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Article

Epidemiological analysis of accidents caused by poisonous animals in the state of Rio de Janeiro from 2019 to 2023

*Análise epidemiológica dos acidentes por animais peçonhentos no estado do Rio de Janeiro entre 2019 e 2023**

Beatriz Domingos Guttierres[1], Débora Loureiro Cintra Schuwarte[2], Luigi Fernandes Barreto[3], Marcos Henrique Barros de Azevedo[4]

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ABSTRACT: Objective: To conduct an epidemiological analysis of accidents involving venomous animals in the state of Rio de Janeiro from 2019 to 2023. **Methodology:** A cross-sectional quantitative and qualitative epidemiological study based on data from the Information System for Notifiable Diseases (SINAN), via DATASUS, for the state of Rio de Janeiro from 2019 to 2023. Variables such as year, month, location, age group, sex, pregnancy, type of accident, time to treatment, final classification, outcome, and use of antivenom were observed. The bibliographic foundation was conducted through databases such as Google Scholar, Scientific Electronic Library Online (SciELO), and PubMed. **Results:** Among the 12.861 recorded cases, 2023 had the highest number (25.93%). A higher incidence was identified in the mountainous region, associated with rural and hilly areas, with seasonality showing peaks in summer and spring. Men aged 20 to 59 were the most affected (62.34%), and hands and feet were the most commonly affected body parts. Spiders (30.1%), scorpions (27%), and snakes (25%) were the main causes. Most cases were classified as mild (65.17%), and 60.6% resulted in recovery. However, more than half of the deaths occurred in mild cases, with 52.94% associated with the lack of antivenom. 58.6% of the treatments occurred within 3 hours, but 7.3% exceeded 24 hours, increasing the risk of complications. Many fields in the notification forms were left blank by healthcare professionals. **Conclusion:** There is a need for health education intervention policies focused on regions, seasonality, and vulnerable populations, as well as improvements in data recording to strengthen surveillance and interventions. Additionally, there is a need to improve the preparedness of professionals in managing these cases, as there are still gaps in the completion of notifications, which jeopardize the quality of analysis for epidemiological surveillance purposes and may indicate gaps in the conduct of the teams in these cases.

KEY WORDS: Poisonous animals; Public Health Surveillance; Compulsory notification; Epidemiologic studies.

RESUMO: Objetivo: Realizar análise epidemiológica dos acidentes por animais peçonhentos no estado do Rio de Janeiro no período de 2019 a 2023. **Metodologia:** Estudo epidemiológico transversal quantitativo e qualitativo, a partir de dados do Sistema de Informação de Agravos de Notificação (SINAN), via DATASUS, referentes ao estado do Rio de Janeiro entre 2019 e 2023. Foram observadas variáveis como ano, mês, localização, faixa etária, sexo, gestação, tipo de acidente, tempo de atendimento, classificação final, evolução e uso de soroterapia. O embasamento bibliográfico foi realizado nas bases de dados Google Acadêmico, Scientific Electronic Library Online (SciELO) e PubMed. **Resultados:** Entre os 12.861 casos registrados, 2023 apresentou o maior número (25,93%). Identificou-se uma maior incidência na região serrana, associada a áreas rurais e montanhosas, e uma sazonalidade com picos no verão e primavera. Os homens de 20 a 59 anos foram os mais afetados (62,34%), e as mãos e pés, as partes mais atingidas. Aranhas (30,1%), escorpiões (27%) e serpentes (25%) foram os principais causadores. A maioria dos casos foi definida como leve (65,17%), e 60,6% culminaram em cura. Entretanto, mais da metade dos óbitos ocorreram em quadros leves, sendo 52,94% associados à ausência de soroterapia. 58,6% dos atendimentos ocorreram em até 3 horas, mas 7,3% ultrapassaram 24 horas, aumentando o risco de complicação. Muitos campos nas fichas de notificação foram deixados em branco pelos profissionais. **Conclusão:** Destaca-se a necessidade de políticas de intervenção em educação em saúde, focadas nas regiões, na sazonalidade e no público mais vulneráveis, além de melhorias no registro de dados para fortalecer a vigilância e a intervenção, e no preparo dos profissionais no atendimento a estes casos, pois ainda há falhas no preenchimento das notificações que prejudicam a qualidade de uma boa análise para fins de vigilância epidemiológica e possíveis lacunas de conduta das equipes nestes casos.

PALAVRAS-CHAVE: Animais peçonhentos; Vigilância em Saúde Pública; Notificação compulsória; Estudos epidemiológicos.

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1. Centro Universitário de Valença-UNIFAA. ORCID: https://orcid.org/0009-0006-7006-786X. E-mail: biaguttierres@gmail.com
2. Centro Universitário de Valença-UNIFAA. ORCID: https://orcid.org/0000-0003-0333-8448. E-mail: drdeboracintra@gmail.com
3. Centro Universitário de Valença-UNIFAA. ORCID: https://orcid.org/0009-0004-6775-9254. E-mail: luigifbarreto@gmail.com
4. Centro Universitário de Valença-UNIFAA. ORCID: https://orcid.org/0009-0002-0899-871X. E-mail: marcoshba2015tk@gmail.com

Correspondence: Beatriz Domingos Guttierres. Rua Paulino de Aquino, 73, Torres Homem, Valença-RJ, Brasil. CEP: 27601-630. biaguttierres@gmail.com.

INTRODUCTION

The control of accidents caused by venomous animals in Brazil has a long trajectory, marked by critical events and significant changes in public health policies. Starting in June 1986, driven by the crisis in antivenom production and the death of a child in Brasília, the National Ophidism Program was established within the National Secretary for Basic Health Actions of the Ministry of Health[1].

This program marked the beginning of a new control period, with the mandatory notification of snakebite accidents and the initiation of data collection on scorpionism and spider bites[2]. The crisis in antivenom production led to the centralization of purchasing and distribution of antivenoms, adjusting quotas based on national demand[3]. Once antivenom production was stabilized, mandatory notification was relaxed, and SINAN (Information System for Notifiable Diseases) was implemented in 1995. However, resistance from counties and states to the new system resulted in a significant drop in reported cases from 1995 to 1998[4].

Accidents involving venomous animals are classified by the World Health Organization (WHO) as neglected tropical diseases and are included in Brazil's List of Mandatory Notifications, reflecting the severity of this health problem[5]. According to the WHO, the main accidents in tropical regions include scorpionism and snakebites, which can result in severe clinical complications and even death[6].

Accidents caused by venomous snakes can lead to local effects such as edema, hemorrhage, and myonecrosis, in addition to severe systemic effects, including hemostatic alterations, systemic bleeding, and cardiovascular and renal damage[7]. Similarly, severe envenomation from scorpion stings can lead to multiple organ failure, cardiogenic shock, and respiratory syndrome, with reports of edema[8]. Additionally, other animal-related accidents are recorded in the country, including spider bites (araneism), lepidopterism (moths and their larvae), hymenopterism (bees, ants, and wasps), and fish stings, among others[1].

The increase in accidents caused by venomous animals in the state of Rio de Janeiro is attributed to ecological imbalances caused by deforestation, climate change, and uncontrolled urban growth. These factors force animals to seek shelter and food in urban areas, changing the profile of accidents, which were previously predominantly rural. Currently, urban areas face higher accident rates than less urbanized zones, reflecting the "urbanization of ophidism"[9].

Thus, this study aims to conduct an epidemiological analysis of accidents caused by venomous animals in the state of Rio de Janeiro from 2019 to 2023 to outline a profile of the prevalence of cases in the region and observe the clinical characteristics of the affected population.

METHODOLOGY

This is a quantitative and qualitative epidemiological study conducted through a cross-sectional design. Data collection was carried out using the Notifiable Diseases Information System (SINAN), made available through the Department of Informatics of the Unified Health System (DATASUS), both under the Ministry of Health. SINAN is a national system for the compulsory notification of diseases and health conditions, including accidents caused by venomous animals. Healthcare professionals from across the country record cases through notification forms, which include detailed information about the patient, the accident, and the treatment. The recorded data is collected, compiled, and made available by SINAN virtually, and can be accessed by anyone on the DATASUS website[10].

For this study, data related to notifications of accidents caused by venomous animals in the state of Rio de Janeiro from 2019 to 2023 were collected. The observed variables included year, month, state administrative division, age group, sex, pregnancy status, bite location, time to medical care (in hours), type of accident, type of snake, type of spider, bite location, antivenom therapy, final classification, and outcome. Some variables were combined to better identify patterns and trends in the data.

Statistical analyses were performed using absolute and relative frequency calculations, and the data were presented in graphs and tables created using Microsoft Excel. For the literature review, the databases Google Scholar, Scientific Electronic Library Online (SciELO), and PubMed were used.

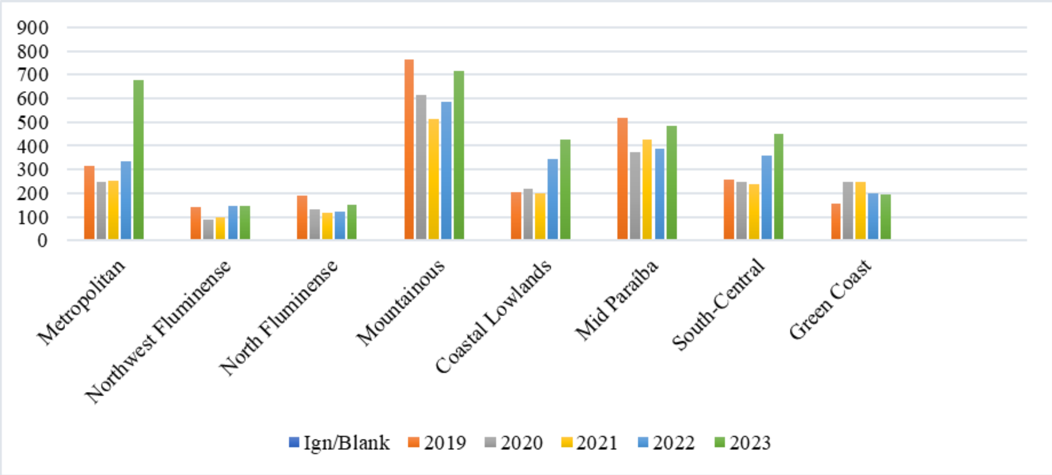
RESULTS

Between 2019 and 2023, reports of accidents involving venomous animals in the state of Rio de Janeiro totaled 12,861 cases, with 2023 recording the highest number (25.93%). Cases varied significantly across the state's administrative divisions. The Serrana region reported the highest number of cases, with 3,189 notifications during the period, as shown in Graph 1. Data analysis revealed a clear seasonal pattern, with peaks in accident notifications occurring during the summer months (January to March) and spring (October to December), as illustrated in Graph 2[10].

Most notifications of accidents involving venomous animals occurred in individuals aged 20 to 59 years, accounting for approximately 64% of the total 12,861 cases, as illustrated in Graph 3. There was a lower number of notifications among children and the elderly. Between 2019 and 2023, accidents predominantly affected men, who accounted for 63% of notifications, while women represented 37% of cases, as shown in Graph 4[10].

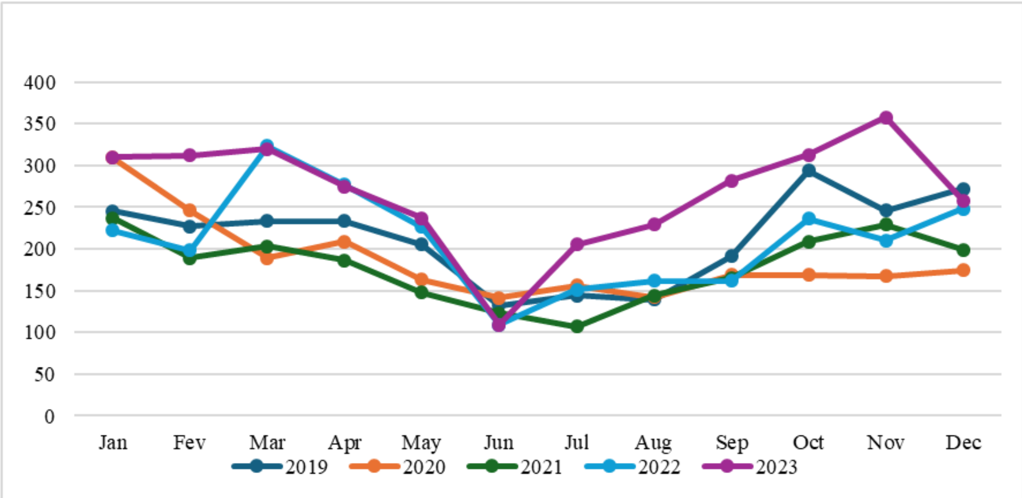
The number of cases involving pregnant women was not significant, accounting for only 0.51% of the total cases (66 pregnant women). However, it is noteworthy that in 9.45% of the total cases, information regarding pregnancy status was ignored, and in 10.6% of cases involving pregnant women, the field for gestational age was also left blank[10].

Between 2019 and 2023, accidents were predominantly caused by spider bites (30.1%), scorpion stings (27%), and snakebites (25%). The hands (21.3%) and feet (24.6%) were the most commonly affected body parts, as shown in Graph 5[10].



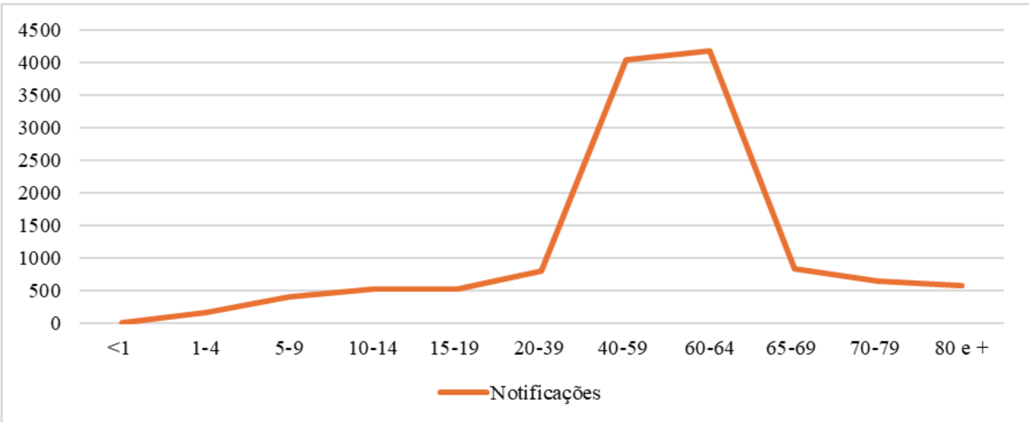
Source: MS/SVS/Notifiable Diseases Information System

GRAPH 1 - Notifications of accidents involving venomous animals recorded in the Notifiable Diseases Information System, by state administrative regions and year of notification, Rio de Janeiro, 2019–2023



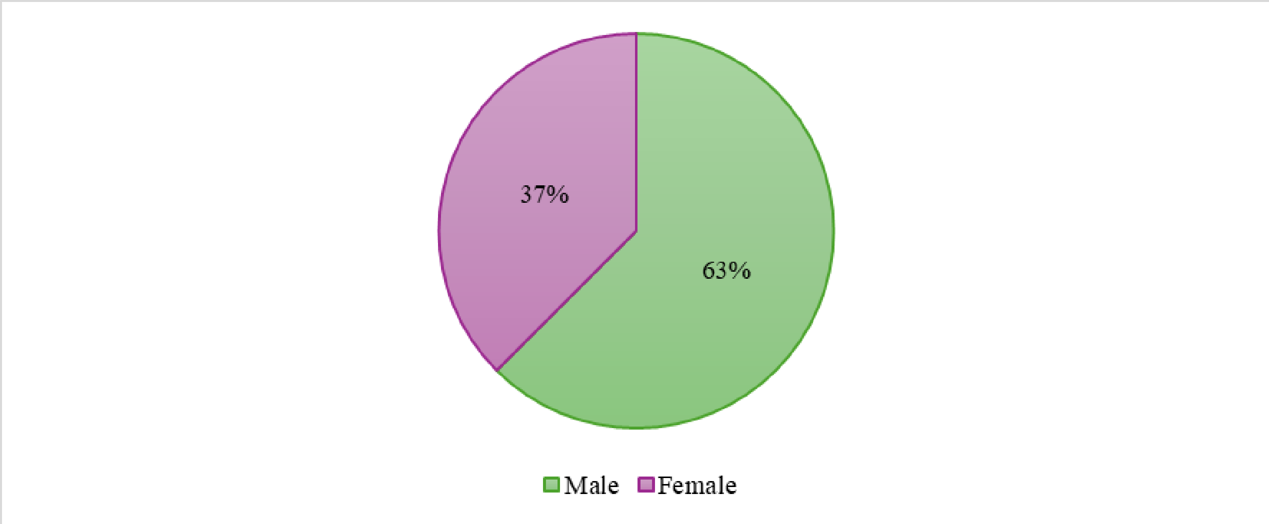
Source: MS/SVS/Notifiable Diseases Information System

GRAPH 2 - Notifications of accidents caused by venomous animals registered in the Notifiable Diseases Information System by year and month of notification, Rio de Janeiro, 2019-2023



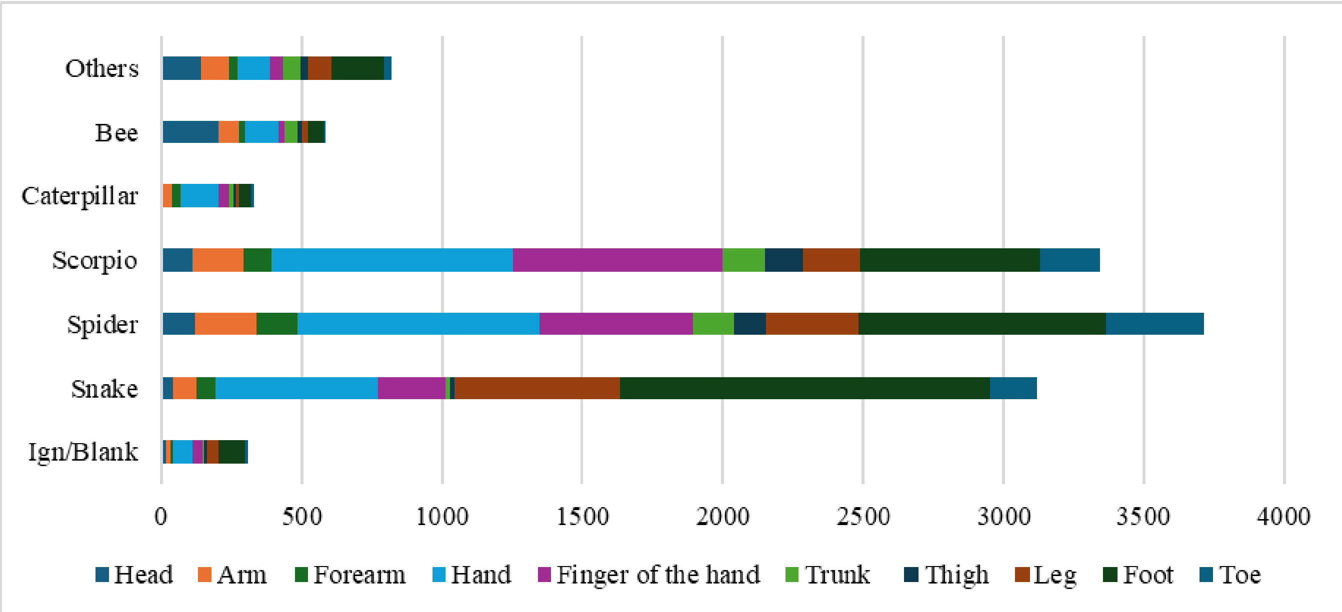
Source: MS/SVS/Notifiable Diseases Information System

GRAPH 3 - Notifications of accidents caused by venomous animals registered in the Notifiable Diseases Information System according to age group, Rio de Janeiro, 2019-2023



Source: MS/SVS/Notifiable Diseases Information System

GRAPH 4 - Notifications of accidents caused by venomous animals registered in the Notifiable Diseases Information System according to sex, Rio de Janeiro, 2019-2023



Source: MS/SVS/Notifiable Diseases Information System

GRAPH 5 - Notifications of accidents involving venomous animals recorded in the Notifiable Diseases Information System, by type of accident and affected body part, Rio de Janeiro, 2019–2023

Furthermore, in Table 1 it is possible to observe that 58.6% of victim care in the state occurred within 3 hours, 7.3% of victims were seen only after 24 hours and 20.4% of cases did not inform the time of care. . Regarding the type of animal responsible, the genus Bothrops (popularly referred to as jararaca) was the most recorded. 80% of notifications of snake accidents in Rio de Janeiro did not specify the type of snake involved. 86.5% of reports of accidents involving spiders also did not specify the type of spider, with the genus Phoneutria (known as armor spiders) being the most insidious[10].

From 2019 to 2023, most cases of accidents involving venomous animals were classified as mild (65.17%), with a smaller proportion of severe cases (2.21%) and 13.47% of cases with missing data. Regarding the clinical outcomes, 60.6% resulted in recovery, while only 0.26% resulted in deaths due to the reported condition, with 39.02% of the data missing. Additionally, 32.35% of patients received antivenom therapy, while 51.26% did not[10].

TABLE 1 - Notifications of accidents caused by venomous animals registered in the Notifiable Diseases Information System, time between bite and treatment, type of snake and type of spider, Rio de Janeiro, 2019-2023

Pickup/service time	Notifications	%	Serpent type	Notifications	%	Spider type	Notifications	%
Ign/Blank	2630	20.45%	Ign/Blank	10316	80.21%	Ign/Blank	11150	86.70%
0 a 1 hours	4272	33.22%	Bothrops	2239	17.41%	Phoneutria	662	5.15%
1 a 3 hours	3273	25,45%	Crotalus	125	0.97%	Loxosceles	519	4.04%
3 a 6 hours	958	7.45%	Micrurus	22	0.17%	Latrodectus	24	0.19%
6 a 12 hours	348	2,70%	Lachesis	6	0.05%	Another species	506	3.93%
12 a 24 hours	439	3,41%	Non-venomous	153	1.19%	-	-	-
>24 hours	941	7,32%	-	-	-	-	-	-
TOTAL	**12861**	**100%**	**TOTAL**	**12861**	**100%**	**TOTAL**	**12861**	**100%**

Source: MS/SVS/Notifiable Diseases Information System

DISCUSSION

Reports of accidents involving venomous animals in Brazil showed an increasing trend between 2019 and 2023, reflecting improvements in epidemiological surveillance systems and environmental factors that heightened the risk of exposure. A study based on data from the Notifiable Diseases Information System highlights that, after steady growth until 2019, there was a reduction in 2020 and 2021, attributed to the COVID-19 pandemic and associated underreporting. However, the resumption of social activities and intensified reporting efforts explain the significant increase in subsequent years, culminating in a peak in 2023[11,12].

The higher prevalence of accidents involving venomous animals in the Serrana region may be linked to its predominance of rural and mountainous areas, which present a higher risk of contact with these animals. Studies demonstrate that regions with similar geographic characteristics, such as hard-to-reach areas with greater wildlife presence, tend to have a higher incidence of accidents, as rural populations are more exposed to natural environments and their inherent risks[13,14,15,16].

Regarding population groups, the age group from 20 to 59 years old concentrates most cases of accidents with venomous animals, as evidenced by national epidemiological studies. This predominance is associated with greater occupational exposure and outdoor activities, especially among men, due to the nature of their work occupations. There is evidence that rural workers and other professionals in risk areas are particularly vulnerable. The extremes of age, such as children and the elderly, although less affected, present a greater risk of complications, reinforcing the importance of health education for the entire population. Improvements in epidemiological data and the expansion of prevention strategies are essential to reduce mortality and morbidity rates resulting from these accidents[17,18,19].

Even though the rate of pregnant women is relatively small, there are cases in the literature of embryological complications due to exposure to toxins that may be related to the trimester of pregnancy, and failure to complete data on gestational age compromises deeper analyzes on the risks to embryonic development, pointing to a significant gap in epidemiological research[16,20,21].

The analysis of the service time demonstrated the effectiveness of the health system in providing assistance, but there are still cases of delays exceeding 24 hours, which can increase the risk of complications. Response time is a critical factor in the management of accidents involving venomous animals. Studies indicate that delays of more than six hours in care increase the risk of complications, such as necrosis, secondary infections and acute renal failure[22,23,24]. Despite good general efficiency rates, significant delays considerably increase the risks to patients' health. Furthermore, the high rate of notifications with this data ignored reinforces the need to improve the collection and recording of information in the health system.

Regarding accident-causing agents, the most relevant, such as snakes, scorpions and spiders, require prevention strategies adapted to the different Brazilian biomes. The high incidence of bites on the extremities of the body is related to manual activities and walking in risk areas, such as the Cerrado and the Atlantic Forest, where snakebites are more frequent. However, the lack of specificity in data on snake genera and species compromises more precise interventions. More than 80% of reports of snake accidents in Rio de Janeiro did not inform the gender of the animal, highlighting the lack of knowledge on the part of the victim or the healthcare team. This limits the correct choice of treatment, since different genera of snakes, such as Bothrops and Crotalus, require specific serums[25,26,27].

Most notifications of accidents involving spiders in Rio de Janeiro also did not specify the gender involved, which does not necessarily reflect a notification problem in itself, but a likely lack of knowledge on the part of the victim or the rescue team. The system did not provide data on the species of scorpions with the highest incidence, even though they are the second most reported type of venomous animal.

The high cure rate found suggests that the available treatment is, in general, effective. However, the analysis of deaths indicates that the majority were associated with mild conditions, which raises concerns about the adequacy of medical management and, especially, about the quality of filling out medical records. Studies indicate that well-prepared clinical records are essential to ensure continuity of care and guarantee the accuracy of epidemiological analyses, and failures in this process can compromise therapeutic outcomes and decision-making[28,29]. Despite the high rate of clinical success and mild cases, the large proportion of missing data on case outcomes and severity suggests a significant need for improvements in documenting case details and outcomes.

Furthermore, the finding that 52.94% of deaths did not use serum therapy highlights gaps in the therapeutic approach, possibly worsened by inconsistencies in records. Ignored data on the use of serotherapy in 16.39% of cases further compromises the analysis of the effectiveness of this essential treatment, highlighting the need for greater rigor in the standardization of clinical information.

CONCLUSION

Finally, the epidemiological profile outlined in the state of Rio de Janeiro between the years 2019 and 2023 of accidents caused by venomous animals highlights the need for intervention policies in health education, professional training and resources focused on the most vulnerable regions and the public during the most susceptible annual periods, focusing on the main animals involved. Although the results point to an efficient health system in dealing with these cases, there are still failures in filling out notifications that undermine the quality of a good analysis for epidemiological surveillance purposes and highlight possible gaps in conduct, from the first consultation to treatment. . In this logic, improvements in documentation and greater training of care and registration teams can contribute to more effective public policies and a reduction in preventable deaths, strengthening surveillance and intervention in cases.

AUTHOR CONTRIBUTION: Beatriz Domingos Guttierres: Structuring the study; collection, analysis and interpretation of data; writing, reviewing and correcting the article. Débora Loureiro Cintra Schuwarte: Bibliographic research, creation of graphs and tables; article writing. Luigi Fernandes Barreto: Bibliographic research, analysis and interpretation of data and writing of the article. Marcos Henrique Barros de Azevedo: Bibliographic research; collection, storage, analysis and interpretation of data; article writing.

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