



Texto & Contexto - Enfermagem

ISSN: 0104-0707

ISSN: 1980-265X

Universidade Federal de Santa Catarina, Programa de Pós
Graduação em Enfermagem

Carmo, Érica Assunção; Nery, Adriana Alves; Pereira,
Rafael; Rios, Marcela Andrade; Casotti, Cezar Augusto
FACTORS ASSOCIATED WITH THE SEVERITY OF SCORPIO POISONING
Texto & Contexto - Enfermagem, vol. 28, e20170561, 2019
Universidade Federal de Santa Catarina, Programa de Pós Graduação em Enfermagem

DOI: <https://doi.org/10.1590/1980-265X-TCE-2017-0561>

Available in: <https://www.redalyc.org/articulo.oa?id=71465278118>





- How to cite
- Complete issue
- More information about this article
- Journal's webpage in redalyc.org

UABEM
redalyc.org

Scientific Information System Redalyc
Network of Scientific Journals from Latin America and the Caribbean, Spain and
Portugal

Project academic non-profit, developed under the open access initiative

FACTORS ASSOCIATED WITH THE SEVERITY OF SCORPIO POISONING

Érica Assunção Carmo¹ 
Adriana Alves Nery¹ 
Rafael Pereira¹
Marcela Andrade Rios^{1,2} 
Cezar Augusto Casotti¹ 

¹Universidade Estadual do Sudoeste da Bahia, Programa de Pós-Graduação em Enfermagem e Saúde. Jequié, Bahia, Brasil.

²Universidade do Estado da Bahia, Departamento de Educação. Guanambi, Bahia, Brasil.

ABSTRACT

Objective: to analyze the factors associated with the severity of scorpionism, according to sociodemographic, clinical and epidemiological aspects.

Method: a cross-sectional study was carried out, in 2017, with data extracted directly from the Epidemiological Investigation Records of the Information System for Notifiable Diseases, for the period from 2007 to 2015. These records were provided by the reference hospital in attendance to the cases of scorpionism, located in the municipality of Jequié (Brazil). Logistic regression was used to verify the factors associated with the severity of scorpionism.

Results: in the period investigated, 3,565 cases of scorpionism were identified, of which 15.9% were classified as of greater severity. The adjusted analysis showed that the severity of the scorpionism is associated with the ages ranging from 0 to 9 years (OR=6.87; CI 5.23-9.03), from 10 to 19 years old (OR=1.39; CI 1.03-1.87) and 60 or more (OR=4.04, CI 3.12-5.23), and the time elapsed between the moment of the bite and the hospital care of more than 3 hours (OR = 1.38; CI 1.02-1.85).

Conclusion: it was found that the age range and the time elapsed between the moment of the bite and the hospital care are associated with the severity of the scorpionism, which signals the emergency characteristics of these accidents, especially when children and elderly people are affected.

DESCRIPTORS: Animals poisonous. Scorpion stings. Notification. Patient acuity. Epidemiology.

HOW CITED: Carmo EA, Nery AA, Paula RP, Rios MA, Casotti CA. Factors associated with the severity of scorpion poisoning. *Texto Contexto Enferm* [Internet]. 2019 [cited YEAR MONTH DAY]; 28:e20170561. Available from: <http://dx.doi.org/10.1590/1980-265X-TCE-2017-0561>

FATORES ASSOCIADOS À GRAVIDADE DO ENVENENAMENTO POR ESCORPIÕES

RESUMO

Objetivo: analisar os fatores associados à gravidade do escorpionismo, segundo os aspectos sociodemográficos, clínicos e epidemiológicos.

Método: realizou-se um estudo transversal, realizado em 2017, com dados extraídos diretamente das Fichas de Investigação Epidemiológica do Sistema de Informação de Agravos de Notificação, referentes ao período de 2007 a 2015. Estas fichas foram disponibilizadas pelo hospital referência em atendimento aos casos de escorpionismo, localizado no município de Jequié (Brasil). Foi utilizada regressão logística para verificar os fatores associados à gravidade do escorpionismo.

Resultados: no período investigado, identificaram-se 3.565 casos de escorpionismo, dos quais 15,9% foram classificados como de maior gravidade. A análise ajustada mostrou que a gravidade do escorpionismo está associada às faixas etárias de 0 a 9 anos (OR=6,87; IC 5,23-9,03), de 10 a 19 anos (OR=1,39; IC 1,03-1,87) e de 60 ou mais (OR=4,04; IC 3,12-5,23), e ao tempo transcorrido entre o momento da picada e o atendimento hospitalar superior a 3 horas (OR=1,38; IC 1,02-1,85).

Conclusão: constatou-se que a faixa etária e o tempo transcorrido entre o momento da picada e o atendimento hospitalar estão associados à gravidade do escorpionismo, o que sinaliza a característica emergencial desses acidentes, sobretudo quando são acometidos crianças e idosos.

DESCRIPTORIOS: Animais venenosos. Picadas de escorpião. Notificação. Gravidade do paciente. Epidemiologia.

FACTORES ASOCIADOS A LA GRAVEDAD DEL ENVENENAMIENTO POR ESCORPIONES

RESUMEN

Objetivo: analizar los factores asociados a la gravedad del escorpión, según aspectos sociodemográficos, clínicos y epidemiológicos.

Método: se realizó un estudio transversal, en 2017, con datos extraídos directamente de las Fichas de Investigación Epidemiológica del Sistema de Información de Agravamientos de Notificación, referentes al período de 2007 a 2015. Estas fichas fueron puestas a disposición por el hospital de referencia en atención de casos de alacranismo, ubicado en el municipio de Jequié, Brasil. Se utilizó la regresión logística para comprobar los factores asociados a la gravedad del alacranismo.

Resultados: en el período investigado, se identificaron 3.565 casos de alacranismo, de los cuales 15,9% han sido clasificados como de mayor gravedad. El análisis más estricto demostró que la gravedad del alacranismo está vinculada a los rangos de edad de 0 a 9 años (OR=6,87; IC 5,23-9,03), de 10 a 19 años (OR=1,39; IC 1,03-1,87) y de 60 o más (OR=4,04; IC 3,12-5,23), y al tiempo transcurrido entre el momento de la picada y la atención hospitalaria superior a 3 horas (OR=1,38; IC 1,02-1,85).

Conclusión: se pudo constatar que el rango de edad y el tiempo transcurrido entre el momento de la picada y la atención hospitalaria están asociados a la gravedad del alacranismo, lo que indica la característica de emergencia de estos accidentes, sobre todo cuando son afectados niños y ancianos.

DESCRIPTORIOS: Animales venenosos. Picaduras de escorpión. Notificación. Gravedad del paciente. Epidemiología.

INTRODUCTION

The importance of accidents involving contact with scorpions can be expressed by their high incidence and potential for causing severe poisoning. These accidents are recognized by the World Health Organization (WHO) as an emerging public health problem that is sometimes neglected.¹

It is estimated that approximately 1.5 million accidents occur each year and approximately 2,600 deaths by scorpion bite in the world.² According to the Ministry of Health, in Brazil, cases of scorpionism already outnumber those of ophidism,³ being registered about 50 thousand cases per year, with an increase in incidence in the warmer periods.⁴ In addition, the importance of these events is emphasized in rural areas, where accidents with scorpions and other types of venomous animals are quite frequent, leading to signs of poisoning and burns.⁵

In Brazil, accidents involving scorpion bite have become increasingly important in clinical practice because of the high toxicity of the venom of these animals, as well as the greater involvement of individuals of the economically active age group and the high lethality rates in children and the elderly. In the period from 2000 to 2012, were recorded in the country, average annual rates of incidence of scorpion bite of 19.6 per 100 thousand inhabitants and mortality rate of 0.030 per 100 thousand inhabitants.⁴

From the clinical point of view, in the first 24 hours after the bite, the scorpion toxin can cause local and/or systemic effects.⁶ The commonly observed local manifestations are pain, edema, warmth and hematoma,⁶ whereas, systemically, hypotension or systemic arterial hypertension may occur, respiratory failure, cardiovascular toxicity, renal failure, hemorrhage and mental confusion.⁷ In more severe cases, with a potential risk of death, cardiac and respiratory dysfunctions are usually involved, which are observed in two-thirds of hospitalized patients.⁸

The severity of the scorpionism depends on the clinical manifestations evidenced, however, several factors may interfere in the evolution of the cases (such as age, early onset of symptoms and their intensity)⁹ and thus favor the establishment of an early prognosis.¹⁰ Thus, the evaluation and classification of the severity of the cases, as well as the identification of the associated factors, are aspects that may influence the therapeutic behaviors and, consequently, the best or worse prognosis of the accident.

Therefore, studies that seek to analyze the cases of scorpionism and investigate the factors associated with its severity become relevant, since they can contribute to the planning of health actions by directing appropriate and immediate assistance to the most vulnerable groups, as well as to subsidize the design of strategies that reduce morbimortality by this aggravation. Moreover, the lack of studies that address the aspects of scorpionism, through analytical methodology, is added as justification for the realization of this research, since most of the scientific works related to the subject are restricted to descriptive analyzes.

In this sense, this study aimed to analyze the factors associated with the severity of scorpionism, according to sociodemographic, clinical and epidemiological aspects.

METHOD

This is a cross-sectional study on the factors associated with the severity of scorpionism carried out in the municipality of Jequié, Bahia, Brazil.

Although cross-sectional studies are chosen to investigate prevalent cases, researchers say that it is possible to estimate the incidence rate in some cases, such as sudden, acute, clearly defined onset events, such as scorpionic events, since fit perfectly under the designation of new cases, which would make up the numerator of an incidence measure.¹¹

The study population consisted of a total of 3,565 cases of scorpionism assisted at the *General Hospital Prado Valadares* (HGPV), from 2007 to 2015. The HGPV was chosen as the collection site because it is the only unit to dispense serum anti-poison in Jequié and, therefore, reference in assisting the cases of poisoning by these animals in the municipality.

The data were collected directly from the Epidemiological Investigation records of the Information System of Notification Diseases (SINAN) of the Ministry of Health, which were made available by the HGPV Hospital Epidemiology Center. These records refer to accidents involving venomous animals, which since 1988 are mandatory reporting in Brazil. Only cases that had the scorpion as the animal involved in the accident were selected for this study, and whose victims lived in the municipality of Jequié.

In this study, the severity of the cases was considered as a dependent variable (outcome), which was classified by the health professional who evaluated the case and completed the research record. In order to classify the cases, the professional must follow the recommendations of the Ministry of Health, which based on clinical manifestations, guides the cases of scorpionism to be classified as: mild (present only local symptoms such as pain, edema, erythema and paraesthesia); moderate (present some systemic manifestations such as nausea, sweating, occasional vomiting, tachycardia, tachypnea, agitation and mild arterial hypertension); or severe (have one or more systemic manifestations such as profuse sweating, uncontrollable vomiting, excessive salivation, alternation of agitation with prostration, bradycardia, heart failure, pulmonary edema, shock, seizures and coma).¹²

This classification is in line with the proposal in a study involving specialists from 11 countries with the aim of proposing a unique classification of the natural and clinical history of accidents by scorpions, aiming to standardize the care provided to patients and to standardize the communication between researchers from all over the world.¹³

For the analysis of the associated factors, the severity of the cases was dichotomized in: severe cases (moderate and severe cases included) and non-severe cases (only mild cases). It was chosen to group the moderate to severe cases by the greater proximity of their clinical characteristics, as well as the greater possibility of comparing the results with the literature. Thus, the incidence of severe cases was calculated by dividing the sum of moderate and severe cases, identified in the analyzed period, by the total number of cases in the study.

As independent variables (exposure), sociodemographic characteristics were considered: gender (male, female); age range (0 to 9 years, 10 to 19 years, 20 to 59 years, 60 or more); color/race (Caucasian, non-Caucasian); schooling (illiterate, incomplete/complete elementary, from high school); occupation (minor/student, domestic, works in commerce, rural worker, retired, others) and zone of residence (urban, rural). The epidemiological aspects were: place of occurrence (domicile, farm, others); area of occurrence (urban, rural); season of occurrence (spring/summer, fall/winter); location of the bite (upper limbs, lower limbs, others) and time elapsed until hospital care (<1 hour, 1 to 3 hours, >3 hours). And, regarding the clinical characteristics: local manifestations (yes, no); systemic manifestations (yes, no); classification of severity (mild, moderate, severe); serum therapy (yes, no) and evolution (cure, death by scorpionism).

In the analysis of the data, the characterization of the total cases was done through descriptive statistics, which was presented in absolute and relative frequencies (Table 1). Then, the factors associated with the outcome were verified by the crude and adjusted estimates of the odds ratio (- OR) and their respective Confidence Intervals of 95% (CI_{95%}), through logistic regression using a hierarchical model (Figure 1).

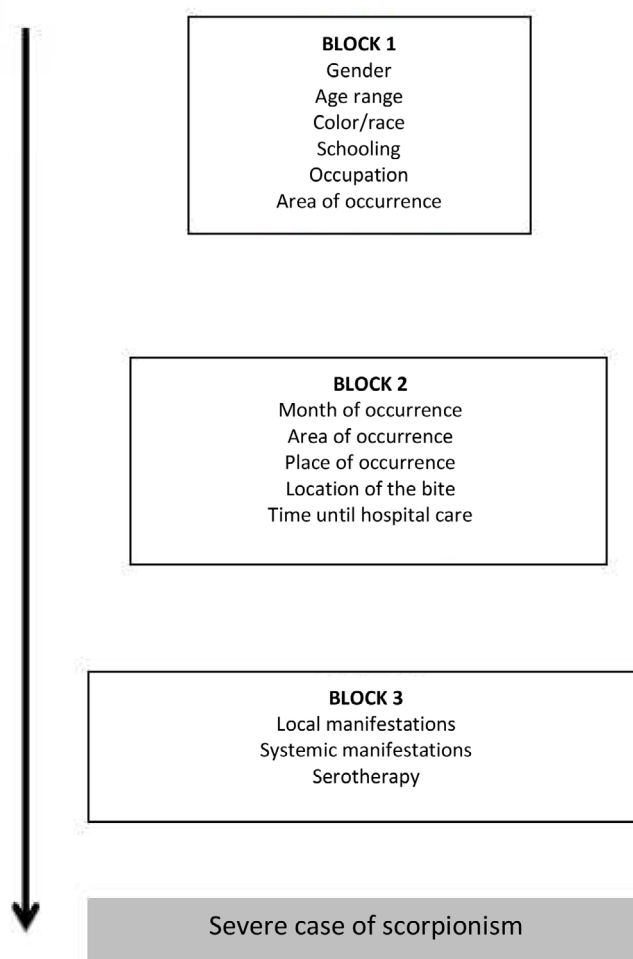
Table 1 - Characterization of the cases of scorpionism, according to sociodemographic, clinical and epidemiological variables, from 2007 to 2015. Jequié, BA, Brazil, 2017 (n=3565)

| Variables | % Answer | N | % |
|---------------------------------------|----------|------|------|
| Gender | 99.9 | | |
| Male | | 1608 | 45.1 |
| Female | | 1955 | 54.9 |
| Age group (in years) | 99.7 | | |
| 0 to 9 | | 365 | 10.3 |
| 10 to 19 | | 616 | 17.3 |
| 20 to 59 | | 2092 | 58.8 |
| 60 or more | | 483 | 13.6 |
| Color/race | 82.9 | | |
| Caucasian | | 480 | 16.2 |
| Non-Caucasian | | 2475 | 83.8 |
| Schooling | 65.0 | | |
| From high school | | 779 | 33.6 |
| Incomplete/complete primary education | | 1200 | 51.8 |
| Illiterate | | 339 | 14.6 |
| Occupation | 72.1 | | |
| Minor/student | | 746 | 29.0 |
| Domestic | | 555 | 21.6 |
| Work in commerce | | 249 | 9.7 |
| Rural worker | | 103 | 4.0 |
| Retired | | 211 | 8.2 |
| Others | | 708 | 27.5 |
| Area of residence | 99.7 | | |
| Area | | 3371 | 94.8 |
| Rural | | 184 | 5.2 |
| Season of occurrence | 99.7 | | |
| Spring/Summer | | 1972 | 55.5 |
| Autumn/winter | | 1583 | 44.5 |
| Area of occurrence | 99.0 | | |
| Area | | 3286 | 93.1 |
| Rural | | 244 | 6.9 |
| Place of occurrence | 79.3 | | |
| Residence | | 2415 | 85.5 |
| Farm | | 86 | 3.0 |
| Others | | 325 | 11.5 |
| Time until hospital care | 91.0 | | |
| < 1 hour | | 2154 | 66.4 |
| 1 to 3 hours | | 677 | 20.9 |
| > 3 hours | | 412 | 12.7 |
| Location of the bite | 96.0 | | |
| Upper limbs | | 1815 | 53.0 |
| Lower limbs | | 1296 | 37.9 |
| Others | | 312 | 9.1 |
| Local Manifestations | 99.0 | | |
| No | | 103 | 2.9 |
| Yes | | 3425 | 97.1 |

Table 1 - Cont.

| Variables | % Answer | N | % |
|----------------------------|-----------------|----------|----------|
| Systemic manifestations | 90.5 | | |
| No | | 2896 | 89.8 |
| Yes | | 330 | 10.2 |
| Classification of severity | 97.2 | | |
| Mild | | 2913 | 84.1 |
| Moderate | | 481 | 13.9 |
| Severe | | 69 | 2.0 |
| Serotherapy | 96.2 | | |
| No | | 2836 | 82.7 |
| Yes | | 594 | 17.3 |
| Evolution | 90.2 | | |
| Cure | | 3211 | 99.9 |
| Death by Scorpionism | | 3 | 0.1 |

Source: Epidemiological investigation records/Notification of Injury Information System/ Ministry of Health.

**Figure 1** - Hierarchical conceptual model of outcome determination. Jequié, BA, Brazil, 2017

In order to verify the associated factors, initially, there was a bivariate analysis (crude OR) between the dependent variable (gravity) and other variables of the study (Table 2), followed by multivariate analysis (adjusted OR), in which only the variables that presented $p \leq 0.20$ in bivariate analysis.

Table 2 - Bivariate analysis of sociodemographic, clinical and epidemiological factors with the severity of scorpionism, period 2007 to 2015. Jequié, BA, Brazil, 2017. (n=3565)

| Variables | % | crude OR [*] | CI 95% [†] | P value |
|---------------------------------------|------|-----------------------|---------------------|---------|
| Gender | | | | |
| Female | 15.4 | 1.00 | - | |
| Male | 16.5 | 1.08 | 0.90-1.30 | 0.391 |
| Age group (in years) | | | | |
| 20 to 59 | 9.3 | 1.00 | - | |
| 0 to 9 | 41.5 | 6.94 | 5.36-8.99 | <0.001 |
| 10 to 19 | 12.5 | 1.40 | 1.05-1.86 | 0.020 |
| 60 or more | 29.6 | 4.11 | 3.20-5.27 | <0.001 |
| Color/race | | | | |
| Caucasian | 18.0 | 1.00 | - | |
| Non-Caucasian | 16.4 | 0.89 | 0.69-1.15 | 0.397 |
| Schooling | | | | |
| From high school | 9.3 | 1.00 | - | |
| Incomplete/complete primary education | 16.2 | 1.88 | 1.41-2.51 | <0.001 |
| Illiterate | 37.6 | 5.86 | 4.21-8.16 | <0.001 |
| Occupation | | | | |
| Work in commerce | 7.9 | 1.00 | - | |
| Minor/student | 25.8 | 4.08 | 2.48-6.71 | <0.001 |
| Domestic | 11.5 | 1.51 | 0.88-2.60 | 0.128 |
| Rural worker | 19.4 | 2.81 | 1.40-5.64 | 0.004 |
| Retired | 27.8 | 4.52 | 2.58-7.90 | <0.001 |
| Others | 11.9 | 1.58 | 0.94-2.67 | 0.082 |
| Area of residence | | | | |
| Area | 15.3 | 1.00 | - | |
| Rural | 26.7 | 2.01 | 1.40-2.88 | <0.001 |
| Season of occurrence | | | | |
| Autumn/winter | 16.4 | 1.00 | - | |
| Spring/Summer | 15.3 | 1.25 | 0.93-1.67 | 0.134 |
| Area of occurrence | | | | |
| Area | 15.5 | 1.00 | - | |
| Rural | 23.6 | 1.68 | 1.21-2.34 | 0.002 |
| Place of occurrence | | | | |
| Residence | 16.1 | 1.00 | - | |
| Farm | 22.2 | 1.48 | 0.87-2.54 | 0.145 |
| Others | 14.8 | 0.90 | 0.65-1.26 | 0.562 |
| Location of the bite | | | | |
| Others | 18.3 | 1.00 | - | |
| Upper limbs | 16.7 | 0.89 | 0.65 - 1.23 | 0.500 |
| Lower limbs | 14.2 | 0.73 | 0.53 - 1.02 | 0.073 |
| Time until hospital care | | | | |
| <1 hora | 14.9 | 1.00 | - | |
| 1 to 3 hours | 18.8 | 1.31 | 1.04-1.66 | 0.019 |
| >3 hours | 18.4 | 1.28 | 0.97-1.70 | 0.078 |
| Local Manifestations | | | | |
| No | 12.1 | 1.00 | - | |
| Yes | 16.1 | 1.38 | 0.75-2.55 | 0.292 |

Source: Epidemiological investigation records/Notification of Injury Information System/Ministry of Health.

*OR: *odds ratio*; †CI95%: confidence interval of 95%.

In the multiple modeling, the variables were included based on the order of the established hierarchical model, which shows that the variables of the higher (upper) levels interact and determine the variables of the lower levels (lower). The effect of each independent variable on the outcome was controlled by the variables of the same level and higher levels in the model. The final model estimate was based on the statistical assumptions of significance ($p < 0.05$), as well as in the theoretical importance of each variable for the model (Table 3). For the tabulation and analysis of the data the statistical program was used, SPSS® (*Statistical Package for the Social Sciences*), 21.0 version.

Table 3 - Final model of the multivariate logistic regression of the variables associated with the severity of scorpionism, period from 2007 to 2015. Jequié, BA, Brazil, 2017. (n=3565)

| Variables | Adjusted OR* | CI 95%† | P value |
|--------------------------|--------------|-----------|---------|
| Age group (in years) | | | |
| 20 to 59 | 1.00 | - | - |
| 0 to 9 | 6.87 | 5.23-9.03 | <0.001 |
| 10 to 19 | 1.39 | 1.03-1.87 | 0.030 |
| 60 or more | 4.04 | 3.12-5.23 | <0.001 |
| Time until hospital care | | | |
| < 1 hour | 1.00 | - | - |
| 1 to 3 hours | 1.26 | 0.98-1.60 | 0.066 |
| > 3 hours | 1.38 | 1.02-1.85 | 0.033 |

Source: Epidemiological investigation records/Notification of Injury Information System/Ministry of Health.

*OR: odds ratio; †CI95%: confidence interval of 95%.

Due to the fact that these were secondary data, the exemption of the written informed consent (WIC) was requested and approved.

RESULTS

In the investigation period, 3565 cases of HGPV scorpionism were reported, of which 84.1% were classified as mild and 15.9% were severe, being 13.9% moderate and 2.0% severe. In 2.9% of cases, the degree of severity was not specified.

Table 1 shows the sociodemographic, clinical and epidemiological characteristics of all cases of scorpionism.

Concerning the sociodemographic aspects, injured were in a higher proportion of females (54.9%), the age group 20-59 years (58.8%), non-Caucasian (83.8%) with complete or incomplete primary education (51.8%) and residents of the urban area (94.8%). As to the occupation, 29.0% of the cases were minors or only students, and 21.6% were domestic.

Regarding the epidemiological characteristics, it was evidenced that 93.1% of the accidents occurred in the urban area, the main place of occurrence (85.5%) and the upper limbs were the most affected body segment (68.7%).

Regarding the clinical aspects, 97.1% of the cases presented local manifestations, such as pain, paresthesia and edema. The systemic manifestations were evidenced in 10.2% of the injured, being systemic arterial hypertension, vomiting, nausea and headache the most frequent. The time elapsed between the moment of the bite and the hospital care was, in greater proportion, less than 1 hour (66.4%). The majority of cases evolved to cure (99.9%), and serotherapy was performed in 17.3% of the cases.

In the bivariate analysis, it was verified the association between the severity of scorpionism and the variables: age group; schooling; occupation; area of residence; area of occurrence and time elapsed until hospital care ($p < 0.05$). The systemic manifestations and serum therapy variables were excluded from the analysis because they were directly related to the outcome (Table 2).

The age groups of 0 to 9 years, 10 to 19 years and those with 60 years or more presented a higher incidence of severe cases when compared to those of 20 to 59 years, with $p < 0.001$, $p = 0.020$ and $p < 0.001$, respectively. Likewise, the incidence of severe cases of scorpionism was higher among individuals with low schooling and illiterates, as well as those living in the rural area ($p < 0.001$).

Accidents that have occurred in rural areas had incidence of severe poisoning 68% higher when compared to those that occurred in the urban area. As for the time elapsed between the moment of the bite and the hospital care, it was observed that the accidents that took from 1 to 3 hours had incidence of severe cases 31% higher than those who received medical care in less than 1 hour ($p = 0.019$). The presence of local manifestations was not associated with the greater severity of scorpionism ($p = 0.292$).

The variables that presented $p \leq 0.20$ and that followed for the multivariate model were: age group, area of residence, season of occurrence, area of occurrence, place of occurrence, location of the bite and time elapsed until hospital care. Although the variables education and occupation were associated with bivariate analysis, they were not included in the multivariate model due to possible information bias, due to the high number of cases ignored, as well as the probable coding errors.

After verification of the best adjustments, and considering the theoretical importance of each variable, the variables remaining in the final logistic model were the variables age range and time elapsed until hospital care that were shown to be factors associated with the severity of scorpionism (Table 3).

All age groups remained associated with the outcome, presenting a greater chance for severity when compared to the reference category (0 to 9 years: OR=6.87; CI: 5.23-9.03 / 10 to 19 years: OR=1.39; CI: 1.03-1.87/ 60 or more: OR=4.04; CI: 3.12-5.23). Regarding the time elapsed between the moment of the bite and the hospital care, after the adjustment with the age group, it was observed that those with a time greater than 3 hours exhibited a 38% greater chance for severity, when compared to those with the time inferior to 1 hour (OR = 1.38, CI: 1.02-1.85).

DISCUSSION

In this study, it was verified that the severity of scorpionism is associated to the age group from 0 to 9 years, from 10 to 19 years and 60 years or more, as well as to the longer time elapsed from the moment of the bite and the hospital care. The incidence of severe cases was 15.9%, which was higher when compared to studies conducted in the State of Ceará (Brazil) (3.4%),¹⁴ in the years 2007 to 2013, in the municipality of Campina Grande (Brazil) (2.4%),¹⁵ in the period 2007 to 2012 and in tropical areas of Iran (7.1%),¹⁶ between the years 2008 and 2009.

The high incidence of severe cases can be justified by the socio-demographic characteristics of the region studied, which has a large population that lives or works in the rural area, which may have contributed to the delay in access to health services. In addition, the fact that the scorpion bite is, in most cases, of low gravity, causes the population not to immediately seek hospital care, a condition that may favor the severity of the case.

The severity of scorpionism is referred to as related to the characteristics of both the animal and the victim.¹⁴ In this study, after adjusting for the multivariate analysis, the higher severity of the cases was associated with the age group and the time elapsed between the moment of the bite and the hospital care.

The association between the severity of the scorpionism and the age group, especially for the higher incidence of severe cases in groups 0-9 years and those aged 60 or more, corroborates the findings of other studies,¹⁷⁻¹⁹ a fact that demonstrates the vulnerability of these age groups to the scorpion toxin and, therefore, the greater susceptibility to present complications and to evolve to death.

In children, the association between age and worse prognosis can be explained by the proportion of venom inoculated in relation to the body surface, since studies have shown a positive association between the severity of scorpionism and the amount of venom in the plasma.²⁰⁻²¹ Thus, children, especially those of lower age, because they have a smaller body surface, generally present higher serum levels of venom²² and consequently, the clinical manifestations are rapidly triggered and with greater intensity. In addition, the high rates of morbidity and mortality from scorpion bites in children have been justified by the low immunological capacity,²³ as well as by a possible greater absorption of the poison by the heart and other organs in this age group.²⁴

On the other hand, the high incidence of severe cases among the elderly is probably due to the higher sensitivity of this group to the toxins due to the deterioration of the physiological mechanisms inherent in the aging process characterized by the depletion of the enzymatic systems and the reduction of endocrine and immunological functions, which make the elderly person more vulnerable to various types of diseases.²⁵⁻²⁶ In addition, the greater severity of the scorpionic accidents in the elderly may be related to the health status of these individuals, in view of the frequent presence of concomitant poisoning of diseases affecting noble organs such as the kidneys and lungs, which are precisely those injured by the action of poison.²⁷

The association found between the severity of scorpionism and the variables of schooling and occupation, in the bivariate analysis, can reinforce the relation between the outcome and the age of the victim, since the categories of low schooling, minors or students and retirees had a higher incidence of cases, which is possibly due to the high proportion of children and the elderly among these cases.

The time elapsed between the moment of the bite and the hospital care was another factor that was shown to be associated with the greater severity of scorpionism, which corroborates the results pointed out in a study that analyzed the factors associated with the severity of scorpionism in children and adolescents, in which the cases that had a time superior to 3 hours presented 2.20 times greater chance for the severity in relation to those that had less time between the moment of the bite and the hospital care.⁷

Similarly, a study that evaluated the lethal evolution of scorpionism in children and adolescents pointed out that, for each hour of increase in time until the primary care, there is a 9% increase in the chance of progression to death, and that this chance increases for 13% every year decreased at the victim's age.¹⁹ Likewise, research that analyzed the cardiac effects of scorpion poisoning has shown that the administration of serum within 4 hours after the bite can reduce mortality from these complications in children.²⁸

The higher incidence of severe cases in the group of those who had the rural area as the area of residence and the occurrence of the accident, corroborates the association between delayed treatment and the worse clinical condition of the cases, since these individuals usually take more time to receive the therapeutic measures, given the difficulties in the rapid access to health services in these localities, often due to the lack of medical facilities in rural areas.^{5,19}

The unfavorable evolution of the cases that had a longer time to the primary care and, therefore, a delay in the administration of the serum, can be explained by the rapidity with which the scorpionic venom is distributed by the body and, with this, is increasingly linked to its sites of action, triggering the pathological alterations and, consequently, aggravating this condition.^{19,22,29} Thus, the urgency of attending to cases of scorpionism should be considered, since a possible systemic clinical picture can be established within a few minutes to a few hours.¹²

With regard to the limitations of this study, the scarcity of similar research is highlighted, which compromised the comparability of the results, and the use of secondary data, which has the main methodological disadvantage, underreporting of information and/or underreporting of cases. The fact that the data were obtained from an instrument filled by different professionals, with possible differences in their interpretation, may have generated information bias. However, in spite of these obstacles, studies based on this data source are extremely important, as there are no other means to measure the magnitude of the problem and no other national systems that allow the comparison of these findings.⁵

CONCLUSION

In this study, the incidence of severe cases of scorpionism was 15.9%, being the variables age range and time elapsed between the moment of the sting and hospital care associated with greater severity of the poisoning.

These results indicate the need to carry out new studies on the subject, seeking to investigate the characteristics, causes and repercussions of this event, in order to contribute to a better delineation of the actions of prevention and health promotion, in order to reduce morbimortality by this aggravation. In addition, they indicate the importance of investing in educational actions for both the population and health professionals about the magnitude and emergency characteristics of these accidents, especially when children and elderly are affected.

REFERENCES

1. World Health Organization: Rabies and Envenomings: A Neglected Public Health Issue: Report of a Consultative Meeting. Geneva: World Health Organization [Internet]. 2007. [cited 2017 Jan 7]. Available from: http://www.who.int/bloodproducts/animal_sera/Rabies.pdf
2. Chippaux JP. Emerging options for the management of scorpion stings. *Drug Des Devel Ther* [Internet]. 2012 [cited 2017 Jan 7]; 6:165-73. Available from: <https://dx.doi.org/10.2147/dddt.S24754>
3. Ministério da Saúde (BR), Secretaria Vigilância em Saúde. Departamento de Vigilância Epidemiológica. Manual de Controle de Escorpiões [Internet]. Brasília (DF): MS; 2009 [cited 2017 Jan 7]. Available from: http://bvsmis.saude.gov.br/bvs/publicacoes/manual_controle_escorpioes.pdf
4. Reckziegel GC, Pinto Jr VL. Scorpionism in Brazil in the years 2000 to 2012. *J Venom Anim Toxins Incl Trop Dis* [Internet]. 2014 [cited 2017 Jan 10]; 20(46):1-8. Available from: <https://dx.doi.org/10.1186/1678-9199-20-46>
5. Rocha LP, Cezar-Vaz MR, Almeida MCV, Borges AM, Silva MS, Sena-Castanheira J. Workloads and occupational accidents in a rural environment. *Texto Contexto Enferm* [Internet]. 2015 [cited 2017 Nov 20]; 24(2):325-35. Available from: <https://dx.doi.org/10.1590/0104-07072015000480014>
6. Fevzi Y, Arslan ED, Semir A, Kavalci C, Durdu T, Yilmaz MS, et al. Epidemiologic and clinical characteristics and outcomes of scorpion sting in the southeastern region of Turkey. *Ulus Travma Acil Cerr Derg* [Internet]. 2013 [cited 2017 Jan 10]; 9(5):417-22. Available from: <https://dx.doi.org/10.5505/tjtes.2013.52333>
7. Horta FMB, Caldeira AP, Seres JAS. Escorpionismo em crianças e adolescentes: aspectos clínicos e epidemiológicos de pacientes hospitalizados. *Rev Soc Bras Med Trop* [Internet]. 2007 [cited 2017 Jan 17]; 40(3):351-53. Available from: <https://dx.doi.org/10.1590/S0037-86822007000300022>
8. Bahloul M, Ben Hamida C, Chtourou K, Ksibi H, Dammak H, Kallel H, et al. Evidence of myocardial ischaemia in severe scorpion envenomation. Myocardial perfusion scintigraphy study. *Intensive Care Med* [Internet]. 2004 [cited 2017 Jan 17]; 30(3):461-67. Available from: <https://dx.doi.org/10.1007/s00134-003-2082-7>

9. Guerra CMN, Carvalho LFA, Colosimo EA, Freire HBM. Analysis of variables related to fatal outcomes of scorpion envenomation in children and adolescents in the state of Minas Gerais, Brazil, from 2001 to 2005. *J Pediatra* [Internet]. 2008 [cited 2018 Apr 26]; 84(6):509-15. Available from: <https://dx.doi.org/10.1590/S0021-75572008000700007>
10. Brazil TK, Porto TJ. *Os escorpiões*. [Internet] Salvador, BA: EDUFBA; 2010. [cited 2017 Jan 17], Available from [http://www.noap.ufba.br/biotabahia/brazil_porto_os_escorpi%c3%b5es\(livro\)_2011.pdf](http://www.noap.ufba.br/biotabahia/brazil_porto_os_escorpi%c3%b5es(livro)_2011.pdf)
11. Santana VS, Cunha S. Estudos transversais. In: Almeida Filho N, Barreto ML, organizadores. *Epidemiologia & saúde: fundamentos, métodos, aplicações*. Rio de Janeiro: Guanabara Koogan; 2011:186-193.
12. Ministério da Saúde (BR), Fundação Nacional de Saúde. Manual de diagnóstico e tratamento de acidentes por animais peçonhentos [Internet]. 2nd ed. Brasília (BR): MS; 2001 [cited 2017 Jan 20]. Available from: http://bvsms.saude.gov.br/bvs/publicacoes/funasa/manu_peconhentos.pdf
13. Khattabi A, Soulaymani-Bencheikh R, Achour S, Salmi LR. Classification of clinical consequences of scorpion stings: consensus development. *Trans R Soc Trop Med Hyg* [Internet]. Jul 2011 [cited 2017 Jan 20]; 105(7):364-9. Available from: <https://dx.doi.org/10.1016/j.trstmh.2011.03.007>
14. Furtado SS, Belmino JFB, Diniz AGQ, Leite RS. Epidemiology of scorpion envenomation in the State of Ceará, Northeastern Brazil. *Rev Inst Med Trop São Paulo* [Internet]. 2016 [cited 2017 Jan 20]; 58(15):1-5. Available from: <https://dx.doi.org/10.1590/S1678-9946201658015>
15. Barros RM, Pasquino JA, Peixoto LR, Targino ITG, Sousa JA, Leite RS. Clinical and epidemiological aspects of scorpion stings in the northeast region of Brazil. *Cien Saude Colet* [Internet]. 2014 [cited 2017 Jan 20]; 19(4):1275-82. Available from: <https://dx.doi.org/10.1590/1413-81232014194.01602013>
16. Khatony A, Abdi A, Fatahpour T, Towhidi F. The epidemiology of scorpion stings in tropical areas of Kermanshah province, Iran, during 2008 and 2009. *J Venom Anim Toxins Incl Trop Dis* [Internet]. 2015 [cited 2017 Jan 20]; 21:45. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4636075/>
17. Silva AM, Bernarde PS, Abreu LC. Acidentes com animais peçonhentos no Brasil por sexo e idade. *Rev Bras Crescimento Desenvol Hum* [Internet]. 2015 [cited 2017 Jan 20]; 25(1):54-62. Available from: <https://dx.doi.org/10.7322/JHGD.96768>
18. Chippaux JP, Goyffon M. Epidemiology of scorpionism: A global appraisal. *Acta Trop* [Internet]. 2008 [cited 2017 Jan 20]; 107(2):71-9. Available from: <https://dx.doi.org/10.1016/j.actatropica.2008.05.021>
19. Bouaziz M, Bahloul M, Kallel H, Samet M, Ksibi H, Dammak H et al. Epidemiological, clinical characteristics and outcome of severe scorpion envenomation in South Tunisia: Multivariate analysis of 951 cases. *Toxicon* [Internet]. 2008 [cited 2017 Jan 20]; 52(8):918-26. Available from: <https://dx.doi.org/10.1016/j.toxicon.2008.09.004>
20. Rezende NA, Amaral CF, Freire-Maia L. Immunotherapy for scorpion envenoming in Brazil. *Toxicon* [Internet]. 1998 [cited 2017 Jan 20]; 36(11):1507-13. Available from: [https://dx.doi.org/10.1016/S0041-0101\(98\)00141-X](https://dx.doi.org/10.1016/S0041-0101(98)00141-X)
21. Bucarety F, Fernandes LC, Fernandes CB, Branco MM, Prado CC, Vieira RJ. Clinical consequences of *Tityus bahiensis* and *Tityus serrulatus* scorpion stings in the region of Campinas, Southeastern Brazil. *Toxicon* [Internet]. 2014 [cited 2017 Jan 20]; 89: 17-25. Available from: <https://dx.doi.org/10.1016/j.toxicon.2014.06.022>
22. Ghalim N, El-Hafny B, Sebt F, Heikel J, Lazar N, Moustansir R, et al. Scorpion envenomation and serotherapy in Morocco. *Am J Trop Med Hyg* [Internet]. 2000 [cited 2017 Jan 20]; 62(2):277-83. Available from: <https://dx.doi.org/10.4269/ajtmh.2000.62.277>

23. Cavazos MEO, Garza CR, Guajardo-Rodríguez G, Hernández-Montelongo BA, Montes-Tapia FD. Snake bites in pediatric patients, a current view. In: Özdemir Ö, ed. *Complementary Pediatrics*. [Internet] 2012:123-136. [cited 2017 Jan 20], Available from: <https://dx.doi.org/10.5772/34749>
24. Bahloul M, Chabchoub I, Chaari A, Chtara K, Kallel H, Dammak H, et al. Scorpion envenomation among children: clinical manifestations and outcome (analysis of 685 cases). *Am J Trop Med Hyg* [Internet]. 2010 [cited 2017 Jan 20]; 83(5):1084-92. Available from: <https://doi.org/10.4269/ajtmh.2010.10-0036>
25. Farinatti PTV. Teorias biológicas do envelhecimento: do genético ao estocástico. *Rev Bras Med Esporte* [Internet]. 2002 [cited 2017 Jan 20]; 8(4):129-38. Available from: <https://doi.org/10.1590/S1517-86922002000400001>
26. Soares MRM, Azevedo CS, Maria M. Escorpionismo em Belo Horizonte, MG: um estudo retrospectivo. *Rev Soc Bras Med Trop* [Internet]. 2002 [cited 2017 Jan 20]; 35(4): 359-63. Available from: <https://dx.doi.org/10.1590/S0037-86822002000400013>
27. Ribeiro LA, Albuquerque MJ, Pires de Campos VAF, Katz G, Takaoka NY, Lebrão ML, et al. Óbitos por serpentes peçonhentas no Estado de São Paulo: avaliação de 43 casos, 1988/93. *Rev Assoc Med Bras* [Internet]. 1998 [cited 2017 Jan 20]; 44(4):312-8. Available from: <https://dx.doi.org/10.1590/S0104-42301998000400010>
28. Kumar EB, Soomro RS, Hamdani A. Scorpion venom cardiomyopathy. *Am Heart J* [Internet]. 1992 [cited 2017 Jan 20]; 123(3):725-9. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/1539523>
29. Petricevich VL. Scorpion venom and the inflammatory response. *Mediators of Inflammation* [Internet]. 2010 [cited 2017 Jan 20]; 2010:1-16. Available from: <https://dx.doi.org/10.1155/2010/903295>

NOTES

ORIGIN OF THE ARTICLE

Article extracted from the dissertation - Clinical, epidemiological and factors associated with the severity of scorpionism, presented to the Graduate Program in Nursing and Health of the State University of Southwest of Bahia, in the year 2017.

CONTRIBUTION OF AUTHORITY

Conception of this study: Carmo EA e Nery AA.

Data collection: Carmo EA.

Analysis and interpretation of data: Carmo EA, Nery AA, Paula RP, Rios MA e Casotti CA.

Discussion of the results: Carmo EA

Writing and/or critical review of content: Carmo EA, Nery AA, Paula RP, Rios MA e Casotti CA.

Review and final approval of the final version: Carmo EA, Nery AA, Paula RP, Rios MA e Casotti CA.

ETHICS COMMITTEE IN RESEARCH

Approved by the Research Ethics Committee of the State University of Southwest of Bahia, under Opinion No.1,376,751 and *Certificado de Apresentação para Apreciação Ética* 51420315. 1.0000.0055.

CONFLICT OF INTERESTS

No any conflict of interest

HISTORICAL

Received: November 20, 2017.

Approved: July 3, 2018.

CORRESPONDENCE AUTHOR

Érica Assunção Carmo
eacarmo20@gmail.com