

Original Research Article

Epidemiological profile of snake bite at tertiary care hospital, East India

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ABSTRACT

Background: Snakebite is a common medical emergency and an occupational hazard for majority of Indian population especially farmers. Epidemiological data on snake bite from the East India is sparse.

Methods: This hospital based prospective study was conducted from March 2013 to February 2014. 200 cases of snakebite poisoning were admitted to the hospital during the study period.

Results: Majority of victims belonged to the age group of 15-45 (60%), resident of rural areas (92%) and were involved in agricultural activities (60%). The study population was predominately bitten outdoors (66%), in the lower extremity (86%), at night (82%). Respiratory muscle paralysis (66.7%), ptosis (66.7%), coagulopathy (60%), acute renal failure (55.6%), shock (55.6%) were the signs associated with poor prognosis.

Conclusions: Snakebite is an important occupational hazard, though preventable in principle remains to be one of the common medical emergencies.

Keywords: Epidemiology, Poisoning, Snake, Snake bite

INTRODUCTION

In any language of the world, snake produce's unimaginable fear and anxiety. This has been happening in our society since the dawn of civilization. Right from the cases where earliest man lived, snakes would have caused first kind of poisoning. The death caused then, might have been first alarm of sensing death at vision of a snake.¹

Some developed venom (and the apparatus to deliver them) of such exquisite complexity and design that unlike most biochemical substances, they cannot yet be manufactured through biotechnology or genetic engineering. In short, snakes are incredibly successful, unique and remarkable animals, well deserving of our respect and admiration.²

Snakebite morbidity and mortality cannot be ignored as a health problem. Death figures up to 5.4 per 100,000 resident Indian rural coastal population definitely speak the magnitude of the problem. But inspite of this, it has been overlooked through ages. In 1796, Dr. Patrick Russell (after whom Russell's viper has been named) wrote from India on snakebite. "The progress of the disease and succession of symptoms had either not been attended to or, were indistinctly recollected". His plea for clinical observation and for paying significance as a tropical health problem has remained ignored. Attempts made by International Seminar on Epidemiology and Medical Treatment of Snakebite jointly organized by Japan Institute and World Health Organization in August 1980 at Naha, Okinawa, Japan elucidate the status of snakebite and invite epidemiological and clinical works on the subject.³

Snakebite is a major public health problem throughout the world especially in tropical and sub-tropical countries. Frayer in his study of Thanatophidia of India estimated that about 1 in 1 lakh population died due to snake bite.⁴

Snake bite is responsible for about 2.85%-5.3% of the mortality of total hospital admission in India in different states as compared to 20 per year in USA, every 3 to 5 years in Europe. The high mortality in India is due to climatic factors, rural predominance of population and their agricultural dependence. Nearly 3500 species of snakes exist in the world. India has about 216 varieties of snakes of which about 52 are venomous and of these only 4 varieties of snakes are commonly encountered as the cause of snakebite poisoning. They are Russell's viper, Echis Carinatus (Viperidae), Cobras (Elapidae) and pit viper (Crotalidae).⁵

Based on their morphological characteristics including arrangement of scales, dentition, osteology, myology, sensory organs etc. snakes are categorized into families. The families of venomous snakes are Atractaspididae, Elapidae, Hydrophidae and Viperidae.

The major families in the Indian sub-continent are

- Elapidae which includes common cobra, king cobra and krait (cause neuromuscular paralysis leading to flaccid paralysis and death by respiratory failure)
- Viperidae which includes Russell's viper, pit viper and saw scaled viper (cause hemorrhagic syndromes)
- Hydrophidae are myotoxic.⁶

The study was conducted to assess the epidemiological and clinical features of different type snake bite patients and to find out factors associated with fatal outcome of snake bite patients.

METHODS

This study was carried out from March 2013 to February 2014. The study comprised of 200 cases of snakebite poisoning admitted under the emergency ward of Department of General Medicine of Burdwan Medical College and hospital, Burdwan.

The patients were studied, from the time of admission and followed up till discharge from the hospital or till death.

The data was collected from patient's case sheets and information from the victims or the relatives present regarding socioeconomic status, family history, time of bite, type of snake, and first aid measures taken.

Inclusion criteria

Patients with history of unknown bite suspicion of snake bite, or history of snake bite, or with features of neurotoxic snake bite without any history of bite, who all are treated according to WHO protocol.

At the time of admission inquiry is made about the type of snake, time of snakebite, site of snakebite, the signs and symptoms, and any first aid measures taken. Inquiry was also made about the preliminary data of the victim, such as age, occupation, educational status, marital status and domicile.

General physical examination

The vital signs like pulse rate, blood pressure, respiratory rate and level of consciousness were noted. The site of the snakebite was examined for any local tissue reaction, such as swelling, erythema, necrosis.

An attempt was made to correlate the pattern of fang marks with the type of alleged snake.

Systemic examinations

A detailed examination of central nervous system, cardiovascular system, respiratory system and per abdomen was carried out in all the cases.

Laboratory investigations

The blood was sent for the routine haematological investigations with a detail study of coagulation profile.

Immediate resuscitative measures with administration of anti-snake venom and symptomatic treatment.

Exclusion criteria

Patients with history of scorpion bites, bee sting were excluded and having any other co-morbid condition which may hamper or influence in-hospital morbidity and mortality were not included in our study.

RESULTS

In this study, we observed 200 snake bite patients regarding their demographic profile, clinical characteristics, treatment required and hospital outcome.

Mean age of victims of snake bite was 31.5 ± 15.1 among which maximum number i.e., 120 (60%) belong to 15-45 years of age and 48% were males and 52% were females. Rural people formed the biggest group of the victims (92% cases) and 60% Snake bite victims were farmer by occupation.

Out of 200 cases of snakebite, 82% were bitten at night, 66% were bitten outdoor and 86% were bitten in the lower limbs.

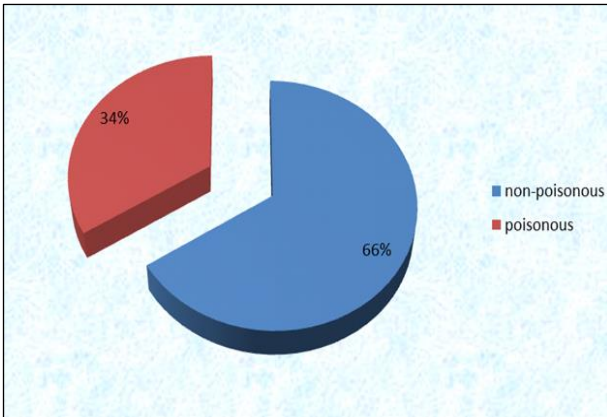


Figure 1: Type of snake bites.

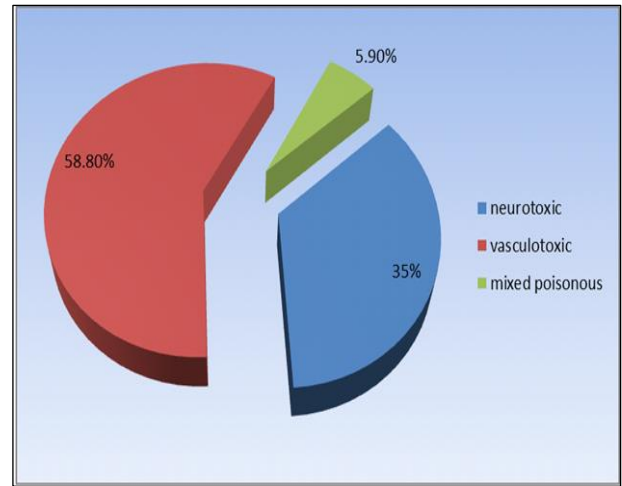


Figure 2: Type of poisonous snake bites.

Table 1: Demographic profile poisonous versus non-poisonous snake bite.

Parameters	Non-poisonous (n= 132)	Poisonous (n=68)	Total (n= 200)	Sig. (p value)
Mean age in years	28.6±13.0	37.3±17.2	31.5±15.1	<0.001
Age between 15-45 years	63.6%	52.9%	60%	<0.001
Gender: male	45.5%	52.9%	48%	0.315
Locality: rural	87.9%	100%	92%	0.003
Occupation: Farming	60.6%	58.8%	60%	0.255
Type of snake identified	30.3%	64.7%	42%	<0.001
Type of house: non-brick	54.5%	64.7%	58%	0.168
Time of bite: at Night	81.8%	82.4%	82%	0.926
Place of bite: outdoor	69.7%	58.8%	66%	0.124
Site of bite: lower limb	84.8%	88.2%	86%	0.513

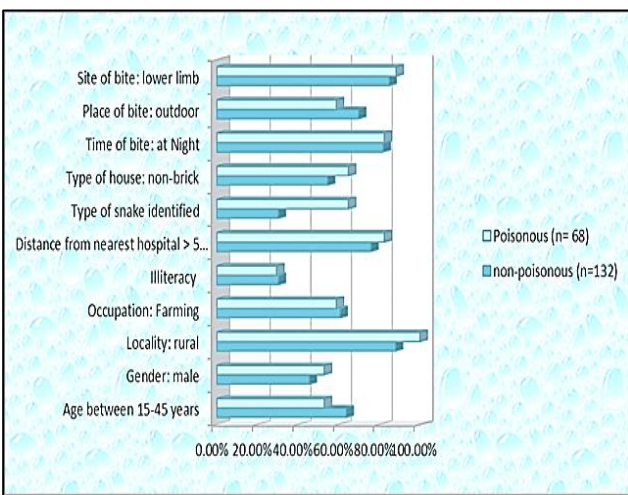


Figure 3: Demographic profile: poisonous versus non-poisonous snake bite.

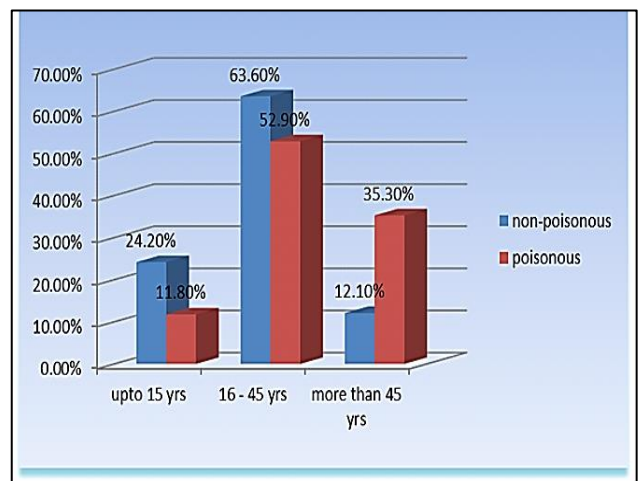


Figure 4: Age group distribution in poisonous and non-poisonous snake bites.

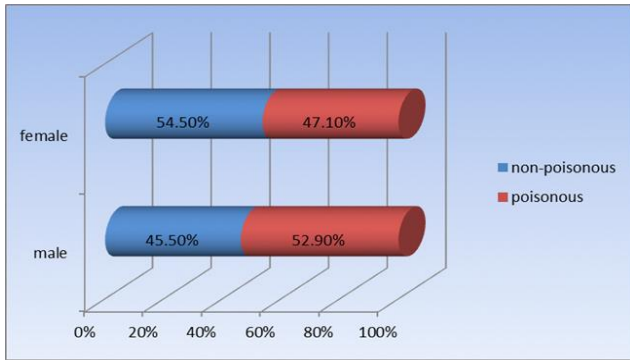


Figure 5: Gender distribution in poisonous and non-poisonous snake bites.

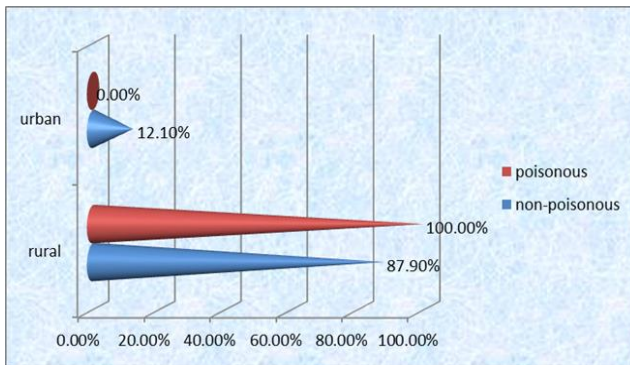


Figure 6: Urban and rural; locality distribution in poisonous and non-poisonous snake bites.

Cellulitis was found in 56 (28%), shock was found in 36 (18%), coagulopathy was found in 20 (10%), Haematuria was found in 32 (16%), acute renal failure was found in 36 (18%), Ptosis was found in 12 (6%), Dysphagia was found in 16 (8%) and pain abdomen was found in 36 (18%)

Among 34% (n=68) diagnosed as poisonous snake bite, neurotoxic bite comprises 35%, vasculotoxic bite comprises 58.8% and mixed poisonous bite 5.9%.

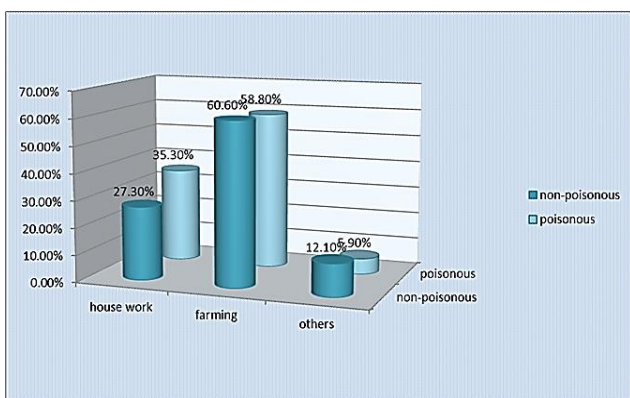


Figure 7: Distribution of occupation in poisonous and non-poisonous snake bites.

All the poisonous snake bite cases i.e. 68 (34%) got ASV among whom high dose (20 vials or more) of AVS was given to 52 (76.5%) of the victims. ASV was not given to non-poisonous cases.

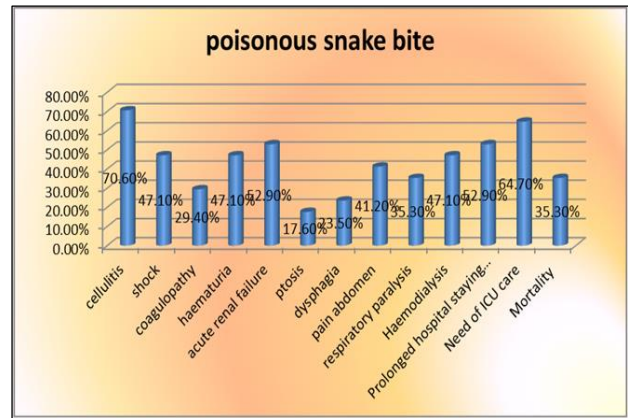


Figure 8: Clinical profile of poisonous snake bite patients.

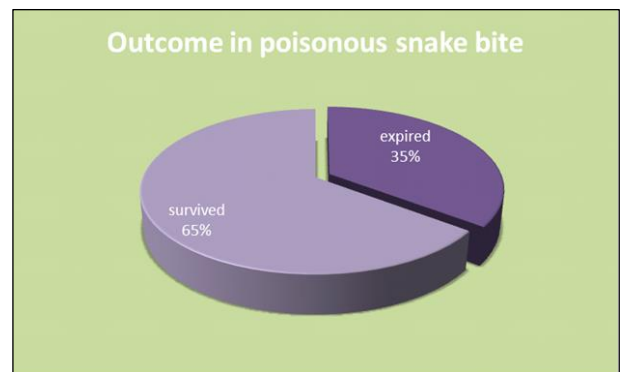


Figure 9: Mortality outcome of poisonous snake bite patients.

78% Snake bite victim were living at a distance of >5km from the nearest hospital. Mean duration of hospital stay in days for victims of snake bite were 4.5±2.1. 52.9% of cases among poisonous snake bite group needed prolonged hospital stay (≥7days). Haemodialysis was required for 47.1% of poisonous snake bite cases. Mechanical ventilation was required for 35.3% of poisonous snake bite cases.

Mortality was 12% (n=24) all among poisonous snake bite victims, and it was nil in non-poisonous group. In neurotoxic bite mortality was 33.3%, among vasculotoxic bite mortality was 30%, and in mixed poisonous bite mortality was 100%. Among the cases with cellulitis mortality was 28.6%, among cases with shock mortality was 55.6%, among cases with coagulopathy mortality was 60%, among cases with haematuria mortality was 50%, among cases with acute renal failure mortality was 55.6%, among cases with ptosis mortality was 66.7%, among cases with dysphagia mortality was 50%, among cases with respiratory muscle paralysis mortality was

66.7%. This difference is statistically significant (p <0.001). Among the cases with pain abdomen mortality was 11.1%. This is statistically not significant (p 0.856).

Table 2: Clinical profile of poisonous versus non-poisonous snake.

Parameters	Non-poisonous (n=132)	Poisonous (n= 68)	Total (n= 200)	Sig. (p value)
Cellulitis	6.1%	70.6%	28%	<0.001
Shock	3%	47.1%	18%	<0.001
Coagulopathy	0%	29.4%	10%	<0.001
Haematuria	0%	47.1%	16%	<0.001
Acute renal failure	0%	52.9%	18%	<0.001
Ptosis	0%	17.6%	6%	<0.001
Dysphagia	0%	23.5%	8%	<0.001
Pain Abdomen	6.1%	41.2%	18%	<0.001
AVS Required	0%	100%	34%	<0.001
High dose of AVS required (20 vials or more)	0%	76.5%	26%	<0.001
Haemodialysis	0%	47.1%	16%	<0.001
Mechanical ventilation required for respiratory muscle paralysis	0%	35.3%	12%	<0.001
Mean duration of hospital staying in days	3.5±1.1	6.3±2.4	4.5±2.1	<0.001
Prolonged hospital staying (≥7days)	0%	52.9%	18%	<0.001
Mortality	0%	35.3%	12%	<0.001
Serum urea level in mg/dl	32.6±6.7	75.7±37.5	42.2±30.3	<0.001
Serum creatinine level in mg/dl	0.85±0.09	2.97±2.43	1.57±1.73	<0.001
Mean ventilation duration in days	-	3±1.3	3±1.3	-

Table 3: Demographic factors responsible in mortality outcome of poisonous snake bite patients (n=68).

Parameters	Non-survivors (35.3%)	Survivors (64.7%)	Sig. (p value)
Poisonous bite	35.3%	64.7%	<0.001
Neurotoxic bite	33.3%	67.7%	<0.001
Vasculotoxic bite	30%	70%	<0.001
Mixed poisonous	100%	0%	<0.001
Mean age in years	40.3±10.9	30.3±15.2	<0.001
Age upto 15yrs	0%	100%	0.018
Age >15 – 45yrs	13.3%	86.7%	0.018
Age > 45yrs	20%	80%	0.018
Gender: Male	12.5%	87.5%	0.834
Gender: Female	11.5%	88.5%	0.834
Locality: Rural	13%	87%	0.124
Locality: Urban	0%	100%	0.124
Occupation: House working	6.7%	93.3%	0.220
Occupation: Farming	13.3%	86.7%	0.220
Occupation: Others	20%	80%	0.220
Type of snake identified	19%	81%	0.009
Type of snake not identified	6.9%	93.1%	0.009
Type of house: non-brick	6.9%	93.1%	0.009
Type of house: brick	19%	81%	0.009
Time of bite: at Night	12.2%	87.8%	0.856
Time of bite: at daytime	11.1%	88.9%	0.856
Place of bite: outdoor	9.1%	90.9%	0.078
Place of bite: indoor	17.65%	82.4%	0.078
Site of bite: lower limb	11.6%	88.4%	0.688
Site of bite: other than lower limb	14.3%	85.7%	0.688

Table 4: Clinical factors responsible in mortality outcome of poisonous snake bite patients (n=68).

Parameters	Non-survivors (35.3%)	Survivors (64.7%)	Sig. (p value)
Cellulitis	28.6%	71.4%	<0.001
Shock	55.6%	44.4%	<0.001
Coagulopathy	60%	40%	<0.001
Haematuria	50%	50%	<0.001
Acute renal failure	55.6%	44.4%	<0.001
Ptosis	66.7%	33.3%	<0.001
Dysphagia	50%	50%	<0.001
Pain Abdomen	11.1%	88.9%	0.856
Respiratory muscle paralysis	66.7%	33.3%	<0.001

Table 5: Treatment related factors responsible in mortality outcome of poisonous snake bite patients (n=68).

Parameters	Non-survivors (35.3%)	Survivors (64.7%)	Sig. (p value)
AVS Required	35.3%	64.7%	<0.001
High dose of AVS required (20 vials or more)	38.5%	66.5%	<0.001
Haemodialysis required	50%	50%	<0.001
Mechanical ventilation required	66.7%	33.3%	<0.001
Mean duration of hospital staying in days	8.5±1.9	3.9±1.5	<0.001
Prolonged hospital staying (≥7days)	55.6%	44.4%	<0.001
Mean serum urea level in mg/dl	107±32.7	39.1±8.8	<0.001
Mean serum creatinine level in mg/dl	4.9±2.8	1.1±0.7	<0.001
Mean ventilation duration in days	3.7±0.8	1.5±0.5	<0.001

DISCUSSION

Snakebite poisoning is one of the commonest public health problem in the tropics. It is an occupational hazard of agricultural workers and hunters in many tropical countries. Unlike mortality from snakebite poisoning and the incidence of snakebite cannot be ascertained as large number of cases go unnoticed, which may be attributed to treatment by local quacks or witch doctors or may be bites by non-poisonous snakes requiring no treatment. The present study has shown interesting statistical facts which can be discussed under the following headings:

Age groups

Majority of the victims were in the age group of 15-45 years (60%) which is comparable to studies done by other authors.^{5,7,9,11,12,14}

Occupation

In consistency with similar studies, the present study also shows that the incidence of snakebite poisoning is more in farmer (60% in present study) compared to other occupations, attributed to the risk of exposure of these people to the snakes during their activities.^{9,11-15}

Rural Inhabitants

Rural people formed the biggest group of the victims (92% cases), as the snakes are in abundance in rural areas and the people living there come across snakes in their life very often due to their living conditions, habits,

working and walking bare footed and their occupation(farming) and this collaborates with inference drawn from other studies.^{8,10,12,14}

Outdoor activity

The incidence ratio of bites occurring outdoor in open space and indoor space of human dwellings was 1.9:1 due to outdoor presence of snakes and their rare interference in day-to-day life of humans. A similar pattern was also observed in other studies.^{9,12,15}

Site of bite

Lower extremities were the most observed bitten part of body (86%) in the present study as observed by similar studies. This finding suggest that the site of snakebite is predominantly determined by accidental or inadvertent contact of the reptile during the activities.^{5,8,12,13}

Diurnal variation

Maximum incidence of snakebite occurred at night mostly because of poor visibility and accidental stepping on the snake. Similar conclusion has been reached in studies conducted earlier.^{7,12,14}

Duration of hospital stay

Mean duration of hospital staying in days for victims of snake bite was 4.5±2.1. Majority of cases (52.9%) among poisonous snake bite group needed prolonged hospital

staying (≥ 7 days). This is consistent with the findings reported by other authors.^{12,15}

Anti-snake venom and outcome

All the poisonous snake bite cases i.e. 68 (34%) got ASV out of which 24 (35.3%) expired. Respiratory muscle paralysis (66.7%), ptosis (66.7%), coagulopathy (60%), acute renal failure (55.6%), shock (55.6%) were the signs associated with poor prognosis in decreasing order. High mortality rate may be due to the delay in arriving at the hospital after the snakebite, since most patients came from distant rural areas lacking transport facilities, health centres incapable of providing first aid, unavailability of anti-snake venom (ASV) and perhaps due to lack of public awareness about the urgency of treatment & patients initially seeking treatment from traditional healers and local practitioners.

CONCLUSION

Snakebite, an important occupational hazard, though preventable in principle remains to be one of the common medical emergency. In the present study, the snakebite cases were more common in females, in age group of 15-45 years, and among people with rural background, employed in agricultural related activities. The most common site of bite was lower limb and the maximum cases were recorded at night.

To reduce the incidence of snakebite poisoning, the following remedial measures are suggested

- Wearing full length pants and shoes, while working in fields, especially in rainy season, people should be very cautious while working to avoid stepping on the snake.
- Get rid-off warm, cozy holes or gaps in the house to prevent nesting of the snake in indoor and to clear bushes surrounding the house.

Mortality due to snakebite poisoning can be reduced by taking certain steps

- Rush the patient to the nearest health care facility for prompt treatment. If possible identify the snake and report it without fail to the doctor to institute specific antivenom serum (ASV)
- Coagulation study should be done in all the cases if possible
- Institute anti-snake venom as soon as the patient is brought to the casualty with any sign and symptom of poisoning, and do not wait for any investigations or a detail history
- Primary prevention by imparting information regarding quick transport, correct first aid measures and training of primary level health workers can

drastically bring down the mortality of this neglected tropical disease.

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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