ORIGINAL ARTICLE

Scorpion stings and spider bites in the Upper Juruá, Acre – Brazil

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Abstract

Introduction: Epidemiological information on poisonings by venomous animals is fundamental in order to elaborate proposals for educational campaigns for prevention of poisonings, and may contribute to the improvement of the care of patients admitted to health facilities.

Objective: Thus, the objective is to analyze the epidemiological profile of spider and scorpion poisoning in the Upper Juruá region, Western Amazonia, Brazil, from 2012 to 2017.

Methods: Epidemiological data were obtained from the records of SINAN (Information System of Notifiable Diseases) in the Epidemiological Surveillance Sector of the Juruá Regional Hospital located in Cruzeiro do Sul.

Results: There were 207 cases of accidents with arachnids, predominantly stinging by scorpions (148 cases, 71.9%), in the Regional Epidemiological Surveillance Sector of the Juruá Regional Hospital located in Cruzeiro do Sul. The average morbidity coefficient during the study period was 12 cases per 100,000 inhabitants for spider bites and 29.28 for scorpion stings. There was no correlation between spider and scorpion incidents with rainfall over the months during the study period.

Conclusion: The average incidence of spider and scorpion incidents in the Upper Juruá region is one of the highest recorded for the Brazilian Amazon and is higher than the averages for Brazil, the Northern region and the state of Acre. Incidents with spiders and scorpions were not correlated with rainfall, and other factors associated with species biology or with human activities related to the temporal distribution, therefore there could be a risk of an arachnid incident throughout the year.

Keywords: venomous animals, spiders, scorpions, epidemiology, Amazon.

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INTRODUCTION

Envenomation by spiders and scorpions in Brazil represents approximately 86,000 cases per year[1], and constitutes a major public health problem. During the period from 2009 to 2013, scorpions were responsible for an average of 60,000 cases of poisoning per year that resulted in an average of 80 deaths[1]. During this same period, there were about 25,000 cases of spider bites and 13 deaths per year. Scorpions in Brazil are the main cause of incidents by poisonous animals, exceeding double the cases of accidents by spiders[2]. In Brazil, between 2000 and 2012, scorpion stings showed a significant increase in the number of cases – a rise of over five times the previous number of recorded cases[3]. Urbanization and environmental changes in some way favored the multiplication of scorpions, especially the Tityus serrulatus, a species with great potential to colonize anthropic areas[3,4].

In the Amazon, spider bites and scorpion stings have been studied more in the eastern region and the central region[5,6], with a relative scarcity of publications regarding the western region. In the state of Amazonas, the main municipalities with records of spider bites are: Rio Preto da Eva with 91 cases per 100,000 inhabitants, followed by Apuí with 58 cases and other municipalities with a frequency of 4 cases per 100,000 inhabitants[6], for the scorpion stings, the state of Amazonas has an average population of 7.6 cases / 100,000 inhabitants, where the highest records were in Apuí with 182 cases followed by Rio Preto da Eva with 58.9 cases / 100,000 inhabitants[5].

Information on spider bites and scorpion stings is scarce in the western region of the Amazon and almost no published information on this subject exists on the state of Acre. A study carried out by Pierini *et al.*[7], only reported the prevalence of natives and riverine people being bitten by spiders and stung by scorpions. Epidemiological information on poisonings by venomous animals is fundamental to elaborate proposals for educational campaigns for prevention and could contribute to improving the care of patients treated at health facilities. Thus, the objective is to analyze the epidemiological profile of spider and scorpion poisoning in the Upper Juruá region, Western Amazonia, Brazil, from 2012 to 2017.

METHODS

Epidemiological data were obtained from the records of SINAN (Information System for Notifiable Diseases) in the Epidemiological Surveillance Sector of the Juruá Regional Hospital, located in the city of Cruzeiro do Sul (Figure 1). The municipality of Cruzeiro do Sul has approximately 82,000 inhabitants[8]. Its main economic activities are the production of cassava flour, extractive activities, fishing, agriculture and livestock[9]. The climate of the region is characterized as tropical, hot and humid, with average annual temperature of 24º C, and average annual rainfall of 2500 mm. The period between the months of May to October is considered the driest of the year (Figure 1).

The following variables were recorded: month of occurrence, arachnid involved (type of accident), accident site (urban and rural area), location, municipality, patient data (age group, sex and anatomical region affected), symptoms and signs presented, the circumstances of the incident, the time elapsed between the incident and the care, the type of serum therapy of the victims and the amount of ampoules used.

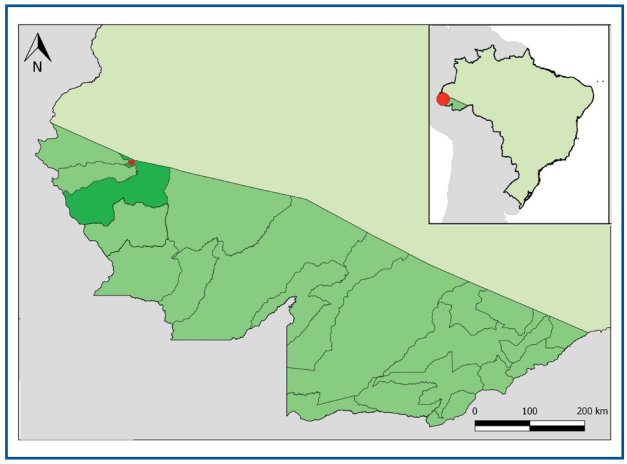

Figure 1: Study area: Municipality of Cruzeiro do Sul in the Upper Juruá region.

The morbidity coefficient (cases/100,000 inhabitants) was calculated by dividing the number of people who suffered accidents with spiders or scorpions, by the number of inhabitants of the municipality during the period of study[9]. Rainfall data were obtained electronically at the Cruzeiro do Sul Meteorological Station of the National Meteorological Institute (INMET). The Spearman correlation test[10] was used to verify a possible relationship between the number of spider accidents and monthly scorpions with rainfall. For the analysis of epidemiological and clinical characteristics, the chi-square test was used, considering significant when the p-value was less than 0.05.

The project was approved by the Research Ethics Committee of the Hospital das Clínicas do Acre - HCA / FUNDHACRE, on 12/22/2017.

RESULTS

During the period from 2012 to 2017, 207, cases of arachnid incidents were treated at Juruá Regional Hospital (Table 1), with scorpion stings predominating (148 cases, 71.9%) (Figure 2). The mean morbidity coefficient during the study period was 12 cases per 100,000 inhabitants for spider bites and 29.28 cases per 100,000 inhabitants for scorpion stings. The morbidity coefficients of spider bites and scorpion stings varied each year, with the highest rate of spider bites (18.15 cases/100,000 inhabitants) recorded in 2017 and scorpion stings (40.48) in 2015 (Figure 3).

The distribution of spider bites and scorpion stings had significant differences in relation to the area of occurrence (urban or rural), occupation of the victims and manifestations and systemic complications (Table 1). In relation to gender, age group, place of occurrence, whether it was a work related incident, the time elapsed between the accident and the hospital care, the anatomical region where the bite occurred and in the local manifestations, severity classification and the number

Table 1: Clinical and epidemiological characteristics of spider bites and scorpion stings occurring in the Upper Juruá region (AC) during the period of 2012 and 2017 (n = 207).

CHARACTERISTICS	SPIDER BITES (n = 59)	SCORPION STINGS (n = 148)	p
SEASON (n = 207; 100%)			0.04
Rainy (November to April)	34 (57.6%)	62 (41.8%)	
Dry (May to October)	25 (42.3%)	86 (58.1%)	
AREA OF OCCURRENCE (n = 207; 100%)			0.012
Urban	41 (69.4%)	75 (50.6%)	
Rural	18 (30.5%)	73 (49.3%)	
LOCATION OF OCCURRENCE (n = 167; 80.6%)			0.2
Home	36 (70.6%)	70 (53%)	
Track	8 (15.7%)	21 (15.9%)	
Backyard	3 (5.9%)	14(10.6%)	
Fields	2 (3.9%)	14 (10.6%)	
Forest	2 (3.9%)	12 (9.1%)	
Automobile	0 (0%)	1 (0.8%)	
SEX (n = 207; 100%)			0.06
M	32 (54.2%)	101 (68.2%)	
F	27 (45.7%)	47 (31.7%)	
AGE GROUP (in years) (n = 207; 100%)			0.127
0 to 10	8 (13.5%)	10 (6.7%)	
11 to 20	6 (10.1%)	17 (11.4%)	
21 to 30	9 (15.2%))	38 (25.6%)	
31 to 40	15 (25.4%)	45(20.4%)	
41 to 50	6 (10.1%)	12 (8.10%)	
51 to 60	4 (6.7%)	15 (10.1%)	
> 60	11 (18.6%)	11 (7.43%)	
OCCUPATIONAL ACCIDENT (n = 195; 94.2%)			0.087
Yes	5 (8.6%)	26 (17.6%)	
No	53 (91.3%)	121 (82.3%)	
OCCUPATION OF VICTIM (n = 112; 54.1%)			<0.0001
Student	9 (25.8%)	20 (26%)	
Farmer	5 (14.3%)	16 (20.7%)	
Housewife	5 (14.3%)	9 (11.7%)	
Retired	7 (20%)	6 (7.8%)	
Bricklayer	0 (0%)	4 (5.2%)	
Housemaid	1 (2.8%)	2 (2.6%)	
Military personnel	1 (2.8%)	2 (2.6%)	
Pitsawyer	0 (0%)	3 (3.9%)	
Others	7 (20%)	15 (19.5%)	

continuation - Table 1: Clinical and epidemiological characteristics of spider bites and scorpion stings occurring in the Upper Juruá region (AC) during the period of 2012 and 2017 (n = 207).

CHARACTERISTICS	SPIDER BITES (n = 59)	SCORPION STINGS (n = 148)	p
TIME TO TREATMENT (n = 203; 98%)			0.11
0 to 1 hour	40 (67.7%)	65 (45.1%)	
1 to 3 hours	10 (16.9%)	39 (27.0%)	
3 to 6 hours	5 (8.4%)	22 (15.2%)	
6 to 12 hours	2 (3.3%)	10 (6.9%)	
12 to 24 hours	1(1.6%)	3 (2.0%)	
> 24 hours	1(1.6%)	5 (3.4%)	
ANATOMICAL REGION OF STING/BITE (n = 206; 99.5%)			0.189
Foot	21 (35.5%)	52 (35.3%)	
Lower leg	5 (8.4%)	6 (4.0%)	
Thigh	0 (0%)	1 (0.6%)	
Hand	30 (50.8%)	82 (55.7%)	
Upper arm	0 (0%)	2 (1.3%)	
Forearm	0 (0%)	2 (1.3%)	
Trunk	2 (3.3%)	0 (0%)	
Head	1 (1.6%)	2 (1.3%)	
CLASSIFICATION OF THE ACCIDENT (n = 201; 97.1%)			0.205
Light	40 (70.1%)	97 (67.3%)	
Moderate	16 (28.0%)	36 (25%)	
Serious	1 (1.7%)	11 (7.6%)	
Manifestations and local complications (n = 207; 100%)			0.212
Yes	59 (100%)	148 (100%)	
No	0 (0%)	0 (0%)	
Pain	58 (98.3%)	121 (81.7%)	
Edema	47 (79.6%)	99 (66.8%)	
Bruising	1 (1.6%)	0 (0%)	
Necrosis	1 (1.6%)	0 (0%)	
Manifestations and systemic complications (n= 207; 100%)			0.012
Yes	3 (5.0%)	8 (5.4%)	
No	56 (94.9%)	140 (94.5%)	
Neuroparalytics	0 (0%)	7 (4.7%)	
Hemolytic	1 (1.6%)	0 (0%)	
Renal (Oliguria/ anuria)	1 (1.6%)	0 (0%)	
Vagais (Vomitting/ diarrhea)	0 (0%)	3 (2.0%)	
DAYS IN HOSPITAL (n = 207; 100%)			0.151
< 24 hours	33 (55.9%)	57 (38.5%)	
1 to 2 days	19 (32.2%)	66 (44.5%)	
3 to 4 days	4 (6.7%)	16 (10.8%)	
> 4 days	3 (5.0%)	9 (6.0%)	

Figure 2: Pictures of some species of spiders and scorpions of medical interest present in the Upper Juruá region. A) *Phoneutria fera*; B) *Phoneutria reidyi*; C) *Latrodectus geometricus*; D) *Tityus metuendus*; E) *Tityus silvestris*. Pictures by P. S. Bernarde (Personal archive).

of days of hospitalization of the patients, no significant differences were observed. No deaths were recorded during the study period. There was no correlation between spider and scorpion accidents with rainfall over the months during the study period (r = -0.3450; p = 0.1742; n = 72). When analyzed separately, no correlation was observed between spider incidents (r = 0.0870, p = 0.8718, n = 72) and scorpions incidents (r = -0.2131, p = 0.0486, n = 72) regarding rainfall. In relation to the distribution of spider and scorpion accidents between rainy and dry seasons, a significant difference was observed (Table 1), since spider bites occurred more during the rainy season (57.6%) and scorpion stings during the drier months (58.1%).

Spider bites were more frequent in the urban area (69.4%), while incidents with scorpions occurred in similar proportions in both areas (Urban = 50.6%; Rural = 49.3%) (Table 1). Most of the accidents happened in the home environment inside the houses or in the backyards of both rural and urban areas.

In relation to the profile of the victims, spider bites and scorpion stings predominated in males, with 54.2% for spider bites and 68.2% for scorpion stings (Table 1). Incidents involving scorpions were more frequent in the age groups between 21 to 40 years old and, in incidents involving spiders, in adults in the age group between 31 and 40 years old and

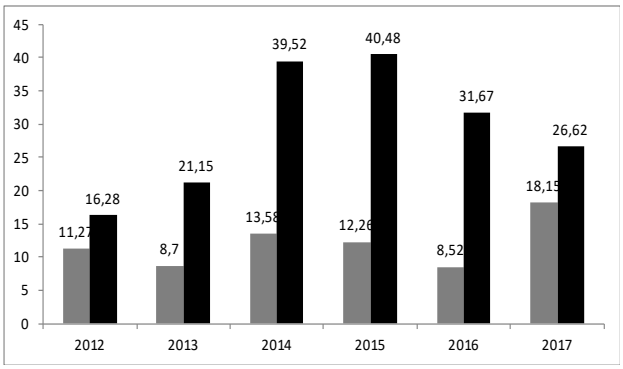

Figure 3: Coefficient of morbidity per 100,000 inhabitants of cases of spider bites and scorpion stings during the period of 2012 to 2017.

also in the elderly. Another difference observed in relation to the age of the victims is that a greater frequency of spider bites occurred in children than in relation to the scorpion stings. Scorpion stings were more associated with work (17.6%) than were spider bites (8.2%). The main occupation of victims of spider bites and scorpion sting was students, followed by farmers, the retired, housemaids and other miscellaneous occupations (Table 1).

In most of the spider incidents (67.7%), the victims arrived at the hospital in less than an hour after the accident, whereas in the scorpion stings only 45.1% arrived within the same time interval (Table 1).

The spider bites and scorpion stings occurred mainly to the hands (50.8% and 55.7%, respectively) and the second most affected anatomic region of the body was the foot (35.5% and 35.3%). In both spider bites and scorpion stings, most incidents were classified as mild (70.1% and 67.3%, respectively). However, moderate incidents were more frequent in spider bites (28%) and the serious incidents were more frequently scorpion stings (7.6%). Pain and edema were the most frequent local manifestations in both types of incidents, and in spider bites; one case presented ecchymosis and another necrosis. Few patients had systemic manifestations, being hemolytic and renal in spider bites (one case each) and neuroparalytic in scorpion stings (seven cases). Patients who were bitten by spiders were mostly discharged in the first 24 hours (55.9%), while the majority of those bitten by scorpions were discharged the next day (44.5%).

Overdose was observed in relation to the quantity of ampoules in the serum therapy in the cases of spider bites (Table 2) and of scorpion stings (Table 3).

Table 2: Amount of ampoules of anti-arachnid serum used in cases of spider bites that received serum therapy (n = 31; 44.3%) in the Upper Juruá region (AC).- Brazil

Classification of the accident	1 ampoule	2 – 4 ampoules	5 - 10 ampoules
Light	2	11	3
Moderate	0	9	1
Serious	0	0	1

Table 3: Amount of ampoules of anti-scorpion serum used in the cases of scorpion stings that received serum therapy (n = 113; 68.9%) in the Upper Juruá region (AC)- Brazil.

Classification of the accident	1 ampoule	2 – 3 ampoules	4 - 6 ampoules
Light	5	44	7
Moderate	0	20	15
Serious	0	0	11

DISCUSSION

The majority of cases reported were scorpion stings (164 cases, 70%), which is the most frequent at the national level[1,2] and also in studies conducted in other regions of the country[5,6, 11-13]. However, the mean incidence of cases of spider bites (12 cases) and scorpion stings (29.28) recorded per 100,000 inhabitants in this study for Cruzeiro do Sul is much higher than that reported for Brazil (2.9 and 16.7, respectively) and in the state of Acre (3.85 and 4.58) by Chippaux[2].

The mean of the morbidity coefficient (12 cases/100,000 inhabitants) during the period of this study was higher than that of some municipalities in the neighboring state of Amazonas (4 cases / 100,000 inhabitants) reported by Sampaio *et al*.[6] and lower than in other municipalities, Rio Preto da Eva (91 cases/100,000 inhabitants) and Apuí (58 cases/100,000 inhabitants), also in Amazonas state. Incidents with scorpions had an average of 29.28 cases /100.00 inhabitants, being higher than that registered for the Amazonas state (7.6 cases/100,000 inhabitants), which presents higher incidence levels in two of its municipalities, Rio Preto da Eva (58.9 / 100,000 inhabitants) and Apuí (182.6 cases/100,000 inhabitants)[5].

Rainfall during the year did not have a positive correlation with spider and scorpion incidents in Cruzeiro do Sul, unlike that observed in Amazonas, where spider bites were correlated with rainfall[6] and scorpion stings with the high river levels[5]. Cruzeiro do Sul has been shown to be a municipality with a risk of incidents with arachnids throughout the year, with a higher occurrence of spider bites during the rainy season and scorpion stings during drought. In addition to climatic influences, the search for partners by arachnids during the reproductive period and human activities with crops and in forests may be associated with the level of incidents with venomous arachnids[14-16].

In Brazil, in general, there is no difference in the distribution of spider and scorpion accidents between the sexes[1], probably due to the large number of cases occurring in home environments, which was observed in this study when regarding the spider bites. However, a predominance of male individuals in scorpion stings compared to spider bites was observed in this study, probably due to the fact that this type of incident had a higher frequency in the rural area and affected more rural workers[5]. Accidents with spiders and scorpions were more frequent in adults and also in the elderly. In children, there was a higher frequency of spider bites than in relation to scorpion stings, probably due to the fact that spider accidents were more frequent in households in the urban area and with scorpions in rural areas during occupational activities.

Students were the group most bitten by spiders and stung by scorpions in this study, followed by farmers, retirees, housemaids and the miscellaneous occupations. In Rio Branco (AC), a study on snakebites developed by Moreno *et al.*[17], observed that students were the second group that suffered the most snakebites after farmers, mainly during their journeys in rural areas from their homes to their schools. However, in this study, the fact that incidents with spiders and scorpions occurred mainly in homes and backyards, may explain the reason for children and adolescents to have been more affected, as with the retired and housemaids. Rural workers make up the second most affected group and this is probably due to their activities in the fields and forests which leave them more exposed to spiders and scorpions[5,6,16].

The time elapsed between the envenomation and the receiving of hospital care is a key factor for a good prognosis in accidents with venomous animals[5,6]. In this study, the majority of cases (91.2% of spider bites and 88.1% of scorpion stings) were treated within six hours of the bite, which may have contributed to only a few cases being considered serious. The majority (62.3%) of patients bitten by spiders were treated in less than one hour and, when by scorpions, a lower percentage (42.8%) in that same time interval, which is due to the fact that the spider bites occur more often in the urban area and the scorpion stings in rural areas. It should be noted that many people stung by venomous animals do not seek hospital care because they live in remote areas and find it more difficult to get to the city[5,7], or resort to home-based treatments[7,16], which may cause underreporting.

The spider bites and scorpions occurred mainly in the lower and upper limbs, as was observed in other studies[5,6,18]. Because of the fact that the legs and hands are the main anatomical areas affected, preventive measures such as the use of boots and gloves by rural workers could contribute to the reduction of accidents[5,16].

The main local clinical manifestations in both types of incidents were localized pain, followed by edema, as already reported in other studies[5,18]. Based on clinical-epidemiological diagnosis, Sampaio *et al*.[6] recorded the genus *Phoneutria* as the main cause of accidents in the Amazonas state, which in this study is also being considered. One case of spider bite, that showed signs of ecchymosis and necrosis, led to a suspicion of the possibility of being a loxoscelic envenomation, which presents these clinical manifestations[6,19].

A few patients presented systemic clinical manifestations, with hemolytic and renal manifestations being observed in spider accidents (one case each), leading to the suspicion of being caused a brown spider (*Loxosceles spp*.)[19]. In scorpions, seven patients presented neuroparalytic manifestations which, because they were not detailed in the SINAN form, do not allow for further discussion. In the case of scorpion stings, the patient may present symptoms such as sweating, agitation, nausea, vomiting, tachycardia, arterial hypertension, tachypnea and tachycardia[4]. In severe cases these manifestations will be more evident, in addition to profuse and frequent vomiting, and may evolve to cardiocirculatory shock and acute pulmonary edema, which are the main causes of death[4]. In Santarém (PA), Pardal *et al*.[18] reported neurological manifestations of myoclonus, where electric shock was the most frequent sensation in the body, and these symptoms have not been observed in other regions.

Most of the incidents with spiders and scorpions were classified as mild, as was observed in other studies in the Amazon[5,6], with the exception of the study on scorpion stings carried out in Santarém, Pará state by Pardal *et al*.[18], where moderate accidents predominated. In this

study, moderate accidents were more frequent in spider bites (28%), whereas scorpion incidents occurred in more severe forms than those of spiders (7.6% and 1.7%, respectively), with figures close to that registered for the Amazonas state by Sampaio *et al*.[6] and Queiroz *et al*.[5]. In Brazil, scorpion stings have a higher lethality (0.13%) and mortality (30% of deaths from terrestrial venomous animals) than in the case of spider bites (0.05% and 6%, respectively)[2].

Another indication in this study that scorpion accidents tend to have a greater severity was the fact that patients who were bitten by spiders were mostly (55.9%) discharged in the first 24 hours, while the majority (44.5%) of the cases of scorpion stings were discharged the following day. As reported for the Amazon by Sampaio *et al*.[6] in relation to spider bites, in this study, serum therapy was observed above and below the recommended doses according to the severity of the accident, evidencing the lack of training of health professionals in dealing with cases of poisoning by spiders and scorpions, which was also observed for snakebite in a study also carried out in Cruzeiro do Sul[20].

The average occurrence of spider incidents (12 cases/100,000 inhabitants in 2017) and scorpions (29.28 cases / 100,000 inhabitants) in Cruzeiro do Sul is one of the highest recorded for the Brazilian Amazon and is higher than the national average in Brazil, than the North region and also for the state of Acre. Incidents with spiders and scorpions were not correlated with rainfall, and other factors associated with the biology of the species or with human activities related to the temporal distribution may be present, and the risk of an arachnid incident is present throughout the year.

In this study, an overdose in the serum therapy administered in the patients was often observed, evidencing the need for training of the health professionals in order to better deal with the snakebites and scorpion stings. This denotes the need during health professional training to promote health[21], with the early insertion of the academic in practice and disciplines on venomous animals. Prevention and first aid campaigns for the population are recommended in cases of accidents with venomous animals as well as better training of health professionals on this topic.

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Resumo

Introdução: Informações epidemiológicas sobre envenenamentos por animais peçonhentos são fundamentais para elaborar propostas de campanhas educativas para prevenção e podem contribuir para a melhoria do atendimento de pacientes admitidos nas unidades de saúde.

Objetivo: Assim, o objetivo é Analisar o perfil epidemiológicos sobre o envenenamento por aranhas e escorpiões ocorridos na região do Alto Juruá, Amazônia Ocidental, Brasil no período de 2012 a 2017.

Método: Os dados epidemiológicos foram obtidos a partir das fichas do SINAN (Sistema de Informação de Agravos de Notificação) no Setor de Vigilância Epidemiológica do Hospital Regional do Juruá localizado em Cruzeiro do Sul.

Resultados: Foram registrados 207 casos de acidentes com aracnídeos, predominando as picadas por escorpiões (148 casos; 71,9%). A média do coeficiente de morbidade durante o período de estudo foi de 12 casos por 100.000 habitantes para o araneísmo e de 29,28 para o escorpionismo. Não houve correlação entre os acidentes com aranhas e escorpiões com a pluviosidade ao longo dos meses durante o período de estudo.

Conclusão: A média da incidência de acidentes com aranhas e escorpiões na região do Alto Juruá é uma das maiores registradas para a Amazônia brasileira e é maior do que as médias para o Brasil, região Norte e para o estado do Acre. Os acidentes com aranhas e escorpiões não estiveram correlacionados com a pluviosidade, podendo outros fatores associados a biologia das espécies ou com as atividades humanas relacionados com a distribuição temporal, estando assim o risco de acidente com aracnídeos durante todo o ano.

Palavras-chave: animais peçonhentos, aranhas, escorpiões, epidemiologia, Amazônia.