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Original Article

Epidemiological characterization of accidents caused by venomous animals in Rondônia, Brazil, 2020–2025

Caracterização epidemiológica dos acidentes por animais peçonhentos em Rondônia, Brasil, 2020–2025

Caracterización epidemiológica de los accidentes por animales ponzoñosos en Rondônia, Brasil, 2020–2025

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ABSTRACT

Objective: To describe the epidemiological profile of accidents caused by venomous animals in Rondônia, Brazil, from 2020 to 2025, considering demographic, clinical, and healthcare-related aspects. **Methodology**: Ecological, descriptive, and retrospective study based on secondary data from the Notifiable Diseases Information System. Variables analyzed included year, sex, age group, type of animal, time between the bite and healthcare assistance, severity, and case outcome, using descriptive statistics. **Results**: A total of 8,966 cases were recorded, with higher concentration in recent years. Most cases occurred in males and individuals of working age. Snakes, especially of the genus Bothrops, were the main causative agents. Most patients received care within the first hours after the accident, with a predominance of recovery. However, delayed care and a high proportion of incomplete records were identified, indicating limitations in timely access to health services and in data quality. **Conclusion**: These accidents remain an important public health issue, associated with environmental and occupational factors. Strengthening epidemiological surveillance, improving data quality, and ensuring timely access to healthcare are essential to reduce complications and deaths.

DESCRIPTORS:

Epidemiological Profile; Venomous Animals; Epidemiological Surveillance; Public Health.

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RESUMO

Objetivo: Descrever o perfil epidemiológico dos acidentes por animais peçonhentos em Rondônia, entre 2020 e 2025, considerando aspectos demográficos, clínicos e relacionados ao atendimento. **Metodologia**: Estudo ecológico, descritivo e retrospectivo, com dados secundários do Sistema de Informação de Agravos de Notificação. Foram analisadas variáveis como ano, sexo, faixa etária, tipo de animal, tempo entre a picada e o atendimento, gravidade e evolução, por meio de estatística descritiva. **Resultados**: Foram registrados 8.966 casos, com maior concentração nos anos mais recentes. Predominaram indivíduos do sexo masculino e em idade economicamente ativa. As serpentes, especialmente do gênero *Bothrops*, foram o principal agente. A maioria dos atendimentos ocorreu nas primeiras horas após o acidente, com predomínio de evolução para cura. Entretanto, identificaram-se atendimentos tardios e elevada proporção de registros incompletos, evidenciando limitações no acesso oportuno aos serviços e na qualidade das notificações. **Conclusão**: Os acidentes permanecem como importante problema de saúde pública, associados a fatores ambientais e ocupacionais. Destaca-se a necessidade de aprimorar a vigilância, a qualidade dos registros e o acesso ao atendimento precoce, visando reduzir complicações e óbitos.

DESCRITORES:

Perfil Epidemiológico; Animais Peçonhentos; Vigilância Epidemiológica; Saúde Pública.

RESUMEN

Objetivo: Describir el perfil epidemiológico de los accidentes por animales ponzoñosos en Rondônia, Brasil, entre 2020 y 2025, considerando aspectos demográficos, clínicos y relacionados con la atención en salud. **Metodología**: Estudio ecológico, descriptivo y retrospectivo, basado en datos secundarios del Sistema de Información de Enfermedades de Notificación. Se analizaron variables como año, sexo, grupo etario, tipo de animal, tiempo entre la picadura y la atención, gravedad y evolución del caso, mediante estadística descriptiva. **Resultados**: Se registraron 8.966 casos, con mayor concentración en los años más recientes. Predominaron individuos del sexo masculino y en edad económicamente activa. Las serpientes, especialmente del género Bothrops, fueron el principal agente. La mayoría de los pacientes recibió atención en las primeras horas tras el accidente, con predominio de curación. Sin embargo, se identificaron atenciones tardías y una alta proporción de registros incompletos, evidenciando limitaciones en el acceso oportuno a los servicios de salud y en la calidad de los datos. **Conclusión**: Estos accidentes continúan siendo un importante problema de salud pública, asociados a factores ambientales y ocupacionales. Se destaca la necesidad de fortalecer la vigilancia epidemiológica, mejorar la calidad de los registros y garantizar el acceso oportuno a la atención, con el fin de reducir complicaciones y muertes.

DESCRIPTORES:

Perfil epidemiológico; Animales ponzoñosos; Vigilancia epidemiológica; Salud pública.

INTRODUCTION

Accidents involving venomous animals constitute significant public health problems, especially in tropical countries like Brazil, where environmental, climatic, and socioeconomic factors favor the wide distribution of these animals and human exposure [1-2]. These accidents are responsible for high morbidity and, in more serious cases, deaths, in addition to overburdening health services, especially in regions with difficult access to specialized care [3].

In the Brazilian context, the diversity of venomous species, combined with regional inequalities in access to health services, contributes to variations in the number of cases, severity, and outcomes of care [4-5]. Regions of the Legal Amazon, such as the state of Rondônia, have specific environmental and occupational characteristics, including agricultural activities, extractive activities, and urban expansion in natural areas, which increase the risk of contact between humans and venomous animals [6]. In this scenario, accidents involving snakes, scorpions, spiders, bees, and other animals represent a recurring problem of epidemiological relevance [7]. Epidemiological surveillance of these diseases, through systems such as the Notifiable Diseases Information System (SINAN), allows for the analysis of the behavior of cases over time, as well as the identification of the most vulnerable population groups, the main causative agents and the associated clinical outcomes[8]. Regional epidemiological studies are fundamental to support the planning of prevention actions, organization of the health care network and adequate distribution of antivenom serums[9].

Although there are previous investigations on accidents caused by venomous animals in the state of Rondônia, such as the epidemiological profile described between 2009 and 2019[10] and municipal analyses up to 2021[11], there is a need for updates that include more recent periods. Studies extended to 2022 already indicate temporal variations and an increase in the number of notifications in certain years, suggesting changes in the pattern of occurrence of these accidents[12]. Furthermore, national analyses point to differences between Amazonian regions, including a higher frequency of clinical complications and variations in outcomes, which reinforces the importance of updated local investigations in Rondônia in light of environmental, demographic and health system changes [13]. Thus, it becomes relevant to systematically analyze the behavior of these accidents in the state over the last few years.

OBJECTIVE

To describe the epidemiological profile of accidents involving venomous animals in the state of Rondônia, from 2020 to 2025, contributing to the improvement of surveillance, prevention, and clinical management strategies for these omplications.

METHODOLOGY

Study design

This is an epidemiological, observational, descriptive study with a quantitative approach and a retrospective design, based on the analysis of secondary data from official health information systems.

Study site and period

The study was conducted in the state of Rondônia, located in the Northern region of Brazil, covering all reported cases of accidents involving venomous animals between 2020 and 2025.

Inclusion and exclusion criteria

All records of accidents involving venomous animals reported in the Notifiable Diseases Information System (SINAN) concerning residents of the state of Rondônia, occurring within the period delimited by the study, were included. Duplicate records, incomplete notifications that made the analysis of the main variables unfeasible, and cases concerning individuals not residing in the state were excluded.

Study protocols

A Data collection was carried out by accessing the SINAN database, made available by the Department of Informatics of the Unified Health System (DATASUS). Initially, the category "accidents caused by venomous animals" was selected, with a geographic focus on the state of Rondônia and a period between the years 2020 and 2025.

The selected variables included: year of occurrence, type of animal causing the accident, sex of the affected individual, age group, time elapsed between the accident and health care, classification of the severity of the case, and clinical evolution.

After extraction, the data were organized into spreadsheets, undergoing verification, cleaning, and standardization, in order to ensure the consistency of the information and minimize possible biases resulting from filling errors or underreporting.

Data and statistical analysis

The data were analyzed using descriptive statistics, employing absolute and relative frequencies to characterize the epidemiological profile of the cases. The results were presented as tables and graphs, allowing visualization of the temporal, demographic, and clinical distribution of accidents involving venomous animals in the state.

Ethical aspects

The study was conducted in accordance with Resolution No. 466/12 of the National Health Council, which establishes guidelines and regulatory standards for research involving human beings [14]. Considering that only secondary data, in the public domain and without identification of individuals, were used, there was no need for submission to the Research Ethics Committee or to obtain the Informed Consent Form.

RESULTS

The results of the temporal distribution of notifications of accidents involving venomous animals in Rondônia are presented in Table 1. Variation in the frequency of cases was observed throughout the analyzed period, with the lowest number of cases recorded in 2019 (n=5; 0.06%), resulting from notifications entered into the system later. From 2020 onwards, a higher frequency of cases was

observed, followed by a reduction between 2021 and 2022 and a subsequent increase in subsequent years.

The highest number of notifications was recorded in 2025 (n=1,730; 19.29%), showing a greater concentration of cases at the end of the historical series (Table 1). In total, the analyzed period accounted for 8,966 cases of accidents involving venomous animals in the state of Rondônia.

Table 1. Distribution of reported accidents involving venomous animals according to year of occurrence in the state of Rondônia (2019–2025).

Year of accident	Notifications	Percentage (%)
2019	5	0.06
2020	1,484	16.55
2021	1,334	14.88
2022	1,167	13.01
2023	1,574	17.55
2024	1,672	19.65
2025	1,730	19.29
Total	8,966	100.00

Source: Ministry of Health/SVSA – Notifiable Diseases Information System – Sinan Net.

Table 2 shows the distribution of venomous animal bite cases according to age group, sex, and year of occurrence. A higher frequency of cases was observed in males in all age groups throughout the analyzed period. Accidents occurred at all ages, with a higher concentration in the 20-39 and 40-59 age groups, showing a higher occurrence among individuals of working age. This distribution remained similar throughout the analyzed years. The lowest frequencies were observed at the extremes of age, especially in children under 1 year old and in individuals aged 80 years or older. In general, no relevant variations were observed in the distribution pattern between sexes and age groups throughout the historical series (Table 2).

Table 2. Distribution of cases of accidents involving venomous animals according to age group, sex and year of occurrence, Rondônia, Brazil, 2019–2025

Age Group	2019	2020	2021	2022	2023	2024	2025	Total	Ign	Male	Fem
<1 Year	1	26	15	17	15	19	20	113	1	5,912	3,053
01-04	-	58	51	45	70	101	91	416	-	73	40
05-09	-	65	72	46	82	93	106	464	-	238	178
10-14	1	91	75	73	95	92	113	540	-	268	196
15-19	1	104	101	77	114	123	115	635	-	318	222
20-39	1	526	496	393	481	540	557	2,994	-	390	245
40-59	1	448	390	369	483	519	510	2,720	-	2,028	966
60-64	-	62	61	56	99	72	90	440	-	1,878	842
65-69	-	47	28	39	53	44	69	280	-	292	148
70-79	-	45	37	46	66	66	40	293	-	177	103
80 or +	-	12	8	6	16	16	19	71	1	201	91
Total	5	1,484	1,334	1,167	1,574	1,672	1,730	8,966	-	49	22

Source: Ministry of Health/SVSA – Notifiable Diseases Information System – Sinan Net.

The results in Table 3 show the distribution of accidents involving venomous animals according to the type of animal and their respective genera in the state of Rondônia, from 2019 to 2025. A predominance of accidents involving snakes is observed, with emphasis on records classified as unknown/blank. Among the identified cases, the genus *Bothrops* showed the highest frequency, while *Crotalus*, *Micrurus*, and *Lachesis* contributed with a smaller number of occurrences throughout the analyzed period.

Concerning accidents caused by spiders, a high frequency of records classified as unknown/blank was observed. Among the genera identified, *Loxosceles* and *Phoneutria* had the highest participation, while *Latrodectus* was less frequent. The category "other species" also presented a significant number of notifications (n=494), indicating possible limitations in the taxonomic identification of the offending animal at the time of notification.

As for accidents caused by caterpillars, the unknown/blank category predominated. Among the identified cases, the genus *Lonomia* stood out in relation to the other caterpillars. These findings highlight a high proportion of records without specific identification of the causative agent, which may compromise more detailed analyses of the epidemiological profile and the planning of targeted prevention and control actions (Table 3).

Table 3. Distribution of accidents involving venomous animals according to animal type, gender, and year of occurrence, Rondônia, Brazil, 2019–2025.

Type of animal	Genus / classification	2019	2020	2021	2022	2023	2024	2025	Total
Snake									
	Ignored/In blank	4	905	808	699	1,048	1,142	1,313	5,919
	Bothrops	1	499	467	414	447	425	327	2,580
	Crotalus	–	6	9	1	7	8	7	38
	Micrurus	–	3	1	2	2	10	4	22
	Lachesis	–	7	3	7	12	7	6	42
	Non-venomous	–	64	46	44	58	80	73	365
Spider									
	Ignored/In blank	4	1,363	1,334	1,062	1,414	1,476	1,511	8,046
	Phoneutria	–	29	28	22	37	38	31	185
	Loxosceles	1	29	29	24	37	60	44	224
	Latrodectus	–	2	3	–	4	3	5	17
	Another species	–	61	58	59	82	95	139	494
Caterpillar									
	Ignored/In blank	5	1,455	1,316	1,150	1,550	1,636	1,695	8,807
	Lonomia	–	20	16	9	9	15	14	83
	Another caterpillar	–	9	2	8	15	21	21	76
Overall total	–	5	1,484	1,334	1,167	1,574	1,672	1,730	8,966

Source: Ministry of Health/SVSA – Notifiable Diseases Information System – Sinan Net.

The data presented in Table 4 demonstrate the distribution of time elapsed between venomous animal bites and healthcare assistance in Rondônia, from 2019 to 2025. There is a predominance of care provided within one hour of the bite, corresponding to 38.7% (n=3,469) of cases, evidencing relatively timely access to health services. Next, the interval of one to three hours stands out, with 26.3% (n=2,355), indicating that most care occurred in the first hours after the incident.

Care between three and six hours represented 10.5% (n=946) of cases. The intervals of six to twelve hours and twelve to twenty-four hours corresponded to 4.0% (n=358) and 4.0% (n=354), respectively. Patients treated after 24 hours totaled 7.1% (n=635), representing a group potentially more susceptible to complications. The proportion of records classified as unknown/blank (9.5%; n=849) is also noteworthy, highlighting limitations in the completeness of the information. Regarding clinical evolution, cures predominated, with 8,237 cases registered in the analyzed period. Deaths directly attributed to the omplication were infrequent, totaling 20 cases, while deaths from other causes accounted for only two records. There were also notifications with unknown or blank evolution (n=707), indicating weaknesses in the completion of this variable.

Table 4. Distribution of accidents involving venomous animals according to the time elapsed between the bite and treatment and clinical evolution, Rondônia, Brazil, 2019–2025.

Variable	2019	2020	2021	2022	2023	2024	2025	Total
Bite/treatment								
Ign/In blank	2	94	96	85	188	192	192	849
0 - 1 hours	2	568	524	459	588	623	705	3,469
1 - 3 hours	-	457	366	310	377	422	423	2,355
3 - 6 hours	-	173	161	157	162	157	136	946
6 - 12 hours	-	61	58	57	64	61	57	358
12 - 24 hours	-	33	44	33	96	72	76	354
24 and + hours	1	98	85	66	99	145	141	635
Case evolution								
Ign/In blank	-	103	72	84	78	183	187	707
Cure	5	1,377	1,261	1,079	1,493	1,485	1,537	8,237
Death from the reported complication	-	3	1	4	3	3	6	20
Death from other cause	-	1	-	-	-	1	-	2
Overall Total	5	1,484	1,334	1,167	1,574	1,672	1,730	8,966

Source: Ministry of Health/SVSA – Notifiable Diseases Information System – Sinan Net.

Table 5 presents the distribution of accidents involving venomous animals according to severity classification during the analyzed period. A predominance of mild cases is observed throughout all years, indicating that most patients presented with less complex clinical manifestations. Moderate cases also occurred in a significant proportion, with a relatively stable distribution during the period. On the other hand, severe cases represented the smallest portion of notifications, but are associated with the most unfavorable outcomes. This pattern reinforces the importance of early identification of severity and timely institution of therapeutic measures, aiming at reducing complications and deaths.

Table 5. Distribution of cases of accidents involving venomous animals according to severity classification and year of the accident, Rondônia, 2020–2025.

Final Classifica.	2019	2020	2021	2022	2023	2024	2025	Total
Ign/In blank	1	34	32	42	55	90	78	318
Mild	3	1,070	940	774	1,113	1,167	1,275	6,136
Moderate	1	332	319	307	340	354	354	1,902
Severe	-	48	43	44	66	61	62	308
Total	5	1,484	1,334	1,167	1,574	1,672	1,730	8,966

Source: Ministry of Health/SVSA – Notifiable Diseases Information System – Sinan Net.

DISCUSSION

The occurrence of accidents involving venomous animals in Rondônia reflects an epidemiological context strongly influenced by the environmental, demographic, and occupational characteristics of the Northern region of Brazil[15]. The high biodiversity, associated with the presence of extensive rural areas and the development of agro-extractive activities, favors the interaction between humans and venomous animals, contributing to the maintenance of this condition as a relevant public health problem [16,17]. In addition, typical climatic conditions of the Amazon region, such as rainy periods, can intensify this interaction by altering the behavior and dispersal of these animals[3].

The distribution of cases in male individuals and in economically active age groups reinforces the influence of occupational exposure on the occurrence of accidents, especially in activities carried out in outdoor environments, such as agriculture, livestock farming, and extractive activities [19–21]. This pattern, widely described in the literature, highlights the need for preventive strategies directed at rural workers, including the use of personal protective equipment and educational actions aimed at reducing risk[20-21]. However, the occurrence of cases in other population groups, such as women, children and the elderly, indicates that the risk is also present in domestic and peridomestic environments, requiring more comprehensive preventive approaches[13,23].

With regard to the causative agent, the predominance of snakebite accidents, especially involving the *Bothrops* genus, is consistent with the epidemiological profile of the Legal Amazon, where these events represent the main cause of poisoning by venomous animals[24-25]. However, the high frequency of records classified as unknown or unspecified highlights important limitations in the quality of notifications, which may compromise more detailed analyses and the planning of specific control and prevention actions[26-28]. This scenario reinforces the need for continuous training of health professionals regarding the identification of the etiological agent and the proper completion of notification forms.

The analysis of the time between the accident and the care, associated with the clinical evolution of the cases, highlights the importance of timely access to health services. Early care is directly related to the reduction of severity and lethality, especially through the proper administration of antivenom therapy[29]. On the other hand, the occurrence of late care indicates the persistence of structural barriers in access to care, particularly in remote areas. Factors such as large geographical distances, transportation difficulties and limitations in the organization of the health network can delay care, increasing the risk of complications[30-31]. In this context, the importance of decentralizing antivenom serums and strengthening the emergency care network is highlighted.

Despite the predominance of favorable evolution, with a high cure rate, the deaths recorded demonstrate that these accidents still have the potential for severity, especially when associated with delays in care or greater initial clinical severity[32]. This finding highlights the need to maintain and

strengthen surveillance, prevention, and care actions, with an emphasis on the early identification of severe cases and ensuring adequate treatment in a timely manner.

The trend of maintaining high numbers of cases throughout the period may be related not only to care and surveillance factors, but also to environmental changes resulting from human activity. The advance of deforestation and the expansion of urban and agricultural areas towards natural environments alter the ecological balance, favoring the approach of venomous animals to inhabited areas[24-25]. This process increases the risk of accidents, including in domestic contexts, and reinforces the need for integration between health surveillance and environmental surveillance.

It is important to note that the findings should be interpreted considering the limitations inherent in the use of secondary data from SINAN. The presence of underreporting, inconsistencies, and a high number of incomplete fields can impact the accuracy of the analyses and the interpretation of the results[8]. Nevertheless, the available information allows us to identify relevant patterns in the occurrence of these accidents in the state, highlighting weaknesses in the quality of records and the need to improve surveillance systems. Strengthening the completeness and reliability of notifications is fundamental to supporting health planning, especially regarding the distribution of antivenom, the organization of the healthcare network, and the definition of more effective prevention strategies.

Study Limitations

This study presents limitations inherent to the use of secondary data from the Notifiable Diseases Information System (SINAN), which are subject to underreporting, incompleteness, and inconsistencies in data entry. The high proportion of records classified as "ignored" or "in blank" in relevant variables, such as identification of the attacking animal and time between the accident and treatment, may compromise more detailed analyses and the accuracy of the estimates. Furthermore, the absence of some variables of interest in the system, such as the area where the accident occurred, limits spatial assessment and comparison between urban and rural areas. Finally, this is a descriptive study, which makes it impossible to establish causal relationships between the factors analyzed and the occurrence of accidents.

Contributions of the Nursing Area, Health or Public Policy

This study highlights the relevance of the findings for strengthening nursing practices, organizing health services, and improving public policies aimed at surveillance and management of accidents involving venomous animals. The epidemiological characterization presented allows nursing to understand more precisely the most exposed population groups, the periods of greatest occurrence, and the main agents involved, supporting the planning of educational, preventive, and care actions based on evidence.

In the context of care, the results reinforce the strategic role of nursing in the early identification of the severity of cases, in qualified reception, and in the speed of referral for antivenom therapy, especially considering the time between the bite and the care as a determining factor for clinical evolution. The predominance of cases in adults of working age and in males highlights the need for interventions directed at the economically active population, with an emphasis on guidance on prevention in the home and work environment.

For public health, the findings contribute to improving epidemiological surveillance by highlighting temporal patterns and occurrence profiles that can guide the strategic distribution of antivenom serums and the organization of the care network, especially in regions with a higher occurrence of cases. The identification of filling errors, expressed by the high number of records classified as ignored or blank, also signals the need for continuous training of health professionals regarding the correct recording of notifications.

In the field of public policies, the study provides subsidies for the formulation and strengthening of intersectoral strategies aimed at preventing accidents caused by venomous animals, including permanent educational actions, improvements in timely access to health services, and investments in the structuring of primary care and emergency care. Thus, the results can contribute to reducing morbidity and mortality associated with these injuries and to strengthening the Unified Health System in addressing a problem that is relevant to regions of high biodiversity, such as the state of Rondônia.

FINAL THOUGHTS

The data demonstrate the persistence of these injuries as a relevant public health problem, predominantly affecting individuals of working age, with a higher occurrence in males, and a high proportion of snakes and spiders among the causative agents. Analysis of the time to treatment reinforces the importance of timely access to health services for reducing complications and deaths. This information contributes to guiding surveillance, prevention, and healthcare network organization actions, especially in regions with a higher risk of occurrence, supporting strategies aimed at reducing morbidity and mortality associated with venomous animal accidents in Rondônia.

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