoms was noted and it was found to be highly significant ($p<0.05$) (table II)

Table II: Association between time taken to arrive at hospital and resolution of symptoms

		time till resolution of symptoms				
		No resolution	24-36 hours	36-48 hours	>48 hours	Total
time taken to reach hosp	<3 hours	0	13	2	0	15
	3-6 hours	1	3	5	2	11
	>6 hours	2	1	1	0	4
Total		3	17	8	2	30

Fischer's exact value= 14.890, p=0.003

Similarly, association between time taken to reach hospital from the time of snake bite and duration of mechanical ventilation is highly significant ($p<0.05$) (table III)

Table III: Association between duration of mechanical ventilation and time taken to arrive at hospital

		Duration of mechanical ventilation (hours)					Total
		0	<24	24-36	36-48	>48	
Time taken to reach hospital	<3 hours	3	1	11	0	0	15
	3-6 hours	2	0	5	3	1	11
	>6 hours	1	0	1	0	2	4
Total		6	1	17	3	3	30

Fischer's exact value= 12.641, p=0.04

Discussion

In the study it was observed that majority of the victims were male and between the age group ranging from 25-50 years. This may be because men are the main earning members of the family in rural set up. They are more involved in the outdoor activities in the early morning like in the fields. Decreased visibility in the early morning increases the chances of midnight or early morning bite. Similar observation was also reported in studies by Brunda G et al and Anil A et al where early morning bites were high.[2,3] This is the classical history of krait bite because they are usually found near the residences looking for the burrholes or cracks in the house. The incidence of snake bite increases in the months of rainy season (july to september) which is similar to findings in our study.

Neuroparalysis is the leading cause of increased morbidity and mortality in the neurotoxic snake bite victims in Northern India. The elapidae family members, cobra and krait snakes cause neuroparalytic symptoms. In ours study the snake bite

victims presented with the classical symptoms of ptosis, blurring of vision and body weakness. The snake venom toxin (Bungarotoxins) bind to the the presynaptic and post synaptic acetylcholine receptors, depletes the acetycholine filled synaptic vesicles at the synaptic sites, causing the structural damage at the motor end plates. This leads to the muscles weakness of the eyes, tongue, throat and chest leading to the respiratory failure and other associated symptoms.

The polyvalent ASV can only neutralize the unbound snake venom and cannot reverse the bound venom at the motor end plates. That is why early arrival at hospital and subsequently administration of the first ASV is most important. It should be given as early as possible to neutralize the maximum snake venom present in the body. The severity of envenomation and progression to neuroparalysis may vary, depending on various factors such as the age of the victim, comorbid condition (old age, anaemia, hypertension, diabetes mellitus and renal disease), anatomical site of the bite, potency of the venom (depends on species, age and health of the snake, condition of fangs and timing of the first aid and time elapsed before first antivenom and supportive treatment received).[4] So in such conditions, early arrival at the hospital after snake bite, early administration of anti snake venom and institution of early mechanical ventilation and cardiopulmonary support came out with the best outcome.

In this study, the mean time to reach hospital was 5.5 hrs (range: 2 hrs to 19 hrs). Delayed arrival in hospital leads to fatal outcome. In case of respiratory failure, early intubation and mechanical ventilation is necessary to protect the airway and prevent aspiration in patients with bulbar paralysis. Mechanical ventilation in neuroparalysis is usually short and uncomplicated. The lung mechanics are usually normal and patients recover faster from neuroparalysis with prompt administration of ASV.[5] Early extubation decreases the chances of ventilator associated pneumonia. None of the patient developed VAP in the study. The mean duration of mechanical ventilation was 40.1 hours ranging between 23 hrs to 9 days. Kularatne [10] reported a duration ranging from 12 h to 29 days.[6] The other investigators reported the similar finding.[7]

The mean time to receive the first ASV was 6.2 hrs (range: 2-20 hours). ASV is most efficacious when administered within 1-4 hours of snake bite. The usual dose ASV is 10 vials, administered stat as 1 hour infusion followed by repeat dose of 10 vials after 1

hour if symptoms persist. The subsequent doses of ASV was repeated in patients with persistent symptoms of dysphagia and blurring of vision. Ptosis persisted till the last in all the patients. The mean time to complete resolution of the symptoms was 43 hours and the mean ASV received was 35 vials in the study. The average dose of ASV given was similar other studies too.[8]

All patients except three, recovered completely. They might have sustained severe neurological damage most likely because of delay in reaching medical facility, also they had associated comorbidities ranging from ischaemic heart disease, uncontrolled hypertension and uncontrolled diabetes mellitus. None of the patient developed ventilator associated pneumonia (VAP). Tracheostomy was done in one patient who had prolonged clinical course and had sustained hypoxic brain injury.

Conclusion

The time taken to arrive at the hospital after the snake bite and early institution of treatment and anti snake venom administration plays a vital role in reducing the duration of mechanical ventilation in snake bite victims. It is the key to better outcome of the neurotoxic snake envenomation and leads to early resolution of neuroparalytic signs and symptoms in snake bite patients.

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1.Vasudha Govil, 2. Anupma Jinagal, 3.Anju Rani, 4. Sudha Puhal, 5.Vinay Phogat, 6.Sahil Arora
Work concept and design 1,2,3,4,5,6
Data collection and analysis 2,,3,4,5,6,
Responsibility for statistical analysis 2
Writing the article 1,2,3
Critical review, 1, 2,3
Final approval of the article 1,2,3,3,4,5,6

Each author believes that the manuscript represents honest work and certifies that the article is original, is not under consideration by any other journal, and has not been previously published.
Availability of Data and Material: The corresponding author is prompt to supply datasets generated during and/or analyzed during the current study on wise request.

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