



Understanding Human-Snake Conflict Dynamics in Buxar District, Bihar, India: A Multifaceted Approach

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Abstract

Human-snake conflict (HSC) poses significant challenges in regions like the Buxar district of Bihar, India, where rapid urbanization and agricultural expansion encroach upon snake habitats. This research paper presents a comprehensive study aimed at understanding the dynamics of HSC in Buxar, focusing on species-wise snakebite cases and snake rescues during the monsoon season. Through questionnaire surveys, data analysis, and field observations, the study investigates factors contributing to HSC and proposes mitigation strategies. Findings reveal the prevalence of venomous snake species, such as the Common Indian krait and Cobra, in snakebite incidents, underscoring the need for proactive measures to mitigate conflict and conserve biodiversity.

Keywords: Human-snake conflict, snakebite, mitigation strategies, habitat conservation, biodiversity, Buxar district, Bihar, India.

Introduction: India is renowned for its rich biodiversity, particularly its diverse array of snake species, which account for nearly 10% of global snake diversity. Snakes, classified under the suborder Serpentes, are characterized by their limbless bodies and elongated tails, evolving from terrestrial lizards during the Middle Jurassic epoch approximately 174.1 to 163.5 million years ago. Despite their ecological significance, snakes often face misunderstanding and conflict with humans, especially in regions undergoing rapid urbanization and habitat fragmentation.

Human-snake conflict, a longstanding issue, remains prevalent in underdeveloped and developing countries like India, where awareness of the problem is often lacking. India boasts over 300 identified snake species, with more than 60 considered venomous, including the Russell's viper, Common krait, Cobra, and Saw-scaled viper. The escalation of human-wildlife conflict, fueled by increasing human populations and urbanization, poses significant challenges, particularly in areas where human habitats overlap with snake territories.

Snakes are misunderstood primarily out of ignorance about their true nature and position in the natural world, human snake conflict had been present for centuries but in underdeveloped and developing countries there is a lack of awareness of this problem, and the conflict is considered negligible or neglected so far. In India over 300 species of snake are identified in various parts of the country out of which more than 60 species are considered venomous (Whitaker R Captain 2008). Increase in human population and urbanization had led to an increase in human-wildlife conflict, especially in the areas where there is an expansion in human habitat and fragmentation or biodiversity are at highest (Saulsbury and White(2016)).

It is a matter of concern that for the safety of humans and the conservation of wildlife is considered at least priority, especially in the rural areas where the cases of snake-human conflict are at their highest but due to lack of awareness and concern this conflict is being neglected. Snake human conflict is encountered more near the human property, gardens, villages, roads farmland infrastructure or the places where the snake distribution overlap the human habitat. Humans are majorly envenomed by four of the species that encroaches upon human habitats and agricultural fields namely:-Russel's viper (*Daboia russelii*), Common krait (*Bungarus caeruleus*), Cobra (*Naja Naja*) and Saw scaled viper (*Echnis carinatus*) (Whitaker R Captain 2008).

Human-snake conflict can be defined as incidents of an encounter between a human and a snake that negatively impacts and results in injury, stress, relocation, neural damage, and



death. HSC incidence can result in 1.2 to 5.5 million snakebites annually and a considerable amount of mortality, mobility, and strain on the local health care system was reported by (Kasturriratne et al 2008) worldwide particularly in India around about 35000 to 50000 death per year is estimated due to snakebite (Alirol et al. 2010). The best Indian estimate is currently 45,900 death per year due to snake bites from the work of the million-death study (Mahapatra et al 2011) snake venom acts in several ways including bleeding disorder neurotoxicity, local tissue damage, renal tissue damage, and rhabdomyolysis, it varies from person to person and species to species.

Snake-human conflict incidents will likely intensify unless we gain a thorough understanding of the cause and implement effective mitigation measures.

Activity and movement patterns are interrelated with the climate weather season and landscape variables. Snake activity can be influenced by temperature, humidity precipitation, cloud cover, and fragmentation though activity may vary with the species (Marques et al 2001), (Brown and shine 2002), (Buttler et al 2005). There is an increase in activity before and during the breeding season (Marques et al 2001, Mesaka 2010).

Landscape variables such as land cover or habitat type can also influence snake activity according to their niche type preference though their pattern may vary from different species (Hartman et al. 2009, Weatherhead et al.2010)

Currently, in India, there is an antivenom for only four main species Spectacled cobra, Common Krait, Russel's viper and Saw Scaled viper

Bihar is one of the poorest and least resourced states in terms of its health services (Dept. of health govt. of Bihar). Each year in Bihar, 45000 deaths are attributed to snakebites. Bihar is considered third highest number of snakebite death in India after Uttar Pradesh and Andhra Pradesh (Mohapatra et al 2011). Buxar is a Nagar Parishad city in the state of Bihar, the present study aims to explore the factors related to the snake bite or human snake conflict in Buxar district secondary and gather information related to HSC and the nature of conflict and to find out the proactive measure to be taken to overcome the conflict present scholar has selected particularly Buxar district in order to explore the causes factor and influence of conflict on the people and ecology of an area as this district have many cases which are not reported and unpublished due to lack of awareness and poor health facilities in the district.

The objectives of the present study are categorized under the following subheadings.

Bihar, one of India's poorest states in terms of health services, faces significant challenges related to snakebite incidents, with approximately 45,000 deaths attributed to snakebites annually. Buxar, a Nagar Parishad city in Bihar, serves as a focal point for studying human-snake conflict dynamics. This study aims to explore the factors contributing to snakebite incidents and human-snake conflict in Buxar district, highlighting the need for proactive measures to address this pressing issue.

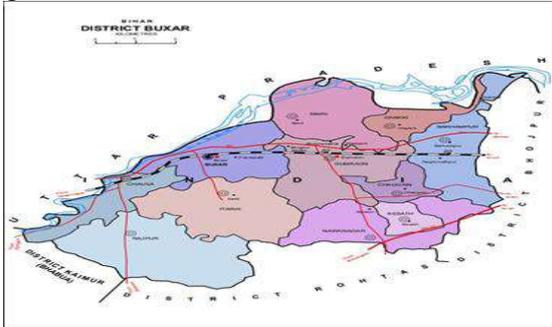
Objectives:

- To study species-wise snakebite cases in the Buxar district in monsoon season.
- To collect data on snakes rescued during monsoon by rescuers.
- To find and analyse the reason for human-snake conflict.

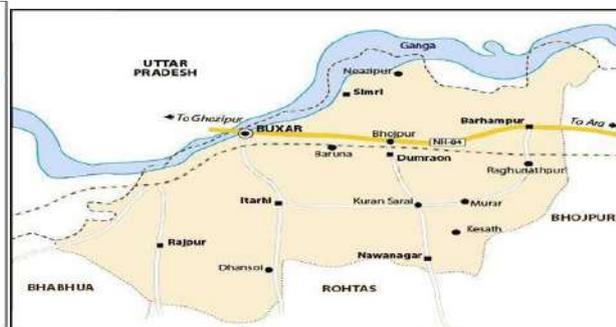
Study Area: Buxar is a Nagar Parishad city located in the northern part of the Indian state of Bihar, bordering Uttar Pradesh. Positioned at coordinates 25°30'29" N latitude and 83°59'18" E longitude, it serves as the administrative headquarters of both the Buxar district and the Buxar community development block. Situated just south of the mighty Ganges River, Buxar district encompasses 132 rural villages.

The district's geographic boundaries are defined by the meandering Karamnasa River to the west and southeast, demarcating its border. Buxar shares its borders with neighboring districts including Bhojpur, Bhabua, and Rohtas, further enriching its cultural and social

tapestry. This strategic location positions Buxar as a pivotal hub connecting various regions within Bihar and neighboring states, contributing to its historical, cultural, and economic significance.



1.1 Geographical location of Buxar district



1.2 Physical Map of Buxar district

Materials and Methods:

Investigation of Snakebite Cases in Buxar District during the Monsoon Season.

A questionnaire survey method was employed to examine species-specific snakebite incidents across ten villages in Buxar district, namely Dalsagar, Bhojpur, Padarai, Ramolia, Chausa, Badharia, Kamaepur, Dhansoi, Ahiraoli, Semri, and Niyajipur. The survey questionnaire included the following inquiries:

- Have you ever been bitten by a snake?
- Has any livestock died due to snakebite?
- Has anyone experienced death due to snakebite?
- Have there been any snakebite cases reported in your household?
- How many different types of snakes have you encountered?
- Where do you seek treatment after a snakebite incident?
- Have you ever killed a snake?

Collection of Data on Snake Rescues During the Monsoon

Collaborating with the Wildlife Nature Care Trust, an NGO dedicated to snake rescue and data collection on snakebite cases, primary data on snake encounters and rescue operations during the monsoon season in Buxar district were obtained. The NGO, through social media outreach, has established contact numbers in every village of Buxar to facilitate prompt response to human-snake conflict incidents. Local rescuers are dispatched by the NGO upon receiving reports, and after proper inspection, identification, and assessment of the snake's health by trained personnel, the snake is released back into its natural habitat. Records of rescue operations and human-snake conflict incidents, including village names, dates, and species involved, were meticulously compiled from the NGO's database.

Analysis of Factors Contributing to Human-Snake Conflict

Several factors contributing to human-snake conflict were identified and analyzed, including:

- Lack of awareness about snakes
- Absence of protective footwear during nocturnal activities in fields
- Poor hygiene practices in household maintenance
- Inadequate knowledge and training in snake rescue operations

Understanding these factors is essential for devising effective strategies to mitigate human-snake conflict and promote coexistence between humans and snakes in the region.

Observation: The study revealed the presence of four highly venomous snakes in the area, namely:

- Spectacled Cobra (*Naja naja*)
- Common Indian Krait (*Bungarus caeruleus*)



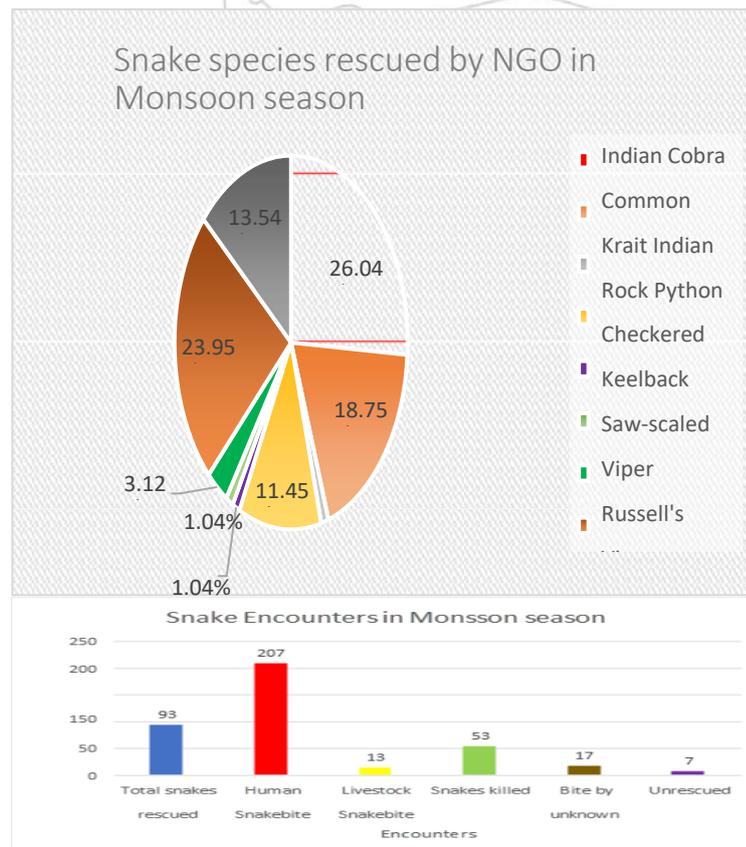
- Russell's Viper (*Daboia russelii*)
- Saw-scaled Viper (*Echis carinatus*)

The presence of non-venomous snakes in the area, likely facilitated by rivers like the Ganga and Karmnasha, includes:

- Red Sand Boa (*Eryx johnii*)
- Indian Rock Python (*Python molurus*)
- Indian Wolf Snake (*Lycodon aulicus*)
- Common Sand Boa (*Erycinae*)
- Checkered Keelback (*Fowlea piscator*)
- Indian Rat Snake (*Ptyas mucosa*)

During the monsoon season of the year 2022, the present scholar, in collaboration with the NGO, rescued a total of 93 snakes, encompassing various species. During the study, the researchers encountered various snake species in the area, with the following frequencies: Cobra (25), Krait (18), Indian Rock Python (1), Checkered Keelback (11), Saw-scaled Viper (1), Russell's Viper (1), Red Sand Boa (3), Indian Rat Snake (23), and Wolf Snake (13).

While the study, a total of 93 snakes belonging to various species were rescued. Additionally,



the incidence of human-snake conflicts and related outcomes were documented. During the study, various incidents of human-snake conflict were reported, including: 207 cases of humans bitten by snakes, 13 cases of livestock bitten by snakes, 53 deaths caused by snake bites, 17 instances of bites from unknown sources, 53 snakes killed by humans, and 7 cases where snakes were present but not rescued.



Further analysis was conducted on species-wise bite cases in Buxar district, revealing significant findings regarding the mortality rates associated with different snake species. The data are presented in given table.

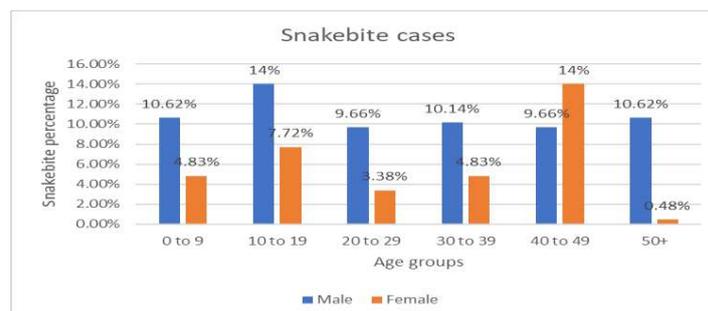
Species	Total Bite Cases	Deaths	Death Percentage
Cobra	98	52	53.06%
Krait	109	83	76.14%
Saw Scaled Viper	0	0	0
Russell's Viper	0	0	0

Table:Species-wise bite and death cases along with the corresponding death percentages during the study period in Buxar district.

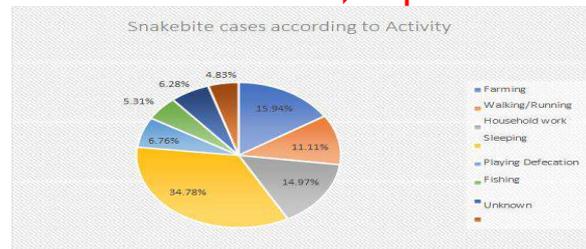


Quality Of Work... Never Ended...

Non-venomous snakes, including the Red Sand Boa, Checkered Keelback, Indian Wolf Snake, and Indian Rat Snake, were also documented in the study area. These species contribute significantly to human-snake conflicts in the region. Given the proximity of the study area to rivers like the Ganga and Karmnasha, non-venomous snakes are prevalent, particularly in agricultural lands with patches of dense forests near human settlements. However, due to a lack of awareness and healthcare facilities, many snake conflict incidents go unreported.



The distribution of snakebite cases across different age groups is as follows: Among individuals aged 0-9, there were 32 reported cases, comprising 22 males and 10 females. In the 10-19 age bracket, there were 45 cases, with 29 males and 16 females. The 20-29 age group accounted for 27 cases, including 20 males and 7 females. For those aged 30-39, there were 31 cases, with 21 males and 10 females. In the 40-49 age category, there were 49 cases reported, with 20 males and 29 females. Lastly, individuals aged 50 and above experienced 23 cases, with 22 males and 1 female. This totals 207 cases, with 134 males and 73 females affected.



In rural areas such as Dhansoi, Semri, Rajpur, and Chausa in Buxar district, a considerable number of deaths occur annually due to snakebites. This is attributed to the local tradition of sleeping on the ground, especially during the rainy season when mud and rag cakes are commonly used.

Snake bites occurred in various settings and activities, with sleeping accounting for the highest number of cases at 72, constituting approximately 34.742% of all incidents. Farming activities reported 33 cases, representing about 15.942% of the total, while housework accounted for 31 cases, approximately 14.975%. Walking/running incidents totaled 23 cases, making up about 11.111% of all snake bites. Smaller percentages were attributed to playing (6.763%), toileting in the field (5.314%), sitting/standing (4.830%), and fishing (6.280%).

Results and Conclusion: Through the comprehensive research conducted in pursuit of various objectives, several noteworthy findings emerged, shedding light on previously unexplored aspects within the Buxar district. The study on species-wise snakebite cases unveiled the presence of both venomous and non-venomous snakes in the area. Among the venomous species, the occurrence of snakebites was notable, with a total of 207 cases reported during the monsoon season. Notably, the incidence of snakebites caused by the Krait accounted for 109 cases, resulting in 83 deaths, representing a staggering 76 percent fatality rate. Similarly, Cobra bites accounted for 98 cases, resulting in 52 deaths, corresponding to a 53 percent fatality rate.

Further investigation into snake rescues during the monsoon season, conducted by NGO rescuers, revealed the retrieval of 93 snakes belonging to various species. Of these, Indian Rat Snake sightings were most frequent at 23, followed by Cobra at 25, Krait at 18, Checkered Keelback at 11, with single sightings of Python, Saw-scaled Viper, Russell's Viper, and Red Sand Boa, and 13 sightings of the Wolf Snake.

Analysis of the factors contributing to human-snake conflicts highlighted habitat loss, negative human perceptions, lack of awareness in distinguishing venomous from non-venomous snakes, inadequate health facilities, urbanization, and agricultural land expansion as major causes. Most snakebite incidents occurred while individuals were sleeping outdoors or engaged in farming activities, with males being more frequently affected than females.

Concerningly, the study reported a low rate of live snake rescues, with more instances of snake killings reported. Thus, heightened efforts are warranted from naturalists, conservationists, and stakeholders to raise awareness regarding wildlife conservation and the importance of preserving snake populations.

Despite the significant insights gained, the study encountered limitations, notably the lack of representative samples. Additionally, biases inherent in existing snakebite studies were acknowledged through thorough literature review.

Moving forward, urgent and sustained efforts are imperative to address and manage snakebite incidents effectively. Community-based programs should be organized to enhance awareness of human-snake conflicts, and mitigative measures must be implemented by both governmental and non-governmental organizations to minimize snakebite casualties. Providing education and training opportunities for students and scholars in snake rescue procedures and safety measures is essential. Furthermore, evaluating the effectiveness of



community interventions stands as a vital step in reducing snakebite incidence and associated mortalities.

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