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ABUNDANCE AND PUBLIC PERCEPTION OF SNAKES AND SNAKE BITE MANAGEMENT IN GORA, KARU LOCAL GOVERNMENT AREA, NASARAWA STATE, NIGERIA

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Abstract

Snakes play a vital role in ecosystem balance, yet negative perceptions, fear-driven killings, and poor snakebite management threaten both their populations and human well-being. This study assessed snake abundance, public attitudes, and snakebite management in Gora, Karu Local Government Area, Nasarawa State, Nigeria. A systematic sampling design was employed to ensure accurate data collection across different habitat types. Field surveys using Time-Constrained Searches (TCS) and Focus Group Discussions (FGDs) provided insights into snake encounters and human-snake interactions. Snake encounters were highest in forested areas (60%), with the Puff Adder (Bitis arietans) being the most frequently observed species. Public attitudes toward snakes were assessed through FGDs and structured interviews with farmers, hunters, and traditional healers, selected for their frequent interactions with snakes. Results indicated that 80% of farmers perceived snakes as pests, leading to widespread snake killings, while 70% of respondents relied on herbal remedies for snakebites despite their limited effectiveness. Findings revealed significant conservation threats and knowledge gaps. Effective community education, culturally inclusive conservation strategies, and improved rural healthcare are essential to mitigating human-snake conflict. Future research should assess seasonal trends in snake encounters and the impact of conservation education on public attitudes.

Keywords: *Conservation, Cultural Perceptions, Human-wildlife Conflict, Snake Abundance, Snakebite Management*

INTRODUCTION

Snakes are globally distributed and play crucial ecological roles (Afroz *et al*., 2024). However, human-snake interactions, particularly in rural, agro-based communities in Asia and Africa, often result in conflict due to overlapping habitats (Sapkota *et al*., 2020). These interactions evoke both positive and negative attitudes. While some cultures revere snakes for their spiritual or utilitarian values, others fear, misunderstand, or harm them (Alves, 2012). Despite being symbols of power and

objects of worship in many traditions, snakes are often subjected to mistreatment, fear-driven killing, or neglect. Such negative perceptions and actions have profound implications for biodiversity conservation and human welfare, yet they remain inadequately studied (Mendonça *et al*., 2014).

Snakes are significant in various cultures, with their parts used in traditional practices and medicines. However, human activities such as habitat destruction and intentional killing severely threaten snake populations, leading to their decline (Godley and Moler, 2013). If such practices persist unchecked, they may result in local extirpation of rare and endangered species, triggering ecosystem-level consequences. Addressing snake-human interactions and incorporating ethnoherpetology insights are essential for designing effective conservation strategies (Alves, 2015).

In Nigeria, limited survey efforts and minimal research have left the conservation status of snakes poorly defined. Human actions, particularly the intentional killing of snakes, negatively impact snake populations, which play vital roles in agricultural and grassland ecosystems. These actions may reduce biodiversity and adversely affect human health. Beyond ecological significance, assessing public perception and understanding of snakes is critical, particularly in snakebite-prone regions. Such assessments are integral to advancing snake diversity conservation, improving snakebite prevention, and enhancing prehospital care (Ijeomah *et al*., 2017).

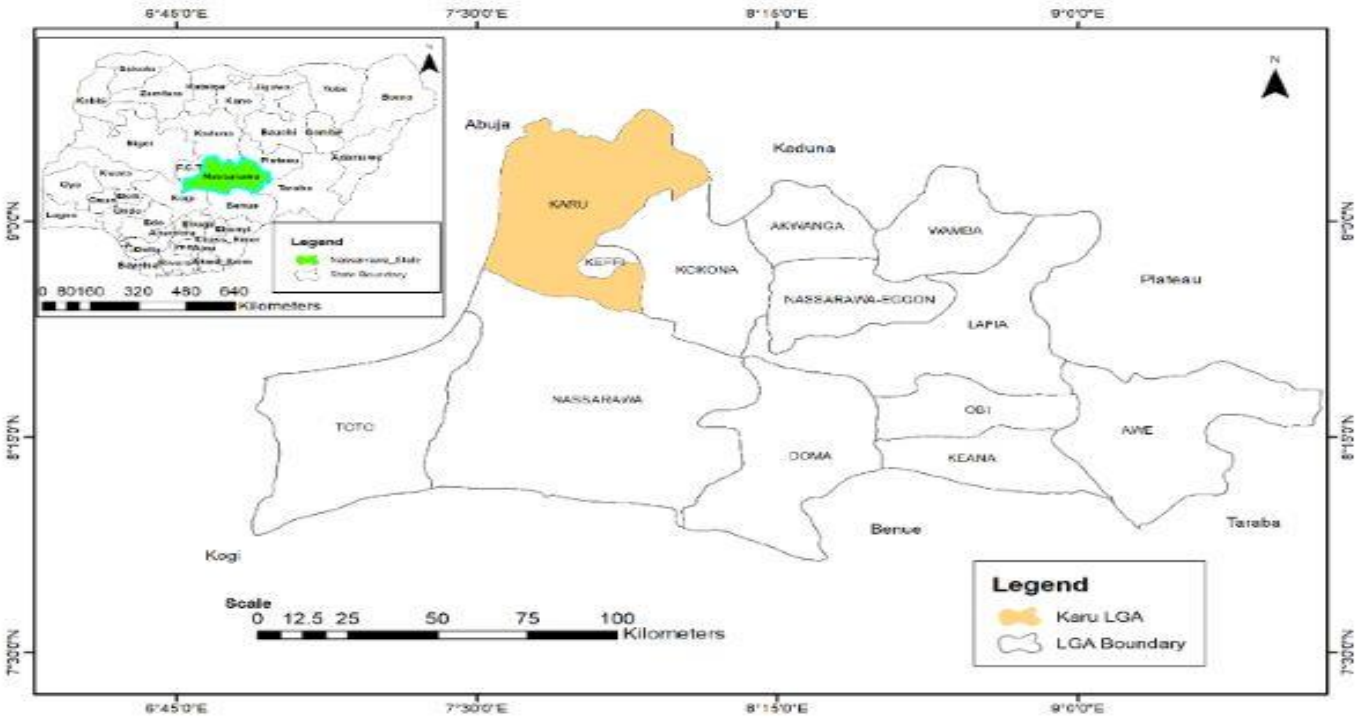
Globally, human-snake conflicts are prevalent, with snakebites posing a significant public health issue (Afroz *et al*., 2024). Snakebite Venom poisoning disproportionately affects middle- and low-income tropical countries, where it leads to high mortality and morbidity rates, especially among agricultural workers. It is estimated that snakebites affect 2 million people annually in tropical regions, causing 20,000 to 94,000 fatalities (Malik *et al*., 2021). In Sub-Saharan Africa, including Nigeria, data indicate a high incidence of snakebite-related hospital admissions, with 174 cases per 100,000 admissions linked to envenomation.

The risk of snakebites in rural areas often results in the ruthless killing of snakes, exacerbating their population decline. Understanding rural perceptions of snakes and snakebite management is crucial for conservation efforts. This includes evaluating general knowledge about snakes, their abundance, diversity, snakebite frequency, and preventive measures. Armed with such knowledge, engaging communities through education can promote more appropriate responses to snakes, reduce snakebite incidents, and enhance snake conservation. Furthermore, understanding how people respond to snakes encountered indoors versus outdoors, such as on roads or agricultural fields, remains an area needing further exploration. This study aims to determine the abundance and diversity of snakes in Gora, Karu Local Government Area, Nasarawa State, Nigeria, and to investigate public perceptions, knowledge, and awareness of snakes and snakebites.

MATERIALS AND METHODS

Study Area

New Karu is located in Nasarawa State, Nigeria, at latitude 8°59′40″ N and longitude 7°34′20″ E, near the capital city, Abuja. It serves as the administrative headquarters of the Karu Local Government Area (LGA), one of the thirteen LGAs that make up Nasarawa State. Created in October 1991, Karu LGA covers a land area of approximately 2,640 square kilometers and is situated in Nigeria's North Central geopolitical zone. Strategically positioned along the boundary of the Federal Capital Territory (FCT), Karu shares borders with Abuja to the west, Keffi LGA of Nasarawa State to the south, and Jaba LGA of Kaduna State to the north.



The proximity of New Karu to Abuja has contributed significantly to its rapid urbanization, placing it within the development corridors of the FCT (Udeh, 2010).

New Karu experiences a typical tropical savanna climate with two distinct seasons: a wet season and a dry season. The wet (rainy) season spans from April to October, lasting approximately 180 to 190 days, with peak rainfall occurring in July, August, and September. The area receives an average annual rainfall of about 1,632 mm. The dry season lasts from November to March, during which temperatures are at their highest due to minimal cloud cover (Kanayochukwu and Dogo, 2019). Annual temperatures in New Karu range between 21°C and 32°C. During the rainy season, heavy cloud cover moderates the maximum temperatures, and the diurnal temperature variation can drop to as low as 7°C in the peak rainy months of July and August. These weather patterns are influenced by the interactions of two dominant tropical air masses, leading to the formation of distinct climatic regimes throughout the year

Figure 1. Map of Karu Local Government Area, Nasarawa, State.

***Source**: Nasarawa State Ministry of Lands and Survey (2016)*

Methods

Field Surveys

Three parallel line transects, spaced 1,000 meters apart, were established across different habitat types (in forests, grasslands, and agricultural fields) within the study area to ensure comprehensive coverage of potential snake habitats. Time-constrained searches (TCS), as described by Oliveira and Martins (2001), were carried out within the boundaries of each designated study area. Each search session lasted 30 minutes and was performed in forests, grasslands, and agricultural fields. This timeframe is commonly used in field studies to ensure consistent effort across various habitats, facilitating reliable comparisons of species presence and activity. (Oliveira and Martins. 2001). The specific locations were chosen based on the likelihood of snake encounters and habitat diversity.

A systematic sampling design was employed during TCS to maximize detection probabilities, including lifting cover objects (e.g., rocks and logs), inspecting crevices, and scanning vegetation. Observations of snakes included species identification, number of individuals, behaviour, and associated habitat type. Data on snake presence and activity were collected through direct and indirect indices which rely on signs or evidence left by snakes. These include detecting shed skins, burrow evidence and Trail markings following the instruction of Carnes-Mason, 2023. Surveys were conducted twice monthly over a six-month period allowing the researchers to account for temporal variations in snake activity and detectability. Snakes are ectothermic, meaning their activity levels are influenced by environmental temperatures. By scheduling observations during early mornings and late evenings, researchers align their efforts with periods when many snake species are most active. This approach enhances the likelihood of detecting snakes and provides a comprehensive understanding of their behavior across different times and conditions. Snakes were identified using the field guide by Chippaux and Jackson, 2019.

Focus Group Discussions (FGDs)

The Dual Focus Group Discussion (FGD) technique, as outlined by Nyumba *et al*. (2018), was used to collect qualitative data on local perceptions, knowledge, and awareness of snakes and snakebite management. Key informants, including community leaders, farmers, and hunters, were purposively selected. Separate FGDs were conducted for each group (farmers, hunters, and Community Leaders) to encourage targeted discussions.

Discussions were held in neutral, comfortable settings to facilitate open and honest communication. Informants were provided with visual aids, such as pictures and models, to aid in identifying common snake species. They were asked to estimate the number of snake encounters in the past six months and share their perceptions of snakes (beneficial, dangerous) and their knowledge of snake behavior, habitats, and snakebite prevention and management techniques. Cultural beliefs and traditional practices related to snakes and snakebites were also discussed.

Data Analysis

Data were analyzed using descriptive statistics. Results were presented in tables and charts.

RESULTS

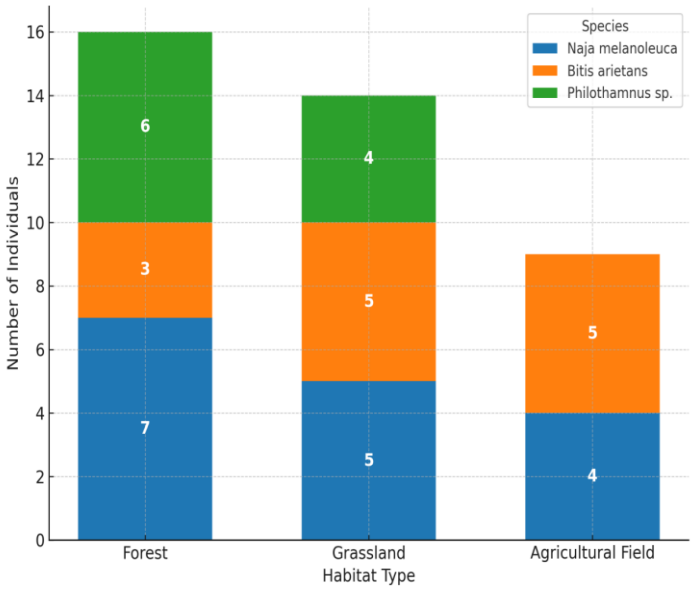


Figure 1: Snake Species and Number of Individuals Encountered in Different Habitat Types

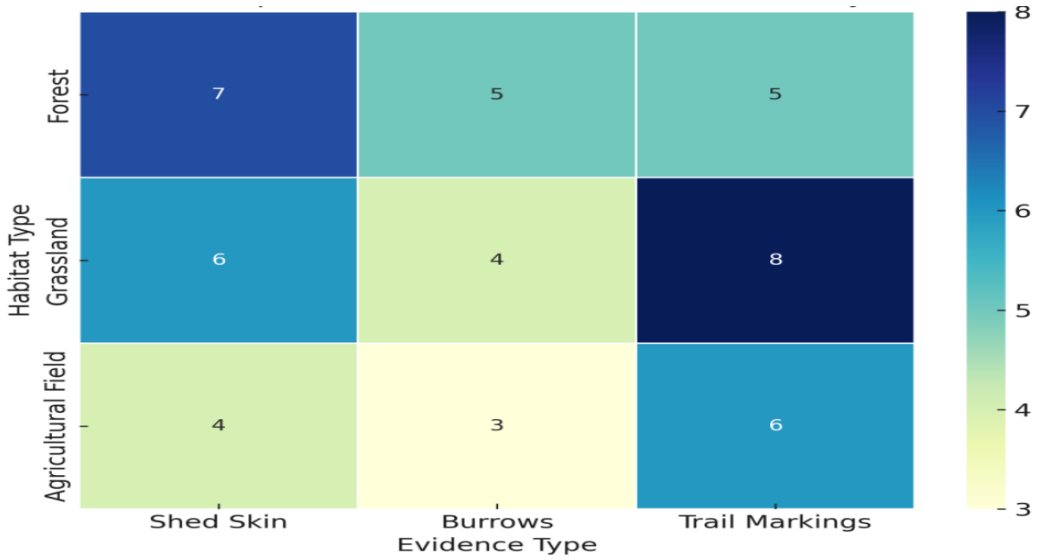


Figure 2: Heatmap of Indirect Indices for Snakes Activity

Table 1: Focus Group Discussion Responses on Snake Encounters and Cultural Perceptions

Group Type (n)	Most Reported Snake Species	Mean Encounters (Last 6 Months)	Perception of Snakes	Knowledge of Snake Behavior	Awareness of Snakebite Management	Cultural Beliefs and Practices
Farmers (n=20)	*Naja melanoleuca* (80%), *Bitis arietans* (50%)	11.2 ± 3.1	80% view snakes as crop pests and threats.	65% misidentify species; rely on folklore	70% use herbal remedies; 30% know first aid	Use protective charms; believe killing snakes brings bad luck
Hunters (n=20)	*Bitis arietans* (90%), *Naja melanoleuca* (60%)	18.7 ± 4.5	50% respect snakes for hunting; 50% see them as dangerous	Recognize behavior patterns; avoid high-risk areas	40% use tourniquets; 60% prefer traditional medicine	Perform rituals post-bite, including incantations and herbal treatments
Community Leaders (n=10)	*Naja melanoleuca* (100%), *Philothamnus* spp. (30%)	7.8 ± 2.6	90% associate snakes with misfortune; acknowledge ecological role	Understand habitat preferences and avoidance strategies	80% advocate hospital visits; 20% combine treatments	Conduct cleansing rituals to neutralize venom; some families practice python worship

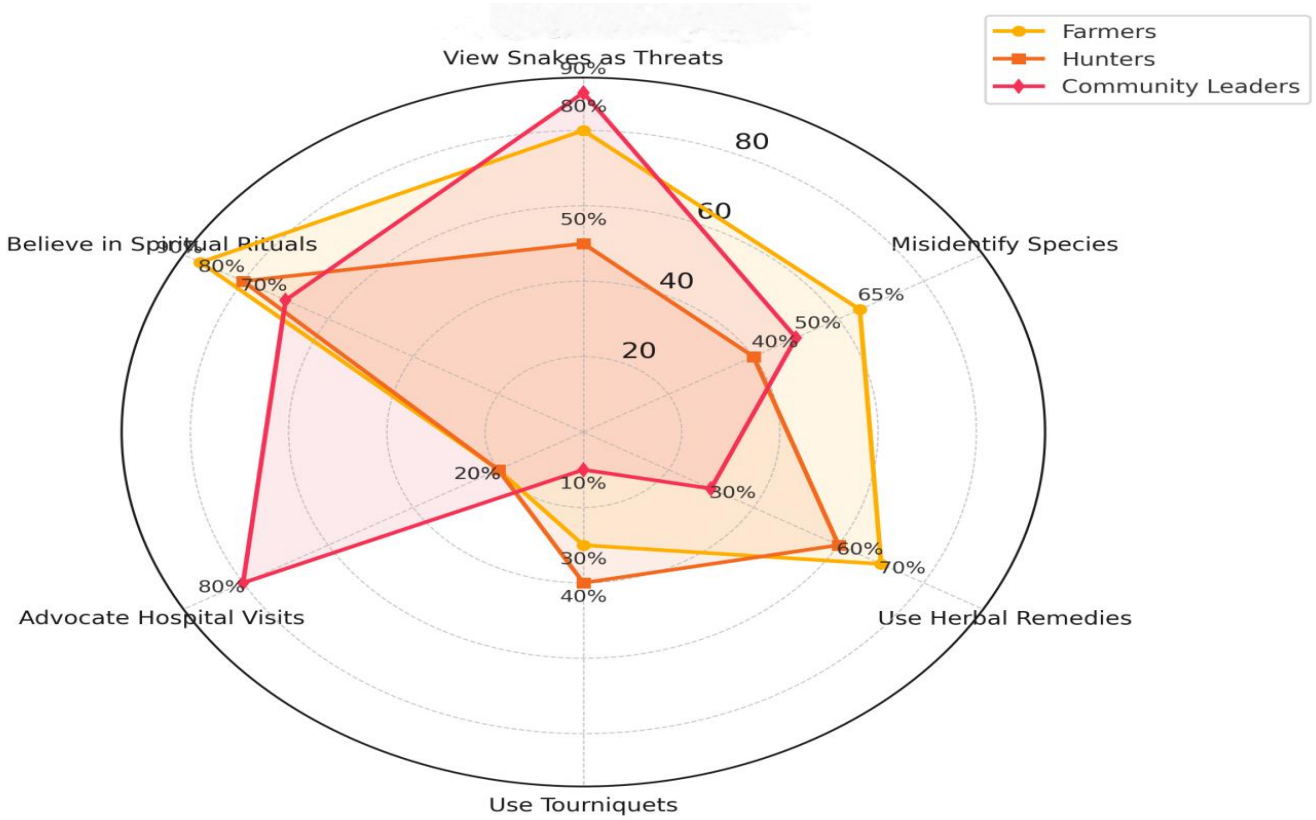


Figure 2: Focus Group Discussion Responses on Snake Encounters and Cultural Perceptions.

Table 2: Key Themes from Focus Group Discussions on Snake Encounters and Perceptions

Theme	Description	Representative Quotes
Perceived Threats and Immediate Responses	Most respondents view snakes as dangerous, leading to **immediate killing** upon sight. Fear is based on **stories of fatal snakebites** rather than personal experiences.	"We kill any snake we see to protect our families." *(Farmer, Male, 45 years)*
Traditional Snakebite Treatment Practices	Many believe in **herbal cures** for snakebites, often **avoiding hospitals** unless symptoms worsen. This practice is deeply rooted in **local traditions and spiritual beliefs.**	"We believe that certain herbs can cure snakebites." *(Community Leader, Male, 60 years)*
Knowledge Gaps in Snake Identification & Management	Most people **cannot differentiate venomous from non-venomous snakes**. There is **widespread misinformation** on first aid treatment, with practices such as **cutting the wound or using tourniquets.**	"Most people don't know how to properly treat a snakebite." *(Hunter, Male, 38 years)*
Emerging Conservation Awareness	Some respondents acknowledge that **snakes help control rodent populations** but **fear still outweighs conservation attitudes.** Younger participants were **more open to snake conservation.**	"Snakes help control pests, but we still fear them." *(Young Farmer, Male, 27 years)*

DISCUSSION

The findings provide insights into snake habitat preferences, human-wildlife interactions, and critical gaps in snakebite management, emphasizing the need for culturally sensitive conservation and public health interventions. The results indicate that forests recorded the highest frequency of snake encounters (60%), while agricultural fields (25%) had moderate encounters, and grasslands (15%) had the lowest. These findings align with expectations, as forests provide dense vegetation, stable microclimates, abundant prey (rodents, amphibians), and sufficient hiding spots that make them ideal for snake populations. Similar studies have confirmed that forests serve as biodiversity hotspots for reptiles due to their complex ecological structure (La Rosa *et al*., 2022).

Agricultural fields recorded moderate snake encounters, suggesting that some species are adapting to human-modified landscapes. The presence of rodents, irrigation channels, and embankments in farmlands may offer alternative prey sources and shelter, making these environments suitable for species with ecological plasticity, such as *Naja melanoleuca* (Forest Cobra). However, snake encounters in farmland could also be influenced by seasonality, pesticide use, and land management practices, factors that should be explored in future studies (Pandey *et al*., 2016).

The low encounter rates in grasslands are likely due to the short height of grasses in the study area, which provides insufficient cover for snakes. Reduced vegetation cover increases exposure to predators, making these areas less favorable for many snake species. Additionally, grasslands experience greater temperature fluctuations, which may create suboptimal thermal conditions for snakes, further reducing their suitability as habitats. This aligns with the observed positive relationship between grass cover and snake relative abundance (RA), indicating that while some grass cover may be beneficial, short or sparse grasslands may not provide adequate shelter or environmental stability for snakes (Glass and Eichhol (2022). However, indirect evidence reveals that certain species still utilize these areas intermittently, emphasizing the importance of considering both direct and indirect detection methods in snake population assessments.

Bitis arietans (Puff Adder) was the most frequently encountered species across all habitats, likely due to its wide habitat tolerance and ambush-hunting strategy. *Naja melanoleuca* (Forest Cobra) was commonly found in forests and agricultural fields, reflecting its high mobility and active foraging behaviour. *Philothamnus spp.* (Green Snake) was least encountered, likely due to its arboreal nature, which limits ground-based detection methods.

The presence of shed skins (most frequent in forests, 45%) indicates that forests provide ideal molting conditions, such as humidity, temperature regulation, and tree bark or leaf litter for shedding support. Burrows were commonly found in agricultural fields and grasslands (30%), suggesting that snakes use abandoned rodent burrows for shelter and thermoregulation. Snake trail markings were most evident in grasslands (35%), likely because open sandy terrain makes trails more visible compared to dense forest floors.

The heatmap analysis reveals that snakes remain active in habitats with low direct encounter rates, highlighting the importance of indirect monitoring techniques. These findings support prior research demonstrating that snake detectability is often underestimated in open environments due to cryptic behaviour and seasonal shifts in activity patterns (Oldham *et al*., 2016).

This study revealed divergent perceptions of snakes among community groups, influenced by livelihood,

personal experience, and cultural beliefs. Farmers (80%) viewed snakes as pests and threats, citing crop damage (due to burrowing behaviour) and livestock predation risks as major concerns. Fear-driven killing was prevalent in this group, posing a significant conservation challenge. Hunters (50%) had mixed views; some recognized snakes' role in controlling prey populations (rodents, birds), while others feared their venomous potential and preferred to eliminate them. Community leaders (90%) **a**cknowledged the ecological importance of snakes, but traditional beliefs often linked snakes to misfortune and spiritual omens, reinforcing negative attitudes.

Traditional beliefs play a key role in shaping attitudes toward snakes. Practices such as using protective charms and conducting rituals to ward off snakebites were common among farmers and hunters, reflecting a deep-rooted fear of snakes in rural communities. Community leaders often associate snakes with spiritual forces or omens, which can either protect **or** endanger species, depending on interpretation. Interestingly, younger respondents (under 30 years) were more open to snake conservation, recognizing their role in pest control and ecosystem balance. This generational shift suggests that conservation education programs targeting youth could be effective in changing long-term attitudes (Eid *et al*., 2021).

Despite this growing awareness, conservation attitudes remain weak due to: Deep-rooted cultural fears, leading to the indiscriminate killing of snakes. The belief that killing snakes prevents misfortune. A lack of structured snake conservation programs in rural areas. There are significant gaps in the understanding of managing snakebite, especially for hunters and farmers. Seventy percent **(**70%) of farmers relied on herbal remedies instead of seeking medical care, primarily due to Traditional beliefs in plant-based antidotes, Limited healthcare access in remote areas and Fear of medical costs associated with hospitalization. 60% of hunters employed harmful first-aid techniques, including **a**pplying tourniquets, which can worsen envenomation, and attempting to suck out venom, a practice widely discredited in the medical literature. 80% of community leaders promoted hospital visits, but 20% still encouraged a blend of traditional and modern treatments, suggesting that cultural factors strongly influence medical choices. This finding is consistent with Pandey *et al*. (2016), who reported that rural communities in Nepal exhibit similar reliance on traditional medicine due to limited healthcare infrastructure.

CONCLUSION

This study reveals the complex interplay between ecological factors, cultural beliefs, and public health practices related to snakes. Forests were identified as the primary habitat for snake encounters (60%), with *Bitis arietans* as the most frequently observed species. However, negative perceptions and traditional beliefs drive fear-based killings, threatening conservation efforts. Knowledge gaps in snakebite management exacerbate public health risks, reinforcing the urgent need for education, culturally integrated conservation strategies, and improved medical training in rural communities.

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