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The Venomous High: A Systematic Review of Published Cases on Deliberate Snake Envenomation for Recreational Purposes

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Main Points

- Though rare compared to typical recreational drugs, snake venom use is a concerning phenomenon.
- The systematic review identified 10 articles describing 14 exclusive case reports of individuals using snake venom for recreational use.
- All cases were adult males from India, belonging to different socioeconomic strata and educational backgrounds.
- The phenomenon might be underreported since this practice was facilitated by social and commercial networks. Also, almost all the cases were discovered accidentally by the treating team while being treated for something else.

Abstract

This study investigates the phenomenon of deliberate snake envenomation for recreational purposes, a practice that appears to be an underreported and potentially growing issue. We conducted a systematic review of the literature, including original papers, case reports, case series, and letters to the editor on PubMed and Scopus databases using the search terms (((Addiction) OR (Recreational Use)) OR (Deliberate Envenomation)) AND (Snake)). Investigators systematically evaluated all cases, and information was extracted using a structured proforma. A total of 14 reports from 10 articles were reviewed. All patients were adult males (age = 29.5 ± 10.13 years) from India, with the majority having a history of substance use disorder. Envenomation was typically sought for psychoactive effects, including stress relief, inducing euphoria, and enhanced sleep. Patients claimed to use cobras and rat snakes, though species were usually uncertain. Premorbid personality traits such as disinhibition, high impulsivity, and sensation-seeking were common among the patients. The practice was prevalent across different socioeconomic strata, facilitated by commercial sources and social networks. Less is known about the actual prevalence, yet results establish recreational snake envenomation as a covert social health issue. Future focused research is needed to establish epidemiology, and consequently the prevention and management of the practice.

Keywords: Illicit Drugs, psychedelic, snake bite envenomation, illicit substance use, substance use disorder, Human-Wildlife Conflict

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Introduction

India accounts for almost half of the total number of annual snakebite deaths globally. Estimates suggest an average of 58,000 such deaths per year over the last two decades in the country (Suraweera et al., 2020) as compared to the estimated 80,000 to 138,000 global deaths (World Health Organization, 2021). Notwithstanding this staggering mortality rate, along with an even higher incidence of

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amputations and permanent disabilities among the survivors (Suraweera et al., 2020; World Health Organization, 2021), many individuals ironically indulge in deliberate snake envenomation for recreational purposes in various forms (Das et al., 2017).

Yet, in this context, snakes present an even more compelling subject of study. First, their potential lethality and status as one of the most fear-inducing animals underscore their significance. Second, snakes, in general, serve as potent stimuli eliciting both fear and disgust in most individuals. While it is only in recent years that the psychoactive use of animals has caught the interest of researchers and media, the use of naturally occurring substances—present in plants and/or animals—is not at all a novel phenomenon. Humans have been engaging in exploiting, cultivating, and modifying such mind-altering substances for millennia, be it for recreational, religious, or psychedelic purposes (Orsolini et al., 2018). Such animals, which can potentially alter an individual's consciousness, are called psychoactive fauna and individuals who deliberately engage in this behavior are called psychonauts (Blom, 2010). There exist various such faunae, including certain types of fish, toads, lizards, Red Harvester ants, Sonoran Desert toads, etc. (Godara et al., 2022; Orsolini et al., 2018; Stringham et al., 2023). This fear and disgust are suggested to have deep biological predispositions (Rádlová et al., 2020). In the Indian context, the use is particularly interesting, given the religious reverence of snakes in many cultures, including the Hindu culture (Allocco, 2013; Jadav et al., 2022; Kakunje et al., 2019; Stanley, 2008).

A simple Google search of "snake bites addiction" or "snake addiction" yields enough news reports indicating that snake venom use is not entirely uncommon (Kanwar, 2018; Mitra, 2024; Sharma, 2017; "Teenager Addicted to Snake Venom Arrested in Kerala," 2014), even if the incidence might be on the fringes compared to conventional psychoactive substances. Moreover, though it is a considerably novel phenomenon, "snake bites" are not the only method, and using snakes to alter consciousness is not altogether new. For instance, the use and production of snake wine is quite common in many parts of the world. In fact, snake wine is legally available in many Southeast Asian countries such as Vietnam (Somaweera & Somaweera, 2010). Moreover, while not for recreational purposes, snakes have been used for medicinal purposes as per Ayurveda, as well as in South America (Jadav et al., 2022).

Compared to the fairly substantial amount of anecdotal evidence, there are just a handful of scientific reports of deliberate snake envenomation, and the topic has precluded large-scale cross-sectional or cohort studies. Hence, to understand the current evidence, we aimed to identify, synthesize, and critically review all the published scientific literature in the area.

Material and Methods

We carried out a systematic review to identify the empirical literature and explore the characteristics of snake envenomation or snake use for recreational purposes.

Search Strategy

The systematic literature review approach was used to identify and select the published reports on the topic. The preliminary search was conducted using the electronic databases PubMed and Scopus for case reports of deliberate snake envenomation. We employed the terms (((Addiction) OR (Recreational Use)) OR (Deliberate Envenomation)) AND (Snake)). The search was supplemented by manually checking sources from the bibliographies of published reports. The final search was performed in May 2024.

Data Abstraction

We obtained full texts of the identified literature. The studies were included if (i) they reported primary data, (ii) were published as case series, case reports, journal articles, and letters to editors, (iii) were published in a peer-reviewed academic journal, (iv) their full text was available, and (iv) were in the English language. No limitations were placed on the year of publication. We excluded the studies (i) which did not report on original cases, (ii) reported on findings of accidental snake envenomation, and (iii) were published as non-scientific literature such as newspaper articles or blog posts. Both authors (KG and AJR) used a priori criteria to independently screen and review each report. Disagreements were resolved by consensus between all authors. The relevant data was entered into an Excel spreadsheet.

Statistical Analysis

The data were analyzed qualitatively and quantitatively using descriptive statistics as applicable, using IBM SPSS version 23 (IBM SPSS Corp.; Armonk, NY, USA).

Results

Included Studies

As depicted in Figure 1, the initial search identified 256 studies from both databases, with three reports added through cross-referencing and snowballing. After removing the duplicates (n = 36), title screening was administered for 223 articles. Gradually, 14 articles were thoroughly read, and four articles were excluded since they did not have primary data or focused on non-deliberate snake envenomation. One article focused on the deliberate envenomation of the black widow (spider). We excluded a Korean report on coagulopathy post-consuming snake wine. The alcohol content is quite high in snake wines, which is expected to denature the proteins in snake venom, and subsequently, this denaturation destroys the biological activity of these proteins. This one case is quite rare and most importantly it pertains to accidental envenomation. Therefore, consuming snake wine is different from "snake bites" or deliberate snake envenomation. Finally, ten articles describing 14 exclusive reports were utilized for the qualitative synthesis. Though we did not aim to set any time limit, all reports were from and/or after 2013, except one which is from 1990.

Sociodemographic Details

All patients were adult males (n = 14, age = 29.5, SD = 10.13), hailing from India (Table 1). Deliberate snake envenomation was almost exclusively found accidentally, except in two reports (Ram, 2022; Talwar et al., 2021). Most of the patients had been admitted seeking treatment for substance use disorder (Katshu et al., 2011; Krishnamurthy & Braganza, 2013; Mehra et al., 2018;

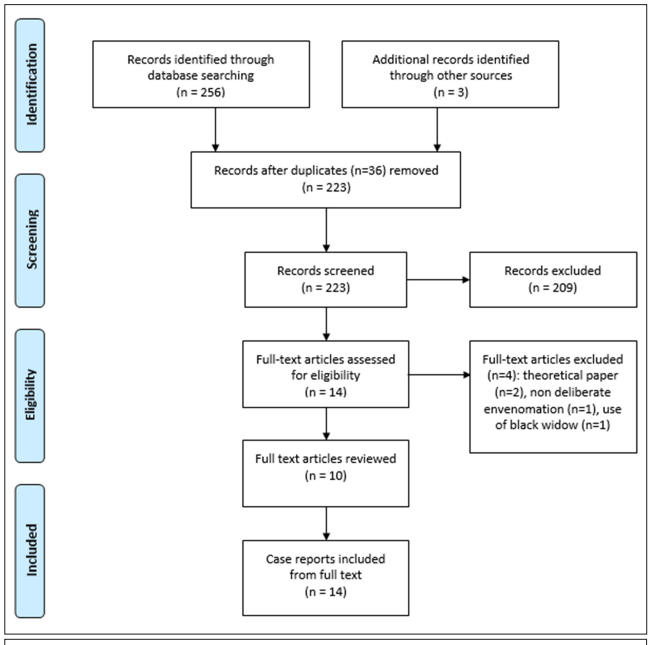

Figure 1. PRISMA flow diagram displaying the selection of articles.

Nath & Patra, 2018; Pradhan, 1990; Shukla et al., 2017; Umate et al., 2015), one case had been brought to seek treatment for using snake bites (Ram, 2022), while one had been brought to the emergency department due to ingestion of snake venom and alcohol (Talwar et al., 2021).

Details of the Snake Used: Type and Access

As seen in Table 1, the type of snake/s had been identified in only five of the reports, namely krait, cobra, rat snake *(Jerothana* or *pothu*, and small Indian cobra *(Naja Naja)* (Katshu et al., 2011; Pradhan, 1990; Senthilkumaran et al., 2013; Shukla et al., 2017). Otherwise, the descriptions provided are vague, such as "baby snakes" or "green snakes that live in trees" (Krishnamurthy & Braganza, 2013; Pradhan, 1990). Besides, only in the case reported by Shukla et al. (2017) is the snake's species ascertained by an expert, i.e., a forest ranger. Interestingly, in this report, the patient stated to have been indulging in cobra bites, whereas the species of the snake turned out to be a rat snake (Shukla et al., 2017).

Barring one case in which the patient was himself a snake charmer and had complete access to the snakes (Talwar et al., 2021), all patients had obtained snakes from commercial sources including "snake dens" (Katshu et al., 2011; Pradhan, 1990; Senthilkumaran et al., 2013) and rave parties (Umate et al., 2015). In one case, the patient was taken to a hotel room for a snake bite (Krishnamurthy & Braganza, 2013). Only a few reports mentioned the cost of snake bites: while the case published in the early '90s reported the price incurred to be INR 50/ bite[1] (Pradhan, 1990), the more recent reports vary from each other extensively: Rs. 250[2] to Rs. 2500/snake bite (Nath & Patra, 2018; Umate et al., 2015).

1 0.60 USD as per conversion in August 2024

2 2.98 USD as per conversion in August 2024

Snake Envenomation: Effects and Reasons for Preference

Table 2 presents the clinical features of all cases. Most patients reported that snake envenomation led to good sleep (Krishnamurthy & Braganza, 2013; Mehra et al., 2018; Pradhan, 1990; Ram, 2022; Senthilkumaran et al., 2013; Shukla et al., 2017; Umate et al., 2015), blurred vision (Katshu et al., 2011; Krishnamurthy & Braganza, 2013), stress relief (Senthilkumaran et al., 2013), the experience of "high," euphoria, happiness, and well-being (Katshu et al., 2011; Mehra et al., 2018; Nath & Patra, 2018; Senthilkumaran et al., 2013; Shukla et al., 2017; Umate et al., 2015); and lethargy (Katshu et al., 2011; Krishnamurthy & Braganza, 2013). Only one patient presented with withdrawal symptoms during admission (Pradhan, 1990). Two patients reported an increased sexual drive and heightened arousal post-envenomation (Senthilkumaran et al., 2013; Umate et al., 2015).

The reasons for preference were the sensation of high for a longer duration ranging from 2 – 3 days to 3 – 4 weeks (Mehra et al., 2018; Shukla et al., 2017; Talwar et al., 2021), reduction in consumption of alcohol and other substances (Talwar et al., 2021), reduced desire to use other substances (Ram, 2022), and no local tissue injury, muscle paresis, diplopia, or gangrene at the bite site (Katshu et al., 2011; Ram, 2022). They also reported a lack of hangover, headaches, tremors (Katshu et al., 2011; Senthilkumaran et al., 2013), craving (Krishnamurthy & Braganza, 2013), and withdrawal symptoms (Pradhan, 1990; Senthilkumaran et al., 2013; Umate et al., 2015). In one case, the patient reported reduced cravings for other substances which diminished 3 – 4 weeks after the snake bite, which led to subsequent bites (Mehra et al., 2018).

Premorbid Personality

Observations about pre-morbid personality were made in four case studies.

Disinhibition

Disinhibition was a common trait found among individuals who engaged in snake envenomation, wherein one patient was found to engage in socially disapproved activities (Katshu et al., 2011) and was even undergoing criminal investigation for robbery (Katshu et al., 2011). Other disinhibition tendencies were reflected, such as use of multiple substances, frequent lying, stealing, abusive and assaultive behavior, and suspicious dealings involving money and drugs (Krishnamurthy & Braganza, 2013). In another case, a history of physical assault, bullying, expulsion from school, and manipulative tendencies was reported. Herein, the patient was engaged in organizing rave parties as well (Ram, 2022). In the case report by Nath & Patra (2018), the primary reason for the admission of the patient was abusive behavior in the orthopedic ward, where he was admitted due to sustaining an injury when he jumped from a rooftop. Additionally, history taken from family members suggests truancy during school, stealing money from home, and "engaging in gang activities" (Nath & Patra, 2018).

High Impulsivity and Sensation Seeking

Shukla (2017) reported that the patient had high impulsive and sensation-seeking tendencies (Shukla et al., 2017). Nath and Patra (2018) conducted psychometric tests wherein the individual had high impulsivity and sensation-seeking scores on impulsive

Table 1.
Sociodemographic and Snakes' Specific Details

Author (Year)	Case Number	Sociodemographic Details	Snake Specification and Acquisition Process
Pradhan (1990) Case I	1	35-year-old, male, married, Lower SES, works in a gambling den	**Type of snake:** Cobra/green-colored snake found in trees **Source:** (an unmentioned) ethnic group in the Southern part of Mumbai (Maharashtra) that only deals with individuals known to them; INR 50/bite
Pradhan (1990) Case II	2	33-year-old, male, married	**Type of snake:** Not given; various types of snakes were available, they were categorized by potential intoxication level: mild, moderate, and severe. **Source:** Snake dens situated in South Mumbai, Kolkata and Goa
Katshu et al. (2011) Case I	3	52-year-old, male, married	**Type of snake:** Not known **Source:** Nomadic snake charmers, suggested by friends
Katshu et al. (2011) Case II	4	44-year-old, male, married	**Type of snake:** Small Indian Cobra (Naja Naja) **Source:** Some sort of snake den where the patient had slept overnight in an urban slum area
Krishnamurthy and Braganza (2013)	5	18-year-old, male	**Type of snake:** Not known (according to the patient, the snakes used were newborn and very small). **Source:** Professional network in this business (as the suppliers used to take him to a hotel room)
Senthilkumaran et al. (2013) Case I	6	25-year-old, male, software engineer	**Type of snake:** Not specified **Source:** Snake dens
Senthilkumaran et al. (2013) Case II	7	23-year-old, male, software engineer	**Type of snake:** Not specified **Source:** Snake dens
Umate et al. (2015) Case I	8	22-year-old, male, educated up to 8th grade, ward boy at a private hospital	**Type of snake:** Not known (green colored) **Source:** INR 2500 /bite
Umate et al. (2015) Case II	9	22-year-old male, educated up to 10th grade	**Type of snake:** Not known **Source:** Rave parties
Shukla et al. (2017)	10	21-year-old, male	**Type of snake:** Rat Snake, also known as *Jerothana* or *Pothu* (according to the patient it was a Cobra) **Source:** Snake charmer
Nath and Patra (2018)	11	38-year-old, male	**Type of snake:** Not known **Source:** Snake charmer Rs 250/bite
Mehra, Basu, and Grover (2018)	12	33-year-old, male	**Type of snake:** Cobra (the patient was not sure) **Source:** Snake charmer, introduced by friends
Talwar et al. (2021)	13	28-year-old male, snake charmer	**Type of snake:** Not known **Source:** The patient was himself a snake charmer, hence the occupational accessibility
Ram (2022)	14	19-year-old, educated up to 10th grade, upper SES	**Type of snake:** Not known **Source:** Through friends/peer

Note: SES, socioeconomic status.

and sensation seeking (Nath & Patra, 2018). Similarly, another participant "constantly desired to remain high and experiment with various local drugs" (Ram, 2022).

Antisocial Personality Traits

These were reflected by making sexual advances toward his sister-in-law, stealing money, and showing a lack of guilt or remorse for the same (Nath & Patra, 2018).

Comorbid Substance Use

All patients had a history of substance use, with a majority presenting with polysubstance use (Katshu et al., 2011; Krishnamurthy & Braganza, 2013; Mehra et al., 2018; Nath & Patra, 2018; Pradhan, 1990; Ram, 2022; Shukla et al., 2017; Umate et al., 2015).

Six cases have been mentioned specifically abusing different substances in a dependent pattern (Katshu et al., 2011;

Table 2.
Describing Clinical and Presentation Variables

Author (Year)	Clinical History	History of Initiation	Snake Envenomation History	Reported Effects and Symptomology
Pradhan (1990) Case I	**Reason for admission:** Heroin withdrawal **Comorbid substance:** Charas, heroin, mandrax	**Reason for initiation:** Was indulging in other substances when he tried snake bites out of curiosity.	**Duration:** 14 years (approximately) **Frequency:** Two or three times/week **Procedure:** Not specified **Site of bite:** Great toe, tongue	Sleep of about 18 – 20 hours (which gradually decreased). Presented withdrawal symptoms during his admission.
Pradhan (1990) Case II	**Reason for admission:** Detoxification for charas and heroin addiction **Comorbid Substance:** Charas, ganja, alcohol	**Reason for initiation:** To get an "extra kick."	**Duration:**15 years (approximately), discontinued at some point. **Frequency:** Not specified **Procedure:** The snake's head was tapped with a blunt object. On tapping, the snake used to bite. **Site of bite:** Not specified	Grandiosity, well-being and happiness post each bite. Mixed symptoms such as either lying down for hours or, on certain occasions, kept "moving in the room." Did not report any hallucinations or withdrawal symptoms.
Katshu et al. (2011) Case I	**Reason for admission:** Not specified. **Comorbid substance:** H/O polysubstance (alcohol, cannabis, benzodiazepines, and opioids) in dependence pattern over the course of 34 years	**Reason of initiation:** "To experience the kick the other substances now lacked."	**Duration:** 2 months **Frequency:** Twice in 15 days **Procedure:** Not specified **Site of bite:** Left forearm.	Dizziness, blurred vision followed by heightened arousal, sense of well-being for a few hours; a more intense state of arousal than pentazocine injections.
Katshu et al. (2011) Case II	**Reason of admission:** Not specified **Comorbid substance:** H/O polysubstance (alcohol, benzodiazepines, opioids, and nicotine) in dependence pattern over the course of 29 years. Opioid was the predominant substance of choice.	**Reason of initiation:** Found out about snake bites as a means of getting high.	**Duration:** 1 month **Frequency:** Once so far **Procedure:** Not specified **Site of Bite:** Foot	Blackout associated with a sense of well-being, lethargy, and sleepiness. Slept overnight at the same place and awoke the next morning without any residual effect.
Krishnamurthy and Braganza (2013)	**Reason of admission:** H/O polysubstance use along with chief complaints of "stealing, assaultive behavior, suspicious behavior regarding drugs, etc" **Comorbid substance:** Alcohol, tobacco, opioid, benzodiazepine, and stimulants **Diagnosis:** Alcohol, tobacco, opioid, and benzodiazepine dependence	**Reason of initiation:** Not specified	**Duration:** Not specified **Frequency:** Thrice so far **Procedure:** A newborn snake (which was fed white powder) was given to the patient in a small box. The patient would sit upright, protruding his tongue, and another person would hold and incite the snake to bite by tapping it on the head. **Site of bite:** Tongue	Increased well-being, lethargy, occasional blurred vision, restlessness, followed by deep sleep of 30 – 36 hours later. Felt weakness the next day back home. No local inflammation or pain was felt subsequently at the puncture site. The patient did not report any craving for the snake bite.

(*Continued*)

Krishnamurthy & Braganza, 2013; Mehra et al., 2018; Nath & Patra, 2018; Umate et al., 2015) and two patients were diagnosed with polysubstance abuse (Nath & Patra, 2018; Shukla et al., 2017). The most commonly reported substance is alcohol. Figure 2 is a word cloud that diagrammatically represents the different substances and their frequency of use; larger text size indicates a higher frequency of use among patients who indulge in deliberate snake envenomation.

Assessment and Management

Pathophysiological assessments including hematological, biochemical (Ram, 2022; Senthilkumaran et al., 2013; Talwar et al., 2021), and urine (Ram, 2022) tests were conducted. Shukla (2017)

Table 2.
Describing Clinical and Presentation Variables (Continued)

Author (Year)	Clinical History	History of Initiation	Snake Envenomation History	Reported Effects and Symptomology
Senthilkumaran et al. (2013) Case I	**Reason for admission:** To get tested for HIV infection **Comorbid substance:** Not specified	**Reason for initiation:** Due to stress and insomnia, despite apparent optimal knowledge of toxic effects	**Duration:** 6 months **Frequency:** once every 30 – 45 days **Procedure:** The handler holds the snake near the head and makes the snake inject a minimal bite on the little toe or index finger, followed by a bite on the tongue or lip, if desired **Site of bite:** Little toe, index finger, lip, tongue	Stress relief, experienced euphoria, and reported good sleep. No withdrawal symptoms.
Senthilkumaran et al. (2013) Case II	**Reason for admission:** To get tested for HIV infection (suggested by a friend, the primary case). **Comorbid substance:** Not specified	**Reason for initiation:** Not specified	**Duration:** Not specified **Frequency:** Not specified **Procedure:** Same as above **Site of bite:** Same as above	Sleep for 20 – 24 hours with a relaxed mind without any hangover or headache, tremor, or sense of crawling. Increased sexual desire. No withdrawal symptoms
Umate et al. (2015) Case I	**Reason for admission:** Use of heroin - "brown sugar consumption" **Comorbid substance:** heroin, codeine	**Reason of initiation:** Engaged in snake bites after chasing brown sugar "to get high."	**Duration:** 1 year **Frequency:** Initially once every 2 months, since the last 4 months, 2 times/ week **Procedure:** A sharp tap with a blunt instrument was given on snakehead, on tapping snake used to bite. **Site of bite:** Tongue or toes	Sleep for 18 – 20 hours (which gradually declined). Dizziness, blurred vision, heightened arousal, and a sense of well-being. No withdrawal symptoms.
Umate et al. (2015) Case II	**Reason for admission:** Use of heroin - "brown sugar consumption" **Comorbid substance:** heroin	**Reason of initiation:** Introduced while attending a rave party in Mumbai suburbs.	**Duration:** Not specified **Frequency:** Not known, (more than once) **Procedure:** A snake was kept in a box which has a hole, where the person had to place his/her tongue. **Site of bite:** tongue	Drowsiness and would sleep for 12-14 hours. Did not report any withdrawal symptoms.
Shukla et al. (2017)	**Reason for admission:** Facial paresis and dimness of vision h/o Multiple substance use for 5 years; **Comorbid substance use includes** intravenous heroin, marijuana, and nicotine. Use of cocaine, "magic mushrooms" "acid blots" and alcohol present (h/o suggestive of dependence). **Diagnosis:** Poly-substance abuse and ADHD, Bells palsy.	**Reason of initiation:** "For a better high."	**Duration:** Not specified **Frequency:** Not specified **Procedure:** Not specified **Site of bite:** Lips and tongue	Drowsiness, euphoria, and feeling of warmth followed by a deep sleep after the bite, which lasted for 2 – 3 days.

(*Continued*)

Table 2.
Describing Clinical and Presentation Variables (Continued)

Author (Year)	Clinical History	History of Initiation	Snake Envenomation History	Reported Effects and Symptomology
Nath and Patra (2018)	**Reason for admission:** Referred by the orthopedics department for exhibiting abusive behavior towards ward staff. Consequently, he was in orthopedics department due to an injury sustained from jumping from the rooftop of his house. **Comorbid substance:** History of multiple substance use (alcohol, cannabis, nicotine, opioid, morphine, promethazine, suggestive of dependence pattern), brown sugar. **Diagnosis:** polysubstance abuse (in dependence) and ADHD with dissocial personality disorder	**Reason of initiation:** Managing cravings for opioids, caused by the unavailability of brown sugar during the 1999 cyclone.	**Duration:** 17 years (approximately), **Frequency:** Not specified **Procedure:** the charmer administered an unidentified liquid onto the patient's tongue to assess venom tolerance. The patient protruded his tongue while the charmer conducted rituals. The snake swiftly bit the tip of the tongue before retreating. **Site of bite:** Tongue	"Tranquility that would cause numbing of senses" which was different from that of opioids.
Mehra, Basu, and Grover (2018)	**Reason for admission:** h/o poly substance use for the past 15 years. **Comorbid substance:** tobacco (dependent pattern), alcohol (dependent pattern), opioid (dependent pattern)	**Reason of initiation:** curiosity and as a cheaper substitute for opioid and alcohol.	**Duration:** Not known **Frequency:** Every 3 to 4 weeks. **Procedure:** Not specified **Site of bite:** Tongue	Jerky movements, blurred vision, and unresponsiveness. ("blackout" for 1 hour). Heightened arousal and well-being more intense than alcohol or opioid, lasting for 3 – 4 weeks. No cravings for alcohol and opioids. After 3 – 4 weeks, well-being declined, and irritability, lethargy, and drug cravings increased, leading to another snake bite. This cycle repeated every 3 – 4 weeks. Over time, opioid and alcohol use decreased, mostly occurring 1 – 2 weeks after a snake bite.
Talwar et al. (2021)	**Reason for admission:** State of irritability after alcohol consumption with snake venom; h/o alcohol addiction for 15 years and repeated failed attempts to quit. **Comorbid Substance:** Alcohol	**Reason of initiation:** As an attempt to reduce alcohol intake **Precipitating factor:** Divorce with wife.	**Duration:** 4 months **Frequency:** Not specified **Procedure:** Not specified **Site of bite:** Not specified	Experienced a high for 6 – 7 days, resulting in reduced alcohol consumption. Eventually, started mixing his alcohol with the venom in order to increase the duration of the high effect.
Ram (2022)	**Reason for admission:** Treatment for deliberate snake envenomation; brought by parents. **Comorbid substance:** current use of tobacco (cigarettes) for 8 years, alcohol for 6 years; cannabis, opioids, cocaine, LSD, and magic mushrooms for 2 years. h/o migraine; facility history: nicotine dependence in grandfather.	**Reason of initiation:** Out of curiosity, considering snake venom as the "ultimate high-sustaining chemical for a more extended period."	**Duration:** 6 months **Frequency:** Several times since **Procedure:** Injected chemicals (provided by friends, content not known) into the snake. Got bitten after smoking cannabis. **Site of bite:** Tongue	Drowsy, feeling of happiness, joyous mood, reduced desire to sleep; did not feel indulging in any other substance use. There was no muscle paresis, diplopia, or gangrene at the bite site.

Note: ADHD, attention-deficit hyperactivity disorder; HIV, human immunodeficiency virus; h/o, history; LSD, lysergic acid diethylamide.

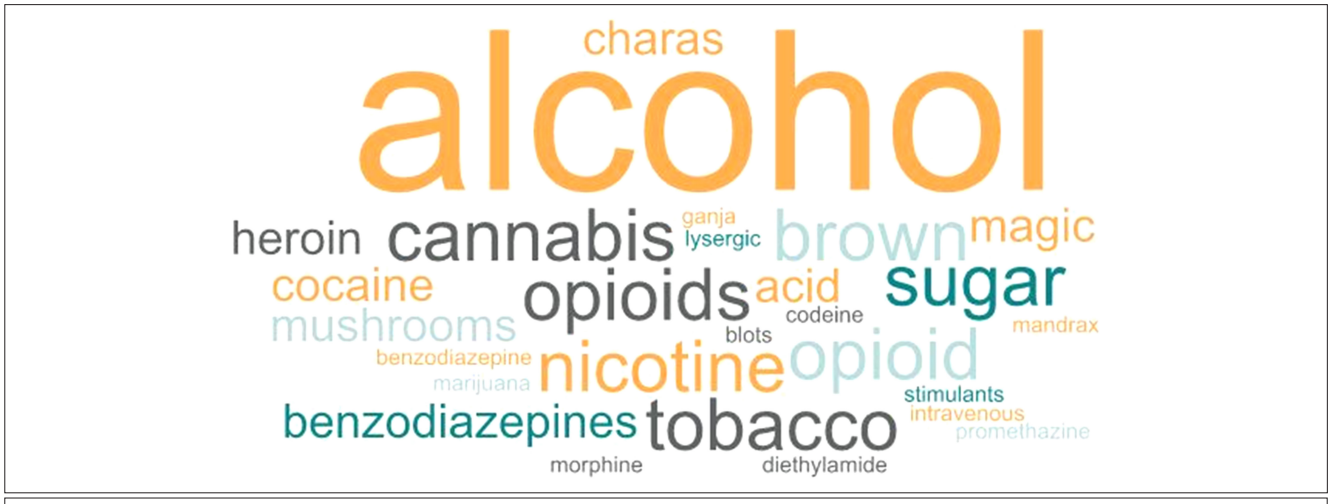

Figure 2. A word cloud diagrammatically representing the different substances and their frequency of use.

conducted serum electrolyte, renal, and liver function tests. It is pertinent to note that all the tests were within normal limits. In addition, neurological tests and magnetic resonance imaging (MRI) scans were also conducted (Shukla et al., 2017). The International Personality Disorder Examination (IPDE) was conducted to gauge personality in one case in which the patient displayed strong impulsive, histrionic, and antisocial tendencies (Ram, 2022). Addiction was assessed using the Clinical Institute Withdrawal Assessment of Alcohol Scale-Revised (Ram, 2022), CAGE, and Alcohol Use Disorder Identification Test (Talwar et al., 2021). Barratt Impulsiveness Scale (BIS) and Sensation Seeking Scale were also used to measure impulsivity and sensation seeking, respectively, and both showed high scores (Nath & Patra, 2018).

Most pharmacotherapy interventions were focused on symptom management, dealing with primary substance addiction, and treating comorbid psychiatric symptoms (Mehra et al., 2018; Nath & Patra, 2018; Ram, 2022; Talwar et al., 2021). Psychotherapeutic interventions included psychoeducation (Mehra et al., 2018; Senthilkumaran et al., 2013), addressing psychosocial factors and personality traits (Nath & Patra, 2018), implementing Motivational Enhancement Therapy (MET) (Mehra et al., 2018; Ram, 2022), Cognitive Behavioral Therapy (CBT) (Ram, 2022; Talwar et al., 2021), and relapse prevention (Mehra et al., 2018)

Discussion

The study collates published case reports and presents a synthesized picture of deliberate snake envenomation since the first paper was published three decades ago (Pradhan, 1990). Our findings suggest that, despite the lack of reporting, this phenomenon might have a higher prevalence. This is evidenced by various pathways through which it is obtained, such as being often introduced by peers or colleagues (Senthilkumaran et al., 2013) and having been sold through available commercial channels (Krishnamurthy & Braganza, 2013). The commercial sources seem to be organized and structured since reports suggest drug administration systems or routes in place, such as ingestion of a white powder (supposedly drugs), having different rituals (Nath & Patra, 2018), and even systems of arranging hotel rooms for clients to sleep post the snake bite (Krishnamurthy & Braganza, 2013).

Southern Asia reports a high fatality rate associated with cobra and krait bites. Despite that, most snake venom for recreational use was derived from potentially poisonous snakes. In most cases, the species of the snake was not known to the patients, while others reported that the snake was either a cobra or rat snake. This reflects an underlying need to seek novel, complex experiences, and a willingness to take physical and social risks for the sake of such experiences, or high sensation seeking and novelty seeking. Increased risk-taking and weak behavioral inhibition in the face of potentially aversive outcomes also point toward low harm avoidance. These findings have been further solidified by Nath and Patra (2018), who used psychometric tests such as Barratt's impulsivity scale and sensation-seeking Scale, discovering high levels of both domains in the case they reported (Nath & Patra, 2018). Furthermore, in four cases the researchers identified a common premorbid personality trait of disinhibition among individuals who engage in deliberate snake envenomation (Katshu et al., 2011; Krishnamurthy & Braganza, 2013; Nath & Patra, 2018; Ram, 2022). Behavioral disinhibition is characterized by a pattern of impulsive, antisocial behavior and is associated with an increased propensity to engage in norm violations, sensation-seeking behaviors, and a generalized vulnerability to externalizing tendencies and behaviors such as drug addiction (Iacono et al., 1999; Young et al., 2009). Volition is misdirected or impaired, and individuals may find it difficult to weigh potential consequences (Moeller et al., 2001). In addition to poor risk assessment, they may also prioritize immediate gratification in the form of "long-lasting highs."

The practice of deliberate snake envenomation as a drug was found to be prevalent across all socioeconomic strata, in rave parties, and in snake dens in villages. Though snake venom is a fringe substance compared to conventional psychoactive drugs, the real prevalence is assumed to be far beyond the reported cases. This assumption is based on the premise that in almost all the published cases, this was observed accidentally. Only in two cases were the patients were brought in for treatment for deliberate snake envenomation (Ram, 2022; Talwar et al., 2021). In the rest of the cases, the primary purposes for seeking help were

consumption or withdrawal related to other substances, detoxification, getting tested for HIV infection, etc.

The varied price per bite, ranging from Rs 50[3] to 2500[4] can be attributed to the period of the cases reported, i.e., about 25 years. Anecdotal and media reports suggest that a prick can cost anywhere from INR 3000 to 4000 (Ranga, 2011), while a gram of snake bite powder can cost around INR 20,000 to 25,000 (Lenin, 2016; Swati, 2016; *V-Day Drug*, 2012). We speculate that the type and potency of snakes, the mechanisms of demand and supply, and the paying capacity of the customers could be determining factors of such varied and high prices. The spate of new reports of law enforcement seizing snake venom worth millions of Indian rupees ("1kg of Dried "snake venom" seized," 2021; Lenin, 2016) also highlights the magnitude of wildlife crimes — the illegal business or possession of wildlife for profit, subsistence, personal ownership, cultural or religious beliefs, or as a consequence of human-animal conflict — (McFann & Pires, 2020) that might be occurring, or may even be on the rise. Additionally, a recent review exploring the wildlife trade market on the dark web found that 90% of dark-web wildlife advertisements were for selling recreational drugs (Stringham et al., 2023) which also points out the covert magnitude of this phenomenon.

To the best of our knowledge, this phenomenon has not been explored systematically. Another strength of our study is its focus on psychosocial factors. The study posed a few limitations as well. The systematic review did not explore or include gray literature. The case reports did not follow any prescribed reporting formats; hence, the depth of information elicited differed significantly and there was a lot of missing information. Future researchers can use exploratory research designs in the area to understand the actual prevalence and depth of the problem. Additionally, future research should explore this phenomenon from a criminal, legal, and environmental standpoint.

This study highlights deliberate snake envenomation for recreational purposes. Considering the news reports, accidental discoveries in medical settings, and organized pathways by the patient, it can be speculated that this phenomenon might be far more widespread than it appears on the surface. Snakes are one of the most fatal animals, and even though individuals might not be using truly "venomous" snakes, the practice poses great harm and risks. Craving, sensation-seeking, disinhibition, a desire to achieve a "high" for a longer period, and attempts at reducing the usage of other substances may lead individuals to seek snakes without commercial networks (snake charmers, peddlers, etc.) and might use a fatal snake. Additionally, this phenomenon raises important concerns from the animal protection lens. This study calls for the need for awareness and prevention models not only for mental health professionals and medical professionals but also for wildlife conservationists.

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