

## CASE REPORT

# FATAL NEUROTOXIC ENVENOMATION FROM THE BITE OF A LESSER BLACK KRAIT (*BUNGARUS LIVIDUS*) IN NEPAL

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**Abstract.** The Lesser Black Krait (*Bungarus lividus*) is a small, secretive, nocturnal elapid snake inhabiting Nepal, Bangladesh and India. We report a case of *B. lividus* bite in Nepal resulting in burning sensation at the bite site and over the whole body, abdominal pain, vomiting, slurred speech, ptosis, and progressive generalized neuromuscular paralysis leading to respiratory distress and death. Only one other case of fatal envenomation by this species has been reported previously in India. This demonstrates that *B. lividus* contributes to snakebite mortality in South Asia. As few snakebite victims in this region kill and bring the snake and because the clinical syndromes appear similar, envenomation by *B. lividus* may be misdiagnosed as envenomation by Common Kraits (*Bungarus caeruleus*). External morphology characters that distinguish *B. lividus* from *B. caeruleus* and other krait species are illustrated.

**Key words:** *Bungarus lividus*, envenomation, snake, neurotoxic, antivenom, Nepal

### INTRODUCTION

The Lesser Black Krait (*Bungarus lividus*) is a small, secretive elapid snake that has been known to science since 1839. It inhabits eastern Nepal, northwestern Bangladesh and northeastern India (Shah and Tiwari, 2004). It differs from other kraits

by having normal-sized or only slightly enlarged body scales in the vertebral row (Fig 1). Only one case of envenomation by this species has been reported in India (Wall, 1910). Here, we describe a proven case of *B. lividus* envenomation documented within the context of epidemiological and clinical studies of snakebite envenomations in southeastern Nepal (Sharma *et al*, 2004; Chappuis *et al*, 2007).

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### CASE REPORT

After combing her hair and putting the comb under the pillow of her bed in a hut in the UNHCR Beldangi I Refugee Camp in southeastern Nepal at 8:20 PM, a

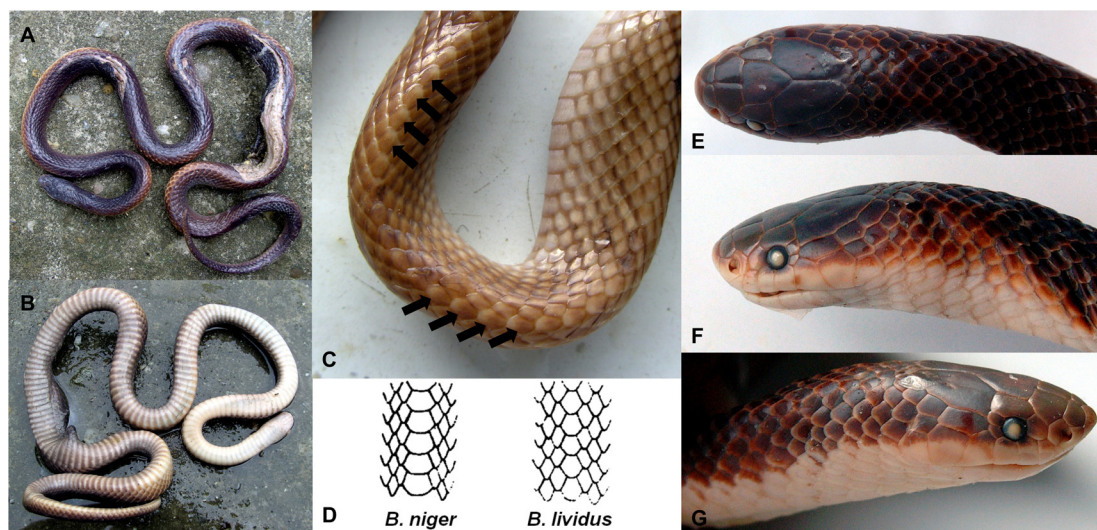


Fig 1—The Lesser Black Krait, *Bungarus lividus*. A, Dorsal and (B) ventral aspect of the adult male (82 cm total length) that caused the bite at Beldangi I Refugee Camp near Damak, Jhapa District, Nepal (26°42.861' N, 87°41.813' E; 159 m). C, Adult specimen from Nepal; dorsal view of posterior body. *Bungarus lividus* differs from all other kraits in having a normal-sized or only slightly enlarged mid-dorsal scales (arrows mark scales of the mid-dorsal row). This characteristic distinguishes *B. lividus* from the only other species of black krait in South Asia, *Bungarus niger*, and the Common Krait, *Bungarus caeruleus* (D, drawing from Wall, 1910). E, Adult *B. lividus* from near Dinajpur, northwestern Bangladesh; top of head, left (F) and right (G) sides of head.

22-year-old Bhutanese refugee was bitten on her index finger by a snake. The snake had been hiding under the pillow of a traditional, 60-65 cm high bamboo bed. She sucked the bitten finger, a tourniquet was immediately applied, and she presented to the primary healthcare center (PHC) of the camp. There, the patient complained of burning pain at the bite site and 5 minutes after reaching the PHC vomited once.

During the following 30 minutes, slurred speech developed while referral arrangements were made, and she complained about feeling hungry and thirsty. She repeatedly asked for water and the PHC staff noticed her tongue was swollen. She was referred to the Snake Bite Treatment Center of the Nepal Red Cross Society of Damak (Jhapa) by ambulance.

She started complaining about abdominal pain 30 minutes after leaving the camp and vomited twice during transport. Because of a local strike and technical problems, the ambulance was held up on the way to the clinic. In the meantime, her husband and a neighbor found the snake still under the pillow, hit it with a stick, and brought the snake to the Snake Bite Treatment Center.

The patient was admitted to the Snake Bite Treatment Center at 9:45 PM, 1 hour 25 minutes after the bite, with one tourniquet applied to her wrist and another one proximal to her elbow. The bitten index finger was slightly swollen. Upon arrival, the patient complained about a burning sensation all over her body; she was subfebrile. She had no signs of neurotoxicity and

was able to talk normally. About 2 hours after admission she vomited 4-5 times. Bilateral ptosis developed at 2:00 AM (5 hours 40 minutes post-bite) and slurred speech reappeared. Upon the appearance of ptosis, antivenom therapy was initiated following Nepal national guidelines. An initial dose of 20 ml of Indian polyvalent antivenom (Haffkine Bio-pharmaceutical Corporation, raised against the venoms of *Bungarus caeruleus*, *Naja naja*, *Daboia russelii* and *Echis carinatus*) was given by slow IV bolus followed by the infusion of an additional 40 ml of antivenom over a 6 hour period. Five doses of neostigmine (0.5 mg IM) and atropine (0.6 mg IV) were given at half-hour intervals. Signs of paralysis progressed and additional bolus injections of antivenom were given at two-hourly intervals. A total of 170 ml of antivenom was administered over an 8 hour period.

Despite this, the patient's condition deteriorated rapidly. She developed respiratory distress and was sent by ambulance to Koshi Zonal Hospital in Biratnagar, but died on the way. The snake that had bitten the patient was preserved in formalin and morphological examination revealed that it was an 82-cm-long adult male *B. lividus*.

## DISCUSSION

This is the first report of a bite by *B. lividus* in Nepal. Although physician-herpetologist Frank Wall suggested in 1928 that "snakes so common as the black kraits (*B. lividus* and *niger*) in Assam ... should furnish many records," (Wall, 1928) up to now, only one series of *B. niger* bites (Faiz *et al*, 2010) and a single *B. lividus* bite have been reported. In this previous report, a *B. lividus* specimen 96.5 cm long had bitten the ankle of a woman sitting on the veranda of her hut in Upper Assam

around 10 PM, causing death within 24 hours (Wall, 1910).

We suspect that envenomation by *B. lividus* has so far been mistaken for Common Krait (*B. caeruleus*) envenomation because most clinical cases of snakebite with neurotoxicity in this region of South Asia are diagnosed as "krait", "cobra" or "Russell's Viper" envenomation based on clinical syndromes alone (Warrell, 2010 a, b) – if any diagnosis beyond "snakebite" is attempted. Lack of awareness of the species diversity of venomous snakes, and the rarity with which snake specimens are permanently preserved for taxonomic identification, have contributed to the popular but erroneous belief that only the four species included in the production of Indian polyvalent antivenoms (*B. caeruleus*, *N. naja*, *D. russelii* and *E. carinatus*) are medically important in Asia (Alirol *et al*, 2010). *Bungarus lividus* and *B. caeruleus* are both nocturnal, and superficially have a similar morphology; their geographic distributions also overlap (Wall, 1928). Confusion with the Greater Black Krait (*B. niger*) is possible, although envenomation by the latter is likely often ascribed to *B. caeruleus*. If the snake is brought to the clinic, distinguishing *B. lividus* from other species of krait is possible on the basis of external morphology characteristics (Fig 1).

The patient did not respond to Indian polyvalent antivenom administered at the low initial dose regimen recommended by Nepal national guidelines. Currently available antivenoms in South Asia do not target *B. lividus* toxins (Alirol *et al*, 2010). It would be useful to collect this species and analyze its venom to determine whether existing antivenoms are inefficient, or if only much earlier and larger initial doses are needed for protective neutralization.

The early and correct identification

of this species in clinical situations could help physicians make informed treatment decisions and focus on other life-supporting interventions, such as assisted ventilation (Warrell, 2010 a,b) especially if available antivenoms prove to be ineffective. More detailed clinical assessment of *B. lividus* envenomation may reveal characteristic clinico-epidemiological features. However, the symptoms of this patient did not appear to differ significantly from the syndrome of *B. caeruleus* envenomation (Ariaratnam *et al*, 2010). The development of intense local pain at the bite site is uncommon in krait envenomation (Alirol *et al*, 2010; Warrell, 2010b). The swelling of the bitten finger may have been caused or exacerbated by the application of tourniquets by the patient. The patient's swollen tongue, also an unusual finding, may reflect an early reaction to the venom which she had tried to suck from the bite site.

The present case underscores the need for improving the emergency capacity for assisted ventilation and related life-saving measures at all levels of the health system in South and Southeast Asia (*eg*, Warrell, 2010a,b; Islam *et al*, 2011). As a consequence of the death of this patient, the training of community health assistants in intubation, manual ventilation and airway management in this resource-poor rural setting and during distance referral was strengthened, and a high (100 ml) initial dose of polyvalent antivenom for all cases of neurotoxic envenoming was implemented at this center in agreement with WHO SEARO guidelines (Warrell, 2010a).

This case adds to recent publications highlighting the underestimated diversity of snake species involved in envenomation in South Asia (Alirol *et al*, 2010; Faiz *et al*, 2010) and the value of permanently

preserving snakes brought by bite victims for subsequent study and species identification (Viravan *et al*, 1992). Given the rarity with which snakes are brought to the clinic in Nepal and Bangladesh (Alirol *et al*, 2010; Harris *et al*, 2010), the development of point-of-care immunological or molecular diagnostic methods that can accurately determine the biting species, including *B. lividus*, is needed to quantify their relative contribution to the regional burden of snake bite morbidity and mortality, and to further improve treatment.

#### ACKNOWLEDGEMENTS

We thank the Health Assistants of the Nepal Red Cross Society Sub-Chapter Damak-Jhapa, and the patient's family for sharing the circumstantial details of this case of envenomation and consenting to its publication. This case was previously presented at the Global Issues in Clinical Toxicology 2008 Conference in Melbourne, Australia. Research was financially supported by Vereinigung der Freunde und Förderer der Johann Wolfgang Goethe-Universität Frankfurt am Main and the research funding program "LOEWE – Landes-Offensive zur Entwicklung Wissenschaftlich-ökonomischer Exzellenz" of the Ministry of Higher Education, Research and the Arts of the State of Hessen, Germany.

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