Original Research Article

CLINICAL AND EPIDEMIOLOGICAL ASPECTS OF ACCIDENTS BY VENOMOUS ANIMALS IN A WESTERN AMAZONIAN CITY

ABSTRACT

Aims: To characterize the frequency and clinical characteristics of venomous animals' accidents in Mâncio Lima, Acre.
Study design: A cross-sectional study.
Place and Duration of Study: The study took place in Mâncio Lima, Acre, Brazil, between 2013 and 2015.
Methodology: We included a cohort of 350 households (estimated to be 1,500 people of all ages) in the urban area of Mâncio Lima. The following questionnaires were applied: I. Occurrence of accidents by venomous animals and clinical characterization of accidents; II. The detailed description of households. **Results:** There were 111 (8%) accidents with snakes, 138 (9.9%) accidents with scorpions, 108 (7.8%) accidents with spiders and 99 (7.1%) accidents with stingrays. Jararaca was the most cited snake, being edema (local and systemic) and muscular pain the main symptoms. In relation to scorpionism and arachnidism, the hands were the body site of the greatest number of accidents occurred, with local pain/tingling and pain/blistering being the main symptoms, respectively. Most accidents by stingrays occurred in the shallow part of the river, where the feet and legs were the body sites in which the injuries occurred and local pain/bleeding were the main symptoms. **Conclusion:** Accidents caused by venomous animals constitute an aggravation of great medical interest, as well as public health policies, considering the possible number of hospitalizations and the risk of death.

Keywords: Accidents by Scorpions; Accidents by Spider; Accidents by Stingrays; Ophidism; Venomous Animals; Scorpionism; Arachnidism.

1. INTRODUCTION

Accidents caused by venomous animals not only constitute an aggravation that requires immediate medical intervention: they also represent a problem of Public Health [6]. Between 2010 and 2014, in Brazil, 601,307 cases of accidents involving venomous animals were registered in the Information System on Diseases of Compulsory Declaration (SINAN). In 2015, 150,004 cases were recorded (24,467 of snakes, 74,598 of scorpions and 26,298 of spiders) and, only in Acre state, there were 985 cases (501 of snakes, 203 of scorpions and 89 of spiders). A year later, in 2016, the total of accidents increased to 173,687, with a higher incidence between March and November, culminating in 305 fatalities [1]. In one of the rare studies on stingray accidents, conducted in the Alto Rio Paraná region between 2004 and 2009 (encompassing southeast, south and center-west cities), there were, at least, 31 reports of accidents only by these animals [2].

In Brazil, poisoning caused by the inoculation of toxins through the inoculating device (prey on snakes, stinger on scorpions and stingrays and chelicerae on spiders) is frequent and may lead to local or systemic disturbance. Besides the accidents by stingrays, the main venomous animals of medical importance in the country are

those related to ophidism, arachnidism and scorpionism. Therefore, are common in the Amazon region:

- Snakes, such as Bothrops (jararaca, jararacuçu, urutu, caiçaca), Crotalus (rattlesnake), Lachesis (surucucu, pico de jaca) and Micrurus (true coral);

- Scorpions, such as Tityus, possessing several species – Tityus serrulatus (yellow scorpion), Tityus bahiensis (brown scorpion), Tityus stigmurus, Tityus paraensis (black scorpion), and Tityus metuendus;

- Spiders, such as, Loxosceles (brown recluse spider), Phoneutria (armadeira) and Latrodectus (black widow);

- Acantotoxic ictism by stringrays, caused by the class Chondrichthyes, subclass Elasmobranchii, subdivision Batoidea, order Myliobatiformes (single order with stingers in the tail), family Potamotrygonidae (where we find freshwater species).

Also, several animals considered non-venomous and of minor medical importance – because they have only a local action (without systemic complications) – can be found in Brazil, such as, Phylodrias (green snake, cobra-cipó), Oxyrhopus (false-coral), Waglerophis (boipeva), Helicops (water snake), Eunectes (sucuri), Boa (jiboa), Lycosidae (grass spider, garden spider) and the caranguejeiras [3].

Accidents by venomous animals are collected in Brazil through notification systems as: SINAN, National Poisoning Information System (Sinitox/Fiocruz/MS), Hospital Information System of the National Unified Health System (SIH-SUS) and Brazil Mortality Information System (SIM). And, in spite availability of all these systems, it is verified that the epidemiological data do not show the real situation of the problem, probably due to the underreporting cases [5].

The objective of this study is to characterize the frequency and clinical characteristics of venomous animals' accidents in Mâncio Lima, Acre, in order to reveal the true reality and predict the importance of establishing an emergency care protocol in the region.

2. MATERIAL AND METHODS

2.1 Area of study:

The study was conducted at the urban center of Mâncio Lima, located in the extreme west of the Amazon region, in Acre state. This municipality, with 550,000 km², is bounded by the municipalities of Cruzeiro do Sul, Rodrigues Alves and the Republic of Peru. Mâncio Lima has 14,884 inhabitants distributed in urban (57.3%), rural or riverside (37.9%) and in indigenous areas (4.8%). The municipality is located 38 km from Cruzeiro do Sul and 650 km from the state capital of Acre, Rio Branco (Fig. 1).

Fig. 1. Map of Brazil highlighting Acre and the location of Mâncio Lima

2.2 Population, design and research of the study:

This study involved, between 2013 and 2015, a cohort of 350 households (estimated to be 1,500 people of all ages) in the urban area of Mâncio Lima. The epidemiological design consists in a cross-sectional study. The following questionnaires were applied: I. Occurrence of accidents by venomous animals and clinical characterization of accidents; II. The detailed description of households.

In the interviews, the study participants were questioned about the occurrence of previous accidents, the symptoms exhibited in each case, the location of the bite, the clinical consequences (local changes – pain, edema, necrosis and systemic alterations), the necessity of medical care, the place where the accident occurred (urban, rural or riverside area), and the variables associated with the accidents.

2.3 Data analysis:

The data was analyzed in the statistical program SPSS, version 16.0, in which the distributions of the relative and absolute frequencies and standard deviations of the variables were calculated. The Student T-Test was used for independent samples and the Chi-Squared Test was used to compare means and proportions. Only values below $P = 0.05$ were considered statistically significant.

2.4 Ethical Aspects:

This study was approved by the Research Ethics Committee of Federal University of Acre (UFAC) – CAE 21457613.6.0000.5010.

3. RESULTS

The study obtained a sample of 1,389 people, with 111 (8%) people who reported accidents with snakes, 138 (9.9%) people who reported accidents with scorpions, 108 (7.8%) people who reported accidents with spiders and 99 (7.1%) people who reported accidents with stingrays. The encounter of more than one episode (accident) per person was frequent.

The epidemiological characteristics showed us that most of the accidents with venomous animals occurred in males; in people who did not live in rural areas; in people who had low level of schooling; who were ethnic black or brown and with up to 2 minimums wage. Minimum Brazilian wage in 2013: approximately R$ 622 (US$ 334) (Table 1).

Table 1. Epidemiological Characteristics of Accidents with Venomous Animals (Snakes, Scorpions, Spiders and Stingrays) in Mâncio Lima

	Snakes			Scorpions		
	N	**(%)**	**P**	**N**	**(%)**	**P**
Gender			< .001			< .001
Male	77	69,4		102	73,9	
Female	34	30,6		36	26,1	
Ethnicity			.009			.019
White	21	19,6		20	14,7	
Brown/Black	73	68,2		102	75	
Indigenous/Mestizo	13	12,1		14	10,3	
Schooling			< .001			< .001
Illiterate	36	34,3		38	28,4	
1-4 Years	43	41		55	41	
>4 Years	26	24,7		41	30,6	
Lived in Rural Area			< .001			< .001
Yes	35	31,5		57	41,3	
No	76	68,5		81	58,3	
Family Income			.71			.66

Up to Two Minimum wages	69	71,9		83	66,4	
More Than Two Minimum wages	27	28,1		42	33,4	
	Spiders			***Stingrays***		
	N	**(%)**	***P***	**N**	**(%)**	***P***
Gender			< .001			.001
Male	81	75		66	66,7	
Female	27	25		33	33,3	
Ethnicity			.015			.6
White	15	13,9		19	19,2	
Brown/Black	79	73,1		72	72,7	
Indigenous/Mestizo	12	11,3		8	8,1	
Schooling			< .001			.003
Illiterate	25	24		17	17,7	
1-4 Years	46	44,2		32	33,3	
>4 Years	33	31,7		47	48,9	
Lived in Rural Area			< .001			< .001
Yes	46	42,6		35	35,4	
No	62	57,4		64	64,6	
Family Income			.58			.64
Up to Two Minimum wages	59	63,4		56	65,1	
More Than Two Minimum wages	34	36,6		30	34,9	

Regarding ophidism, it was verified that the geographic area where the greatest number of accidents occurred was the rural/riverside area (n = 140), with feet and legs being the most affected area (n = 92 and n = 37, respectively). The jararaca was the snake responsible for the largest number of cases (n = 60). About clinical aspects, accident site edema, body edema (anasarca) and muscle pain (n = 143, n = 105 and n = 74, respectively) were the main symptoms reported. Of the total number of snake accidents (n = 111), only 19.5% (n = 30) had hospital care, and 30.1% of the patients (n = 46) reported having received antiofidic serum. Regarding the use of tourniquet and the presence of after-effects, a considerable prevalence was observed (n = 29 and n = 30, respectively) (Table 2).

Table 2. Clinical and Epidemiological Characteristics of Snake Accidents

VARIABLE	FREQUENCY (Accidents)	%
Place of the accident (Geographical)		
Urban Area	9	6
Rural Area/Riverside	140	94
Body Site (Accident)		
Head/Neck/Thorax	5	3,3
Upper Limbs	13	8,6
Thighs	4	2,6
Legs	37	24,5
Feet	92	60,9
Snake Type		
Jararaca	60	45,8
Surucucu	42	32,1
Snake Parrot	7	5,3
Coral	3	2,3
Others	18	13,9
Signs / Symptoms	139	90,8

Pain (Accident site)	63	40,9
Pain (Muscle)	74	48,1
Edema (Accident site)	105	68,2
Edema (Body)	143	92,9
Bleeding (Accident site)	19	12,3
Bleeding (In another region)	41	26,6
Walking difficulty	66	42,9
Medical care	30	19,5
Tourniquet	29	18,8
Serum	46	30,1
After-effects	30	19,7

In relation to scorpionism and arachnidism, the geographic area where the greatest number of accidents took place weas the rural/riverside area (n = 190 and n = 110, respectively), being hands the place of the body most affected (n = 108 and n = 68, respectively) (Tables 3 And 4).

As for the symptoms reported by the victims of scorpion and spider accidents, there was a predominance of pain (n = 176) and tingling at the accident site (n = 164) involving scorpions, while in accidents caused by spider was found a predominance of pain (n = 121) and blister formation (n = 106). Few people who sought hospital care in cases of scorpionism (n = 21) and arachnidism (n = 13) were affected (Tables 3 and 4).

Table 3. Clinical and Epidemiological Characteristics of Scorpion Accidents

VARIABLE	FREQUENCY (Accidents)	%
Place of the accident (Geographical)		
Urban Area	32	14,4
Rural Area/Riverside	190	85,6
Body Site (Accident)		
Head/Neck/Thorax	5	2,7
Arm/Forearm	8	3,7
Hands	108	49,3
Thighs/Legs	31	14,2
Feet	65	29,7
Signs / Symptoms	215	96,4
Pain (Accident site)	176	78,9
Edema (Accident site)	96	43
Erythema (Accident site)	135	60,5
Tingling (Accident site)	164	73,5
Shock sensation (Body)	102	45,7
Medical Care	21	9,5
After-effects	1	0,5

Table 4. Clinical and Epidemiological Characteristics of Spider Accidents

VARIABLE	FREQUENCY (Accidents)	%
Place of the accident (Geographical)		

Urban Area	19	14,2
Rural Area/Riverside	110	82,1
Body Site (Accident)		
Arm/Forearm	6	4,6
Hands	68	52,3
Thighs/Legs	17	13
Feet	37	28,5
Signs / Symptoms	128	97,7
Pain (Accident site)	121	92,4
Edema (Accident site)	76	58
Bleeding (Accident site)	24	18,3
Wound or Stayed Black	28	21,4
Blister (Accident site)	106	80,9
Medical Care	13	9,8
After-effects	0	0

It was verified most of the accidents caused by stingrays occurred in the shallow part of the river (n = 94), and only a minority reported the trauma occurred in the deep part (n = 21). Of the total victims, only 46.2% (n = 54) stated they saw the animal after the accident, being the feet and legs the body sites where the traumas most occurred (n = 94 and n = 14, respectively). Regarding clinical aspects, pain and bleeding at the accident site were reported as the main symptoms (n = 113 and n = 96, respectively). Only 18.8% (n = 22) of the victims sought hospital care and only 10.1% (n = 12) reported some type of after-effects (Table 5).

Table 5. Clinical and Epidemiological Characteristics of Stingray Accidents

VARIABLE	FREQUENCY (Accidents)	%
Place of the accident (Geographical)		
Shallow part of the river	94	79
Deep part of the river	21	17,6
Body Site (Accident)		
Head/Neck/Thorax	3	2,6
Arm/Forearm/Hands	5	4,3
Thigs/Legs	15	12,9
Feet	94	80,3
Saw the stingray	54	46,2
Signs / Symptoms	117	99,2
Pain (Accident site)	113	96,6
Edema (Accident site)	20	17,1
Bleeding (Accident site)	96	18,3
Wound or Stayed Black	67	57,3
Blister (Accident site)	52	44,4
Pus (Accident site)	58	49,6
Fever	34	29,1
Medical Care	22	18,8
After-effects	12	10,1

4. DISCUSSION

In Mâncio Lima, among the traumas caused by venomous animals, it was verified predominance of accidents among males who had low level of schooling, who were brown or black and with up to 2 minimum wages (the less advantageous social strata).

This result may be due to the early insertion of this group in agricultural work and rubber extraction, most likely with a view to contribute to the increase in family income. Taking into account the characteristics of such activities, this labor segment is more exposed to venomous animals, such as snakes, and consequently to accidents. These data corroborate old studies done in the northeast and in Acre itself [5, 11] and ratifies that agricultural activity presents itself as a risk factor for the occurrence of snakebites across the globe [18].

In the present study, however, the accidents involving snakes were not the main responsible for poisoning. In this case, the outcome pointed out that scorpion accidents were the most frequent (n = 227). In addition, all type of accidents occurred more in males and there was a higher frequency of accidents occurring in the rural/riverside area.

According to other studies [6,9], in Brazil, there is, in fact, a predominance of accidents by scorpions, but higher frequency on males happens only in cases of ophidism. Scorpion and spider accidents have a similar frequency of occurrence in both genders, probably because these animals can be easily found inside houses, affecting men and women equally.

Geographically, a higher frequency of ophidian accidents really occurs in rural areas. However, the accidents caused by scorpions and spiders happens the most in the urban area, inside the residences [9].

Regarding the present study, the fact that all types of accidents occurred more frequently in men and in rural areas, also seem to have a connection with agricultural activity and the higher incidence of men in this group, unlike results of national base studies.

In Mâncio Lima, the jararaca (Bothrops) was the most cited snake by the victims, being the rural/riverside area the place of most accidents. Feet and legs were the site of the body most affected while the main symptoms referred were edema in the bite site, edema in the body (anasarca) and muscular pain.

Although this data contradicts a study carried out in Alto Juruá (the mesoregion of which Mâncio Lima is part) that showed that the predominance of accidents was caused by the genus Lachesis, another study in Rio Branco [11] also pointed to Bothrops as the most cited snake. As well, data from the Health Surveillance Secretariat (SVS) and another study at national level obtained the same result [9, 6].

In relation to the areas of greatest occurrence and the body site most affected, studies carried out in Acre [10,11] found that the rural area was where most of the accidents occurred and that the lower limbs were the most frequently mentioned site of the body. Regarding the main symptoms, the study accomplished in Alto Juruá [10] found that pain, bleeding and edema were the most frequently mentioned, while a bibliographic review [12] indicated only pain and edema.

In relation to scorpionism, in Mâncio Lima, a predominance of involvement in the rural/riverside zone was observed, with the hands being the most referenced body site. As for the main symptoms, local pain and tingling were the most reported.

Studies performed in Minas Gerais [13] and in Pará [14], as well as data from SVS [9], pointed to the hands as the most affected body site. The same studies showed that local pain [13] and neurological disorders, such as paresthesia and sensation of “electric shock through the body”, were the main symptoms reported by the victims [14]. The geographic location most reported was inside of the residences [9,13].

The traumas caused by spiders, in Mâncio Lima, presented a pattern of occurrence mainly in the rural/riverside areas. The attacks were most in the hands and presented a clinical profile, in the majority of victims, of pain and blister formation at the trauma site.

SVS data [9] showed most of the spider accidents occurs inside the residences, while another study performed in Minas Gerais [15] showed the working circumstances are those with the greatest association with arachnidism. Concerning the site of the body most affected, a study carried out in Minas Gerais [15] found that the hands are the most exposed to accidents, while another study, who took place in Goiás [2], found to be the feet. In relation to the clinical aspects, both studies [2,15] agree that local pain and edema are the main symptoms referred.

Accidents by stingrays were seen as common in Mâncio Lima. Most accidents occurred in the shallow part of the river with less than half of the victims claiming to have seen the animal. The region of the body most affected were the lower limbs and the most reported symptoms were pain and bleeding at the trauma site.

Research on the clinical-epidemiological aspects of stingray accidents is still incipient, especially when it comes to freshwater stingrays. However, two studies in São Paulo found that the main symptoms reported were pain, edema and necrosis [2], as well as bleeding [16]. The lower limbs were the site of the body where the trauma occurred [2].

5. CONCLUSION

Accidents by venomous animals (snakes, scorpions, spiders, and stingrays) constitute an aggravation of great medical interest, as well as public health policies, considering the possible number of hospitalizations [17] and the risk of death [9].

Most of the interviewed reported they never lived in the rural area, however, most of the accidents occurred in the rural/riverside area. This leads us to infer that the most affected people were not residents of the rural/riverside area, but rather residents of the urban area that frequented this area occasionally, majorly for work.

There was a predominance of accidents in low-income people with low educational level, as well as a low demand for hospital care and a low use of antivenom serum. Most of the traumas occurred in people who called themselves brown or black and the male gender was the most affected. The lower limbs were the anatomical region where most of the traumas occurred, being pain and edema in the body site the main symptoms reported by the victims.

The data collected in this research confirm results found in several other studies and should be used so that public measures for the prevention and better treatment of accidents by poisonous animals are taken in these regions of the country.

CONSENT

As per international standard, patient's written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

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