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Epidemiological Profile And Clinical Manifestations And Laboratories Of Scorpion Accidents Attended In Tocantins Reference Hospital

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Abstract:
The importance of accidents involving contact with scorpions can be expressed by their high incidence and potential to cause severe poisoning cases. These accidents are recognized by the World Health Organization (WHO) as an emerging public health problem that is sometimes overlooked. The aim of the study was to analyze cases of scorpion-related accidents treated at the Hospital of Tropical Diseases (HDT), located in the city of Araguaína, in the northern state of Tocantins, from April to November 2019. This was an observational, descriptive study with a quantitative and qualitative approach. During the period evaluated, 534 accidents with venomous animals were reported, and 138 (25.8%) were caused by scorpions, of which 113 patients were included in this study. There was no difference in the occurrence of accidents between sexes. The highest proportion of accidents occurred in the urban area (73.2%), in the municipality of Araguaína-TO (76.99%), and in places with debris (62.5%). The accidents were largely mild (84.07%), mainly affecting upper limbs (63.83%), with pain at the site of the sting (95%), starting within the first 15 minutes and considered of moderate to high intensity by 72.32% of those affected. Other local symptoms were edema (68.14%), erythema (74.34%), and local or radiating paresthesia to the entire affected limb (38%). Anti-scorpion serum was used in 15.04% of cases, corroborating with the frequency of moderate/severe cases (15.93%). The presence of two other neurological manifestations, type paresthesia, was described: perioral paresthesia and tongue paresthesia. Perioral paresthesia was associated with female sex (OR=3.36) and the presence of tachycardia (OR=4.58). Only 12.77% of patients who underwent laboratory tests showed abnormalities. The species Tityus confluent, Tityus aff. matogrossensis, and Jaguajir gamemnon were identified as causing accidents in the northern region of Tocantins state. These species are reported for the state of Tocantins and described for areas of cerrado and transition between savannas and the Amazon forest. The epidemiological profile reinforces the need for continuous training of health professionals involved in the diagnosis and treatment of the affected, aiming, in a timely manner, at the identification of the genus of the aggressor scorpion and the clinical classification of the case for the institution of appropriate treatment. Strengthening the care area is essential to reduce the lethality of the condition, especially in the most vulnerable groups.

Keywords: *Public health, Scorpionism, Epidemiology.*

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I. INTRODUCTION

Scorpions are arthropods of the Arachnida class, It is order Scorpiones, with a greater incidence in tropical and subtropical zones of the world, especially during the months of highest temperature and humidity (BRAZIL, 2018). Due to their ease of adaptation in hot, humid environments and food availability, these animals easily fit into urban areas, where accelerated and disorderly growth and the accumulation of garbage favor the proliferation of insects, which are their biggest source of food. food (from PAULA et al., 2020; OLIVEIRA et al.,

2020). The increase in the scorpion population in urban environments increases the chances of scorpion accidents, or scorpionism, which occurs when the scorpion injects venom through the telson, known as the stinger. Once inoculated, scorpion venom acts by altering sodium channels, depolarizing postganglionic nerve endings and triggering the release of adrenaline, noradrenaline and acetylcholine systemically, resulting in variable clinical manifestations (TRICHES, 2017; WARD et al. , 2018).

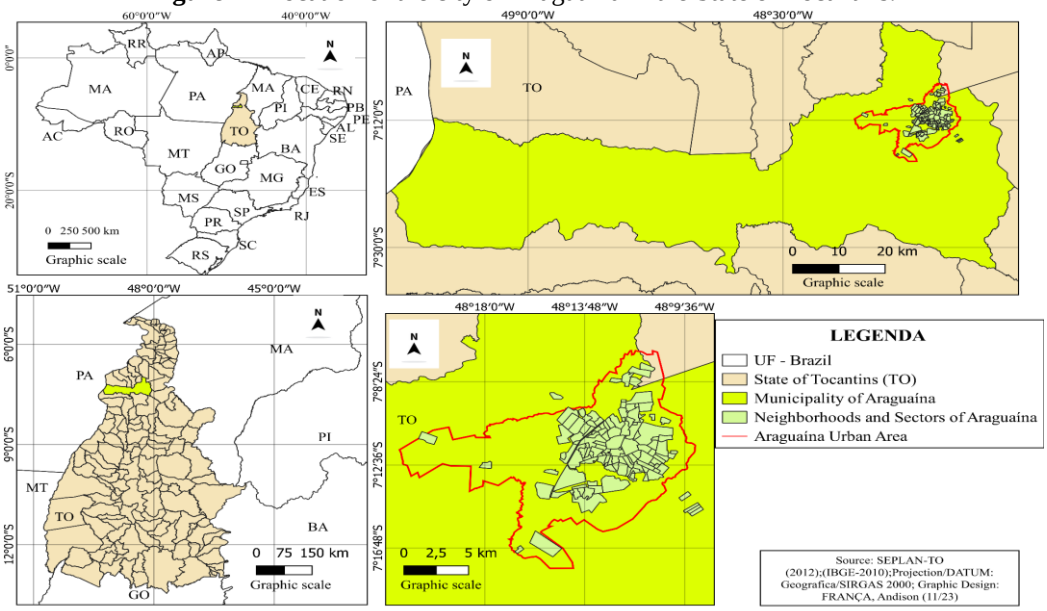
In Brazil, scorpions are the main causes of accidents caused by venomous animals, being responsible for 59% of all these accidents in the country in 2018, with a mortality rate of 0.06% (BRASIL, 2020). Due to the high number of accidents and serious complications that can occur, scorpionism stands out among accidents caused by venomous animals (ALMEIDA et al., 2021; BRITO et al., 2023). To control and prevent these accidents, the Ministry of Health created the National Program for the Control of Accidents caused by Venomous Animals in 1980 and instituted compulsory notification of this disease in the information and notification system (SINAN) in 1993 (BRASIL, 2009a). It is necessary to carry out constant public actions to educate the population and prevent these accidents, as scorpionism can cause temporary or permanent impacts on public health. Therefore, epidemiological knowledge of the disease, its clinical and laboratory manifestations, is essential to support effective control actions against scorpionism.

Currently, the information available about scorpionism in the state of Tocantins is obtained through compulsory notification forms. However, these forms do not include detailed clinical information observed during care,creating gaps in knowledge of the clinical and epidemiology of scorpionism in the region. Therefore, this studysearch expand knowledge about the epidemiological situation and clinical characteristics of scorpion accidents in the Northern Region of Tocantins, identifying factors that indicate the population's vulnerabilities.

II. METHODOLOGY

The study carried out in the municipality of Araguaína – TO (Figure 1), located 7° 11′ 28″ of latitude e 48° 12′ 26″ longitude, in the Northern region of Brazil, the Legal Amazon area.

Figure 1 - Location of the city of Araguaína in the State of Tocantins.



Elaboration: FRANÇA, Andison (2023).

This study is observational and descriptive, with a quantitative-qualitative approach. Being carried out at the Tropical Diseases Hospital of the Federal University of Tocantins (HDT-UFT),being a hospital specializing in tropical diseases and infectious diseases, with a capacity of 50 beds. The HDT-UFT is a secondary reference for the municipality and region in responding to cases of accidents involving venomous animals. The study included victims of scorpion poisoning treated at HDT from April to October 2019, who consented to participate in the research by signing the Free and Informed Consent Form (TCLE) or the Free and Informed Assent Form (TALE).

The sample for this study included all cases of scorpionism treated at HDT - UFT, between the months of April and October 2019, which were reported by the patient themselves or diagnosed by a doctor, and who agreed to voluntarily participate in this study. Patients who suffered other types of injuries or those where the diagnosis of scorpionism discarded by the attending physician, as well as individuals who did not agree to

voluntarily participate in this study. After initial care and stabilization of the patient, during observation or discharge, patients who agreed to participate in the research were interviewed to fill out a research form. In this form, epidemiological data regarding the characteristics of the location and the circumstances of the accident were recorded. The following variables were recorded on the form:

• Epidemiological data: age, sex, municipality of residence, municipality of the accident, circumstances of the accident, injured body part, presence of debris near the accident site, time between the accident and care, presence of comorbidities.

• Assessment of pain on admission: intensity, duration and characteristics (according to VAS);

• Local manifestations on admission: edema, erythema, local heat, piloerection, sweating and paresthesia;

• Systemic manifestations upon admission: tremors, prostration, asthenia, hyperthermia;

• Autonomic clinical manifestations: tachycardia, hypertension, bradycardia, hypotension, sweating, nausea, vomiting, sialorrhoea, diarrhea, priapism, dyspnea, cyanosis;

• Uncommon systemic manifestations: perioral and tongue paresthesia;

• Physical examination upon admission: vital signs, general physical examination and examination of the cardiovascular, respiratory and gastrointestinal systems;

• Classification of the severity of the accident: mild, moderate or severe

• Additional tests upon admission (requested according to the assessment of the doctor on duty): electrocardiogram (ECG), complete blood count, creatine phosphokinase (CPK), aspartate aminotransferase (AST), alanine aminotransferase (ALT), lactic dehydrogenase (DHL), blood glucose, urea, creatinine, amylase, potassium and urinary sediment examination;

• Specific treatment: Antivenom, number of ampoules and dilution of serum therapy;

• Adverse reactions to serum therapy: urticaria, bronchospasm, nausea, vomiting, cough, hypotension and other manifestations.

• Need for observation or hospitalization and time for each;

• Hospital discharge conditions: cure, improvement or death.

To assess the presence and intensity of pain, a ruler-shaped scale was used, on which the patient should assign a score from 0 to 10, with 0 being the total absence of pain and 10 being the maximum bearable level of pain. Classified painaccording to Visual Analog Pain Scale (VAS) in three categories: mild (VAS between 0-2), moderate (VAS between 4-7) and intense (VAS between 8-10) (JENSEN; KAROLY; BRAVER, 1986).

To assess severity, the Brazilian Ministry of Health classification was used, which divides accidents into: mild (presence of local symptoms such as pain and local paresthesia) moderate (intense pain,nausea, vomiting, sweating, tachycardia) or severe (presence of moderate symptoms associated with profuse sweating, prostration, convulsion, edema acute lung disease and shock) (BRAZIL, 2010a).While, during laboratory investigation, data from biochemical tests— blood count, blood glucose, creatinine kinase, transaminases, urea, creatinine and urinary sediment, as well as radiological and electrocardiographic imaging tests performed during care, were used following the hospital protocol and guidelines from the Ministry of Health. Furthermore, the animals that the patients brought during emergency care were collected, identified and stored in a plastic bottle containing 70% alcohol. Then sent to the biological collections laboratory of the Federal University of Tocantins for identification of the species, following the identification key provided by Lourenço and Eickstedt (2009).

Finally, the data obtained were organized in a Microsoft Office Excel 2013 spreadsheet and the clinical and epidemiological characteristics were statistically analyzed. Categorical variables were presented as frequencies and proportion analysis was performed using the binomial test, with a 95% confidence interval for all categories. To test the association between the variables, a univariate analysis was carried out using the Chi-square test, with a significance level of $\alpha = 0.05$. All statistical processing carried out using Epi Info software version 7.0.

III. RESULT

The accidents occurred in 13 municipalities, the majority being in Araguaína (76.99%), followed by the municipalities of Wanderlândia (7.08%) and Barra do Ouro (3.54%) (Table 1). In Araguaína, the neighborhood with the highest frequency is Araguaína Sul (17.44%) (Figure 2).

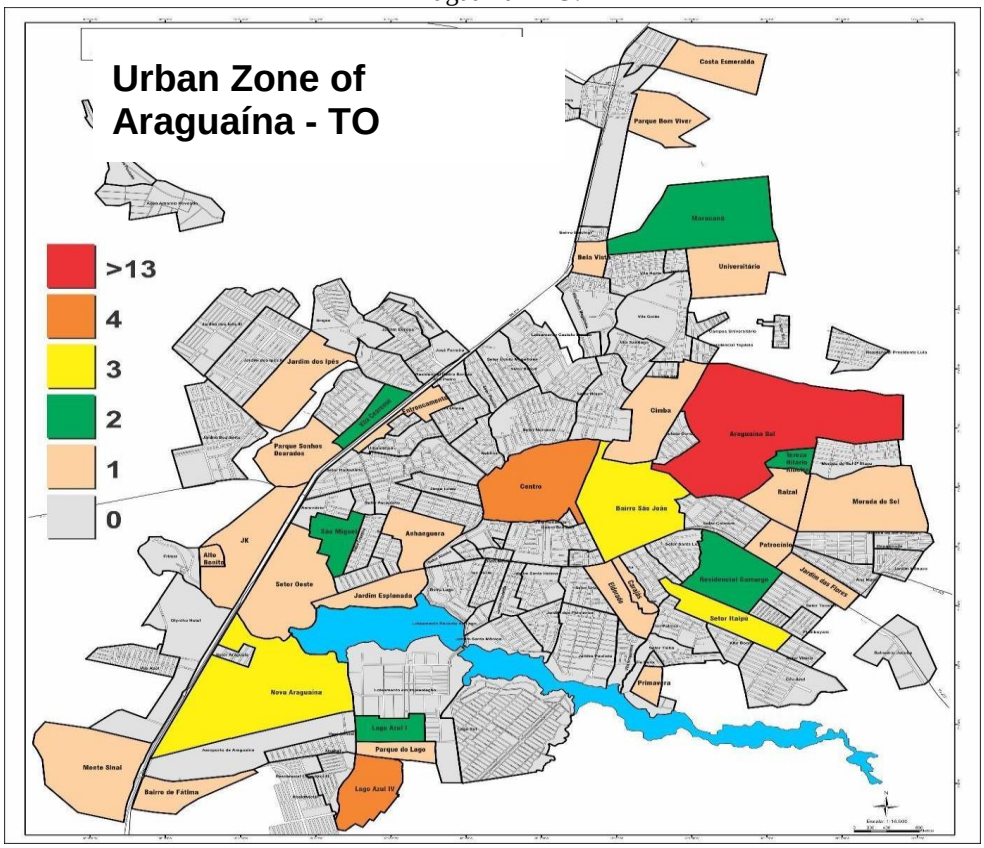
Table 1 - Distribution of scorpion accidents according to the municipality of occurrence, of patients treated at the Hospital for Tropical Diseases of the Federal University of Tocantins (HDT-UFT), from April to November 2019. Araguaína— TO. CI (95%): 95% confidence interval.

Variable	N	%	IC (95%)	
Municipality of the accident/UF				
Araguayna - TO	87	76,99%	68,13%	84,39%
Wanderlândia - TO	8	7,08%	3,11%	13,47%
Barra do Ouro - TO	4	3,54%	0,97%	8,82%
Babaçulândia - TO	3	2,65%	0,55%	7,56%
Estreito - MA	2	1,77%	0,22%	6,25%

Philadelphia - TO	2	1,77%	0,22%	6,25%
Angico - TO	1	0,88%	0,02%	4,83%
Aragominas - TO	1	0,88%	0,02%	4,83%
Arapoema - TO	1	0,88%	0,02%	4,83%
Campos Lindos - TO	1	0,88%	0,02%	4,83%
Darcinópolis - TO	1	0,88%	0,02%	4,83%
Goiatins - TO	1	0,88%	0,02%	4,83%
Palmeiras - TO	1	0,88%	0,02%	4,83%
Total	113	100%		

Source: Research data

Figure 2 - Distribution of scorpion accidents treated at the Hospital for Tropical Diseases of the Federal University of Tocantins (HDT-UFT) from April to November 2019, according to neighborhood of occurrence, Araguaína - TO.



Source: Research data (2023).

There was a greater number of reports of accidents involving scorpions in urban areas (73.2%) compared to rural areas (26.8%) (Table 2).

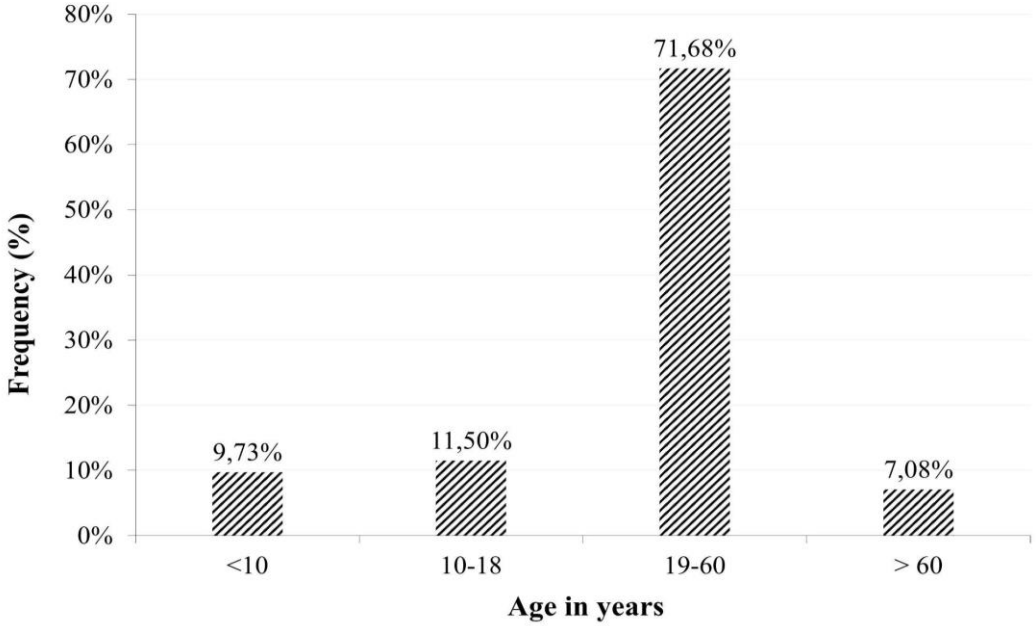
Table 2 - Distribution of scorpion accidents treated at the Tropical Diseases Hospital of the Federal University of Tocantins (HDT-UFT) from April to November 2019, according to occurrence zone. Araguaína - TO. IC (95%): 95% confidence interval.

Variable	**N**	**%**	**IC (95%)**		**p value**
Zone					
Rural	26	26,80%	18,32%	36,76%	p<0,001
Urban	71	73,20%	63,24%	81,68%	
Total	97	100,00%			

Source: Research data (2023.

The age of the victims ranged from 0 to 76 years (Figure 3), with adults being the affected age group (79.65%), cases in children under 10 years old represented only 9.73% and elderly 7.08%.

Figure 3 - Distribution of scorpion accidents treated at the Hospital for Tropical Diseases of the Federal University of Tocantins (HDT-UFT) from April to November 2019, according to age group. Araguaína – TO (N = 113).



Source: Research data (2023).

Table 3 -Distribution of scorpion accidents treated at the Hospital for Tropical Diseases of the Federal University of Tocantins (HDT-UFT) from April to November 2019, according to sex and age, Araguaína-TO. CI (95%): 95% confidence interval.

Variable	N	%	IC (95%)		p value
Age					
Older than 18 years	90	79,65%	71,04%	86,64%	<0,001
18 years or younger	23	20,35%	13,36%	28,96%	
Total	113	100,00%			
Sex					
Masculine	61	53,98%	44,35%	63,40%	0,3972
Feminine	52	46,02%	36,60%	55,65%	
Total	113	100,00%			

Source: Research data (2023).

Table 4 - Distribution of scorpion accidents treated at the Hospital for Tropical Diseases of the Federal University of Tocantins (HDT-UFT) from April to November 2019, according to the characterization of the accident, Araguaína-TO. CI (95%): 95% confidence interval.

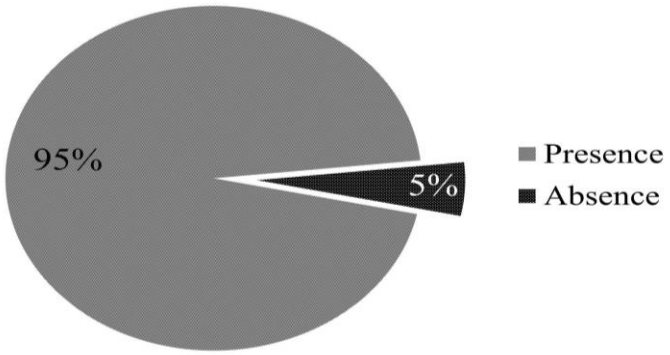
Variable	N	%	IC (95%)		p value
Pathologies previews					
Absent	84	86,5%	78,7%	92,34%	<0,001
Gift	13	13,4%	7,66%	21,3%	
Total	97	100%			
Accident period					
Nocturnal	63	55,75%	46,11%	65,09%	0,221
Daytime	50	44,25%	34,91%	53,89%	
Total	113	100,00%			
Circumstances of the accident					
In rest	53	60,22%	49,75%	70,04%	0,055
In activity	35	39,77%	29,96%	50,25%	
Total	88	100,00%			
Affected member					
Superior	60	63,83%	53,27%	73,49%	0,007
Inferior	34	36,17%	26,51%	46,73%	
Total	94	100,00%			

Debris near the accident site					
Yes	55	62,50%	51,53%	72,60%	0,019
No	33	37,50%	27,40%	48,47%	
Total	88	100,00%			

Source: Research data (2023).

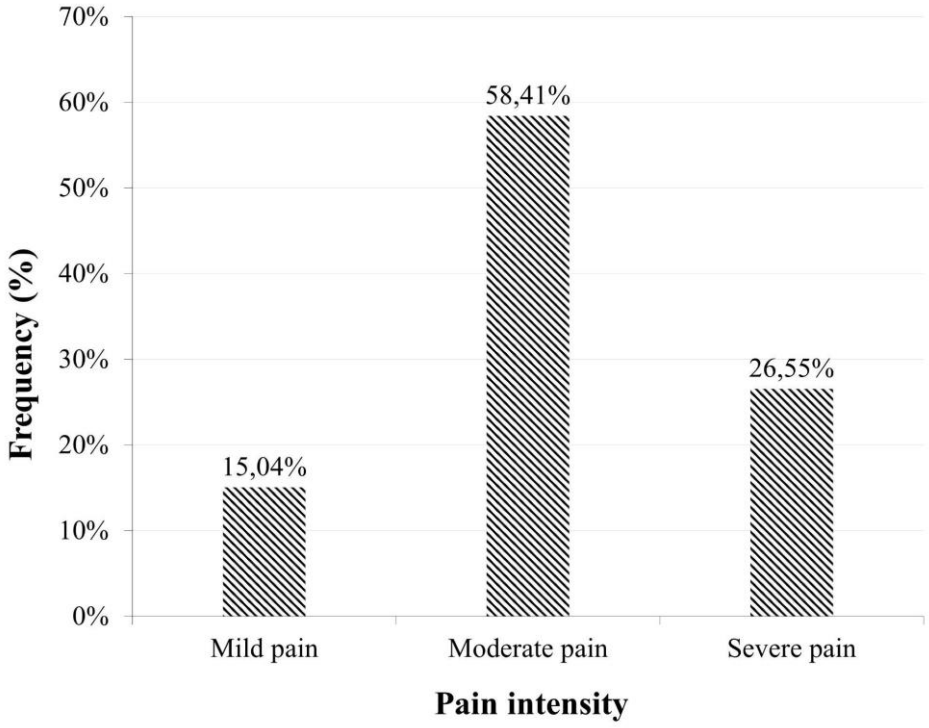
The majority of victims (86.6%) had no previous pathologies. Accidents occurred mainly in the upper limbs (63.83%), with fingers (30.56%), hands (16.67%) and feet (22.22%) being the affected parts. 60.22% of the victims were resting and 39.78% were carrying out some activity at the time of the accident. There was no significant difference in the time of the accident, which can occur at any time. The majority of patients (62%) confirmed the presence of debris near the accident site,95% of victims reported pain at the site of the bite, with 85% classifying the pain as moderate to severe. 79.44% of those injured presented painful symptoms in the first 15 minutes after the bite.

Figure 4 - Distribution of scorpion accidents treated at the Hospital for Tropical Diseases of the Federal University of Tocantins (HDT-UFT) from April to November 2019, according to the presence of local pain. Araguaína-TO (N=113).



Source: Research data (2023).

Figure 5- Distribution of scorpion accidents treated at the Hospital for Tropical Diseases of the Federal University of Tocantins (HDT-UFT) from April to November 2019, according to reported pain intensity (using EVA), Araguaína-TO. (N=113)



Source: Research data (2023).

The majority of victims (97.35%) presented some local clinical sign, the most common being pain (94.69%), edema (68.14%) and erythema (74.34%). There was a low proportion of signs for most of the symptoms analyzed (p<0.001). Neurological manifestations were observed in 38% of cases, in the form of local paresthesia or radiating to the entire affected limb.

Table 5 - Distribution of scorpion accidents treated at the Hospital for Tropical Diseases of the Federal University of Tocantins (HDT-UFT) from April to November 2019, according to local symptoms. Araguaina—TO. CI (95%): 95% confidence interval.

(Continues)

Variable	N	%	IC (95%)		p value
Asymptomatic					
No	110	97,35%	92,44%	99,45%	<0,001
Yes	3	2,65%	0,55%	7,56%	
Total	113	100,00%			
Local heat					
Absent	107	94,69%	88,80%	98,03%	<0,001
Gift	6	5,31%	1,97%	11,20%	
Total	113	100,00%			
Local pain					
Absent	6	5,31%	1,97%	11,20%	<0,001
Gift	107	94,69%	88,80%	98,03%	
Total	113	100,00%			
Pain onset time					
0 to 15 minutes	85	79,44%	70,54%	86,64%	<0,001
Others	22	20,56%	13,36%	29,46%	
Total	107				
Local Edema					
Absent	77	68,14%	58,71%	76,59%	<0,001
Gift	36	31,86%	23,41%	41,29%	
Total	113	100,00%			
Local paresthesia					
Absent	77	68,14%	58,71%	76,59%	<0,001
Gift	36	31,86%	23,41%	41,29%	
Total	113	100,00%			

Source: Research data (2023).

Table 5 - Distribution of scorpion accidents treated at the Hospital for Tropical Diseases of the Federal University of Tocantins (HDT-UFT) from April to November 2019, according to local symptoms. Araguaína - TO. CI (95%): 95% confidence interval.

(Conclusion)

Variable	N	%	IC (95%)	p value	Variable
Paresthesia throughout the injured limb					
Absent	106	93,81%	87,65%	97,47%	<0,001
Gift	7	6,19%	2,53%	12,35%	
Total	113	100,00%			
Piloerection at the bite site					
Absent	110	97,35%	92,44%	99,45%	<0,001
Gift	3	2,65%	0,55%	7,56%	
Total	113	100,00%			

Source: Research data (2023).

A frequency of patients with systemic changes of 34.94%, with increased blood pressure in 25% of cases. In table 6, the frequency of systemic changes is low for all changes observed, with the Elevated blood pressure (25.66%) and cardiac changes (20.83%) were common, with a predominance of tachycardia (73.3%).

Table 6 - Distribution of scorpion accidents treated at the Hospital for Tropical Diseases of the Federal University of Tocantins (HDT-UFT) from April to November 2019, according to the presence of systemic symptoms. Araguaína-TO. CI (95%): 95% confidence interval.

(Continues)

Variable	N	%	IC(95%)		P value
Heart rate					
Normal	98	86,72%	79,51%	92,08%	P<0,001
Amended	15	13,28%	7,92%	20,48%	
Total	113	100,00%			
Mild sweating					
Absent	108	95,58%	89,98%	98,55%	P<0,001
Gift	5	4,42%	1,45%	10,02%	
Total	113	100,00%			
Profuse sweating					
Absent	109	96,46%	91,18%	99,03%	P<0,001
Gift	4	3,54%	0,97%	8,82%	
Total	113	100,00%			
Tachypneia					
Absent	110	97,35%	92,44%	99,45%	P<0,001
Gift	3	2,65%	0,55%	7,56%	
Total	113	100,00%			
Nausea					
Absent	105	92,92%	86,53%	96,89%	P<0,001
Gift	8	7,08%	3,11%	13,47%	
Total	113	100,00%			
BP elevation on admission					
Absent	84	74,34%	65,26%	82,09%	P<0,001
Gift	29	25,66%	17,91%	34,74%	
Total	113	100,00%			

Source: Research data (2023).

Table 6 - Distribution of scorpion accidents treated at the Hospital for Tropical Diseases of the Federal University of Tocantins (HDT-UFT) from April to November 2019, according to the presence of systemic symptoms. Araguaína-TO. CI (95%): 95% confidence interval.
(Conclusion)

Variable	N	%	IC (95%)		P value
Paresthetic sensation throughout the body					
Absent	104	92,04%	85,42%	96,29%	P<0,001
Gift	9	7,96%	3,71%	14,58%	
Total	113	100,00%			
Sialorrhoea					
Absent	111	98,23%	93,75%	99,78%	P<0,001
Gift	2	1,77%	0,22%	6,25%	
Total	113	100,00%			
Tremors					
Absent	109	96,46%	91,18%	99,03%	P<0,001
Gift	4	3,54%	0,97%	8,82%	
Total	113	100,00%			

Source: Research data

Of the 113 patients in the study, only 47 underwent laboratory tests (Table 7). Of the tests performed, only 3 (6.38%) showed leukocytosis, 1 (2.13%) leukopenia and 2 (4.25%) hyperglycemia. 52 electrocardiograms (ECG) were also performed, of which only 2 showed changes. Only 4 echocardiograms were performed, all with positive results.us limits of normality. The changes found in the exams are in Table 8.

Table 7- Distribution of scorpion accidents treated at the Hospital for Tropical Diseases of the Federal University of Tocantins (HDT-UFT) from April to November 2019, according to the tests carried out. Araguaína – TO. CI (95%): 95% confidence interval.

Variable	N	%	IC (95%)		p value
Laboratory change					
Absent	41	87,23%	74,26%	95,17%	<0,001
Gift	6	12,77%	4,83%	25,74%	
Total	47	100,00%			
Electrocardiogram					
With change	2	3,85%	0,47%	13,21%	<0,001
Normal	50	96,15%	86,79%	99,53%	
Total	52	100,00%			

Source: Research data (2023).

Table 8 – Frequency of laboratory changes and exams, of patients injured by scorpions treated at the Hospital for Tropical Diseases of the Federal University of Tocantins (HDT-UFT) from April to November 2019. Araguaína – TO. ECG: electrocardiogram.

Changes	Abnormalities found (%)
ECG	Bradycardia (1.92%), Sinus tachycardia (1.92%)
Leukocytes	Leukocytosis (6.38%) Leukopenia (2.13%)
Glycemia	Hyperglycemia (4.25%)

Source: Research data (2023).

Upon admission, the majority of cases (84.82%)It was considered light. In moderate (13.39%) and severe (1.79%) cases, symptoms such as nausea (44.44%), generalized paresthesia (33.33%), tachycardia (27.78%), increased blood pressure were found. arterial (16.67%) and profuse sweating (16.67%). Service timepost-accident ranged from 30 minutes to 24 hours, and the majority of patients received care within 6 hours after the accident (89.70%), 84.96% did not receive serum therapyspecific. Of the patients who received the antivenin, there were no adverse reactions. The majority of patients (105) remained under observation for a period of 1 to 18 hours, 44 remained for an average of 6 hours, 3 did notneed of observation and 5 required hospitalization lasting an average

of 1 day, and 83 patients were discharged due to cure. There were no deaths recorded during this period (Table 9).

Table 9 - Distribution of scorpion accidents treated at the Hospital for Tropical Diseases of the Federal University of Tocantins (HDT-UFT) from April to November 2019, according to the severity characteristics of the cases, Araguaína - TO. SAE/SAA: Antiscorpion serum/Antiarachnid serum. CI (95%): 95% confidence interval.

Variable	N	%	IC95%		p value
Severity of the accident					
Light	95	84,07%	76,00%	90,28%	<0,001
Moderate or severe	18	15,92%	10,03%	23,56%	
Total	113	100,00%			
Time between accident and care					
Up to 6 hours	87	89,70%	82,4%	94,64%	<0,001
>6h	10	10,30%	5,357%	17,6%	
Total:	97	100,00%			
resorted to SAE/SAA					
No	96	84,96%	77,01%	90,99%	<0,001
Yes	17	15,04%	9,01%	22,99%	
Total	113	100,00%			
Quantity of ampoules					
2	3	17,65%	3,80%	43,43%	<0,001
3	12	70,59%	44,04%	89,69%	0,08
6	2	11,76%	1,46%	36,44%	<0,001
Total	17	100,00%			
Were you under observation?					
No	8	7,08%	3,11%	13,47%	<0,001
Yes	105	92,92%	86,53%	96,89%	
Total	113	100,00%			
Observation time					
Less than 6h	29	27,62%	19,34%	37,20%	<0,001
Greater than or equal to 6h	76	72,38%	62,80%	80,66%	
Total	105	100,00%			
Need for hospitalization					
No	107	94,69%	88,80%	98,03%	<0,001
Yes	6	5,31%	1,97%	11,20%	
Total	113	100,00%			

Source: Research data

The variables associated with the severity of cases were genderfeminine, (OR=3.68), perioral paresthesia (OR=3.75) and tongue paresthesia (OR=3.53), while the other variables did not show significant differences (Table 10). Regarding factors associated with oral paresthesia, it was observed that the chance of oral paresthesia was 3.36 times greater in female patients and associated with paresthesia in the tongue (OR=3.91) and the presence oftachycardia, (OR=4.58), as shown in Table 11.

Table 10 - Distribution of characteristics according to the severity of cases of scorpion accidents treated at the Hospital for Tropical Diseases of the Federal University of Tocantins (HDT-UFT) from April to November 2019. Araguaína - TO. OR: odds ratio. CI (95%): 95% confidence interval.

(Continues)

Variable	Gravity		p	OR	IC(95%)	
	Sim	NO				
Sex						
Feminine	13 (72,22%)	39 (41,05%)	<0,001	3,69	1,242	12,37

Masculine	5 (27,78%)	56 (58,95%)				
Total (100%)	18	95				
Age						
Up to 18 years old	4 (22,22%)	19 (20,00%)	0,405	1,14	0,293	3,757
18 years or more	14 (77,78%)	76 (80,00%)				
Total 100%	18	95				
EVA						
3 or more	16 (88,89%)	80 (84,21%)	0,331	1,45	0,344	10,5
<3	2 (11,11%)	15 (15,79%)				
Total (100%)	18	95				
Member						
Superior	7 (50,00%)	53 (66,25%)	0,132	0,51	0,156	1,678
Inferior	7 (50,00%)	27 (33,75%)				
Total (100%)	14	80				
Time until service						
>6h	3 (18,75%)	7 (8,64%)	0,134	2,41	0,455	10,52
Until 6am	13 (81,25%)	74 (91,36%)				
Total (100%)	16	81				

Source: Research data

Table 10 - Distribution of characteristics according to the severity of cases of scorpion accidents treated at the Hospital for Tropical Diseases of the Federal University of Tocantins (HDT-UFT) from April to November 2019. Araguaína - TO. OR: odds ratio. CI (95%): 95% confidence interval.

(Conclusion)

Variable	**Gravity**		**p**	**OR**	**IC(95%)**	
	Sim	**NO**				
Zone						
Rural	5 (38,46%)	21 (25,00%)	0,166	1,86	0,504	6,41
Urban	8 (61,54%)	63 (75,00%)				
Total (100%)						
Parestesia perioral						
Gift	6 (33,33)	11 (11,58%)	0,017	3,75	1,104	12,22
Absent	12 (66,67%)	84 (88,42%)				
Total (100%)	18	95				
Tongue paresthesia						
Gift	4 (22,22%)	7 (7,37%)	0,043	3,53	0,813	13,92
Absent	14 (77,78%)	88 (92,63%)				
Total (100%)	18	95				

Source: Research data (2023).

Table 11 - Distribution of characteristics according to the presence of perioral paresthesia in scorpion accidents treated at the Hospital for Tropical Diseases of the Federal University of Tocantins (HDT-UFT) from April to November 2019. Araguaína – TO. OR: odds ratio. CI (95%): 95% confidence interval. VAS: visual analogue pain scale.

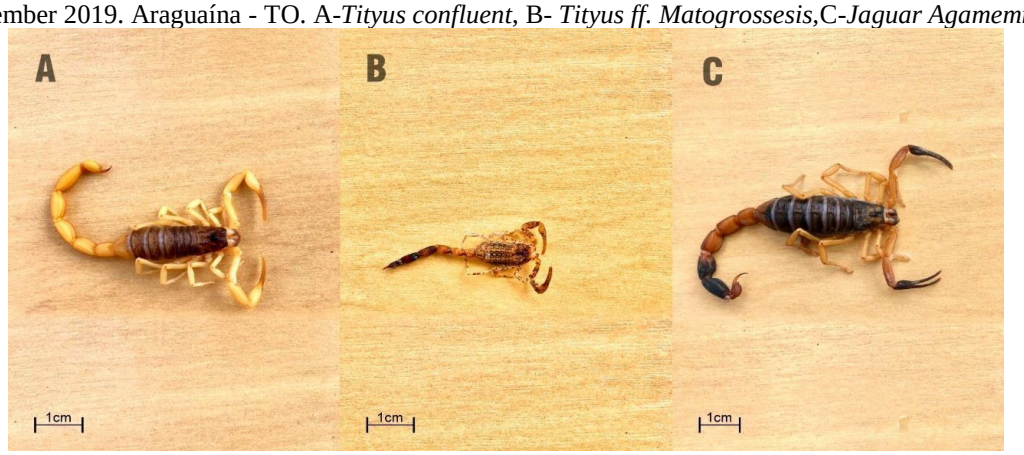
Variable	**Parestesia Perioral**		**p**	**OR**	**IC(95%)**	
	Sim	**THEY**				
Sex						
Feminine	12 (70,59%)	40 (41,67%)	0,0160	3,36	1,096	10,292
Masculine	5 (29,41%)	56 (58,33%)				
Total (100%)	17	96				
Age						
Up to 18 years old	2 (11,76%)	21 (21,88%)	0,1844	0,47	0,100	2,250
18 years or more	15 (88,24%)	75 (78,13%)				
Total 100%	17	96				
EVA						
3 or more	15 (88,24)	81 (84,38%)	0,367	1,385	0,316	9,76
<3	2 (11,76%)	15 (15,63%)				
Total (100%)	17	96				
Time until service						
>6h	2 (13,33%)	8 (9,76%)	0,3315	1,47	0,187	7,004
Until 6am	13 (86,67%)	74 (90,24%)				

Total (100%)	15	85				
Tongue paresthesia						
Gift	4 (23,53%)	7 (7,29%)	0,0356	3,9121	1,005	15,233
Absent	13 (76,47%)	89 (92,71%)				
Total (100%)	17	96				
Member						
Superior	10 (66,67%)	50 (63,29%)	0,4120	1,158	0,361	4,081
Inferior	5 (33,33%)	29 (36,71%)				
Total (100%)	15	79				
Zone						
Rural	5 (33,33%)	21 (25,61%)	0,2709	1,4524	0,445	4,739
Urban	10 (66,67%)	61 (74,39%)				
Total (100%)	15	82				
Tachycardia						
Gift	5 (29,41%)	8 (8,33%)	0,0150	4,5833	1,287	16,317
Absent	12 (70,59%)	88 (91,67%)				
Total (100%)	17	96				

Source: Research data (2023).

Only 5 victims (4.42%) took the attacking animal for treatment, while 110 (97.35%) reported only having been stung by a scorpion. 2.65% of victims were unable to identify the animal.

Figure 6 - Specimens responsible for scorpion accidents in patients treated at HDT-UFT, from March to September 2019. Araguaína - TO. A-*Tityus confluent*, B- *Tityus ff. Matogrossesis*,C-*Jaguar Agamemnon.*



Source: Research data

IV. DISCUSSION

Scorpions are well adapted to urban home life, a fact that is due to human invasion in areas originally occupied by arachnids, which contributed to the rapid proliferation of scorpions, largely due to the availability of shelter, abundant food and lack of competitors and natural predators. (from PAULA et al., 2020; OLIVEIRA et al., 2020). This reflects the fact that 62.5% of patients reported the presence of debris close to the accident site (Table 2). However, the government sector recommends that people do not let dry leaves and household rubbish accumulate, pack them in plastic bags or closed containers and send them to the collection service. As well as avoiding throwing debris in vacant lots to eliminate scorpions' food sources, such as cockroaches, crickets and other synanthropic invertebrates. Furthermore, it is important to prevent the development of environments suitable for scorpions, such as construction sites,terraplanagens that can concentrate debris, uncoated surfaces and moisture accumulation (BRASIL, 2009b).

This is reflected in the profile of the patients involved, where the age range affected by cases of scorpionism is between 19 and 60 years old, which is in line with previous descriptions (NOGUEIRA et al., 2021; SOUZA et al., 2022). The behavior of scorpions, which shelter from sunlight in dark environments, such as the inside of shoes, closets and various residential areas, such as ceilings, gaps in walls and construction debris, is relevant in both everyday and work activities (NOGUEIRA et al. al., 2021). Furthermore, in the present study, there was no significant difference in the proportion of cases between men and women, a result that is in line with the conclusions of Souza et al. (2022) in relation to cases of scorpionism in Brazil. This reinforces the finding that the sex of the patients is not an influential factor in accidents with scorpions, as can be seen in Table 3. However, it is important to highlight that among the affected women there were two pregnant patients and one breastfeeding, which which may be associated with greater exposure in the home environment (ALBUQUERQUE et al., 2004).

In any case, the evidence obtained suggests that males and females are exposed to similar risks of suffering a scorpion accident for the period and region studied. However, there have been accidents with people working in construction, logging, transport and produce distribution, highlighting that greater exposure related to manual labor activities, as reported, cannot be ruled out, as reported by Ferreira and Borges (2020).

Scorpions generally attack in defense situations, when threatened, which can occur when wearing shoes or handling objects without previously checking the presence of these animals in those places. This defensive behavior may explain the occurrence of a high number of accidents involving scorpions in urban areas. Therefore, health education actions can be important to raise people's awareness about the risks and prevent these risky behaviors (MESQUITA et al., 2015). Furthermore, the accumulation of rubbish and debris can encourage the proliferation of pests.urban as cheap, which are the main food of scorpions. This favorable environment can allow the installation and proliferation of these arachnids in the domestic environment, increasing the likelihood of accidents. Therefore, environmental sanitation measures, such as the elimination of garbage and debris, can be important to prevent the proliferation of scorpions in the peri- and intra-domestic environment (MOTA et al., 2022). The Brazilian government recognized the importance of these measures and published guidelines for controlling scorpions in urban areas (BRASIL, 2009).

The presence of local pain was reported with high frequency among the patients involved, which is a finding consistent with previous studies (LOPES et al., 2020; SANTOS et al., 2019), indicating that pain is a common andgenerally present in almost all accident cases. The intensity of pain reported by victims in the survey is worrying, with 85% describing it as moderate to intense. This suggests that pain may be an important factor to be considered in the management and treatment of affected patients. Another important result is that, in the vast majority of cases, painful symptoms appeared quickly, within the first 15 minutes after the accident, which together with the percentage of patients in pain, reinforces the importance of a quick and effective diagnosis in accident cases. with scorpions in order to minimize symptoms and complications associated with the sting. In addition to the need for investments in preventive measures, such as awareness campaigns and the elimination of possible scorpion breeding sites, aiming to reduce the occurrence of these accidents.

Furthermore, they show a predominance of local clinical manifestations in relation to systemic ones, with pain and edema being the common symptoms. This is consistent with the literature that describes local manifestations as frequent in cases of scorpion accidents (NUNES, et al., 2022; SANTANA et al., 2022). In some cases, the patient may feel the sting but experience no pain afterwards. This may indicate that there was no inoculation of venom or that the scorpion did not have venom at the time of the accident. However, there may be hyperesthesia or paresthesia at the inoculation site in the days following the bite. Additionally, hyperemia may occur,what is a reddish spot around the bite, as well as discrete edema, without a localized inoculation point, sweating, piloerection and thermal changes in the affected area or limb (ISMAIL, 1995; BRASIL, 2001).

Scorpion poisoning can present different symptoms, which depend on factors such as the species, amount of venom injected and the victim's age (CARMO et al., 2019). The presence of neurotoxic peptides in scorpion venom can explain a large part of the systemic symptoms, including paresthesias and changes in blood pressure. These toxins act on the modulation of ion channels in biological membranes, such as sodium, potassium, chloride or calcium channels, leading to the depolarization of nerve endings in the sympathetic and parasympathetic systems, the effects of which can be neurotoxic and cardiotoxic (BERALDO-NETO et al ., 2023).

38% of cases showed observable neurological manifestations, including local paresthesia or radiating to the entire affected limb. This can be explained by the mechanism of action of the scorpion toxin involved in the accidents, which has the characteristic of depolarizing ion channels, mainly sodium and potassium channels, affecting the post-ganglionic and postsynaptic terminals, causing a release of sympathetic and parasympathetic mediators. Which can directly affect the neurological system of theindividual (GODOY et al., 2021). Furthermore, the percentage found is in line with previous studies (BARBOSA et al., 2012; SILVA et al., 2015; DIAS; BARBOSA, 2016; FURTADO et al., 2016). Although no serious neurological symptoms have been observed, the occurrence of systemic neurological symptoms is common. In this study, two unusual occurrences of perioral and tongue paresthesia were observed, which are generally described as a feeling of numbness,nuisance or tingling. As in the study by Brandão and Françoso (2010), who report the presence of paresthesia in the tongue in a clinical case description involving poisoning by an animal of the species*Jaguar Agamemnon*. In the present study,it's possible identify the species*J. Agamemnon*, in one of the cases, where the patientpresented Associated perioral and tongue paresthesia.

In turn, echocardiography did not find global hypokinesia of the left ventricle (LV), mitral regurgitation and decreased ejection fraction in the present study, contrasting with the literature, where these are portrayed as the expected changes in cases of myocarditis related to poisoning. scorpion (CAMPOS; CARDOSO; ANDRADE FILHO, 2020), and with a study where echocardiography found heart failure earlier than the serum Troponin T measurement in 20% of patients (SOFER et al., 2013). Therefore, despite the non-observation of these changes in the present study, this methodologyis able to accelerate the introduction of specific cardiac therapy, contributing

to a favorable outcome. However, it is important to mention that the use of echocardiography may be limited by its availability in all medical care locations (CAMPOS; CARDOSO; FILHO ANDRADE, 2020).

Althoughthe majority Although cases of scorpionism present local symptoms, accidents involving children can develop into serious symptoms (ANDRADE FILHO; CAMPOLINA; DIAS, 2017; BRASIL, 2001). Severe cases evolve with cardiorespiratory changes that can lead to hemodynamic instability and, in some cases, result in the patient's death. Early care and efficient management are crucial to modify survival in these cases. Therefore, it is important to understand the pathophysiological mechanisms involved in the systemic changes triggered by venom toxins and establish the use of effective medications and therapies in managing these cases (ALBUQUERQUE et al., 2022; CARMO et al., 2019). Only five victims (4.42%) took the attacking animal for care.Generally, 110 patients (97.35%), the victim only reported being "stung" by a scorpion, and 2.65% of victims were unable to identify the animal. Generally, the animal is killed and destroyed by patients,making it difficult the identification of the attacking species based on oral descriptions made by people without adequate training. Furthermore, the similarity between several species can harm the characterization of the aggressor species (BRANDÃO; FRANÇOSO, 2010)

Of the scorpion species with medical importance in Brazil, 7 were previously recorded in the municipality of Araguaína (SAVIATO et al., 2023). Including the 3 species analyzed in the present study:*Tityus confluent* (Borelli, 1899) in three cases,*Tityus aff. matogrossensis* (Borelli, 1901) in one case and*Jaguar Agamemnon* (C.L. Koch, 1839), specimens of which are illustrated in figure 6. These species are generally found in cerrado areas.*T. aff. matogrossensis* It is endemic to the Brazilian cerrado and occurs throughout the Center-West, Bahia, Goiás and described in Tocantins. This species generally causes minor accidents (BRASIL, 2009b) and measures approximately36 mm long, with a yellowish color and regular spots (LOURENÇO, 2008).*T. confluent* It is found in the Pantanal of Mato Grosso, and is to be described in Tocantins (BERTANI; MARTINS, 2005). This species measures approximately55 mm long and has colorlight yellow, with the presence of a prominent subaculear spine in the telson (LOURENÇO, 2008).*J.Agamemnon* It is a large scorpion, measuring up to110 mm of lenght. It has a yellowish-brown color, with yellowish legs and is endemic to northeastern Brazil, occurring in cerrado areas and recorded in the states of Bahia, Ceará, Goiás, Maranhão, Mato Grosso, Pernambuco, Piauí and Tocantins. Some observations suggest that this species is restricted to fragments of native vegetation with little adaptation to the urban area, disappearing when the cerrado is removed (EXPOSITO et al., 2016).

V. CONCLUSION

The majority of patients treated in the present study came from urban areas and belonged to the adult age group, with accidents being frequent in the domestic environment, particularly when there was debris nearby. Symptoms commonly reported by patients consisted of localized pain and swelling at the site of the bite, with a relatively low incidence of systemic symptoms. However, it was observed that female patients and individuals under 18 years of age were more likely to develop serious cases, although it is important to highlight that no deaths occurred among the patients treated. The need to administer antiscorpion serum is relatively rare.

Furthermore, two neurological manifestations were identified, characterized as paresthesias, with only a minority of patients able to identify the attacking scorpion. The results of the analysis revealed the presence of specimens of*Tityus confluent* in three cases,*Tityus aff. matogrossensis* in one case and *Jaguars Agamemnon* in another case, all associated with the Tocantins cerrado ecosystem.

Based on the conclusions obtained in this study, it is recommended to implement control measures aimed at mitigating the presence of scorpions in peridomiciliary and domestic environments. It is recommended to carry out educational actions aimed at schools and health units, which include promoting the cleaning of vacant land, the periodic removal of construction materials in the vicinity of properties, the adequate sealing of septic tanks, the covering of walls and sealing door sills. Integration between the Surveillance and Primary Health Care sectors is essential in order to plan and implement popular health education actions to reduce the risk of scorpion accidents.

References

[1]. Albuquerque, I. C. S.; Albuquerque, H. N.; Albuquerque, E. F.; Nogueira, A. S.; Farias, M. L. C. Scorpionism In Campina Grande-Pb.Journal Of Biology And Earth Sciences, Campina Grande, V. 4, No. 1, P. 0, 2004. Available At:Https://Www.Redalyc.Org/Articulo.Oa?Id=50040114. Accessed On: 27 June. 2023.

[2]. Albuquerque, M. C. A.; Lyra Filho, C. R. N.; Amorim, M. L. P.; Lins, I. B.; Lima, P. V. C.; Mello, M. J. G. Venomous Animals In Pernambuco: Children At Risk. Brazilian Journal Of Maternal And Child Health, V. 22, N. 1, P. 33-40, Jan-Mar 2022. Doi:Https://Doi.Org/10.1590/1806-93042022000100010.

[3]. Almeida, A. C. C.; Mise, Y. F.; Carvalho, F. M.; Silva, R. M. L. Ecological Association Between Socioeconomic, Occupational And Sanitation Factors And The Occurrence Of Scorpionism In Brazil, 2007-2019.Epidemiol. Serv. Health, V. 30, N. 4, 2021. Two:Https://Doi.Org/10.1590/S1679-49742021000400021.

[4]. Andrade Filho, A.; Campolina, D.; Dias, M.B.Toxicology In Clinical Practice. 2nd Ed. Belo Horizonte: Folium, 2017. Available At:Https://Issuu.Com/Folium/Docs/Toxicologia_2ed-Sample. Accessed On: 27 June. 2023.

[5]. Barbosa, A. D. Et Al. Characterization Of Scorpion Accidents In Belo Horizonte, Minas Gerais, Brazil, 2005 To 2009.Public Health Notebooks, V. 28, N. 9, P. 1785-1789, 2012. Doi:Https://Doi.Org/10.1590/S0102-311x201.

[6]. Beraldo-Neto, E.; Vigerelli, H.; Coelho, G. R.; Da Silva, D. L.; Nencioni, A. L. A.; Pimenta, D. C. Unraveling And Profiling Tityus Bahiensis Venom: Biochemical Analyses Of The Major Toxins. Journal Of Proteomics, V. 274, 104824, 2023. Two: Https://Doi.Org/10.1016/J.Jprot.2023.104824.

[7]. Bertani, R.; Martins, R. Notes Ontityus Confluent Borelli, 1899 (Scorpions: Buthidae) In Brazil.Zootaxa, V. 869, P. 1–7, 2005. Doi:Https://Doi.Org/10.11646/Zootaxa.869.1.1.

[8]. Brandão, R. A.; Françoso, R. D. Case Report Accident Due Torhopalurus Gamemnon (Koch, 1839) (Scorpions, Buthidae).Journal Of The Brazilian Society Of Tropical Medicine, V. 43, N. 3, P. 342-344, 2010. Doi:Https://Doi.Org/10.1590/S0037-86822010000300027.

[9]. Brazil. Ministry Of Health.Accidents Caused By Venomous Animals – Scorpions. Available In:Https://Www.Gov.Br/Saude/Pt-Br/Assuntos/Saude-De-A-A-Z/A/Animais-Peconhentos/Acidentes-Por-Escorpioes. Accessed On: 27 June. 2023.

[10]. Brazil. Ministry Of Health (Br). Health Surveillance Secretariat.Ordinance No. 264, Of February 17, 2020. National Compulsory Notification List Of Diseases, Conditions And Public Health Events. 2020. Available At:Https://Bvsms.Saude.Gov.Br/Bvs/Saudelegis/Gm/2020/Prt0264_19_02_2020.Html. Accessed On: 27 June. 2023.

[11]. Brazil. Ministry Of Health. Health Surveillance Secretariat. Epidemiological Surveillance Department.Infectious And Parasitic Diseases: Pocket Guide. Brasília: Ministry Of Health, 8. Ed, 448 P, 2010. Available At:Https://Bvsms.Saude.Gov.Br/Bvs/Publicacoes/Doencas_Infecciosas_Parasitaria_Guia_Bolso.Pdf. Accessed On: 27 June. 2023.

[12]. Brazil. Ministry Of Health.Scorpion Control Manual. 1st Ed. Brasília: Ms, 2009b. Available In:Https://Bvsms.Saude.Gov.Br/Bvs/Publicacoes/Manual_Controle_Escorpioes.Pdf. Accessed On: 27 June. 2023.

[13]. Brazil.Epidemiological Surveillance Guide. Brasília: Ministry Of Health; 2009a. Available In:Https://Bvsms.Saude.Gov.Br/Bvs/Publicacoes/Guia_Vigilancia_Epidemiologica_7ed.Pdf. Accessed On: 27 June. 2023.

[14]. Brazil.Manual For Diagnosis And Treatment Of Accidents Caused By Venomous Animals. Ministry Of Health. National Health Foundation. 2001. Available At:Https://Www.Icict.Fiocruz.Br/Sites/Www.Icict.Fiocruz.Br/Files/Manual-De-Diagnostico-E-Tratamento-De-Acidentes-Por-Animais-Pe--Onhentos.Pdf. Accessed On: 27 June. 2023.

[15]. Brito, M.; Almeida, A. C. C.; Cavalcante, F.; Mise, Y. F. Completeness Of Notifications Of Accidents Caused By Venomous Animals In The Notifiable Diseases Information System: Descriptive Study, Brazil, 2007-2019.Epidemiol. Serv. Health, V. 32, N. 1, 2023. Two: Https://Doi.Org/10.1590/S2237-96222023000100002.

[16]. Campos, L. L.; Cardoso, F. L.; Andrade Filho, A. Pathophysiology And Treatment Of Cardiovascular And Pulmonary Effects In Scorpion Poisoning.Minas Gerais Medical Magazine, V. 30, P. E-30203, 2020. Doi:Http://Www.Dx.Doi.Org/10.5935/2238-3182.20200038.

[17]. Carmo, E. A.; Nery, A. A.; Pereira, R.; Rios, M. A.; Casotti, C. A. Factors Associated With The Severity Of Scorpion Poisoning. Text Context - Sick., V. 28, 2019. Doi:Https://Doi.Org/10.1590/1980-265x-Tce-2017-0561.

[18]. Dias, C.; Barbosa, A. M. Epidemiological Aspects Of Accidents With Scorpions In The Municipalities Of Taubaté And Adjacent Areas.Science And Health Magazine, Pindamonhangaba, V. 1, No. 3, P. 8-15, Dec. 2016. Available At:Https://Revistaeletronicafunvic.Org/Index.Php/C14ffd10/Article/View/39/59.Accessed On: 27 June. 2023.

[19]. Exposito, L. A.; Yamaguti, H. Y.; Souza Ca; Paint-Da-Rocha, R.; Prendini, L. A Systematic Review Of The Neotropical Club-Tailed Scorpions,Physoctonus, Rhopalurus, And Troglorhopalurus, Revalidation Of Heteroctenus, And Descriptions Of Two New Genera And Three New Species (Buthidae: Rhopalurusinae). Bulletin Of The American Museum Of Natural History, N. 415, P. 1-136, 2016. Available At:Https://Digitallibrary.Amnh.Org/Items/48876bc9-336e-45f0-99ba-2b55dac7029b. Accessed On: 27 June. 2023.

[20]. Ferreira, I. C. Da S.; Borges, G. H. Epidemiological Profile Of Accidents Caused By Venomous Animals In The Municipality Of Patrocínio, Minas Gerais: Portrait Of A Decade.Journal Of Epidemiology And Infection Control, V. 10, N. 4, 2020. Two: Https://Doi.Org/10.17058/Reci.V10i4.14694.

[21]. Fogaça, G. H. S.; Chagas, G. H. N.; Costa, G. B.; Silva, G. M.; Caetano, S. M.; Fazolin, I. A. L. C.; Silvestre, A.; Araujo, G. R. E. Acute Heart Failure Secondary To Scorpion Accident: Case Report.The Brazilian Journal Of Infectious Diseases, V. 26, N. 1, P. 102289, 2022. Doi:Https://Doi.Org/10.1016/J.Bjid.2021.102289.

[22]. Furtado, S. S.; Belmino, J.F.B.; Diniz, A. N. G. Q.; Leite, R. S. Epidemiology Of Scorpion Envenomation In The State Of Ceará, Northeastern Brazil.Tropical Medicine Institute Magazine, V. 58, N. 15, 2016. Doi:Https://Doi.Org/10.1590/S1678-9946201658015.

[23]. Godoy, D. A.; Badenes, R.; Seifi, S.; Salehi, S.; Seifi, A. Neurological And Systemic Manifestations Of Severe Scorpion Envenomation. Cureus, V. 13, N. 4, E14715, 2021. Doi: Https://Doi.Org/10.7759/Cureus.14715.

[24]. Ismail, M. The Scorpion Envenoming Syndrome. Toxicon, V. 33, P. 825-858, 1995. Doi:Https://Doi.Org/10.1016/0041-0101(95)00005-7.

[25]. Lopes, L. D.; Lisbôa, J. D. B.; Silva, F. G. Da. Clinical And Epidemiological Profile Of Victims Of Accidents Caused By Venomous Animals In Santarém – Pa.Journal Health Npeps, V. 5, N. 2, 2020. Two:Https://Doi.Org/10.30681/252610104707.

[26]. Lourenço, W. R. Parthenogenesis In Scorpions: Some History – New Data. Journal Of Venomous Animals And Toxins Including Tropical Diseases, V. 14, N. 1, P. 19-44, 2008. Doi:Https://Doi.Org/10.1590/S1678-91992008000100003.

[27]. Lourenço, W. R.; Eickstedt, V. R. D. V. Scorpions Of Medical Importance. In: Cardoso, J. L. C.; France, F. O. S.; Wen, F.H.; Málaque, C. M. S.; Haddad Jr., V.Venomous Animals In Brazil: Biology, Clinic And Therapeutics Of Accidents. 2 Ed. São Paulo: Sarvier, P. 182-197, 2009. Available At:Https://Pesquisa.Bvsalud.Org/Portal/Resource/Pt/Lil-355800. Accessed On: 27 June. 2023.

[28]. Mesquita, F. N. B.; Nunes, M. A. P.; Santana, V. R.; Neto, J. M.; Almeida, K. B. S.; Lima, S. O. Scorpion Accidents In The State Of Sergipe, Brazil.Sorocaba Faculty Of Medical Sciences Magazine, V. 17, No. 1, P. 15-20, 2015. Available At:Https://Revistas.Pucsp.Br/Index.Php/Rfcms/Article/View/19842. Accessed On: 27 June. 2023.

[29]. Mota, A. L. F.; Arruda, A. M. V.; Melo, G. C. De; Oliveira, S. V. De. Epidemiological Analysis Of Accidents Caused By Scorpions In A Municipality In Triângulo Mineiro.Medicine (Ribeirão Preto), V. 55, N. 3, 2022. Two:Https://Doi.Org/10.11606/Issn.2176-7262.Rmrp.2022.195191.

[30]. Nogueira, C. F.; Alves, L. H. N.; Nunes, D. C. De O. S. Profile Of Accidents Caused By Venomous Animals Registered In Uberlândia, Minas Gerais (2014-2018).Hygeia - Brazilian Journal Of Medical And Health Geography, V. 17, P. 81-96, 2021. Doi:Https://Doi.Org/10.14393/Hygeia17057641.

[31]. Nunes, M. L. C.; Farias, J. A. C. R.; Anselmo, D. A.; Anselmo, M. De A.; Andrade, R. F. V. Accidents Involving Venomous Animals In Brazil: An Integrative Review.Unipar Health Sciences Arch., V. 26, N. 2, P. 147-157, 2022. Doi:Https://Doi.Org/10.0.98.22/Arqsaude.V26i2.2022.8262.

[32]. Oliveira, R. M. De; Cristo, S. S. V. De; Albuquerque, H. B. S. De; Porto, K. A. Dos S.; Souza, J. L. De; Seibert, C. S. Scorpionism In The Urban Area Of Palmas-Tocantins. Hygeia - Brazilian Journal Of Medical And Health Geography, V. 16, P. 137-158, 2020. Doi:Https://Doi.Org/10.14393/Hygeia16052465.

[33]. Paula, L. G. G.; Moreira, G. C.; Castiglioni, L.; Mendes, A. C. C. Clinical-Epidemiological Survey Of Scorpion Accidents In The Region Of São José Do Rio Preto, São Paulo, Brazil.Archives Of Health Sciences, V. 27, N. 1, P. 32-36, 2020. Doi:Https://Doi.Org/10.17696/2318-3691.27.1.2020.1694.
[34]. Santana, R. D. F.; Gil, G.T.; Gaggini, C. T.; Gaggini, M. C. R.; Favaleça, M. F. Clinical And Epidemiological Evaluation Of Accidents Caused By Scorpions In Cities In The Northwest Of São Paulo.The Brazilian Journal Of Infectious Diseases, V. 26, N. 1, P. 101967, 2022. Doi:Https://Doi.Org/10.1016/J.Bjid.2021.101967.
[35]. Santos, A. V.; Nunes, A. L. B. De P.; Nunes, D. C. De O. S. Epidemiology Of Accidents Caused By Venomous Animals In The Municipality Of Patrocínio (Mg), Brazil (2015-2017).Hygeia - Brazilian Journal Of Medical And Health Geography, V. 14, N. 30, P. 82–94, 2019. Doi:Https://Doi.Org/10.14393/Hygeia143007.
[36]. Saviato, M.J.; Coelho, A.L.W.; Oliveira, G. N.; Ferreira, R. A. G. ; Saviato, P. L. And C.; Cavalcante, C. R. M. Scorpions From The Northern Cerrado Of Tocantins: A Brief Report And List Of Animals Deposited In Collection.Research, Society And Development, V. 12, N. 5, P. E24312541773, 2023. Doi: Https://Doi.Org/10.33448/Rsd-V12i5.41773.
[37]. Silva, T. M. A. S.; Teles, D. M.; Braga, P. E. T.; Aguiar, F. C. D. E.; Freire, J. E. Epidemiology Of Scorpion Accidents In Ceará From 2009 To 2012.Health Magazine, V. 41, No. 2, P. 283-289, 2015. Available At:Https://Periodicos2.Uesb.Br/Index.Php/Rsc/Article/View/371.Accessed On: 27 June. 2023.
[38]. Sofer, S.; Zucker, N.; Bilenko, N.; Levitas, A.; Zalzstein, E.; Amichay, D.; Cohen-Lahav, M.; Bernstein, T. The Importance Of Early Bedside Echocardiography In Children With Scorpion Envenomation. Toxicon, V. 68, P. 1–8, 2013. Doi:Https://Doi.Org/10.1016/J.Toxicon.2013.02.016.
[39]. Souza, T. C.; Farias, B. E. S.; Bernarde, P. S.; Neto, F. C.; Frade, D. D. R.; Brillante, A. F.; Melchior, L. A. K. Temporal Trend And Epidemiological Profile Of Accidents Caused By Venomous Animals In Brazil, 2007-2019.Epidemiol. Serv. Health, V. 31, N. 3, 2022. Two:Https://Doi.Org/10.1590/S2237-96222022000300009.
[40]. Triches, C. M. F. Prediction And Characterization Of A Conformational Epitope Of The Beta-Neurotoxin Tsi From The Scorpion Tityus Serrulatas. 2017. 85p. Dissertation (Master's Degree In Health Sciences) - Universidade Do Extremo Sul Catarinense. Criciúma. 2017. Available At:Http://Repositorio.Unesc.Net/Handle/1/5197. Accessed On: 27 June. 2023.
[41]. Ward, M. J.; Ellsworth, S. A.; Nystrom, G. S. A Global Accounting Of Medically Significant Scorpions: Epidemiology, Major Toxins, And Comparative Resources In Harmless Counterparts. Toxicon, V. 151, P. 137-155, 2018. Doi:Https://Doi.Org/10.1016/J.Toxicon.2018.07.007.