

Case Report

First Report of Deadly Bites by Caspian Cobra (*Naja oxiana*) From India, Snakebite Envenoming at 1,757 Meters Above Sea-Level

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A B S T R A C T

Snakebite envenoming (SBE) remains a major cause of preventable mortality in rural India. The Big Four species, namely the spectacled cobra (*Naja naja*), Russell's viper (*Daboia russelii*), common krait (*Bungarus caeruleus*), and saw-scaled viper (*Echis carinatus*), are responsible for the majority of SBE and deaths in the country. The commercially available anti-snake venom (ASV) correspondingly covers these species only. Envenomation and subsequent deaths from the Caspian Cobra (*Naja oxiana*) have never previously been reported from India. While collecting data for the Indian Council of Medical Research (ICMR) project on snakebites, we came across two deaths due to the bite of *N. oxiana*. One patient died within half an hour of the bite and the other within 72 hrs. Potent cardiotoxicity may be an important factor in the high mortality. We also report on the use of herbal remedies that used in the cases in the case of two survivors of *N. oxiana* bites. Educating Local communities about the danger of daytime bites from this species (*N. oxiana*) and how to avoid envenomation is essential. Wasting time by seeking treatment from local faith healers may prove fatal.

Keywords: Snakebite, Mortality, Antivenom, Herbal Remedies

Introduction

Snakebite envenoming is a neglected tropical disease (NTD) that is responsible for enormous suffering, disability, and premature death, especially in impoverished populations. It is estimated that over 5.8 billion people are at risk of snake-human conflict globally, resulting in 7400 bites daily.¹ India accounts for nearly half of global snakepathy deaths, with rural and agrarian populations being most vulnerable.² Although the Indian anti-snake venom (ASV) is available within public health facilities, it targets the venom of only the Big Four species, and more than 20 other medically important species found in India are not covered.³ Envenomation and subsequent deaths from the Caspian Cobra (Figure 1), also known as the Central Asian Cobra (*Naja oxiana*), have never previously been reported from India. However, recent sightings and genetic confirmation of this species in Chamba district of Himachal Pradesh⁴ have generated renewed interest in its habitat, venom, and envenomation.

Methods

In 2025, the Indian Council of Medical Research (ICMR) sanctioned a research project entitled “Data-driven approaches to snakebite: Epidemiology, Reporting, Phenotypes, Environmental factors, Inequalities, and Treatment duration (D-SERPENT)”. The objective of the project was to enumerate envenomation by medically significant snake species and document them to generate evidence for their inclusion in the International Classification of Diseases (ICD) 11th Revision, as many Indian snakes are currently not included in the ICD-10th revision. While collecting data on snakebite patients from different hospitals, project assistants came across deaths due to *N.oxiana*. Both bites that resulted in death occurred during the day and as a result of accidental encounters; otherwise, bites appear to be rare.

Habitat and Feeding Habits of *Naja oxiana*

In order to understand the circumstances and risk factors associated with envenomation by this species, it is instructive to review its distribution and habitat. *Naja oxiana* inhabits mountain ranges in Chamba district, in Himachal Pradesh's Pir Panjal range at elevations of around 2000 m ASL (c. 6,560 feet) and above. The Caspian cobra feeds largely on small mammals that are abundant in its habitat; however, it is likely that the Himalayan trinket snake *Elaphe hodgsoni*, whose range overlaps with that of *N. oxiana* in India, forms part of its diet. It has also been observed by herpetologists as well as locals, that no other cobra species is seen in the high elevational range of *N.oxiana*. The only other cobra species present in the region (the spectacled cobra *Naja naja*) can be found in agricultural fields around villages at lower elevations (<900 m), and up

into dense pine forests. In contrast, *N. oxiana* appears to frequent higher elevations and more open, rocky habitats, where the vegetation largely consists of hemp (*Cannabis sativa*) along with some less dense pine/tree cover. *Naja oxiana* has also been observed basking in the open in the early morning by local herpetologists. In Chamba district, where the bites that we report on have occurred, most of the snakebites are caused by other venomous species in areas at lower elevations, whereas the higher elevation areas are relatively free of snake bites.⁵

Results

The details of two deaths and two survivals of patients with herbal plant extracts bitten by *N.oxiana* (locally known as *Khadpa*) are described below:

Case Report-1

Village Ullansa (population 1136 in the 2011 census) is located at an elevation of c. 1700 m (5,577 feet) ASL in Tehsil Holi, Bharmour block, Chamba District, Himachal Pradesh, in an area occupied by the tribal Gaddi community. On July 6, 2020 a 40-year-old man went to spray a nearby apple garden at 09:30 and accidentally stepped on a *N. Oxiana* and was bitten on the leg twice. He was wearing open footwear. The father of the deceased, a retired para-military serviceman, narrated the incident, describing how his son cried out as soon as he was bitten. After a few hours had passed, he started feeling unable to breathe and was taken to a nearby faith healer. However, his condition continued to worsen and his skin acquired a bluish tinge. At 04:00 on the third day after the bite (i.e, on July 8, 2020), he was taken to the Civil Hospital Bharmour, 10 km away from the village, where he was seen by the doctor and was found to lack a detectable pulse. Cardio-Pulmonary Resuscitation (CPR) was attempted but was unsuccessful, and as his pupils were dilated and unreactive to light, the doctor issued the “Medical Certificate” mentioning the cause of death as snakebite. NO autopsy was done as cause of death was clearly neuropathic snakebite. The family subsequently received a compensation of INR 4,00,000 (c. USD 4216) from the district administration.

Case Report-2

Bhanjraru village, located at an elevation of 1,757 m (5,764 feet) in the Churah valley, Tissa Block of Chamba District has a population of about 200 inhabitants (2011 census). On July 7, 2021, a 62-year-old male from this village accidentally stepped on *N.oxiana* while on his way to work at 09:00 and was bitten on the left leg. He collapsed within half an hour while on his way to the nearest health facility. He was taken to the Civil Hospital Tissa, where he was declared dead by the doctor. The post-mortem report noted the presence of two symmetrical puncture wounds 2.5 cm above the left heel near the medial malleolus, placed 0.5 cm apart, each

surrounded by a bluish halo measuring 1.5 cm diameter. Larynx, trachea, lungs, pleurae, heart and pericardium were found to be congested. In the physician's opinion, the patient had died due to the neurotoxic effects of the venom. The family was given a compensation of INR 400,000 (c. USD 4216) by the Sub-divisional Office, Bhanjraru, for death due to snakebite.

Discussion

Deaths due to *N. oxiana* have never been previously reported from India. *Naja oxiana* is primarily found in central Asia, with high human mortality resulting from envenoming.⁷ This species has been reported from Pakistan and Kashmir and was recorded in 2019 from Tissa block of Chamba district, Himachal Pradesh. *Naja oxiana* has been shown to have rapidly expanded its range from Iran towards the northeast,⁸ and it has been observed to be slowly expanding its range in Chamba towards lower elevations as reported by local rescuers. *Naja oxiana* tends to avoid humans as much as it can,⁹ but can become fiercely defensive when threatened or cornered. In a recent study by Deka et al.¹⁰ it was found that the available ASV does not effectively neutralise the venom components of *N. oxiana*. Immunoprofiling by antivenomics revealed differential antigenicity and poor reactivity towards three-finger toxins and phospholipase A₂ (PLA₂) components of the venom. Based on experiments on rabbits, Angaji et al. concluded that the venom of Iranian *N. oxiana* had acute effects on cardiac tissue during the first few hours following snake bites.¹¹ and induced significant ionotropic changes following intravenous infusion (at 1500 µg/kg), with all animals died after eight minutes due to hypotension.

We also recorded two survivors of bites by this species, who claimed to have survived with the aid of local herbal treatment. These bites occurred on the hand during snake rescues in a 25-year-old male in 2001, who became unconscious within 15 minutes of the bite by a small individual (c. 30 cm, 1 foot) and was taken to the Civil Hospital, Tissa. Scar tissue was observed to be present in the skin between the index finger and thumb of his right hand. Another 45-year-old male, a traditional snakebite healer, was bitten on his right hand while carrying out a snake rescue in 2006. As ASV was not available in the local hospital (Tissa) at that time, they resorted to local application and oral use of a paste made from a local herb identified by them as *Mirchadi*.¹² The non-availability of ASV at local civil hospital Tissa was corroborated on a recent inspection on March 12, 2026. An internet search found *Mirchadi* to refer to the trellis-vine *Pergularia daemia*, and this identification was confirmed by one of the survivors on being shown an image of this species (Fig 2). Interestingly, compounds extracted from this species have been found to antagonize phospholipase A₂ (PLA₂) and L-amino acid

oxidase enzymes (LAAO),¹² and *P. daemia* extract was shown to inhibit the PLA₂-dependent haemolysis of *N. naja* venom in a dose dependent manner. *Mirchadi* is used in Ayurveda to enhance circulation and may be useful to counter the hypotensive effect of *N. oxiana* venom. The herb grows in the wild in the Tissa area and is available between April and November annually, and its use against snake venom requires further study and scientific evaluation.



Figure 1. Central Asian Cobra (*Naja oxiana*) from Tissa, Chamba district, Himachal Pradesh (Pic credit: Vishal Santra)

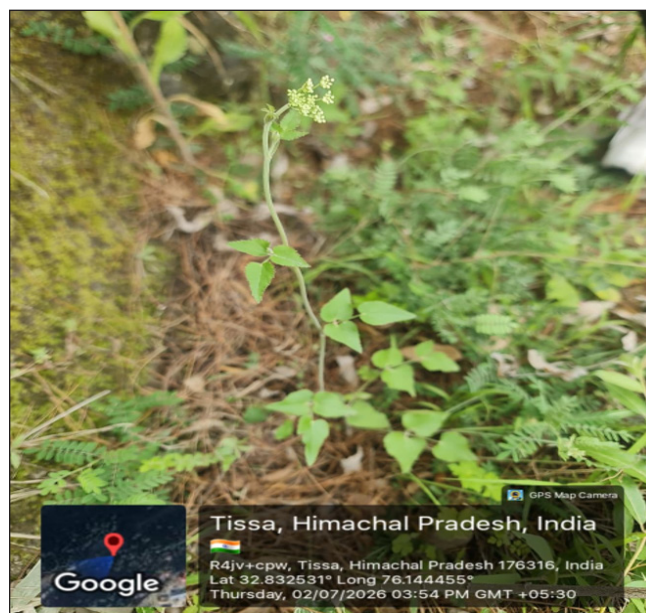


Figure 2. Plant of Mirchadi (*Pergularia daemia*) in Tissa, Chamba, Himachal Pradesh

Conclusions

Local communities need to be educated about the danger of this species (*N. oxiana*) and how to avoid envenomation. Wasting time by seeking treatment from local faith healers may prove fatal, as in one of the cases reported here, and victims should immediately seek treatment at the nearest

health facility in case of snakopathy. Herbal use to mitigate the effects of *N. Oxiana* venom needs further studies.

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Authors Contribution: OB, JM designed the outline for the manuscript, SJ and VS collected data and did field interviews, AP interviewed survivors and AM helped finalize the manuscript with her expert inputs.

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