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AN OUTBREAK OF KRAIT BITE AMONGST TROOPS TRAINING IN THE DESERT SANDS : THE CRYPTIC ENEMY WITHIN

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ABSTRACT

Background: Armed Forces personnel are at high risk of snake bite. This investigation was carried out amongst troops participating in a field exercise in order to identify the factors leading to the bites and recommend preventive measures.

Methods: Three cases bitten by a single snake were investigated retrospectively. Historical data was collected and area reconnaissance was done. Unit authorities were briefed on remedial measures to prevent snake bite cases in future.

Results: The three cases of snake bite were rushed to the facility for first aid. Local signs of envenomation were absent in all cases. Only one case survived before reaching the hospital. He was administered anti snake venom following which he recovered. Environmental survey revealed that the camp was surrounded with thick vegetation; and waste disposal was being done too close to the cookhouse.

Conclusion: Personal protective measures and health education of troops regarding prevention of snake bite with regular refresher cadres need to be put in place.

KEYWORDS : Snake bite, krait, anti-snake venom, tents

Introduction

Snake bite has been a recognised medical emergency since times immemorial; and is associated with significant morbidity & mortality. Of the 2000 species of snakes known worldwide, 216 have been identified in India, of which, 52 are known to be poisonous.[1] 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.[2] 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 Armed Forces constitute a high risk group for snake bite; due to presence of greener pastures in the Cantonments vis-à-vis the civil areas. The risk is further compounded in field conditions; wherein troops have to dig up makeshift tents for shelter while being deployed for training activities and operations in snake infested areas.

Serious cases of snake bite occurring in a mechanised infantry unit carrying out joint exercise in a field firing zone in the desert region located in the western part of the country were investigated with the purpose of identifying the factors that led to the bites and recommending suitable preventive measures.

A total of 312 people including administrative support staff were taking part in the field firing. The troops were located in tents. Three persons serving as catering staff in the cookhouse of the unit were bitten by a single snake while sleeping in their tent which was located just adjacent to the cookhouse. They were given first aid by the unit Regimental Medical Officer (RMO). One person died during treatment at the MI Room, following which the other two were evacuated to the nearest service hospital. 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.

Material and 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 tent where the snake bite cases occurred were interviewed alongwith the Commanding Officer (CO) and the RMO of the unit. Area familiarisation and reconnaissance was carried out in detail.

The strength of the unit personnel residing in tents at the field firing 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.

An epidemio - clinical case for the current snake bite outbreak was defined as any person from the mechanised infantry unit sleeping on the floor in the tent adjacent to the cookhouse on that night who was 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.

An environmental survey was undertaken to scrutinise the location of tentage, food preparation areas and garbage disposal. With specific reference to the current cases, the CO and RMO were briefed on remedial measures to be implemented on a war footing to prevent similar occurrences in future.

Results

Six mess staff were sleeping on the floor in a tent in the field firing location in the night after serving dinner to troops. 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. The three cases were rushed to the MI Room.

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 - 1. There were no local signs of envenomation such as cellulitis, necrosis or gangrene in any of the cases.

Immediate first aid was given by the RMO to the three cases. However, the first case developed severe breathlessness and collapsed within ten minutes of reporting to the MI Room and was declared dead by the RMO. The RMO moved along with the remaining two cases in a light ambulance to the nearest service hospital located about 60 kms from the unit. The second case died enroute after about 20 minutes of the first case. The RMO reached the hospital with the only alive case after about two hours. The patient had developed respiratory paralysis and was put on ventilator and administered anti-snake venom, following which he recovered fully and was discharged.

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 camp was surrounded with thick vegetation. Garbage and waste food generated during food processing activities was being disposed off about ten meters away from the cook house, in a large makeshift uncovered pit. Though deep trench latrines (DTLs) had been constructed, unit personnel were not utilising the same and were resorting to open air defecation en masse. Boots and anklets were not being worn by personnel while working in the camp. Personnel were sleeping on ground and mosquito nets were not being used. 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 to be shy creatures, which bite only in self defence.[3] 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.[4] 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.[5]

The cases were bitten in the month of August. Most snake bite cases are observed in the monsoon months from July to September.[6] Snakes are woken up from aestivation when, following the seasonal rains, their burrows get flooded with water; following which they are forced to seek 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.[7] 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.[8]

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.[9] There were no local signs of envenomation. Krait bites cause no or minimal signs of local tissue destruction and necrosis.[10] Two of the three cases died due to respiratory failure. The third cases also developed severe breathlessness.

Envenomation caused by krait bite is neurotoxic in nature.[11] The symptoms are caused by selective neuromuscular blockade and progressive descending paralysis caused mainly by beta - bungarotoxins present in krait venom.[5] Death due respiratory paralysis is common in krait bite and results due to paralysis of the diaphragm and the intercostal muscles of the victim. CFR in krait bite cases has been reported to as high as 77% to 100%.[12] 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.[13] 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. 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.[14] 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.

Troops often sleep on the floor in tents when in field conditions. The same is a grave risk and should be strictly avoided;[15] as snakes make holes in the ground and may bite troops 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 conditions, maintenance of camp hygiene and sanitation is vital.

Before the camp is sited, the area should be cleared off the thick vegetation; and subsequently, regular pruning of the area should be undertaken till the camp is occupied. Snake trenches about 60 cm wide and 60 cm deep with absolutely vertical edges should be dug around the tents as a deterrent measure.16 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. Dry and fresh rations should be stored in rat-proof containers. Mosquito nets should be used by troops while sleeping; especially in camp sites.16 The same provides protection not only vector borne diseases but also against snakes, scorpions, rodents and diseases transmitted by droplet infection through the naso - oral route .

Troops should be encouraged to wear boots and anklets while working.16 Shoes should be inverted and shaken thoroughly before wearing.16 Personnel should check their beds and sleeping bags for hidden snakes before retiring at night.16 Use of torch light and carrying of stick while walking outside the tents or visiting the toilets at night should be emphasised.[15]

Regular training should be imparted to RMO's in quick respiratory assessment, endotracheal intubation and Ambu ventilation with hands-on experience, as the same may be of immense help in sustaining the victims in the periphery.[16] All snake bite cases should be labelled as as medico-legal cases, and the records should be maintained.

Conclusion

Snake bite is a preventable occupational hazard for troops both in peace and field conditions. Hence, health education of troops regarding prevention of snake bite16 with regular refresher cadres on adoption of personal protective measures needs to be put in place by the medical authorities with support from the administrative staff. Maintenance of proper camp hygiene and keeping the surroundings free of rubble and debris should also be inculcated amongst troops; as the same will prevent ingress of rodents which in turn serve as attractants for snakes.

Table 1 : Clinical presentation of the three cases of krait bite

S No.	Age (yrs)	Site of bite	Fang marks	Clinical presentation												Final outcome	Time between bite and death
				Pre-paralytic						Paralytic							
				Pain at site of bite	Cellulitis	Vomiting	Drowsiness	Peri oral burning sensation	Increased salivation	Abdominal pain	Diplopia	Ptosis	Dilatation of pupils	Severe respiratory depressi so	Convulsions		
Case 1	35	Big toe (Lt)	No	No	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Died	20 minutes
Case 2	31	Index Finger (Lt)	No	No	No	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	Died	40 minutes
Case 3	41	Dorsum of foot (Rt)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Survived	NA

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