ORIGINAL RESEARCH PAPER

Zoology

FATAL OUTCOME OF UNTREATED NECROTIZING SNAKEBITE ENVENOMATION: A CASE STUDY OF DELAYED PRESENTATION AND TRADITIONAL INTERVENTION

KEY WORDS: Snakebite Envenoming, Russell's Viper, Necrosis, Gangrene, Wound Myiasis, Tribal Health, Traditional Medicine, Septicaemia.

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ABSTRACT

Snakebite envenoming is a major public health challenge and a neglected tropical disease that disproportionately affects poor, rural farming communities. In tribal regions, a complex interplay of socio economic barriers and traditional beliefs often delays life saving medical intervention, creating a "therapeutic vacuum." This report examines the 47 day clinical progression of an untreated snakebite in a tribal male, highlighting the transition from localized cytotoxicity to fatal systemic sepsis.

INTRODUCTION

Among the "Big Four" medically important snakes of India, the Russell's viper (*Daboia russelii*) is responsible for a large proportion of severe and fatal envenomations in agricultural landscapes. The species is characterized by potent hemotoxic and cytotoxic venom components that induce coagulopathy, endothelial damage, extensive local tissue necrosis, and systemic complications. Snakebite envenoming (SBE) is a life threatening neglected tropical disease that disproportionately affects poor, rural, and tribal communities in tropical regions (WHO, 2019). Globally, an estimated 1.8 to 2.7 million people suffer from envenoming annually, leading to between 81,000 and 138,000 deaths (Gutiérrez et al., 2017; Afroz et al., 2024). India bears the highest global burden, with approximately 58,000 deaths occurring each year, predominantly among agricultural workers and tribal populations living in close proximity to snake habitats (Suraweera et al., 2020). Despite the availability of life saving antivenom, mortality and long term disability remain high due to a complex interplay of socio economic barriers, cultural beliefs, and delays in seeking formal medical care (Harrison et al., 2009). The pathophysiology of snake envenoming involves a cocktail of toxins, including phospholipases A2 and metalloproteinases, which induce severe local and systemic effects (Slagboom et al., 2017). In the case of Russell's viper envenomation, these metalloproteinases are strongly associated with vascular destruction, blistering, and progressive necrotic injury. Local cytotoxic effects often manifest as intense pain, oedema, and necrosis (tissue death) at the bite site (Gutiérrez et al., 2017). In untreated cases, this necrosis can progress to gangrene, a severe condition characterized by mass tissue decay due to ischemia or secondary bacterial infection (Warrell, 2010). Furthermore, neglected necrotic wounds in tropical environments are highly susceptible to wound myiasis, a secondary complication where flies lay eggs in decaying flesh, leading to maggot infestation (Ahmad et al., 2011).

A critical factor contributing to fatal outcomes in tribal regions is the reliance on traditional healing practices, such as the application of herbal poultices (Jadibooti Lepa) and the use of harmful first-aid measures like tourniquets (Chaaithanya et al., 2021). These methods often provide a false sense of security while allowing venom induced damage and infection to spread unchecked (Sharma et al., 2004). Additionally, social factors such as alcohol consumption may lead victims to underestimate the severity of the bite or use it as a maladaptive coping mechanism for pain, further delaying hospital presentation (Gajbhiye et al., 2019).

This case report documents the 47 day longitudinal observation of a tribal farmer who sustained a snake bite on the lateral dorsum of the left foot. Despite the repeated refusal of hospital based treatment, the clinical progression, severe local cytotoxicity, and epidemiological context strongly suggest envenomation by Russell's viper (*Daboia russelii*). This case highlights the catastrophic consequences of medical noncompliance and the 'therapeutic vacuum' created when traditional beliefs override urgent surgical and medical interventions.

MATERIALS AND METHODS

The documentation of this case followed the CARE guidelines to ensure systematic and transparent reporting (Gagnier et al., 2014). This study utilizes a single patient longitudinal observation to analyse the 'therapeutic vacuum' and sociological drivers of health seeking behaviour following medical treatment refusal. The author was alerted by the victim's relatives following a failed initial hospital intervention. Informed consent for documentation and periodic physical observation was obtained from both the victim and his family. Due to the patient's refusal to reenter formal medical facilities, all observations were conducted at the patient's residence under nonclinical conditions. Data were gathered through frequent site visits over a 47 day period. Primary data collection included physical examinations to monitor wound progression, specifically looking for hemorrhagic bullae, ascending oedema, and necrotizing fasciitis. Semi structured interviews were conducted with relatives to reconstruct the timeline of the initial bite, early herbal applications ('Jadibooti Lepa'), and the victim's use of alcohol as a maladaptive analgesic. Furthermore, expert consultations involved discussions with physicians and surgical experts regarding systemic clinical progression (septicaemia) and an evaluation of local tissue destruction to validate the medical necessity of the refused life saving amputation. Diagnosis was further established through epidemiological correlation, supporting the identification of Russell's Viper (*Daboia russelii*) envenomation by matching the clinical syndrome with regional species prevalence in the Goa region. This monitoring focused on the physiological impact of the 40-day period following hospital discharge against medical advice (DAMA), during which no formal medical interventions were administered

Case Presentation: A male tribal farmer sustained a venomous bite to the lateral dorsum of the left foot (Image 1, 2). Based on clinical presentation, the pattern of progressive cytotoxicity, extensive local tissue necrosis, ascending oedema, and epidemiological prevalence in the region of Goa, the envenomation was consistent with a bite from a Russell's Viper (*Daboia russelii*), a medically significant viperid species widely distributed across peninsular India. Due to a combination of poverty, cultural distrust, and the use of alcohol as a maladaptive coping mechanism, formal medical care was delayed for seven days, during which the patient applied a traditional herbal poultice (Jadibooti Lepa). Upon clinical examination on Day 7, the patient presented with severe necrosis of the fourth and fifth phalanges, cyanosis, and wound myiasis (maggot infestation). Imaging confirmed advanced gangrene and necrotizing fasciitis. Despite recommendations for life saving amputation, the patient refused surgery and left the hospital to continue

traditional treatment at home.

Table 1: Chronological Timeline of Clinical Progression, Patient Decisions, and Outcomes Following Untreated Snake Envenomation

Timeline (Day)	Phase	Clinical Observations & Patient Actions
Day 1	Initial Bite	The patient ignored a bite on the side of his foot, choosing to simply wipe away the blood and wrap it
Day 2–3	Maladaptive Coping	Experienced intense localized pain and progressive swelling, refused to inform family, resorted to heavy alcohol consumption to mask pain while continuing manual labour
Day 4–6	Early Necrosis	Large blood blisters formed as swelling spread up his leg, eventually making him unable to walk
Day 7	Clinical Presentation	Severe oedema, cyanosis of the 4th and 5th phalanges, and maggot infestation, imaging confirmed necrotizing fasciitis and advanced gangrene, Admission to Hospital
Day 8	Hospital Abscondment	Patient refused life saving amputation due to cultural distrust, left hospital against medical advice to pursue traditional "Jadibooti Lepa" (herbal) treatment at home
Day 9–40	Therapeutic Vacuum	Author's period of observation, follow up visits revealed progressive tissue decay, necrosis extended to the mid foot, persistent foul smelling discharge and signs of secondary bacterial infection
Day 41–46	Systemic Decline	Patient exhibited systemic signs of septicaemia, fever, tachycardia, altered mental state, and reduced oral intake, progressive muscle wasting and pallor noted
Day 47	Final Outcome	Patient succumbed to multi organ failure at his residence, death was not officially recorded in the government snakebite surveillance system

RESULTS

The patient survived for 47 days postenvenomation without receiving Anti Snake Venom (Table.1). This indicates that while the systemic toxicity did not cause immediate death, the "therapeutic vacuum" allowed for escalating local tissue destruction and secondary bacterial infections. The patient eventually succumbed to septicaemia and multiorgan failure at his residence.

Case Study: Fatal Outcome of Untreated Envenomation.

The patient, a male from a low income tribal farming background with a history of daily local alcohol consumption, sustained a snakebite to the lateral dorsum of the left foot, specifically posterior to the fourth digit, while walking barefoot in a field at dusk a high risk scenario commonly associated with encounters with Russell's viper, which frequently inhabits agricultural and peri rural landscapes.

Initially, the victim ignored the injury, simply wiping away the blood and applying a standard cloth wrap. Despite progressive oedema and an increasing inability to bear weight, he continued physical labour and returned with severe oedema accompanied by the formation of hemorrhagic bullae. For the next 48 hours, he remained in significant pain without informing his family members. To cope with the escalating discomfort and maintain his ability to perform physical labour, he resorted to heavy alcohol consumption as a maladaptive analgesic. By the seventh day post envenomation, clinical examination revealed severe necrosis of the fourth and fifth phalanges, with the foot appearing dark and cyanotic accompanied by extensive, foulsmelling purulent discharge. Such progressive local cytotoxic destruction is consistent with viperid envenomation, particularly Russell's viper bites known for aggressive soft tissue involvement.

Secondary complications were evident, including wound myiasis (maggot infestation) within the second and third digits, crus, and the ankle region. Swelling had ascended to the entire left pelvic limb, with significant inflammation reaching the tibia and fibula regions; the patient also reported referred pain at the coxofemoral joint. At this stage, the limb was covered in a traditional herbal poultice (Jadibooti Lepa), which obscured the wound and likely created a moist environment conducive to bacterial proliferation.

Upon forced admission to a government hospital on Day 7, X ray imaging and clinical assessment confirmed a diagnosis of advanced gangrene and necrotizing fasciitis, resulting in the total destruction of the phalangeal bones. Although the surgical team recommended immediate life saving amputation and aggressive antibiotic therapy, the patient likely influenced by alcohol withdrawal or deep seated cultural distrust absconded from the facility, leaving against medical advice to resume traditional treatment.

This case presents a clinical paradox, as the patient survived 47 days without Anti Snake Venom (ASV), suggesting that while his systemic immune response may have initially managed the hemotoxins and procoagulant systemic effects typically associated with Russell's viper, it could not overcome the localized cytotoxicity and subsequent septicaemia. The presence of maggots and the use of the Lepa indicate a total breakdown of wound hygiene, while sterile larvae are used in controlled debridement, this "wild" infestation signalled advanced tissue decay. Ultimately, the victim's death on Day 47 resulting from chronic renal failure and secondary septicemia highlights how socioeconomic factors, poverty, and a 'therapeutic vacuum' exacerbated by low health literacy, a reliance on harmful home remedies, and a general lack of awareness can lead to fatal outcomes even when the initial envenomation is not immediately lethal

Image 1. Clinical Examination of the Victim at his Residence During Follow-up Observation.

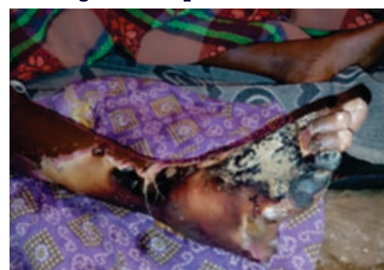

Image 2. Severe Oedema with Cyanosis of the Fourth and Fifth Phalanges and Wound Myiasis, Clinical Assessment Indicated Necrotizing Fasciitis and Advanced Gangrene.

CONCLUSION

The ultimate death of the patient in this case study of confirmed envenomation by the Russell's viper (*Daboia russelii*) serves as a poignant illustration of the "therapeutic vacuum" that exists in rural and tribal regions. While snakebite envenoming is a biological emergency, this case demonstrates that its outcome is frequently dictated by a complex interplay of socioeconomic barriers, cultural perceptions, and systemic healthcare failures (Harrison et al., 2009). The most critical lesson identified is the catastrophic impact of time. The victim's initial survival for 47 days without Anti Snake Venom (ASV) suggests that the systemic dose of Russell's viper venom might not have been immediately lethal. However, the delay in seeking medical care allowed the localized cytotoxic and hemotoxins effects characteristic of *Daboia russelii* envenomation including progressive necrosis and gangrene to become irreversible (Gutiérrez et al., 2017). In such cases, death is often not caused directly by the venom, but by secondary septicaemia and multi-organ failure resulting from untreated decaying tissue (Warrell, 2010).

Reliance on traditional practices, such as the application of herbal poultices (Jadibooti Lepa), remains a primary hurdle. As seen in this confirmed Russell's viper envenomation case, these treatments often provide a false sense of security, delaying hospital arrival during the "golden hours" when treatment is most effective (Chaaithanya et al., 2021). Furthermore, the use of harmful first aid measures like tourniquets or incisions can actually accelerate tissue necrosis and increase the risk of infection (Sharma et al., 2004).

The patient's background of poverty, reliance on subsistence farming, and chronic alcohol consumption directly influenced his health-seeking behaviour, often serving as a barrier to timely clinical intervention (Gajbhiye et al., 2019; Munshi et al., 2024). The use of local alcohol as a maladaptive coping mechanism to mask pain likely led to an underestimation of the injury's severity and contributed to his noncompliance with medical advice (National Institutes of Health, 2023). This is compounded by economic vulnerability; for many tribal families, the high cost of hospital treatment and the loss of daily wages are significant deterrents, leading them to prefer the immediate, lower cost access of local healers (Harrison et al., 2009).

To prevent similar tragedies, a multisectoral approach is required. Targeted awareness programs must be conducted in local languages to provide accurate information on local venomous snake species and proper first-aid such as immobilisation and rapid transport while debunking myths that traditional 'vaccines' or herbs can neutralize venom (WHO, 2019). Importantly, this victim's death was neither reported in government surveillance data nor recorded as snakebite related fatality, highlighting a significant gap in national snakebite reporting systems. Furthermore, rather than alienating traditional healers, they should be trained as first responders to identify danger signs and refer patients immediately to formal facilities (National Institutes of Health, 2022). Strengthening healthcare delivery by ensuring that Primary Health Centers (PHCs) are consistently stocked with ASV and that medical officers are trained to manage both the envenoming and the psychological trauma of the bite particularly in regions where Russell's viper bites are prevalent is essential. Ultimately, this case underscores that a snake bite is more than a medical condition, it is a social disease. Reducing mortality in tribal areas requires a healthcare system that is not only medically equipped but also culturally sensitive and geographically accessible to those most at risk.

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