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A UTILIZAÇÃO DE TRATAMENTOS ALTERNATIVOS EM ACIDENTES OFÍDICOS NOTIFICADOS EM COMUNIDADES TRADICIONAIS DO ESTADO DO AMAPÁ

THE USE OF ALTERNATIVE TREATMENTS IN REPORTED SNAKEBITE ACCIDENTS IN TRADITIONAL COMMUNITIES OF THE STATE OF AMAPÁ

LA UTILIZACIÓN DE TRATAMIENTOS ALTERNATIVOS EN ACCIDENTES OFÍDICOS NOTIFICADOS EN COMUNIDADES TRADICIONALES DEL ESTADO DE AMAPÁ

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RESUMO

O estudo aborda os acidentes com serpentes peçonhentas, que representam um grave problema de saúde pública e foram incluídos, em 2017, na lista de doenças negligenciadas. O objetivo foi levantar informações sobre o uso de extratos de plantas medicinais e substâncias de origem animal no tratamento desses acidentes, especialmente em comunidades tradicionais com acesso limitado à soroterapia. Nessas regiões, práticas terapêuticas alternativas baseadas em saberes empíricos e crenças culturais são amplamente utilizadas. A pesquisa evidenciou que o conhecimento tradicional ainda desempenha papel essencial diante da dificuldade de acesso aos serviços de saúde. Também destacou a necessidade de investir em educação e saúde nas comunidades, promovendo orientações sobre primeiros socorros e fortalecendo políticas públicas que ampliem a rede de atendimento, estimulem pesquisas sobre o uso de plantas medicinais e garantam maior disponibilidade do soro antiofídico em áreas remotas.

Palavras-chave: Acidentes ofídicos; Medicina tradicional; Plantas medicinais; Saúde pública.

ABSTRACT:

The study addresses accidents involving venomous snakes, which represent a serious public health issue and were included in 2017 on the list of neglected diseases. The objective was to gather information on the use of medicinal plant extracts and animal-derived substances in the treatment of snakebite accidents, especially in traditional communities with limited access to antivenom therapy.

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In these regions, alternative therapeutic practices based on empirical knowledge and cultural beliefs are widely used. The research showed that traditional knowledge continues to play an essential role due to the difficulty of accessing healthcare services. It also highlighted the need to invest in education and health within these communities, promoting guidance on first aid procedures and strengthening public policies that expand healthcare networks, encourage research on locally used medicinal plants, and ensure greater availability of antivenom in remote areas.

Keywords: Booklet: Snakebite accidents; Traditional medicine; Medicinal plants; Public health.

RESUMEN

El estudio aborda los accidentes con serpientes venenosas, que representan un grave problema de salud pública y fueron incluidos, en 2017, en la lista de enfermedades desatendidas. El objetivo fue recopilar información sobre el uso de extractos de plantas medicinales y sustancias de origen animal en el tratamiento de estos accidentes, especialmente en comunidades tradicionales con acceso limitado a la seroterapia. En estas regiones, las prácticas terapéuticas alternativas basadas en saberes empíricos y creencias culturales son ampliamente utilizadas. La investigación evidenció que el conocimiento tradicional aún desempeña un papel esencial ante la dificultad de acceso a los servicios de salud. Asimismo, destacó la necesidad de invertir en educación y salud en las comunidades, promoviendo orientaciones sobre primeros auxilios y fortaleciendo políticas públicas que amplíen la red de atención, fomenten investigaciones sobre el uso de plantas medicinales y garanticen una mayor disponibilidad del suero antiofídico en áreas remotas.

Palabras clave: Cartilla; Accidentes ofídicos; Medicina tradicional; Plantas medicinales; Salud pública.

1. INTRODUCTION

Brazil is one of the largest countries in terms of territorial extension and, consequently, harbors an immense diversity of fauna and flora, standing as one of the world's leading examples of biodiversity. This diversity includes snakes, popularly known as serpents (Parise, 2016; Anchieta et al., 2023). In this context, the number of accidents involving venomous snakes is high and represents a serious public health concern. In 2017, snakebite envenomation was included in the list of neglected diseases (Smith et al., 2014; Souza, 2024). These incidents pose a constant threat to the daily lives of Brazilians, as studies indicate that a significant number of individuals are affected by venomous snakebites each year. This highlights the importance of public awareness regarding preventive measures, as well as the training of healthcare professionals to respond effectively to such cases (Cunha et al., 2020; Pinto & Pinto, 2019).

Despite the severity of the problem, Brazil provides antivenom therapy, an antidote composed of specific antibodies capable of neutralizing toxins present in

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snake venoms. Each type of antivenom is produced using venom from a specific snake species and must be administered according to the species responsible for the envenomation. Distributed free of charge through the Brazilian Unified Health System (SUS), this treatment should be administered as soon as possible after clinical identification of envenomation, ensuring greater therapeutic effectiveness (Magalhães et al., 2011; Machado, 2018). However, the search for safer and more effective alternatives remains a challenge, particularly because antivenom distribution faces logistical barriers in remote and infrastructurally vulnerable communities, where access to specialized medical care is limited, compromising timely clinical management (Mourão et al., 2015).

Within this framework, many Brazilian populations rely on natural treatments based on ancestral knowledge transmitted across generations. Indigenous, quilombola, and riverside communities, due to their geographic distance from urban centers and restricted access to industrialized medicines, often depend primarily on traditional medicine as their main form of healthcare. Medicinal plants, natural extracts, and ritualistic practices are therefore widely employed in the treatment of various illnesses, including snakebite envenomation, reflecting the deep interconnection between nature, tradition, and health (Neto et al., 2018; Oliveira et al., 2021).

From this perspective, studies such as Manuiama and Lima (2022) have identified plant species with documented antivenom properties, including *Jatropha curcas* (physic nut), *Casearia sylvestris* (wild coffee), *Anacardium occidentale* (cashew tree), and *Stryphnodendron adstringens* (barbatimão). Other plants have also demonstrated relevant effects against the venom of *Bothrops atrox*, such as *Peltodon radicans*, whose compounds inhibit edematogenic activity, and *Marsypianthes chamaedrys*, popularly known as “boiacaá,” a Tupi term meaning “snake herb,” whose leaf extracts exhibit anti-inflammatory and anticoagulant properties (Santos et al., 2021; Magalhães et al., 2011).

Given this scenario, the objective of this study is to survey information regarding the use of medicinal plant extracts and substances derived from terrestrial

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and aquatic animals in the treatment of snakebite envenomation, focusing on traditional communities and populations living in areas with limited or no access to antivenom therapy. In these settings, alternative therapeutic practices constitute the primary form of intervention, grounded both in empirical knowledge transmitted over generations and in beliefs and rituals which, although distinct from scientific knowledge, are faithfully followed by local residents. Thus, this study seeks to understand how such methods are employed, their effectiveness according to the literature, and the cultural and public health implications of their continued use in contexts marked by insufficient access to adequate medical care.

2. METHODOLOGY

This research was characterized as a mixed-methods study (qualitative and quantitative), with a descriptive and exploratory nature, conducted in traditional communities in the state of Amapá. The study included quilombola, riverside, extractivist, and rural populations located in the communities of Aporema (Tartarugalzinho), Cajari (Laranjal do Jari), Bailique, and Oiapoque (Clevelândia and Vila Vitória). The objective was to analyze alternative therapeutic practices employed in cases of snakebite envenomation and to understand the sociocultural factors influencing the adoption of these practices.

The study was approved by the Research Ethics Committee under opinion no. 81928824.3.0000.0003, ensuring compliance with ethical principles governing research involving human subjects.

2.1 Participants and Sampling

The sample consisted of 116 residents from the investigated communities who reported a previous history of snakebite envenomation. Participants were selected through non-probabilistic convenience sampling, based on their availability and prior experience with snakebite incidents. Inclusion criteria comprised individuals over 18 years old, residing in the studied communities, and who provided formal consent to participate in the research.

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2.2 Data Collection

Data were collected through structured and semi-structured interviews conducted in person. The research instrument included eight main questions covering:

- Sociodemographic variables (age, sex, education level, occupation);
- Circumstances of the accident (location, activity being performed, time elapsed until seeking medical care);
- Use of traditional medicinal practices and alternative methods in treatment.

Additionally, health education sessions were conducted with young people and adolescents from the communities, addressing preventive measures, first aid, and risks associated with potentially harmful practices. Although these activities contributed to a contextual understanding of the phenomenon, they were not included in the statistical analysis.

2.3 Data Analysis

Quantitative data were analyzed using descriptive statistics, calculating absolute and relative frequencies to characterize the epidemiological profile of snakebite envenomation. Responses to open-ended questions were subjected to thematic content analysis, allowing identification of categories related to:

- The use of alternative therapies;
- Barriers to access to antivenom therapy;
- Sociocultural influences on therapeutic decision-making.

The integration of quantitative and qualitative findings enabled a more comprehensive analytical approach, linking epidemiological aspects with cultural factors involved in the management of snakebite envenomation in traditional communities in Amapá.

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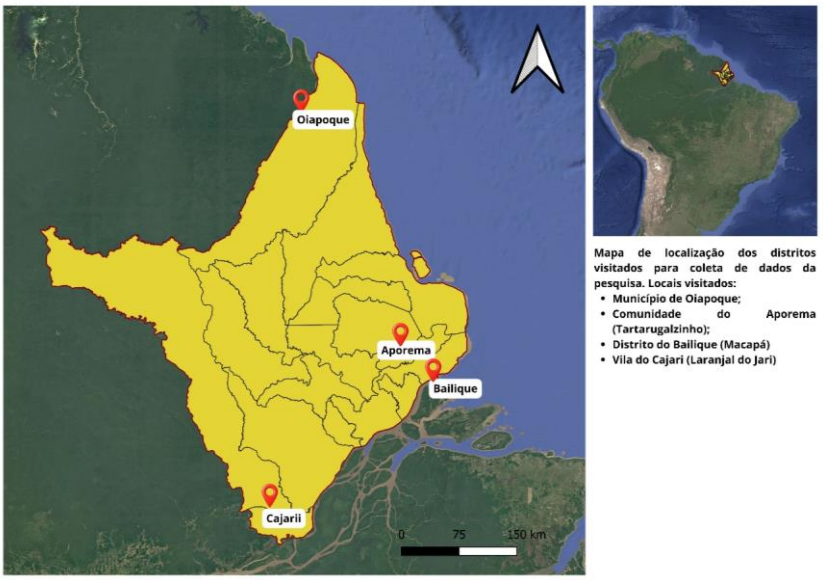
Figure 1 – Map of the locations visited for data collection



3. RESULTS

A total of 116 individuals residing in the communities of Cajari (Municipal District of Laranjal do Jari), Bailique (District of Macapá), Oiapoque, and Aporema (Municipal District of Tartarugalzinho) were interviewed. These communities represent diverse local contexts within the state of Amapá.

Table 1 – Sociodemographic characteristics of the participants

Variáveis	Número	Percentual
Sexo		
Feminino	82	70%
Masculino	34	30%
Total	116	100%
Faixa etária		

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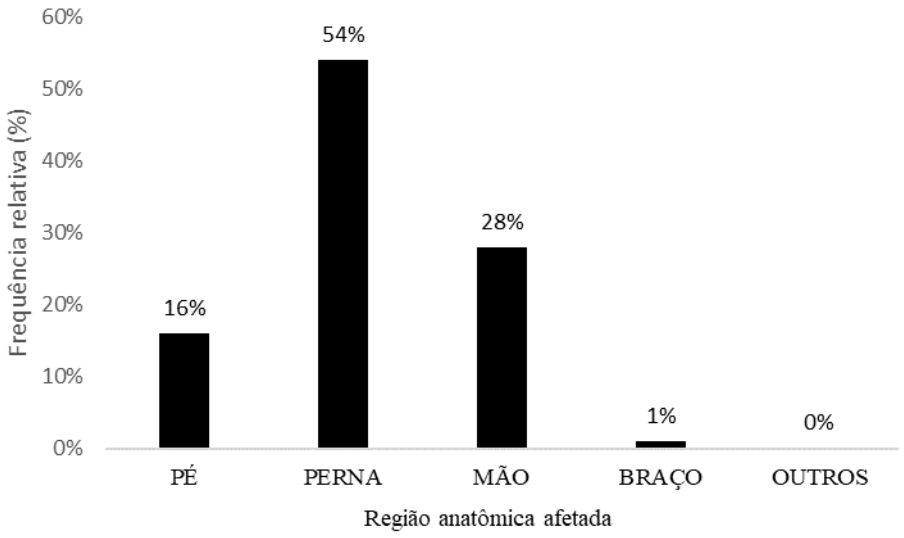
<20	12	11%
20 a 39 anos	47	41%
40 a 59 anos	54	46%
60 ou mais	3	2%
Total	116	100%
Escolaridade		
Analfabetos	28	25%
Ensino Fundamental	59	51%
Ensino Médio	21	18%
Ensino Superior	8	6%
Total	116	100%

Fonte: Dados da pesquisa

Figura 2- Locais do corpo mais atingidos por acidentes ofídicos relatados pelos moradores das comunidades estudadas.



Fonte: Dados da pesquisa

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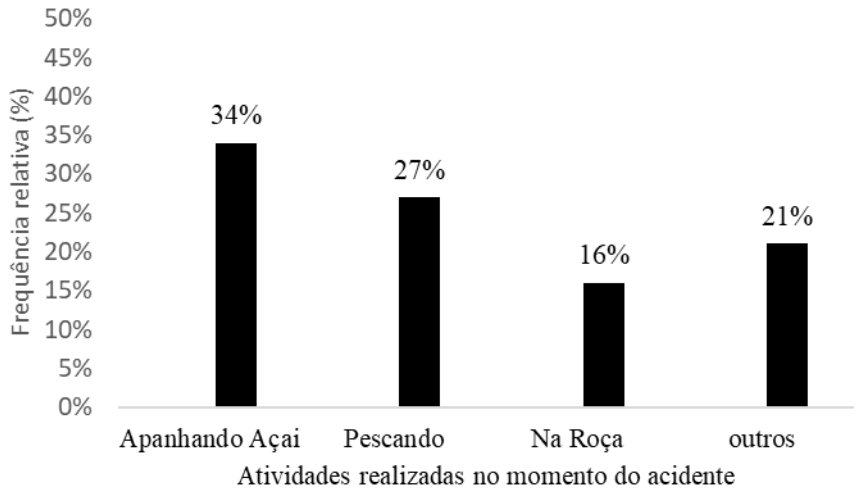
The analysis of snakebite incidents revealed that the lower limbs were the most affected anatomical region, accounting for 54% of cases, followed by the upper limbs, which represented 28% (Figure 1).

Figure 3 – Activities performed by residents at the time of snakebite incidents, according to reports from the studied communities.



Fonte: Dados da pesquisa

Community reports indicate that the majority of snakebite incidents occurred during subsistence activities directly related to the use of natural resources. Açaí harvesting was the most frequently cited activity, particularly in Bailique, representing the most common context: 36 participants (34%) reported snakebite incidents while collecting açaí, reflecting both its central role in the local economy and the risk associated with climbing trees in forested areas. Fishing, primarily concentrated in the communities of Aporema and Bailique, was reported by 28 participants (27%), with incidents involving workers who frequently navigate flooded areas and riverbanks, natural habitats of venomous snakes. Farming activities, highlighted in Cajari, were reported by 17 participants (16%), encompassing both cultivation and movement within dense forest areas. In addition to these productive activities, 22 participants (21%) reported incidents occurring in various daily-life

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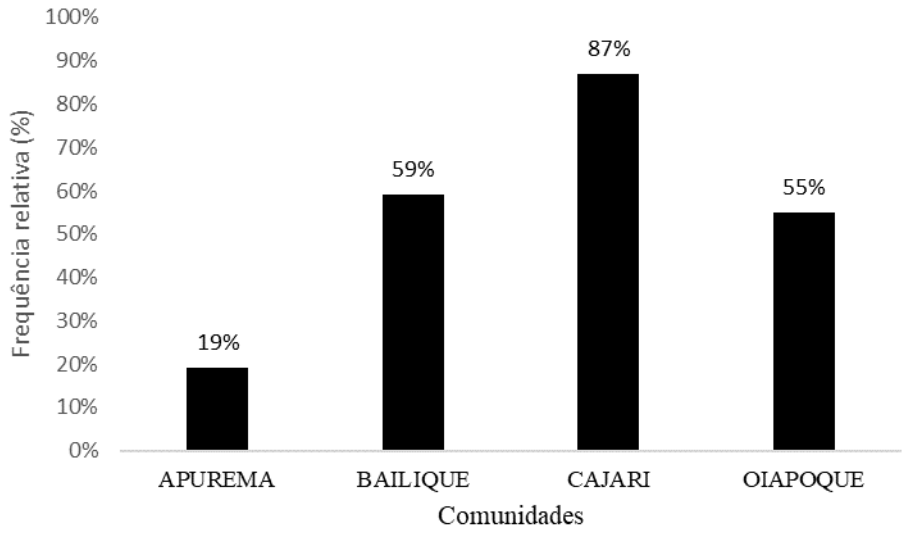
situations, such as casual movements or minor household tasks within forested areas.

3.1 Traditional and Non-Conventional Alternative Treatments Adopted by the Communities

Figure 4 – Distribution of the use of cutting and suction of the bite site as an initial treatment method.



Fonte: Dados da pesquisa

The results revealed the presence of the cutting and suction method as a first-aid practice in snakebite incidents across different communities in Amapá. In the Aporema community, of 32 participants, 6 reported using this procedure, corresponding to 19% of respondents. In Bailique, the frequency was higher: among 46 participants, 27 (59%) stated that they resorted to this method as an initial form of care. More significantly, in the municipality of Cajari, 14 of 16 participants (87%) reported adopting this practice. In Oiapoque, 12 of 22 participants (55%) also mentioned its use.

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Although the cutting and suction method was observed in various communities, its prevalence varied and, above all, it proved ineffective for the proper management of snakebite incidents, potentially posing additional risks to the affected individuals. In the communities of Aporema, Bailique, Cajari, and Oiapoque, adherence to traditional and non-conventional alternative practices appears as an immediate response to the lack of specialized medical support and the limited availability of antivenom. This situation is further exacerbated by difficulties in transportation to healthcare units, delaying access to appropriate treatment. It was also observed that even when formal medical care is sought, many individuals initially rely on these home-based methods as temporary symptom relief until they can reach a health service.

In the specific case of the Bailique Archipelago, this is an isolated community located between 160 and 185 km from the city of Macapá, representing approximately 12 hours of travel by boat. This geographic condition imposes severe limitations on access to proper treatment, leading residents to initially rely on traditional methods as immediate first aid until the Air Tactical Group (GTA) arrives, responsible for emergency rescue and transport. This reality contributes to the continued trust in local knowledge, reinforcing the ongoing use of these practices, either alongside or in place of conventional medicine.

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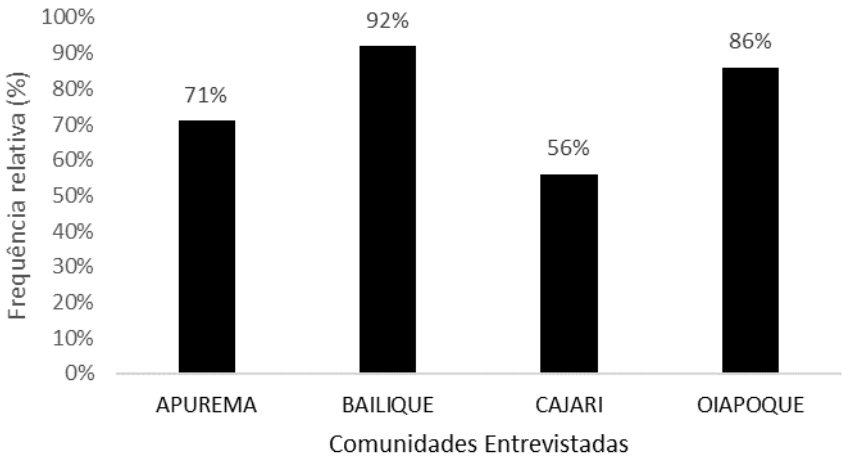
Figure 5 – Comparison among communities regarding the use of the plant *Connarus favosus* in the treatment of snakebite incidents.



Fonte: Dados da pesquisa

The research data indicate that the plant *Connarus favosus* is widely used as a primary treatment in cases of snakebites and other venomous animal incidents within the studied communities. The highest adherence was observed in Bailique, where 92% of the 46 participants reported using the plant, followed by Oiapoque, with 86% of the 22 participants employing this alternative method, Aporema, with 71% of the 32 participants, and Cajari, where 56% of the 16 participants also used the plant as a form of treatment. These findings highlight the significance of traditional knowledge regarding *Connarus favosus* and its application in local folk medicine, underscoring differences in the intensity of use across communities.

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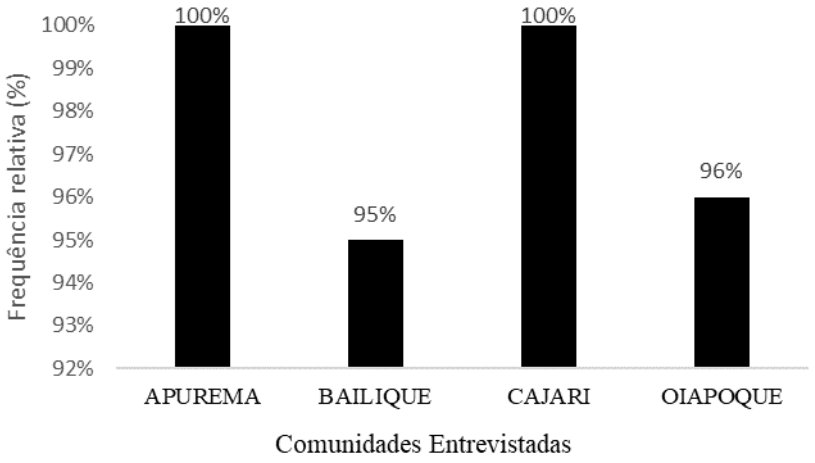
Figure 6 – Comparison among communities regarding the use of tourniquets in snakebite incidents.



Fonte: Dados da pesquisa

High adherence to the use of tourniquets as a first-aid measure in snakebite incidents was observed across the studied communities. In Aporema, all 32 participants (100%) reported using this method; in Bailique, 46 participants (95%); in Cajari, 16 participants (100%); and in Oiapoque, 22 participants (96%). Thus, the tourniquet is widely employed as an initial practice in all locations studied.

For residents, the use of this device is justified by the belief that it prevents the spread of venom to other regions of the body, helping to reduce immediate symptoms. The high frequency of this practice reflects consolidated cultural knowledge transmitted across generations, particularly in rural contexts with limited access to healthcare services.

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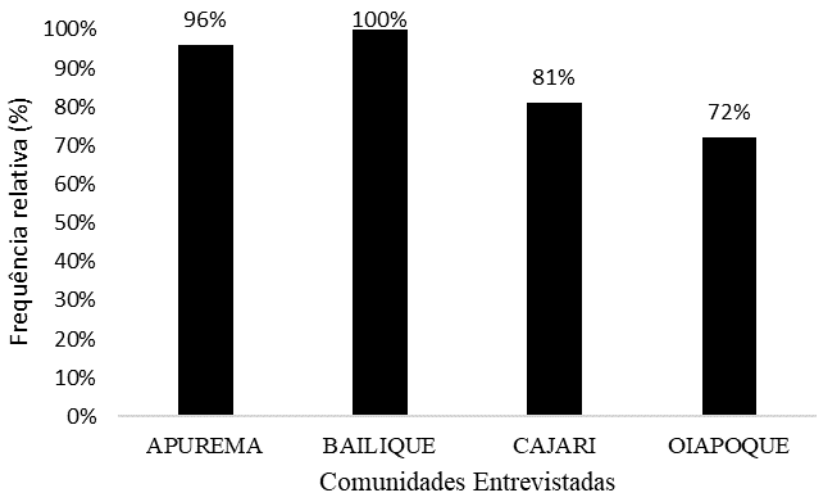
Figure 7 – Comparison among communities regarding the use of the antivenom known as “específico pessoa.”



Fonte: Dados da pesquisa

The use of the home remedy known as “específico pessoa” was reported in all communities as the first-choice treatment for incidents involving venomous species. Adherence was nearly unanimous in Bailique, where all 46 participants (100%) reported using or indicating they would use this remedy. A similar pattern was observed in Aporema, where 32 participants (96%) stated they adopted this practice. In Cajari, 13 of 16 participants (81%) reported using the remedy, while in Oiapoque the proportion was slightly lower, with 16 of 22 participants (72%). These data indicate that, although variation exists among communities, “específico pessoa” remains widely recognized as the primary therapeutic resource for snakebites and other venomous animal incidents.

The high frequency of use of the home remedy “específico pessoa” observed in this study confirms the central role of this treatment within the therapeutic context

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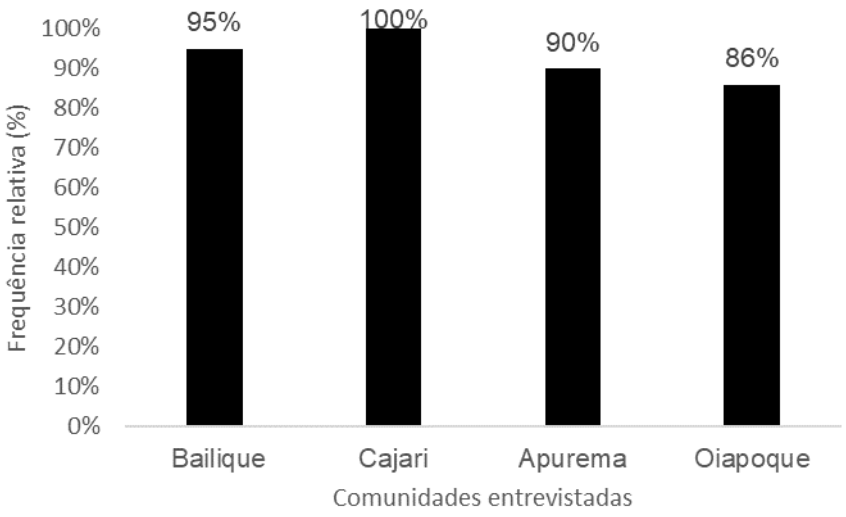
of Amazonian communities. In all surveyed locations, the remedy was reported as the first option in response to snakebite and other venomous animal incidents, reaching 100% adherence in Bailique and 96% in Aporema. These results highlight not only the confidence placed by local populations in this resource but also its cultural significance.

Figure 8 – Comparison among communities regarding the use of antivenom therapy.



Fonte: Dados da pesquisa

The data analysis shows that, although the communities maintain traditional care practices in cases of snakebite incidents, there is a clear willingness to resort to conventional treatment with antivenom therapy if it were available through the primary healthcare network. In Bailique, 95% of the 46 participants stated they would use antivenom; in Cajari, all 16 participants (100%) declared they would seek this treatment; in Aporema, 90% of the 32 participants reported adherence to antivenom use; and in Oiapoque, 86% of the 22 participants indicated they would employ the antidote.

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Table 2 – All alternative treatment methods reported by participants (n = 116)

Tratamentos	Entrevistados
"Específico Pessoa"	*107*
"Chá com folha de jambu"	*8*
""Amarrar cebola encima"	*13*
"Alho com sal"	*6*
"Chá de alho"	*4*
"Urina"	*17*
"Café"	*19*
"Lavar com água e sabão"	*59*
"Vinagre"	*17*
"Corta o local e sugar o veneno"	*60*
"Tabaco"	*14*
"Soro antiofídico"	*116*
"Tomar o féu da paca""	*9*
"Raiz de açaí"	*16*
"Banha de jacuruaru"	*13*
"Lavar com água morna"	*32*
"Lavar com álcool"	*36*

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"Lavar com limão e sal"	*18*
"Tabaco seco em cima pra sugar"	*11*
"Raiz de jatobá"	*7*
"Sumo de barbatimão antes e após"	*9*
"Chá da planta verónica"	*51*
"Planta pirarucu- folha de fortuna"	*4*
"Leite quente"	*7*
"Chá de malvarisco jogar em cima"	*9*
"Babosa"	*23*
"Ovo cozido"	*19*
"Colocar os pés para cima"	*56*
"Chupa o veneno"	*37*
"Argila em cima"	*6*
"Chá de maniva de veado"	*16*
"Tomar sumo do pracaxí"	*28*
"Água com gelo"	*31*
"Jogar gasolina em cima"	*17*
"Chá da folha da carambola"	*16*
"Chá folha de mastruz"	*9*
"Torniquete"	*115*
"Tomar cachaça com escorpião ou a cobra dentro"	*23*

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"Comer o fígado da cobra e amarrar ela encima"	*6*
"Passar óleo do pracaxí pra sarar a ferida"	*95*

Fonte: Dados da Pesquisa

During the interviews, various types of alternative treatments used by residents in cases of venomous animal incidents were reported. These methods correspond to practices typically adopted as a first response, prior to seeking formal medical care.

The data summarized in the following table present the full set of treatments reported by participants, considering the total responses from the four studied communities (Bailique, Aporema, Oiapoque, and Cajari). Each treatment listed corresponds to the absolute number of mentions, aggregated across communities, with no distinction made between individual communities in the table.

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3.2 Educational Intervention: Building Knowledge and Safe Practices in Response to Snakebite Incidents

The educational intervention was conducted through lectures in local community schools, during which a booklet titled *"Guidelines and Prevention in Snakebite Incidents"* was presented. The material covered the main snake species of the Northern region of Brazil, highlighting their morphological and environmental characteristics, and provided guidance on inappropriate practices that should not be used in cases of envenomation, as well as recommended first-aid measures. The importance of promptly seeking hospital care and the use of antivenom as a specific and effective treatment was continuously emphasized.

A total of 80 students participated in the activity, responding to a questionnaire composed of closed-ended questions and two open-ended questions. The first

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question assessed prior knowledge of the term “snakebite incident.” It was observed that 42 students (52.5%) reported familiarity with the term, while 38 students (47.5%) stated they were not familiar with it. Although most participants could identify what constitutes a snakebite, the technical term showed lower recognition, being replaced in everyday language by popular expressions such as “snake bite.”

The remaining questions aimed to explore students’ perceptions regarding appropriate conduct in risky situations in nature, knowledge of possible treatments, and the use of personal protective equipment (PPE) during common community activities, such as hunting, fishing, and fieldwork. The results highlight the importance of contextualized educational strategies capable of bridging technical-scientific knowledge with local language and reality.

The intervention had an informative and formative character, and no post-intervention assessment was conducted using a comparative instrument to quantitatively measure potential changes in participants’ knowledge. Therefore, the presented data refer to the initial diagnostic of prior knowledge. It is recommended that future studies adopt designs incorporating pre- and post-tests to more robustly evaluate the impact of educational actions within traditional community contexts.

4. DISCUSSION

This study adopted a predominantly descriptive approach, aiming to characterize the sociodemographic profile and practices related to snakebite incidents in the investigated communities. No inferential statistical analyses were conducted to test associations between variables, as the study design and sampling strategy were not structured for comparative analytical purposes. Therefore, the interpretations presented should be understood within a descriptive and exploratory framework.

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Table 1 presents descriptive summaries of the social characteristics of the study participants. It was observed that 70% were female, approximately 87% were aged between 20 and 59 years, 51% had only completed elementary education, and 25% were illiterate. These sociodemographic characteristics of the investigated communities indicate that most participants have low educational attainment, particularly incomplete elementary schooling.

This condition may be associated with the fact that many young people leave school early to assume family responsibilities, whether due to early marriage, the need to contribute to household income, or illness among relatives. As a result, activities such as fishing, hunting, agriculture, and açaí harvesting become priorities, reinforcing the link between education level and the type of occupation undertaken (Baldassin et al., 2021; Montimor, 2024).

In this context, a large proportion of snakebite incidents occurred among individuals aged 40–50 years (46% of participants), both men and women who, as heads of households, are more exposed to high-risk environments during work, which favors the occurrence or firsthand knowledge of snake envenomation cases. Notably, men predominantly assume the role of provider, engaging in hunting, fishing, and agriculture, whereas women are largely responsible for household and childcare tasks, reproducing traditional gender roles within these communities (Carvalho & Silva, 2022; Montimor, 2024).

The analysis of the anatomical distribution of bites shows a pattern consistent with the occupational and environmental profile of the investigated communities (Figure 2). The predominance of bites on the lower limbs can be explained by the snakes' crawling habits, whose attack range is limited and therefore tends to affect the legs and feet of individuals moving through forested areas (Souza, 2024; Siqueira et al., 2025).

The socioeconomic and cultural reality of the investigated traditional communities, especially in Bailique and Aporema, directly influences the profile of snakebite incidents. Cases affecting the lower limbs are often associated with

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movements related to hunting, nighttime fishing, and açaí collection, when workers are surprised by snakes along forest trails. Incidents on the upper limbs are mainly related to açaí harvesting, a vital subsistence activity, since the fruit is both a food source and a means of income. In this context, exposure during climbing and manipulation of fruit clusters increases the likelihood of contact with snakes (Barbosa et al., 2024; Siqueira et al., 2025).

Thus, the anatomical distribution of injuries reflects not only the ecology of the snakes involved but also the dynamics of regional subsistence practices, especially hunting, fishing, and, more prominently, açaí harvesting. In this sense, snakebite occurrence is directly related to the lifestyle of the communities, highlighting the need for educational and preventive measures tailored to the local context. Among these measures, the use of personal protective equipment (PPE), such as rubber boots and gaiters, can significantly reduce the risk of envenomation during movement through forested areas (Manuiama et al., 2023; Souza, 2024; Barbosa et al., 2024).

Figure 3 – Activities performed by residents at the time of snakebite incidents, according to reports from the studied communities.

Snakebite incidents reported by the communities are strongly associated with subsistence practices that structure local life. Açaí collection, fishing, hunting, farming, and nut extraction are not only productive activities but also form the economic and cultural basis sustaining families. These practices are transmitted from generation to generation and are essential for food, income, and the maintenance of traditional lifestyles (Schneider et al., 2021; Beck et al., 2022; Ortega et al., 2023).

The activities carried out by community members require direct contact with forests and flooded areas, natural habitats of snakes, and the risk of incidents is closely linked to daily work, reflecting local socioeconomic vulnerability. In addition to productive practices, accidents also occur during routine tasks, such as commuting or household chores, showing that risk exposure extends beyond work

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and permeates daily life, with the territory serving simultaneously as a living and subsistence space (Mise, Lira-da-Silva & Carvalho, 2016; Silva et al., 2020).

Snakebite incidents can therefore be understood in terms of the relationship between the traditional communities' way of life and their environment. These events reflect the constant interaction between productive activities, survival strategies, and direct contact with natural resources. Moreover, they demonstrate how working conditions and the absence of protective measures influence daily exposure to risks, making the context more complex than the mere occurrence of accidents (Mota-da-Silva et al., 2019; Moura et al., 2022).

Figure 4 – Distribution of the use of the cutting and suction method as an initial treatment approach.

The use of traditional methods as a form of treatment in cases of snakebite incidents is widely documented across different regions of Brazil, particularly in rural and riverside communities where access to healthcare services is limited. Studies indicate that the adoption of these practices is associated with cultural factors, the intergenerational transmission of knowledge, and, importantly, difficulties in reaching hospitals that provide antivenom—the specific and effective treatment for such cases (Moura; Mourão & Santos, 2015; Ortega, 2023; Assis et al., 2024).

Among the most common methods are making incisions at the bite site, suctioning the venom, applying tourniquets, using medicinal plants, and consuming alcoholic beverages or home remedies with supposed antivenom properties. Although culturally legitimized, these practices lack scientific evidence regarding their efficacy and, in many cases, can worsen the patient's condition, contributing to local complications such as infections and necrosis or delaying access to appropriate treatment (Melo, 2022; Viegas et al., 2024; Yang et al., 2024).

Research also indicates that even when individuals access the healthcare system, they frequently use these methods as immediate measures to alleviate symptoms until medical support arrives. This behavior highlights the sociocultural relevance of these practices and underscores the need for educational strategies

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that respect traditional knowledge while guiding communities regarding risks and the importance of specialized medical care (Da Silva et al., 2019; Rodrigues, 2022; Santos et al., 2025).

Figure 5 – Comparison among communities regarding the use of the plant *Connarus favosus* in the treatment of snakebite incidents.

The use of medicinal plants as a therapeutic alternative for snakebite incidents is deeply rooted in traditional Amazonian communities. This strategy largely results from limited immediate access to healthcare services and the availability of antivenom in remote regions. In these circumstances, popular knowledge transmitted across generations becomes essential for handling emergencies, with native forest species possessing locally recognized medicinal properties being particularly valued (Moura et al., 2015; Souza et al., 2021).

Among these species, *Connarus favosus* stands out. Administered as a tea or decoction, it is primarily used to relieve local effects caused by snakebites, such as pain, bleeding, and inflammation. This practice reflects both the communities' confidence in natural resources and the cultural importance attributed to the plant, which is regarded as a symbol of resilience and autonomy in the face of limitations imposed by distance from urban centers (Silva et al., 2016; Salehi et al., 2019; Venancio et al., 2022).

From a scientific perspective, experimental studies partially corroborate this traditional knowledge. Research has shown that aqueous extracts of *Connarus favosus* can inhibit hemorrhagic activity induced by venoms from *Bothrops* snakes and possess antioxidant and antimicrobial properties. These findings suggest that the plant contains bioactive compounds capable of neutralizing enzymes such as metalloproteinases and phospholipases A_2, which are responsible for much of the tissue damage and inflammation observed in snakebite incidents (Raclariu et al., 2017; Sharifi-Rad et al., 2018).

Despite its promising potential, it is important to note that most available results are still restricted to laboratory assays and animal models. This means that,

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although empirical use of the plant is well established in traditional practices, there is insufficient scientific evidence to guarantee its efficacy and safety in humans. Therefore, *Connarus favosus* should be understood as a complementary resource that can inspire further research and contribute to the development of therapeutic alternatives, but it does not replace conventional treatments (Mourão et al., 2014; Venancio et al., 2022).

Antivenom remains the primary therapy to neutralize the systemic effects of snake envenomation. In this context, the use of *Connarus favosus* continues to be employed by traditional communities as a complementary resource, reflecting the value placed on popular knowledge and the close relationship of these populations with the forest. This practice demonstrates how traditional knowledge can guide scientific investigations and provide a foundation for the responsible exploration of Amazonian biodiversity, highlighting the importance of documenting ethnobotanical uses before they are lost (Moura; Mourão & Santos, 2015; Barbosa et al., 2024).

Comparison between communities regarding the use of tourniquets in snakebite incidents (Figure 6).

This finding aligns with global studies showing that tourniquet use remains high in remote areas, where access to antivenom or specialized medical care is delayed (Maduwage; Gamage; Gutiérrez, 2024; Barbosa et al., 2024). Systematic reviews of pre-hospital first aid indicate that tourniquet application is one of the interventions that persist the most, despite documented risks.

However, clinical evidence points out that tourniquet use can worsen envenomation outcomes. A study conducted in Chongqing, China, identified the tourniquet as an independent risk factor for increased severity of snakebite incidents (Yang et al., 2024). Adverse effects include ischemia, intensified local tissue damage, and potential exacerbation of the clinical condition.

In Brazil, research involving *Crotalus durissus* envenomations demonstrated that tourniquet application did not reduce toxicity markers, mortality, or severe complications (Amaral et al., 1998; Mahmood et al., 2019). These findings reinforce

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recommendations for evidence-based measures, such as immobilization of the affected limb and rapid referral to specialized medical care.

When confronting the data from this study with the specialized literature, an important dilemma emerges: although tourniquet use is almost universal in the studied communities as an immediate response to snakebite, there is evidence that improper application—due to excessive intensity, prolonged duration, or incorrect indication—can worsen the clinical outcome. Factors such as snake species, venom type, time to treatment, and application technique directly influence patient outcomes (Miato et al., 2024; Vaz et al., 2024).

The persistence of this practice underscores the need for educational programs focused on snakebite first aid. Culturally sensitive and evidence-based health interventions can reduce potentially harmful practices and improve clinical outcomes. This approach enables dialogue between traditional knowledge and biomedical science, prioritizing safety and efficacy in the management of snakebite incidents (Coelho et al., 2013; Da Silva Rodrigues et al., 2022; Souza, 2024).

Comparison between communities regarding the use of the traditional antidote called “Específico Pessoa” (Figure 7).

In ethnobotanical and anthropological literature, “Específico Pessoa” is described as a popular preparation from the Amazon, generally in the form of garrafadas or tinctures made from roots and plant bark. It is widely marketed at local fairs and promoted as a “remedy” for accidents involving venomous animals, such as snake, scorpion, and spider bites. Administration is predominantly oral and may be associated with ritual healing practices. However, its composition lacks standardization, resulting in significant variation in active compound concentrations and making safety and efficacy difficult to define. Preliminary phytochemical studies have identified substances with potential biological activity in some samples, but the results are still incipient and insufficient to support therapeutic or toxicologically safe

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claims (Reichert et al., 2014; Moura; Mourão & Santos, 2015; Santos & Prudencio, 2019).

The intense use of this remedy in the studied communities can be understood from two main dimensions: the cultural, highlighting the intergenerational transmission of traditional care knowledge, and the structural, related to limited access to conventional treatments. Factors such as distance from healthcare centers, transportation difficulties in riverside areas, and trust in community practices contribute to its use as an immediate option. These aspects broadly reflect the complex interaction between local knowledge, health needs, and structural challenges faced by populations in rural and Amazonian contexts (Manuiama & Lima, 2022; Pinto, 2023).

Despite its cultural and symbolic value, the scientific literature clearly indicates that there is no robust evidence supporting the efficacy of “Específico Pessoa” against envenomation. On the contrary, there are potential risks associated with its indiscriminate use, including adverse reactions due to ingestion of unstandardized substances and, above all, delays in seeking medical care. Antivenom remains the only effective and proven treatment to neutralize systemic effects of venom, with delays in administration being a key determinant of clinical outcome severity (Giovannini & Howes, 2017; Cristino et al., 2021; Farias et al., 2024).

The discussion of this remedy, therefore, should not be reductionist but should recognize its cultural and practical role within the Amazonian context. It is essential to understand that for many communities, “Específico Pessoa” represents not only a therapy but also a symbol of autonomy and resilience in the face of limited access to formal healthcare services. In this sense, valuing traditional knowledge should go hand-in-hand with health education strategies, aiming to guide the safe use of cultural practices without compromising the pursuit of proven biomedical care (Cristino et al., 2021; Rodrigues et al., 2023; Barbosa et al., 2024).

Comparison between communities regarding the use of antivenom (Figure 8).

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Antivenom is an immunobiological product obtained through the immunization of animals, predominantly horses, with venoms from medically relevant snakes. The plasma obtained through this process undergoes collection, purification, and formulation steps, resulting in a preparation rich in specific immunoglobulins. Production is carried out in reference institutions, such as the Instituto Butantan and Fundação Ezequiel Dias (FUNED), using venoms from different clinically significant genera—particularly *Bothrops*, *Crotalus*, *Lachesis*, and *Micrurus*—to produce either monovalent or polyvalent antivenoms. Therapeutically, antivenom administration aims to neutralize circulating toxins, mitigate systemic and local effects of envenomation, and significantly reduce morbidity and mortality associated with snakebites (Ferrari, 2024; Instituto Butantan, 2025).

The results indicate a high willingness among the communities to use antivenom if it were available in basic health units (Bailique 95%, Cajari 100%, Apurema 90%, and Oiapoque 86%). This scenario aligns with studies conducted in the Amazon, which show that riverside and indigenous populations, even while maintaining traditional care practices, tend to accept and benefit from antivenom therapy when accessible, recognizing it as a valuable resource that often complements local knowledge. Respectful integration between traditional knowledge and biomedical care is therefore essential to reduce deaths and sequelae resulting from snakebite incidents (Vaz; Brazil & Paixão, 2020; Monteiro et al., 2020; Casséte et al., 2023).

Antivenom is the specific and most effective treatment for envenomation, capable of neutralizing systemic effects and reducing local damage when administered promptly. It reverses hemostatic disorders, prevents progression of neurotoxicity, and decreases mortality, although its effectiveness depends on rapid recognition of the condition and the time elapsed before infusion. Despite being the first-line therapy in moderate to severe cases, challenges persist, including heterogeneity of available antivenoms, risk of adverse reactions, and the need for dose standardization. Additionally, scarcity of access in remote areas remains a

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major barrier to its public health effectiveness (Gutiérrez et al., 2017; Ferreira, 2022; Cosme et al., 2024).

Despite demonstrated efficacy, literature from the Amazonian region highlights logistical and structural barriers that limit timely access to antivenom, contributing to worse outcomes in rural and indigenous populations. Qualitative studies and epidemiological surveys report long therapeutic itineraries involving traditional care, multiple stops, and delays in river or road transport, often resulting in late arrival at referral centers, increased sequelae, and higher complication rates. These coverage and distribution gaps reinforce the direct relationship between decentralized antivenom availability and reduction in case severity (Cristino et al., 2021; Ortega et al., 2023; Cosme et al., 2024).

In traditional communities, antivenom use presents a complex pattern, influenced by beliefs, local practices, and collective experience. Literature demonstrates coexistence between traditional therapies and biomedicine, in which antivenom may be perceived both as a complementary measure and as an indispensable alternative when local methods are ineffective. Qualitative studies with health professionals and research in indigenous contexts indicate that, although dressings, herbal remedies, and rituals remain widely employed, there is receptivity to antivenom therapy, particularly when it is made available locally and implemented in a culturally respectful manner. In this context, acceptance of antivenom tends to increase as interventions demonstrate cultural sensitivity and ease of access (Moura; Mourão & Santos, 2015; Silva de Oliveira et al., 2020; Murta et al., 2023).

Decentralization programs and interventions in primary care units and hubs within traditional and indigenous communities demonstrate potential to redefine the role of antivenom in therapeutic itineraries. Experiences in Brazil indicate that local training, adapted protocols, and stock management logistics enable the safe administration of antivenom outside major centers, reducing delays and transportation costs. Cost-effectiveness studies and implementation reports suggest that expanding access to antivenom in primary care units across the

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Amazon is feasible, cost-effective, and improves clinical outcomes, provided it is accompanied by training, adverse reaction surveillance, and integration with community health practices (Pinto, 2023; Assis et al., 2024; Seabra de Farias et al., 2025).

All alternative treatment methods reported by participants (Table 2).

A diversity of practices was observed, ranging from the use of medicinal plants to physical or spiritual containment methods, reflecting the cultural repertoire of local populations in response to envenomation incidents. Although these practices do not replace antivenom therapy, they represent the first line of action for many community members, highlighting both traditional knowledge and limitations in access to specialized healthcare services.

Several studies conducted in the Brazilian Amazon have shown that riverside and indigenous communities frequently rely on traditional remedies as first aid for envenomation by venomous animals. Commonly reported practices include the use of medicinal plants in the form of teas, decoctions, or macerations, as well as poultices, compresses, application of heat, massages, and in some cases, home remedies such as alcohol or piercing objects. These measures are often adopted immediately, frequently before seeking formal medical care, reflecting the importance of traditional knowledge and the limited access to healthcare services (Maciel et al., 2021; Ramos & Campos, 2025).

Moreover, some traditional remedies have measurable biological effects. In studies conducted in the Santarém region, 24 plant species used against snakebite incidents were identified, whose aqueous extracts reduced *Bothrops jararaca* venom-induced hemorrhagic activity in laboratory tests (Moura et al., 2015). Systematic reviews also indicate that certain plants contain phenolic compounds, such as tannins and flavonoids, which may mitigate venom-induced damage. These treatments are generally used either complementarily to antivenom or prior to medical care, reinforcing their role as first-aid interventions within communities (Liaqat et al., 2022).

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Educational intervention: building knowledge and safe practices regarding snakebite incidents.

The educational booklet aimed not only to inform students but also to train them to share this knowledge with family members, such as parents, uncles, and other community members (Afroz et al., 2023; Peristiowati et al., 2024; Ramos & Campos, 2025).

Educational interventions targeted at schools and adolescents have proven effective in correcting misconceptions and increasing the likelihood of adopting preventive practices and seeking appropriate care. Reviews and evaluations of community programs indicate that multifaceted approaches combining lectures, printed materials, videos, and participatory activities yield better outcomes than isolated interventions, as they reinforce the message in different formats and engage the community continuously. Participatory interventions also tend to enhance local acceptance and sustainability of behavioral changes (Figueiredo, 2021; Vaiyapuri et al., 2022).

The development of supporting materials, such as illustrated booklets and brochures, represents a relevant strategy to strengthen school-based learning and extend knowledge transmission to family and community contexts. When adapted to the sociocultural reality, these resources facilitate comprehension and retention, addressing topics such as snake identification, prevention measures, inappropriate practices, and the importance of antivenom. Additionally, by using accessible language and clear illustrations, these materials serve as pedagogical tools that enable students not only to internalize knowledge but also to share it appropriately with family members and the broader community (Cunha et al., 2020; Figueiredo, 2021).

Guidance on the correct use of personal protective equipment (PPE) and the application of appropriate methods for risk activities is essential to reduce the incidence of snakebites and other hazards in the community. Teaching proper techniques and safe practices, including the use of boots, gloves, and suitable tools, as well as preventive procedures during hunting, vegetation management, or other

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outdoor activities, helps increase personal safety among adolescents. This training not only protects students in risky situations but also promotes the transmission of safe habits to family members and peers, reinforcing a culture of prevention within the community (Mendes et al., 2020; Alqahtani et al., 2022; Da Silva et al., 2022).

CONCLUSION

Throughout this study, it was evident that empirically transmitted knowledge remains relevant within the investigated communities, particularly in the face of limited timely access to healthcare services. The frequent use of traditional practices, including medicinal plants and the so-called “Específico Pessoa,” demonstrates that these resources are employed as initial care strategies in contexts marked by geographic and logistical barriers to antivenom therapy.

The results, descriptive in nature, allowed for the characterization of participant profiles and the identification of the recurrence of alternative therapeutic practices in snakebite incidents. Although the study was not designed to perform inferential analyses of associations between sociodemographic variables and adopted practices, the findings indicate the importance of the sociocultural context in shaping responses to these traumatic events.

Furthermore, the study highlighted the need to strengthen health education interventions, emphasizing appropriate guidance on first aid and the risks associated with potentially harmful practices. Culturally sensitive educational strategies can promote safer use of traditional practices without replacing proper medical treatment.

The findings reinforce the importance of public policies that expand access to antivenom therapy in remote areas and foster intercultural dialogue in health, valuing traditional knowledge without compromising therapeutic safety and efficacy. Future studies with analytical designs may further explore possible associations between sociodemographic profiles and therapeutic choices.

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