

## Original Research Article

# An outbreak of krait bite amongst people in the desert sands: the cryptic enemy within

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### ABSTRACT

**Background:** Snake bite has been associated with high morbidity and mortality. Personnel are at high risk of snake bite. This investigation was carried out amongst residents with the purpose of identifying the factors that led to the bites and recommending preventive measures.

**Methods:** Three cases bitten by a single snake were investigated retrospectively. Historical data was collected and area reconnaissance was done. The severity of envenomation was assessed using a graded scale. Local authorities were briefed on remedial measures to prevent snake bite cases in future.

**Results:** The three cases of snake bite were rushed to the Primary health centre for first aid. Local signs of envenomation were absent in all cases. Two cases died before reaching the hospital. The third case managed to reach the hospital and was administered anti snake venom and put on ventilatory support, following which he recovered. Absence of local signs, along with the neurotoxic features led to the conclusion that the bite was caused by a krait. Environmental survey revealed that the village was surrounded with thick vegetation, waste disposal was being done too close to the cookhouse and snake trenches were not dug up.

**Conclusions:** The key for preventing fatality in snake bite is the immediate transfer of the victim to the nearest hospital equipped with anti-snake venom and ventilatory support equipment.

**Keywords:** Anti-snake venom, Krait, Snake bite, Tents

### INTRODUCTION

Snake bite has been a recognised medical emergency since times immemorial; and is associated with significant morbidity and mortality. Of the 2000 species of snakes known worldwide, 216 have been identified in India, of which, 52 are known to be poisonous.<sup>1</sup> As per the World Health Organization, an estimated 2,50,000 poisonous snake bites occur yearly across the globe, of which about 1,25,000 end fatally; with India accounting for about 20,000 deaths. However, exact statistics on snake bite are elusive, as a sizeable number of victims report to traditional faith healers and quacks rather than medical care centres.<sup>2</sup>

Most snakes are usually nervous, shy and timid. They try to escape and hide if disturbed, and attack only in self

defence when escape is impossible, or if trodden upon unawares. The villagers constitute a high risk group for snake bite; due to presence of greener pastures in the surroundings. The risk is further compounded in field conditions; wherein villagers have to work in snake infested areas.

Serious cases of snake bite occurred in villagers carrying out in a field work in the desert region located in the western part of the country were investigated with the purpose of characterising the bites with reference to time, place and person besides identifying the probable reasons that led to the bites and recommending measures for future prevention.

A total of 312 people including administrative support staff were taking part in the field activities. Three out of

six persons serving as catering staff in the cookhouse of the village were bitten by a single snake while sleeping in their hut which was located just adjacent to the cookhouse in the night. They were rushed to the Primary health centre given first aid by the Medical Officer. One person died during treatment at the primary health centre, following which the other two were evacuated to the nearest distt hospital in a light ambulance. The second person died enroute while the third was able to reach the hospital. He was managed with anti snake venom (ASV) and ventilatory support and was discharged after complete recovery.

**METHODS**

A retrospective study was undertaken among the three persons who were bitten by the snake on the fateful night. The seriousness of the cases and the logistic bottlenecks precluded interviewing the first two victims. The third case was interviewed when he was taken off ventilatory support. In addition, the other occupants of the hut where

the snake bite cases occurred were interviewed along with the Administrative Officer and the Medical Officer of the primary health centre. Area familiarisation and reconnaissance was carried out in detail.

The strength of the villagers residing in huts at the field activity location was taken into account for defining the population at risk. Line listing of the cases was done. Historical data pertaining to the bites was collected using an epidemiological case sheet containing items for personal information, time and place of bite, site of bite, presenting symptoms, time of onset of symptoms following the bite, medical care provided including time interval between the bite and initiation of treatment, and time between onset of symptoms and the outcome in terms of death or recovery.

Case fatality rate was calculated. The severity of envenomation was assessed using a suitably modified graded scale; taking into account the clinical presentation and laboratory parameters (Table 1).<sup>3</sup>

**Table 1: Graded scale for assessing the severity of krait bite envenomation.**

Distinct		Grade			
Minimal local symptoms	Zero	I (Mild, transient and spontaneously resolving symptoms or signs)	II (Moderate, pronounced or prolonged symptoms or signs)	III (Severe or life threatening symptoms or signs)	IV (Extremely severe envenomation leading to mortality)
	Colic	No symptoms or signs	Miniscule fang marks	Sluggish optical response	Hypotension
Ptosis				Unconscious state	
Diplopia				Coma	
Hypokalemia	Difficulty in swallowing After 5-12 hrs	Hypokalemia	Glossopharyaryngeal dysfunction	Respiratory arrest	
			Arrythmia	Sudden cardiac arrest	
			Glossopharyngeal Palsy		
			Colic		

The scale ranged from zero to IV; Grade zero implying no envenomation with successively increasing grades till Grade IV; which implied life threatening symptoms and signs followed by death.

An epidemio - clinical case for the current snake bite outbreak was defined as any person from the village sleeping on the floor in the hut/ tent adjacent to the cookhouse in the night, who were bitten by the snake and presented with fang marks or abrasion at the site of bite followed by development of one or more symptoms and signs of neurotoxic envenomation including pre-paralytic symptoms such as vomiting, drowsiness, burning sensation around the peri-oral region, increased salivation and neuroparalytic symptoms and signs such as ptosis, diplopia, dilated pupils, dysphagia, severe epigastric pain, severe respiratory distress, convulsions, arrhythmia and death.

An environmental survey was undertaken to scrutinise the location of huts/tents, food preparation areas and garbage disposal. With specific reference to the current cases, the Administrative officer and Medical Officer were briefed on remedial measures to be implemented on a war footing to prevent similar occurrences in future.

**RESULTS**

Six villagers were sleeping on the floor in a tent in the field activity location in the night. The villagers were in deep sleep. It was only after the third person had been bitten and raised an alarm that the other tent mates woke up to realise that two more persons had also been bitten. The third person was able to see the snake slither away and disappear in the dark after biting him. Frantic efforts were to locate the snake inside the tent, but to no avail.

Table 2: Clinical presentation of the three cases of krait bite.

Clinical Presentation		Paralytic										Time						
Pre-Paralytic																		
S.No of case	Age	Site of bite	Fang marks	Pain at site of bite	Cellulitis	Vomiting	Drowsiness	Peri-oral burning sensation	Increased salivation	Abdominal Pain	Diplopia	Proptosis	Dilatation of Pupils	Dysphasia	Severe Respiratory depression	Convulsions	Final Outcome	Between bite and death
1	35	Big Toe	Yes	No	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Died	20 min
2	31	Index finger	No	No	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Died	40 min
3	41	Dorsum of Foot	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Survived	-

The three cases were rushed to the primary health centre in a light vehicle by their colleagues and the Medical Officer was in attendance within ten minutes of the bite.

The bite was on the left big toe in the first case, in the left index finger in the second case and in the dorsum of the right foot in the third case. Fang marks were observed at the site of bite in the first and third case as two well defined puncture marks about 1 cm apart; while the second cases presented only with an abrasion. The symptoms and signs experienced by the patients are as given in Table 2.

There were no local signs of envenomation such as cellulitis, necrosis or gangrene in any of the cases. First aid was given by the Medical Officer in the form of reassurance, application of crepe bandage and limb immobilisation using a splint. Tetanus toxoid was administered, intravenous line was initiated and oxygen was administered by face mask to all the cases. However, the first case developed severe breathlessness and collapsed within ten minutes of reporting to the primary health centre, following which the Medical Officer made his best efforts to revive the patient using cardiopulmonary resuscitation (CPR), but the patient could not be revived and was declared dead by the Medical Officer. After initial first aid, the Medical Officer moved along with the remaining two patients by road in a light ambulance to the nearest distt hospital located about 60 kms from the primary health centre. The second case died enroute in the ambulance after about 20 minutes of the first case due to respiratory failure. The Medical Officer reached the hospital with the only alive case after about two hours. The case was managed aggressively. He was investigated with complete blood count, bleeding and clotting time, 20 minute whole blood clotting time, renal function test, chest X-ray and ECG. The patient had developed respiratory paralysis and was put on ventilator and administered 23 vials (230 ml) of anti-snake venom. The patient recovered and was weaned off the ventilator after 48 hours and was discharged after 06 days.

Multiple bites by a single snake in the night, the presence of fang marks, absence of local signs, presence of severe abdominal pain and death of two cases due to respiratory failure coupled with the circumstantial evidence in the form of sighting of a slender snake by one of the cases led to the conclusion that the bite was by the deadly krait (*Bungarus caeruleus*). With two out of three cases succumbing to the bites, the case fatality rate was 66.67%.

An environmental survey of the area where the cases occurred was undertaken. It was observed that the village was surrounded with thick vegetation. Garbage and waste food generated during food processing activities was being disposed off about ten meters away from the village, in a large makeshift uncovered pit. The tents were

poorly illuminated and snake trenches were not dug up around the tents.

## DISCUSSION

Kraits belong to the family Elapidae. They are exclusively nocturnal by habit and have been known to be shy creatures, which bite only in self defence.<sup>4</sup> They are likely to approach residential areas at night in search of prey, such as mice, frogs and lizards. Kraits may bite persons sleeping on the floor, who move accidentally in sleep.<sup>5</sup> Hence majority of the cases of krait bite occur while sleeping, as in the present situation. Kraits are known to inflict multiple successive bites, either on the same person or on different persons.<sup>6</sup> Krait bite cases are observed in the monsoon months from July to September.<sup>7</sup> Snakes are woken up from aestivation when, following the seasonal rains, their burrows get flooded with water; following which they are forced to seek The cases were bitten in the month of August. Most snake alternate sources of shelter near human dwellings, thereby increasing the chances of man - snake contact.

The snake bite cases came to notice only when the third and final case was bitten. Kraits are known to cause the least painful bites.<sup>8</sup> The local pain may be masked due to the dampening of reflexes during sleep. Cases have been on record where the patients were bitten by kraits during sleep and were unaware that they had been bitten. They were brought to the hospital by relatives only when signs of envenomation had set in resulting in two of the cases not feeling the pain resulting from the bite.<sup>9,10</sup> Fang marks were noticed in two of the cases. At times, fang marks may be too small to be visualised. Poisoning may occur even when fang marks are not present, as was seen in the third case. Inversely, presence of fang marks does not confirm that envenomation has taken place for sure.<sup>11</sup> There were no local signs of envenomation. Krait bites cause no or minimal signs of local tissue destruction and necrosis.<sup>12</sup>

Two of the three cases died within 40 minutes of the bite, both due to respiratory failure. The third cases also developed severe breathlessness. Envenoming caused by krait bite is neurotoxic in nature.<sup>13</sup> The symptoms are caused by selective neuromuscular blockade and progressive descending paralysis caused mainly by beta - bungarotoxins present in krait venom.<sup>6</sup> Death due respiratory paralysis is common in krait bite and results due to paralysis of the diaphragm and the intercostal muscles of the victim. Hence, mechanical ventilation is indispensable to prevent death due to respiratory paralysis. CFR in krait bite cases has been reported to as high as 77% to 100%.<sup>14</sup> Two cases had the typical presentation of preparalytic symptoms including vomiting, drowsiness and burning sensation in peri-oral region and increased salivation. Ptosis in both the eyelids was observed in two of the three cases. The same was due to paralysis of extraocular muscles; which is an early sign of neuromuscular blockade.<sup>15</sup> Diplopia was observed in

two cases while dilatation of pupils was noticed in all three cases. Dysphagia was observed in two of the three cases due to paralysis of muscles of deglutition caused by glossopharyngeal nerve palsy. Violent convulsions were observed only in one case. The third case survived on reaching the hospital after being put up on ventilator support and ASV. The cornerstone of treating snake bites is lyophilised polyvalent ASV which is effective against kraits, cobras, Russel's vipers and saw-scaled vipers.<sup>16</sup> Polyvalent ASV comes in handy where snake identification is not possible due to escape of snake after biting or lack of expert identifying staff even when the snake has been caught alive or killed. As two deaths occurred enroute, the importance of timely transfer of the patient to an intensive care setting equipped with ventilator support cannot be over emphasised. Villagers often sleep on the floor in tents when in field working conditions. The same is a grave risk and should be strictly avoided as snakes make holes in the ground and may bite villagers when searching for food; either when the victim moves accidentally in sleep or mistaking the human body parts to be a prey in the dark.

Even in field working conditions, maintenance of hygiene and sanitation is vital. The area should be cleared off the thick vegetation; and subsequently, regular pruning of the area should be undertaken. Snake trenches about 60 cm wide and 60 cm deep with absolutely vertical edges should be dug around the huts/tents as a deterrent measure. A wider trench should be dug around the perimeter of the camp. In known snake infested areas the trenches should be sprayed with kerosene oil mixed with a little engine oil and 0.5 percent carbolic acid.

As kitchen waste and garbage attracts the potential prey for snakes, it should be disposed off at least 100 metres away from the cookhouse and the pit should be kept covered at all times. If a cover is not available, the pit may be covered with dug up earth. Medical officers and auxiliary health workers should be given refresher courses for first aid and management of snake bite.

The importance of keeping the bitten limb of the victim at a level lower than the heart, avoiding unnecessary movement of the victim, crepe bandage and splint application and avoiding adventurous unscientific and harmful excursions such as incision of the site of bite or local application of ice should be emphasised to the paramedical workers.

Villagers should be encouraged to wear boots and anklets while working. Shoes should be inverted and shaken thoroughly before wearing. Villagers should check their beds for hidden snakes before retiring at night. Use of torch light and carrying of stick while walking outside the huts/tents or visiting the toilets at night should be emphasised.

All snake bite cases should be labelled as medico-legal cases, and the records should be maintained.<sup>17</sup>

## CONCLUSION

Snake bite is an occupational hazard for villagers. It may become life threatening if adequate treatment measures are not undertaken; time being the most vital element. The key for preventing fatality in bites by kraits and other venomous snakes in remote areas lies in immediate transfer of the victim to the nearest hospital equipped with lyophilised polyvalent ASV and ventilatory support equipment. In villages and semi-urban settings, there is an unflinching faith in getting persons bitten by snakes treated through traditional faith healers and alternative systems of medicine including Chinese and herbal remedies; with disastrous consequences. Hence, repeated education of villagers regarding reporting to the authorised and scientific treating channels should be undertaken.

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