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The role of the emergency physician in snakebite accidents caused by snakes of the genus *Bothrops:* a literature review on clinical conduct and use of antivenom

Emergency physician's attention to ophthalmic accidents due to snakes of the Bothrops genus: a bibliographic review on clinical conduct and use of antivenom serum

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Summary

Snakebites continue to be a significant public health problem in Brazil, especially in rural and tropical regions. Among venomous snakes, the Bothrops genus—responsible for a large proportion of recorded cases—causes potentially serious envenomations that require immediate medical intervention. This study aimed to review the scientific literature on the role of emergency physicians in snakebites caused by Bothrops, focusing on clinical procedures and the use of antivenom as the primary therapeutic measure. This is a narrative literature review, searching for articles in the PubMed database using the descriptors "Bothrops," "snakebites," "antivenins," and "emergency medical services." Studies published between 2015 and 2025, available in full, in English or Portuguese, that addressed clinical and therapeutic aspects of Bothrops snakebites were included. The results indicate that rapid and precise intervention by emergency physicians is essential to reduce complications, with antivenom being the treatment of choice, combined with clinical support and continuous patient monitoring. Furthermore, the importance of professional training and adequate healthcare infrastructure is highlighted, especially in hard-to-reach areas. The conclusion is that management based on updated protocols and timely access to antivenom are crucial for improving the prognosis of patients injured by Bothrops.

Keywords: snakebites; Bothrops; medical emergency; antivenom; clinical conduct.

Abstract

Ophidic accidents continue to be a relevant public health problem in Brazil, especially in rural and tropical regions. Among the small snakes, the Bothrops genus — responsible for the large part of two recorded cases — causes potentially serious poisonings, requiring immediate medical intervention. This work aims to review the scientific literature in respect of the work of emergency physicians in accidents caused by snakes of the Bothrops genus, with a focus on clinical conduct and the non-use of antivenom as the

main therapeutic measure. This is a narrative bibliographic review, searching for articles in the PubMed database, using the descriptors “Bothrops”, “snakebites”, “antivenins” and “emergency medical services”. These include studies published between 2015 and 2025, available in full, in English or Portuguese, that address clinical and therapeutic aspects of botropic events. The results indicate that rapid and accurate intervention by the

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emergency physician is essential to reduce complications, using antivenom or choice treatment, allied to clinical support and continuous monitoring of the patient. Furthermore, the importance of professional training and the adequate structure of health services is highlighted, especially in regions with difficult access. It is concluded that conduct based on updated protocols and timely access to serum are determinants for the better prognosis of patients victims of accidents due to Bothrops.
Keywords: ophidic accidents; Bothrops; medical emergency; antivenom serum; clinical conduct.

1. Introduction

Snakebites represent a major public health problem in countries tropical countries, such as Brazil, where the wide geographic distribution of venomous snakes, especially of the genus Bothrops, contributes to the high incidence of these events, mainly in rural areas. The Bothrops species – popularly known as jararaca – is responsible for approximately 70% of snake envenomation cases registered in the national territory, according to data from the Ministry of Health. The Bothrops envenomation causes local and systemic clinical manifestations that can vary in severity, including pain, edema, necrosis, coagulation disorders, and in severe cases, kidney failure and shock. In this case, medical care emergency plays a crucial role in reducing morbidity and mortality, being the early diagnosis, correct administration of antivenom and adequate management of complications are the main pillars of treatment. The role of the emergency physician is decisive in this context, requiring technical knowledge, quick decision-making and mastery of clinical procedures established by official protocols. However, there are significant challenges, such as the lack of specific training, access limited to serum in remote regions and the difficulty in transporting victims. Given the clinical and social relevance of Bothrops snakebites, this work aims to objective to review the available scientific literature on the role of emergency physicians in these cases, with emphasis on the clinical procedures adopted and the use of serum antivenom as the main therapeutic tool.

2. Methods

This work is a narrative bibliographic review with the objective of gathering and analyze scientific publications that address the role of emergency physicians in cases

of snakebites caused by snakes of the genus Bothrops, with emphasis on clinical procedures and the use of antivenom.

The search for articles was carried out in the PubMed database (US National Library of Medicine), as it is one of the most relevant in the health area, bringing together periodicals international high-quality scientific research. This research was conducted between the months of [09/2025] and [10/2025] and used the following descriptors (MeSH terms), combined with Boolean operators (AND/OR): “Bothrops”, “Snakebites”, “Snake venom”, “Antivenins”, “Emergency medical services”, “Clinical protocols”, “Envenomation”.

The following inclusion criteria were defined:

Articles published between 2015 and 2025;

Texts available in full, in English or Portuguese;

Studies with a clinical, epidemiological or therapeutic approach on accidents caused by snakes of the genus Bothrops;

Works that directly address emergency medical conduct and/or the use of antivenom.

The exclusion criteria were:

Duplicate articles;

Works that exclusively addressed laboratory or experimental aspects, without direct clinical application;

Studies related to accidents by other snake genera (such as Crotalus, Lachesis and Micrurus);

Publications that were not available in full.

After applying the eligibility criteria, the selected articles were analyzed as to its content, relevance to the proposed theme, and contributions to the understanding of the practices adopted by medical professionals in care emergency care of patients who are victims of Bothrops accidents.

3. Literature Review

Snakebites constitute a serious public health problem, especially in tropical countries, such as Brazil. According to Fernández and Youssef (2024), “accidents with venomous snakes in Brazil affect between 20 and 30 thousand people annually, with highest incidence in the North, Northeast and Central-West regions”. These authors highlight that the genus Bothrops is responsible for the majority of reported cases, corresponding

to about 70% of accidents. This high incidence is mainly associated with rural activities, where the population has greater contact with the natural environment (Resiere et al., 2024).

Seasonality is also a determining factor, as "the rainy months present increased number of accidents due to increased snake activity and exposure human" (Cavalcante et al., 2023, p. 524).

3.1 Characteristics of snakes of the genus Bothrops

Snakes of the genus Bothrops are responsible for envenomations that result in severe local and systemic clinical manifestations. Pereira et al. (2023) state that species Bothrops jararaca, Bothrops atrox and others have "venoms composed of proteolytic enzymes, serine proteases and phospholipases A2, which cause necrosis, hemorrhages and coagulopathies".

Santos et al. (2023) add that the venom of these snakes "acts mainly destroying local tissues and interfering with the blood clotting system, which can lead to serious complications if not treated properly" (p. 130).

3.2 Clinical manifestations of Bothrops envenomation

The clinical picture varies depending on the dose of the poison and the speed of treatment. Fernández et al. (2025) highlight that "local symptoms include severe pain, edema, bruising, necrosis and blistering, while systemic symptoms may include severe coagulopathies and acute renal failure."

According to Ribeiro et al. (2023), "delay in treatment is directly associated with worsening of the clinical picture, with increased mortality and sequelae". Therefore, care emergency is essential to reverse the poisoning process.

3.3 Emergency care: role of the emergency physician

The emergency physician plays a fundamental role in the initial approach to the patient victim of a snakebite. Norris (2022, p. 2) states that "a rapid and careful assessment

of signs and symptoms, combined with knowledge of updated clinical protocols, is essential for the success of the treatment".

Santos et al. (2023) highlight the importance of continuous training of professionals, stating that "lack of familiarity with the management of Bothrops envenomation can lead to delays in serum administration and increased complications." In addition Furthermore, close observation in the first 24 hours is recommended to monitor for signs of aggravation.

3.4 Use of antivenom

The specific treatment for accidents caused by Bothrops is the use of serum antibothropic, which neutralizes the toxins present in the venom. According to Resiere et al. (2024), "early administration of serum is crucial to reduce mortality and complications, and should preferably be performed in the first hours after the accident".

Antivenom is the specific and fundamental treatment for patients who are victims of envenomation by snakes of the genus Bothrops. It consists of a preparation immunological produced from animal plasma (usually horses) hyperimmunized against the venom of these snakes, which contains antibodies capable of neutralize the toxins present in the venom.

3.4.1 Indication of Antivenom

The indication for the use of antivenom is based on the clinical evaluation of the patient and the severity of poisoning, which can be classified as:

Mild: mild local symptoms such as pain and swelling restricted to the bite site, with no signs systemic.

Moderate: more extensive edema and pain, presence of bruising, laboratory disturbances mild (altered coagulogram).

Severe: edema progressing to distant regions, significant systemic signs (bleeding, renal failure, shock), severe laboratory abnormalities.

The clinical decision must take into account the time elapsed since the accident, the evolution symptoms and laboratory test results, especially those related to coagulation (prothrombin time, thromboplastin time, platelets).

3.4.2 Preparation for Administration

Before applying the serum, the emergency physician must:

Confirm the correct identity of the Bothrops antiserum, evaluate the patient's previous allergies, as the serum can cause allergic reactions.

Prepare medications to manage possible adverse reactions, such as adrenaline, corticosteroids and antihistamines.

Ensure adequate venous access (appropriate caliber intravenous catheter).

Request continuous monitoring of vital signs (blood pressure, heart rate, respiratory rate, oxygen saturation).

3.4.3 Serum Administration

The serum should be administered slowly intravenously, preferably in a cool, hospital with conditions for immediate monitoring and support. The steps include:

Dilute the serum in saline or administer directly as recommended by the manufacturer and local protocols.

Start the infusion slowly, observing initial signs of an allergic reaction (itching, hives, difficulty breathing, hypotension). If there is no reaction, speed up the infusion according to the patient's tolerance.

Doses are defined according to the severity of the condition and can vary from 4 to 12 ampoules for mild to severe cases, respectively.

3.4.4 Post-Administration Monitoring

After administering the serum, it is essential to:

Keep the patient under observation for at least 24 hours, due to the possibility of delayed reactions or worsening of the condition.

Reassess local and systemic signs, checking for progression of edema, pain, bleeding and laboratory signs.

Repeat coagulation tests periodically to assess the effectiveness of the serum and the need for additional doses.

Monitor vital signs constantly to identify early signs of shock or anaphylactic reaction.

3.4.5 Management of Adverse Reactions

Adverse reactions to serum can range from mild (fever, chills, itching) to severe (anaphylaxis, anaphylactic shock). The physician should be prepared to:

Stop the infusion immediately if severe symptoms occur.

Administer intramuscular adrenaline in case of anaphylaxis.

Use corticosteroids and antihistamines to control allergic reactions.

Maintain respiratory and circulatory support as needed.

3.4.6 Final Considerations

The correct use of antivenom is crucial for reducing morbidity and mortality. associated with Bothrops accidents. The effectiveness of treatment depends on the early onset administration, dose adequacy and strict observation of the patient during and after treatment.

In addition, continuing education of health professionals, the availability of serum in care units and quick patient access to medical services are factors critical to the success of clinical management.

Cavalcante et al. (2023) warn of the risks of adverse reactions, such as anaphylaxis, recommending “constant monitoring during serum infusion, in addition to support appropriate clinical practice”. They also highlight the logistical difficulties that still exist in access to serum in remote regions of Brazil, which compromises care emergency.

3.5 Complications and prognosis

Even with proper treatment, some victims experience long-term consequences. Fernández et al. (2025) indicate that “local necrosis and chronic renal failure are the most frequent complications that can lead to functional limitations permanent”.

Cavalcante et al. (2023) associate secondary infections with a worsening of the prognosis, warning that “multidisciplinary monitoring is essential for the rehabilitation of patient and reduction of sequelae”.

Ribeiro et al. (2023) emphasize that “the main factor for a good prognosis is time between the accident and the start of antivenom treatment, reinforcing the importance of action emergency physician's quick response”.

4. Discussion

Snakebites caused by snakes of the genus Bothrops continue to be a significant public health problem in Brazil, especially in the North, Northeast and Central-West. According to Fernández and Youssef (2024), these accidents represent about 70% of snakebite cases in the country, highlighting the relevance of this gender in the national scenario. Scientific literature indicates that proper management and early stages of these accidents are crucial for the patient's clinical outcome, with the emergency physician the central figure in this process.

Several studies reinforce the importance of the time between the accident and the beginning of the medical care as a prognostic factor. In a comprehensive study conducted by Bochner and Struchiner (2018), with more than 144 thousand cases, it was observed that the care performed after 6 hours of the accident significantly increases the probability of progression to moderate or severe poisoning, with odds ratio higher than 2.0 in some contexts (BOCHNER; STRUCHINER, 2018, p. 6).

Furthermore, a more recent survey showed that between 2012 and 2021, 202,604 cases of Bothrops accidents were reported in Brazil, resulting in 766 deaths and an average fatality rate of 0.37% (REZENDE et al., 2023). These data reinforce the need for rapid and effective response in the emergency environment.

The role of the emergency physician goes beyond simply administering antivenom. He must be able to recognize the clinical signs of poisoning, classify its severity and apply established protocols for patient stabilization, in addition to monitor possible adverse reactions to the serum. As Norris (2022, p. 3) states, “management proper handling of snakebite requires not only technical knowledge about the serum, but also the ability to deal with clinical emergencies arising from manifestations systemic and local effects of venom”.

The administration of antivenom should ideally occur within the first few hours after the accident, preferably before 6 hours. Literature shows that when this period is outdated, there is a significant increase in the rate of complications, such as necrosis tissue, renal failure and coagulopathies (CAVALCANTE et al., 2023). In a regional analysis, victims treated between 6 and 12 hours after the bite presented a risk 1.4 times more likely to develop complications. This risk increased to 3.8 times when care was provided between 12 and 24 hours after the accident (CARVALHO et al., 2022, p. 4).

Another aspect discussed in the literature is the availability of antivenom in the units health. In many inland regions, the lack of serum and the difficulty in transporting it even specialized centers result in significant delays in starting treatment, the that compromises the patient's prognosis (PEREIRA et al., 2023). Such limitations reflect not only the deficiency in health infrastructure, but also the need of public policies aimed at the decentralization of serum and the training of primary care professionals.

Even when the serum is administered correctly, care must be taken regarding possible adverse reactions, such as hives, bronchospasm and, in more severe cases, anaphylaxis. The emergency physician must be prepared to stop the infusion and start treatment with adrenaline, corticosteroids and antihistamines, as needed emergency protocols (RIBEIRO et al., 2023).

Finally, the literature also highlights the occurrence of long-term sequelae, such as necrosis, secondary infections, amputations and permanent renal dysfunction, especially in patients who do not receive early care. Fernández et al. (2025) demonstrate that, in regions such as the Amazon, the rate of physical sequelae among Bothrops victims may exceed 40%, which highlights the social and economic impact of this type of accident.

Thus, the discussion shows that, although there are well-established protocols and effective therapeutic resources such as antivenom, there are still structural and significant assistance challenges to be overcome. The efficient performance of the doctor emergency physician, combined with increased access to serum and ongoing training of health professionals, is essential for reducing morbidity and mortality associated with accidents by Bothrops.

5. Conclusion

Snakebites represent a significant public health problem in countries tropical countries, such as Brazil, where the wide geographic distribution of venomous snakes, especially of the genus Bothrops, contributes to the high incidence of these events, particularly in rural areas. The Bothrops species, popularly known as jararaca, is responsible for about 70% of snakebite poisoning cases in the territory nationally, according to data from the Ministry of Health.

Bothrops envenomation causes clinical manifestations of varying severity, which include pain, edema, necrosis, changes in blood clotting and, in situations more severe, kidney failure and shock. In this case, medical care emergency is essential to reduce morbidity and mortality, and the early diagnosis, adequate administration of antivenom and effective management of complications arising.

In this scenario, the emergency physician's role is decisive and requires technical mastery, agility in decision-making and in-depth knowledge of clinical procedures recommended by official care protocols. However, challenges persist, such as the shortage of trained professionals, limited access to serum in regions remote areas and logistical difficulties in transporting victims to health units appropriate.

Thus, it is concluded that the effective performance of the emergency physician in cases of snakebites by Bothrops depends not only on technical training, but also of public policies that guarantee the equitable distribution of antivenom, continuing training of health professionals and structuring of the care network urgently. It is hoped that this work will contribute to critical reflection and expanding knowledge on the topic, promoting improvements in care for patients who are victims of this condition.

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