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# Clinical-epidemiological profile of snakebite accidents in Brazil

Perfil clínico-epidemiológico de los accidentes por mordeduras de serpiente em Brasil

Perfil clínico-epidemiológico dos acidentes ofídicos ocorridos no Brasil

## ABSTRACT

**Objective.** Analyze scientific articles in online journals about the epidemiological aspects of snakebites in Brazil, to obtain better and more accurate information on the subject. **Method.** Descriptive research outlined on an integrative literature review. The steps were: formulation of the guiding question, search for studies in all databases indexed to the BVS, SciELO and PubMed. **Results.** 105 articles were found and 29 were elected for data collection. Most of the studies were in the Northeast and North regions, during the period 2007 and 2011. About the victims, most of them are male, live in rural areas and are in the age group of 20 to 49 years. **Conclusion.** Ophidianism is still a public health problem in Brazil that lacks studies and actions focused on the topic based on its associated risk and protection factors, in order to minimize this damage in the national scenario.

**DESCRIPTORS:** Snake bites; epidemiology; snakebite; Health Services Research.

## RESUMEN

**Objetivo.** Analizar artículos científicos en revistas en línea sobre los aspectos epidemiológicos de las mordeduras de serpientes en Brasil, para obtener información mejor y más precisa sobre el tema. **Método** Investigación descriptiva delineada en una revisión integradora de la literatura. Los pasos fueron: formulación de la pregunta orientadora, búsqueda de estudios en todas las bases de datos indexadas a la BVS, SciELO y PubMed. **Resultados.** Se encontraron 105 artículos y se eligieron 29 para la recolección de datos. La mayoría de los estudios se realizaron en las regiones Nordeste y Norte, durante el período 2007 y 2011. Sobre las víctimas, la mayoría son hombres, viven en áreas rurales y se encuentran en el grupo de edad de 20 a 49 años. **Conclusión.** El ofidionismo es todavía un problema de salud pública en Brasil que carece de estudios y acciones enfocadas en el tema con base en sus factores de riesgo y protección asociados, a fin de minimizar este daño en el escenario nacional.

**DESCRIPTORES:** Picaduras de serpiente; epidemiología; mordedura de serpiente; Investigación sobre servicios de salud.

## RESUMO

**Objetivo.** Analisar artigos científicos em periódicos on-line acerca dos aspectos epidemiológicos dos acidentes ofídicos no Brasil, para se obter melhores e mais precisas informações acerca do assunto. **Método.** Pesquisa descritiva delineada sobre uma revisão integrativa da literatura. Os passos foram: formulação da pergunta norteadora, busca de estudos em todas as bases de dados indexadas à BVS, SciELO e PubMed. **Resultados.** Foram localizados 105 artigos e 29 foram eleitos para coleta de dados. A maioria dos estudos foi na região Nordeste e Norte, durante o período de 2007 e 2011. Sobre as vítimas, a maior parte é do sexo masculino, reside em zonas rurais e está na faixa etária de 20 a 49 anos. **Conclusão.** O ofidismo ainda é um problema de saúde pública no Brasil que carece de estudos e ações voltadas ao tema a partir de seus fatores de risco e proteção associados, a fim de minimizar esse dano no cenário nacional.

**DESCRIPTORIOS:** Mordeduras de serpentes; epidemiologia; mordida de cobra; Serviços de saúde Pesquisa.

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**INTRODUCTION**

**S**nake attack or snakebite is the poisoning situation resulting from the inoculation of a venom and represents a public health problem that deserves to be highlighted for causing great morbidity and mortality, especially in tropical countries like Brazil.<sup>1</sup> In relation to epidemiology, snake poisonings account for approximately 125 thousand deaths annually in Brazil.<sup>2</sup> It is important to highlight that these numbers are underreported, since in Brazil there are still regions with difficulty in accessing health services, especially in the Amazon. Therefore, it is to be expected that there will be difficulty in accessing medical care and, therefore, data recording.<sup>3</sup>

Incidence and morbidity and mortality rates are striking, but this damage to health is still recognized by the World Health Organization (WHO) as a neglected tropical disease.<sup>4,5</sup> It generally affects populations in remote and rural areas, urban slums or conflict zones. As most of those affected have little political voice, neglected tropical diseases have a low impact on the priorities on the public health agenda, which causes, in addition to the little practical focus on the problem, a deficient scientific production on the subject, despite the fact that the issue has a great influence on the health and quality of life of individuals.<sup>4</sup>

Based on the relevance of the theme, this study aimed to present an integrative literature review that will allow a characterization of the clinical and epidemiological profile of snakebites that occurred in Brazil during the period 2009 to 2019. With this, this work will contribute to investigate the existing gaps about the subject and thus contribute to the scientific community.

**METHOD**

This is a descriptive study with an outline based on an Integrative Literature Review. Based on the guiding question "What is the scientific production existing in the national scenario about the theme of snakebites and epidemiological aspects in Brazil?", A search for studies was carried out in all databases indexed to the VHL, SciELO and PubMed with the descriptors : in Portuguese: mordeduras de serpentes or acidentes ofídicos; epidemiologia; in English: snakebite; Health Services Research; epidemiology. The inclusion criteria were articles available in full and free of charge, in Portuguese and English; published in the period from 2009 to 2019; and works found in the form of thesis, dissertation, editorials and abstracts were excluded. The search was limited by selecting articles involving human beings. To better obtain the information from the articles, an instrument for data collection

was used, as published by Souza, Silva and Carvalho (2010). 6 (Annex 1) In addition, it should be noted that the PRISMA methodology was followed 7 and the study was carried out by two independent researchers.

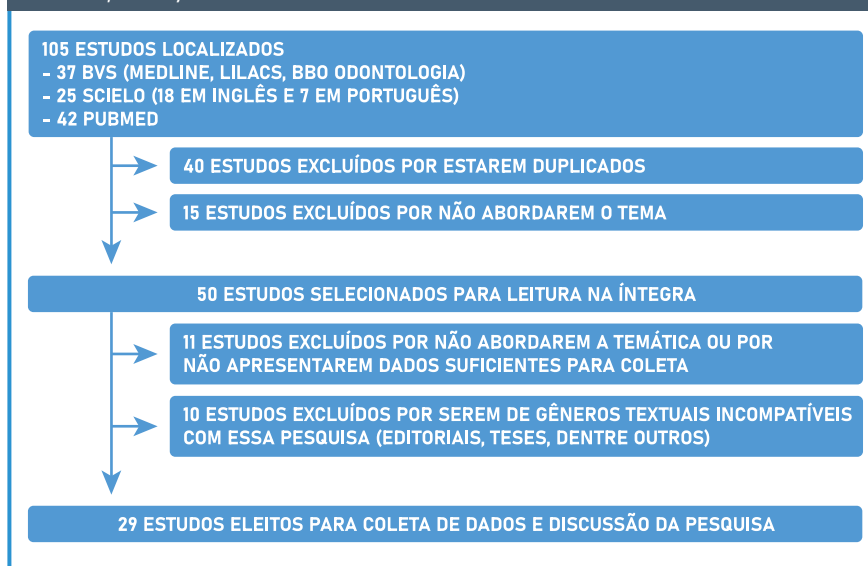
**RESULTS**

105 studies were found. After applying the inclusion and exclusion criteria, duplicate articles were excluded, those that did not address the topic or presented insufficient data for collection. From this, 29 final studies were obtained. (Figure 1)

**SELECTED STUDIES**

Each article brought information about snakebite accidents in a given Brazilian region from 1945 to 2019, since the studies provided epidemiological data and, therefore, present information from periods prior to the date of publication. Most arti-

Figure 1. Flowchart of study selection for analysis (Source: prepared by the authors, 2020)



cles studied the year 2010, with about 20 articles produced over that period. Other years with a major focus of study on the topic were 2007 to 2009 and 2011, with approximately 15 studies on each year. In addition, based on such data, a constant drop in the approach to the theme was also noticed since 2014. (Graphic 1)

As for the Brazilian regions studied by each article, scientific publications were given, above all, about the Northeast region, with 38% of the articles and in the North region, with 27%. In the South region, there was no study on the subject.

Regarding the number of snakebite accidents reported by the studies, there were a total of 125.098 cases, most of which were male victims (73,62%), while female victims accounted for 23,8%. In 2,58% of the reported cases, there was no gender classification. Regarding the most prevalent age group of victims of snakebites, a detailed observation cannot be made, since each article used a different reference to address ages more broadly. However, it is possible to observe a trend towards the prevalence of young adults and adults.

Most studies did not mention the severity of accidents (76,71%). However, 13,93% of the cases were reported as mild, 7,62% as moderate and less than 2% as severe. When the ignored data are excluded, the proportion of each degree of severity is more evident: 59,8% mild, 32,7% moderate and 7,5% severe.

Regarding the clinical evolution, it was

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reported that 20,90% of the cases evolved with complete cure, whereas death and evolution with sequelae occurred in less

than 1% of the cases in each. In 78,75% of cases, clinical evolution was ignored. Isolating this ignored part, we have that of the reported cases, the great majority (97,27%) obtained complete cure, 1,16% evolved with death and 1,57% with sequelae. The profile of the cases also pointed out that most accidents occurred in rural regions, with 60,77% of the cases. The urban area accounted for 12,4% of the cases and the periurban or unidentified, with 26,83%. Another data collected was about snakes: the accidents occurred mainly with *Bothrops* genus, followed by crotalic and laquetic accidents. Many articles did not show the genus or species, which made it difficult to systematize the information.

## DISCUSSION

Ophidian accidents represent a serious public health problem in tropical countries, due to the frequency with which they occur and the morbidity and mortality they cause. In South America, Brazil is the country with the highest number of accidents with about 20.000 cases per year.<sup>8</sup> Therefore, the relevance of this study is evident.

From 29 articles selected according to the specified methodology, 125.098 cases of snakebites were reported between 2009 and 2019 in Brazil. The snake mostly described as the causer was of the *Bothrops* genus, since it is present throughout the national territory, followed by the crotalic and laquetic genus. In most studies, data on non-venomous species has not been described.

Most accidents involved male victims and of working age. The probable cause of this is the greater number of men performing activities that expose them to accidents, such as extractive activities.<sup>9</sup> As for the area where accidents occurred, it was mostly described as rural. However, there was great emphasis on periurban or unidentified regions. As for the rural area, the data obtained were as expected: they are, of course, the regions in which there is a greater existence of snakes in contact with

Graphic 1 – Period of epidemiological data studied by the articles (Source: prepared by the authors, 2020)



humans, due to the activities carried out in rural areas. Regarding the emphasis on peri-urban or unidentified regions, there are two hypotheses for this: many unidentified rural regions or an increase in the incidence of cases in peri-urban regions, given the synanthropization of these animals due to changes in ecosystems. One of these changes can be described as the increase in the amount of domestic waste produced and precariously conditioned in these regions, where a large part of the pockets of poverty are located, which attract rodents and their main predators: snakes. This last hypothesis demonstrates that cities need more organization, planning and infrastructure, to avoid the synanthropization process, since it brings losses to the population, such as the occurrence of snakebites.

The lower limbs were the regions most affected, followed by upper limbs, with this pattern being followed by all selected articles. This fact can be explained by the fact that they are more exposed and active regions of the body, in addition to demonstrating the absence of adequate individual protection in many cases - which could prevent such accidents.<sup>10</sup> With regard to the severity of accidents, in most studies this was ignored. However, when there was a report, the occurrence was mild, followed by moderate and severe cases. Although severe cases have a low occurrence, it should be noted that there are patients who take several hours to seek care due to difficulties in accessing health services, for example, especially in remote areas, which impairs the prognosis of victims, especially in the most severe cases.<sup>11</sup>

The clinical evolution of the victims follows the pattern of the severity of accidents: in most cases there was no report, but when it was, complete cure was highlighted and a minority evolved with death or cure with sequelae. The lack of data and research on this specific issue is worrying, since the analysis of evolution is important to assess in a general way whether the treatment of patients has occurred efficiently and is consistent with the expected severity of accidents.

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Orienting the discussion to the selected studies, greater scientific production was perceived in the Northeast and North regions, since they have a higher incidence of cases. It is also important to highlight at this point that these regions most affected are also the least economically balanced and developed and the main risk group for snakebites is impoverished rural farmers, which corroborates for less investment in research and actions on the subject. Rural and/or economically disadvantaged populations generally have little visibility and victims find it difficult to influence administrative policy makers to act on this health damage. As a result, snakebite remains on the WHO list of Neglected Tropical Diseases, receiving little attention from the global health community, the pharmaceutical industry, governments and having low priority on the global health research agenda.<sup>12</sup>

The other Brazilian regions had less prominence in publications, having, for example, the South region with no study. However, it would be important to have data on the region, to ascertain if there was really no change in the pattern of a few cases during the investigated period of ten years.

Regarding the years studied for each article, a large number of publications were noticed between the years 2007 and 2011, with approximately 15 articles about each year, with a peak in the year 2010. However, the number of studies has been decreasing in the last few years, with an increasing fall from 2014, reaching, for example, the publication of only one article in 2018. This fact is very worrying, since these accidents are still a relevant public health problem, which deserves attention and needs cease to be considered neglected, due to its impact on the population's quality of life.

A limitation of the present study is related to the high proportion of ignored or blank variables, especially for those that refer to the gender of the snake, the severity and clinical evolution of the cases and the area where the accident occurred, as well as time of care and administration

serum. This information is essential to assess the need for serum in each region, to guide which regions deserve more attention and, regarding the length of care, it is important to verify that the victims are receiving assistance with an adequate maximum period and also to investigate the implication between that time and the clinical evolution and severity of the patients. With the lack of this information, it is difficult to systematize the data and obtain discussions on the subject.

Another factor that is characterized as a limitation of the study is the lack of research in certain areas, especially the most remote ones. Thus, epidemiology ends up neglecting aspects of these areas and obtaining data that may not match all realities, which makes specific health actions difficult. In addition, it is essential to emphasize that underreporting also influences the interpretation of the study. When compared to the South and Southeast re-

gions, the Northeast still has higher rates of underreporting.<sup>11</sup>

In order to remedy the gaps evidenced, scientific productions are suggested that better address aspects that are often overlooked in research, such as administration of serum, length of service and better specified clinical evolution. The purpose of such a suggestion is to minimize the large proportion of ignored or blank variables, to improve the quality of information and expand knowledge on the topic.

A greater number of studies is also suggested, as the number of studies has been decreasing over the years, which makes it difficult to raise awareness about this damage to health. In this sense, even, it would be essential to carry out more research addressing remote areas, since they are the regions most affected. For these studies, the use of data from the Information System for Notifiable Diseases, Sinan, is suggested, obtaining quality in-

formation, so that the real dimension of the problem can be traced in the various spheres of management of the Unified Health System.<sup>11</sup>

## CONCLUSION

Ophidian accidents are a public health problem in Brazil. It mainly affects men of working age, residents of rural and peri-urban areas and who probably do not use personal protective equipment. Most accidents are caused by snakes of the genus *Bothrops*, with moderate severity and evolution to complete cure. Scientific production on the subject has been decreasing over time and, for the most part, addresses the Northeast region of Brazil. Due to the morbidity and mortality caused by snakebites, high rates of incidence in the Brazilian scenario and scarcity of studies in recent years, it is necessary to focus more on the topic in question. ■

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