

## HOSPITALIZATIONS OF VICTIMS OF ACCIDENTS WITH VENOMOUS ANIMALS

### *INTERNAÇÕES HOSPITALARES DE VÍTIMAS DE ACIDENTES POR ANIMAIS PEÇONHENTOS*

### *HOSPITALIZACIONES DE VÍCTIMAS DE ACCIDENTES POR ANIMALES VENENOSOS*

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A descriptive study based on data obtained from a toxicological information and assistance center, from 2007 to 2011. This study aimed to characterize hospitalizations of victims of accidents with venomous animals, in order to support the development of preventive and assistance measures. Data were tabulated using the Epi Info 6.04d<sup>®</sup> program; and the results were presented in tables and figure. 344 hospitalizations were found, with predominance of male patients (58.1%), from 20 to 59 years (56.8%), mostly in the summer (39.0%) spring (27.0%), for snakebites (35.2%). The hospital stay ranged from one to 23 days, with 39.0% of patients hospitalized for two or more days, with two deadly accidents with bees. The profile of the inpatients showed a higher number of cases in the economically active population and in males, the percentage of hospitalizations per animal aggressor differed from morbidity data, giving greater severity of accidents by snakes and bees.

**Descriptors:** Animals Poisonous; Accidents; Hospitalization; Length of Stay.

Estudo descritivo, a partir de dados de um centro de informação e assistência toxicológica, do período de 2007 a 2011. Objetivou-se caracterizar internações de vítimas de acidentes por animais peçonhentos, com vistas a fornecer subsídios à elaboração de medidas preventivas e assistenciais. Os dados foram tabulados pelo programa *Epi Info 6.04d<sup>®</sup>*, sendo os resultados apresentados em tabelas e gráficos. Encontrou-se 344 internações, com predomínio de pacientes do sexo masculino (58,1%), com 20 a 59 anos (56,8%); a maioria no verão (39,0%) e na primavera (27,0%), por acidentes ofídicos (35,2%). A internação variou de um a 23 dias, com 39,0% internados por dois ou mais dias, ocorrendo dois óbitos, após acidente com abelhas. O perfil dos internados apontou maior número de casos na população economicamente ativa, no sexo masculino e, o percentual das internações, por animal agressor, diferiu dos dados de morbidade, conferindo maior gravidade aos acidentes por serpentes e abelhas.

**Descritores:** Animais Venenosos; Acidentes; Hospitalização; Tempo de Internação.

Estudio descriptivo, basado en datos del Centro de información y asistencia toxicológica, de 2007 a 2011. El objetivo fue caracterizar los ingresos de víctimas de envenenamientos, con el fin de aportar al desarrollo de medidas de prevención y atención. Los datos fueron tabulados utilizando Epi Info 6.04d<sup>®</sup>, y los resultados se presentan en tablas y gráficos. Se encontraron 344 admisiones, con predominio de pacientes del sexo masculino (58,1%), 20 a 59 años (56,8%), mayoría en verano (39,0%), primavera (27,0%), mordeduras de serpiente (35,2%). La estancia hospitalaria varió de uno a 23 días, con 39,0% hospitalizados durante dos o más días, dos muertos tras accidente con abejas. El perfil de los pacientes presentó mayor número de casos en la población economicamente activa, del sexo masculino, el porcentaje de los ingresos por animal agresor, difieren de datos de morbilidad, dando mayor severidad a los accidentes por serpientes y abejas.

**Descriptores:** Animales Venenosos; Acidentes; Hospitalización; Tiempo de Interacción.

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## INTRODUCCION

Accidents with venomous animals are the second leading cause of epidemiological notification in Toxicological Information and Assistance Centers (CIAT) in Brazil. According to data from the National Poison Information System (SINITOX), in 2009 there were 7,076 accidents with venomous animals registered in the South Region of Brazil, representing 31.6% of poisonings registered in this region<sup>(1)</sup>.

Even though these accidents represent a public health problem in tropical countries, epidemiological data are still inconsistent in Brazil, with underreporting or omissions in collected information<sup>(2)</sup>.

Poisonous animals have a specialized venom apparatus inoculum and may inject toxic or poisonous substances called venom in humans and other animals. In Brazil, the main responsible for accidents with humans are scorpions, spiders, snakes, bees, wasps, hornets and rays<sup>(3)</sup>.

Accidents with venomous animals should be treated in units equipped for emergency clinical care, not only for the quick response required to neutralize the toxins inoculated during the accident, but also due to the frequent need to introduce measures to support the vital conditions of the injured people<sup>(4)</sup>. The immediate demand for health services is required, in order to define an early diagnosis, since the time interval between the accident and the beginning of treatment has a direct association with the severity and prognosis of the accident<sup>(5)</sup>.

According to the criteria of clinical severity, the accidents with venomous animals are classified into: minor accidents, with temporary symptoms and spontaneously solved; moderate accidents, with pronounced or prolonged symptoms; and critical accidents, with severe symptoms or that present risk of death. Hospitalization occurs in moderate and critical

cases, which require specialized care due to their prolonged symptoms and the possibility of death<sup>(6)</sup>.

An indicator of the severity of cases refers to the need for hospitalization and the length of stay. According to the Ministry of Health, in 2011 there were 137,421 thousand accidents with venomous animals nationwide, with 13,081 thousand (9.5%) hospitalizations for these causes, and 51 patients died, representing a mortality rate of 0.39<sup>(7)</sup>.

A study carried out in a teaching hospital, aiming to characterize the poisoning treated in that service, showed that accidents with venomous animals were responsible for the second highest average of hospitalization days<sup>(8)</sup>. The length of stay needed in these accidents increases the occupation of hospital beds and the costs for the Unified Health System, in addition to personal and social losses, and points to the need for more effective actions from public bodies, aiming mainly at preventing this type of injury<sup>(5)</sup>.

In this context, we aimed to characterize the hospitalization of victims of accidents with venomous animals, in order to support the development of preventive care measures.

## METHODS

This is a descriptive and documentary study of quantitative approach, with retrospective analysis on database of the Poison Control Center of the Hospital Universitário Regional de Maringá, Paraná, Brazil (CCI/HUM). The CCI/HUM provides consultancy and advisory services in the field of toxicological emergencies for a total of 115 municipalities belonging to Northwest macro-region of Health, and has as one of its activities the epidemiological surveillance of poisoning, since investigating the cases enables knowing what causes its occurrence and designing prevention and control actions.

The study population comprised patients hospitalized after an accident by venomous animals and registered at the CCI/HUM from 2007 to 2011, regardless of sex, age and city of origin. Data were collected from the Monthly Inpatient Data, a form used to register all cases that required hospitalization.

From the Monthly Inpatient Data, we compiled data related to the date of hospitalization – the year in which the case notification was generated; seasonality of hospitalizations – organized according to the seasons; animal aggressors – spider, snake, scorpion, unidentified insect, bee, caterpillar and others; circumstances of the accident – classified as accidental and occupational; patient age – organized in age groups of one to four years, 5-9 years, 10-14 years, 15-19 years, 20-29 years, 30-39 years, 40-49 years, 50-59 years, 60-69 years, 70 years and older; patient gender – organized into male and female; length of stay – categorized in 01 day, 02-03 days, 04-05 days and greater than or equal to 06 days; and clinical outcome of the case – in the form of hospital discharge and death.

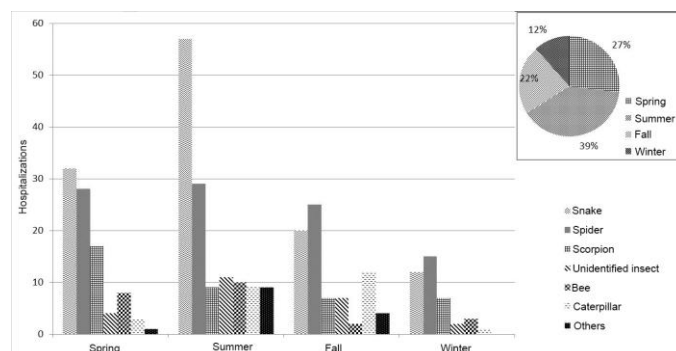
Data were entered into a spreadsheet in Microsoft Excel<sup>®</sup> and were later tabulated using Epi Info 6.04d<sup>®(9)</sup>, and the results were analyzed in absolute and relative frequencies, and standard deviation, and presented in tables and figures. The discussion focuses on aspects related to the accident and to the injured person.

The research project was submitted to the Ethics Committee on Research Involving Human Subjects of the Universidade Estadual de Maringá (COPEP/UEM), being approved under protocol No. 41906/2012. Since this is a research with data from patients' medical records, we requested the dismissal of the Free and Informed Consent.

## RESULTS

From 2007 to 2011 there were 4,018 hospitalizations for poisonings and injuries caused by animals and plants registered at the CCI/HUM, with 344 (8.6%) due to accidents with venomous animals. This last number represents an annual average rate of  $68.8 \pm 14.5$  hospitalizations, in which the largest amount was registered in 2009 (90 - 26.2%).

We verified that most of hospitalizations happened in the summer months (39.0%) and spring (27.0%), accounting for 66% of cases. However, there was a seasonal variation regarding the animal aggressor, since in spring and summer hospitalizations for snakes were more frequent, with 34.4% and 42.5% respectively; whereas accidents by spiders were responsible for the largest number of admissions in the fall (32.5%) and winter (37.5%) (Figure 1).



**Figure 1** - Seasonality of hospitalizations from accidents with venomous animals according to the animal aggressor. CCI/HUM, 2007-2011.

Snakebites were responsible for the highest number of hospitalizations – 121 cases (35.2%), followed by accidents with spiders (28.2%) and scorpions (11.6%). Accidents caused by bees, unidentified insects and caterpillars showed similar percentages ranging from 6.7% to 7.3%.

Regarding the circumstances of the accidents, most was of accidental origin; only 17 patients (4.9%)

were hospitalized due to occupational accidents, with homogeneous length of stay for this category.

Hospitalizations were more frequent in males (58.1%) and there was a heterogeneous distribution in terms of victims' age, being more frequent among the economically active population (20-59 years) (56.8%). Children and adolescents represented 31.7% of cases and the elderly accounted for 11.6% (Table 1).

**Table 1** – Distribution of hospitalizations of victims of accidents with venomous animals according to age group and sex. CCI/HUM, 2007-2011.

Hospitalization days	1		2 to 3		4 to 5		6 to 23		Total	
	N	%	N	%	N	%	N	%	N	%
<b>Variables</b>										
<b>Age group</b>										
1 to 4 years	12	5,7	8	7,9	1	5,9	1	6,3	22	6,4
5 to 9 years	17	8,1	7	6,9	1	5,9	1	6,3	26	7,6
10 to 14 years	28	13,3	7	6,9	2	11,8	2	12,5	39	11,3
15 to 19 years	15	7,1	6	5,9	1	5,9	--	--	22	6,4
20 to 29 years	24	11,4	16	15,8	2	11,8	4	25,0	46	13,4
30 to 39 years	32	15,2	12	11,9	2	11,8	2	12,5	48	14,0
40 to 49 years	38	18,1	16	15,8	1	5,9	1	6,3	56	16,3
50 to 59 years	22	10,5	15	14,9	4	23,5	4	25,0	45	13,1
60 years and older	22	10,5	14	13,9	3	17,6	1	6,3	40	11,6
<b>Sex</b>										
Male	118	56,2	58	57,4	12	70,6	12	75,0	200	58,1
Female	92	43,8	43	42,6	5	29,4	4	25,0	144	41,9

The length of stay ranged from one to 23 days, with an average of  $1.9 \pm 2.3$  days, and 134 cases (38.6%) required a period of at least two days of hospitalization. In accidents that required only one day of hospitalization there was prevalence of those caused

by spiders (35.2%). A total of 33 patients (9.6%) required less than four days of hospitalization, with special reference to accidents caused by snakes (Table 2).

**Table 2** - Distribution of hospitalizations of victims of accidents with venomous animals according to animal aggressor. CCI/HUM, 2007-2011.

Animal	Hospitalization days		1		2 to 3		4 to 5		6 to 23		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Snake	48	22,9	48	47,5	14	82,4	11	68,8	121	35,2		
Spider	74	35,2	20	19,8	1	5,9	2	12,5	97	28,2		
Scorpion	33	15,7	6	5,9	1	5,9	--	--	40	11,6		
Unidentified insect	14	6,7	9	8,9	1	5,9	--	--	24	7,0		
Bee	15	7,1	6	5,9	--	--	2	12,5	23	6,7		
Caterpillar	18	8,6	7	6,9	--	--	--	--	25	7,3		
Others	8	3,8	5	5,0	--	--	1	6,3	14	4,1		
Total	210	100,0	101	100,0	17	100,0	16	100,0	344	100,0		

Regarding the outcome of the cases, most patients (97.4%) were discharged after the end of treatment. Two patients (0.6%) victims of accidents

caused by bees died, and in seven cases this information was not included in the CCI/HUM database.

**DISCUSSION**

Accidents with venomous animals have significant social and economic impact in tropical countries; however, they are not among the priority actions of public health programs, constituting one of the most neglected health problems worldwide<sup>(10)</sup>. Hospitalizations resulting from these accidents happen less often, since the majority of cases are considered as minor accidents<sup>(6)</sup>. Therefore, the need for hospitalization of subjects in this study indicates the severity of the cases analyzed.

The prevalence of hospitalizations during the summer and spring is related to higher temperatures and increased rainfall during this period. These seasons eventually coincide with holiday periods, and at the same time the animals are more active and looking for

food and partners for reproduction<sup>(5, 11)</sup>. All the above mentioned factors favor the exposure of humans to accidents with venomous animals and the consequent higher rates of hospitalizations due to these conditions in these periods.

A study carried out in the North macro-region of health in Minas Gerais identified that most accidents were caused by snakes in the period comprising the summer and spring, as confirmed in this study, establishing relationship with increases in rainfall<sup>(12)</sup>. Accidents caused by snakes are emergencies commonly observed, however the assistance to victims still causes anxiety and uncertainty for the healthcare team. The victims of these accidents should be treated in a specialized unit with resources to ensure appropriate

support, since there are predictable and possibly preventable complications<sup>(13)</sup>.

It is worth mentioning that the profile of hospitalizations, according to the animal aggressor, found in this study differs from that found in general accidents, regardless of the need for hospitalization. In the statistics of accidents with venomous animals, we observe a greater number of those caused by scorpions, with snakes and spiders in the second and third places in this ranking, respectively<sup>(14)</sup>.

In the case of hospitalizations caused by accidents with spiders, the seasonal distribution also showed higher incidence in the summer and spring. Although the notification of these cases is relatively neglected compared with snakebites, the accidents caused by spiders are also a public health problem. According to the World Health Organization (WHO), human accidents caused by spiders of greater severity are caused by four main species: *Latrodectus*, *Loxosceles*, *Phoneutria* and *Atrax*. In Brazil, the spiders of medical importance belong to the first three genera and the accidents are more frequent in the South and Southeast Regions<sup>(15)</sup>.

Scorpionism was also among the leading causes of hospitalization, and occurred mostly during the spring. These accidents are a serious problem in some regions of Brazil due to the high number of cases reported annually.

Despite the scorpion antivenom and the advances in intensive care medicine, scorpionism is still responsible for lethal cases in Brazil. Most of the accidents happen during the hot and rainy season and have a mortality rate of 0.58%. The deaths registered are mostly correlated to accidents by *Tityus serrulatus* in children<sup>(16)</sup>.

Accidents caused by bites from unidentified insects and bees represented approximately 14% of hospitalizations. Although about 90% of the victims of these accidents have presented mild reactions such as erythema and pruritus, some individuals may develop an

important inflammatory reaction, like in the case of accidents by bees and wild ants, in these cases there might be severe allergic reaction, anaphylactic shock and death<sup>(17)</sup>.

The cases of erucism, accidents resulting from direct contact with caterpillars of order Lepidoptera, are mostly acute and with benign course, except those caused by *Lonomia sp.* In this study, 7.3% of hospitalizations occurred due to exposure to these animals, being more frequent in summer and fall. The seasonality of these accidents is expressed more in the warm months and has possible relationship with the biological cycle of the agent<sup>(17)</sup>.

The percentage of occupational accidents in the present study (4.9%) is lower than that found in the state of Paraná in 2009 (7.3%)<sup>(1)</sup>. In this context, we emphasize the accidents with venomous animals occurred on rural workers, since the state of Paraná has the economy strongly linked to agriculture, despite the process of mechanization of the labor force, there is still a great number of people engaged in agriculture. This situation has favored greater human exposure to the external environment, providing them with many health risks, including the accidents with venomous animals, especially snakes<sup>(5, 18)</sup>.

Regarding the age of the victims, even though there is a higher incidence in the age group that comprises the workforce and represents the economically active population, hospitalizations of children and elderly should be analyzed carefully, since they represent greater severity. In accidents involving children, the quantity of inoculated venom is the same, but the concentration in the target organs is greater. In accidents by snake, we assume that children have reactions of greater intensity than adults due to low immune capacity and lower muscle mass; in addition, they have higher risks of adverse reactions to antivenom therapy when this is recommended, due to specific neurobiological features of this age group<sup>(5, 17)</sup>.

Likewise, accidents involving individuals aged 60 and older deserve special attention because they are potentially serious, given the decline of the immune defense of the elderly, promoting greater individual vulnerability<sup>(17)</sup>.

The highest number of hospitalizations in males confirms the profile of exposure and occurrence of accidents with venomous animals. The male predominance in these accidents is probably related to the greater frequency of outside activities performed by this group, such as those related to agriculture<sup>(2, 12)</sup>.

In less severe cases of accidents with venomous animals, a period of clinical observation of six to 12 hours is sufficient for proper monitoring of this type of occurrence<sup>(17)</sup>. However, staying for more than 12 hours in health care services indicates that the cases are considered moderate to critical, for they represent more serious cases, since the duration of symptoms and its intensity are proportional to the amount of venom inoculated at the time of accident, which suggests that the adverse effect is greater<sup>(6, 17)</sup>. The study sample included only inpatients, and therefore considered more severe cases.

Individuals remained hospitalized an average of  $1.9 \pm 2.3$  days. This finding is lower than that presented by the Ministry of Health for 2011, which corresponds to an average of 3.3 days of hospitalization. This fact can be explained by the presence of an active CIAT in the study area, since the distribution of intoxication centers is not uniform across the country, with States that do not have this service in their territory.

The specific treatment for such cases is the antivenomous serotherapy – administration of natural serums for the treatment of accidents with venomous animals. Antivenomous serums are refined and concentrated preparations of serum immunoglobulins, obtained by fractionating blood from healthy horses that were previously immunized with different type of venoms<sup>(17, 19)</sup>.

The accidents that required only one day of hospitalization were mostly caused by spiders (35.2%). In these cases, one day of hospitalization, although it does not mean they have received specific treatment, indicates the need for more rigorous attention in treating the symptoms caused by these accidents.

Accidents caused by snakes were responsible for the largest length of hospitalization. In popular wisdom, these represent the most serious accidents, thus the individuals who suffer this type of accident more often seek medical care. Accidents requiring two or more days of hospitalization may be due to the onset of more intense local symptoms, or need for specific treatment for progression to systemic symptoms.

Thus, it is common to use antivenomous serotherapy in the management of snakebites. A study carried out at the CCI/HUM between 2007 and 2009 showed that 39% of snakebite victims required antivenomous serotherapy<sup>(5)</sup>. In these cases, the Ministry of Health recommends a minimum hospital stay of 24 hours after administration of antivenom therapy for monitoring possible complications<sup>(17)</sup>.

In 2011, according to the Ministry of Health, more than R\$ 3 million were spent in hospitalizations due to accidents with venomous animals, with an average value of R\$ 257.45 per hospitalization, showing that they place a huge burden on the Unified Health System<sup>(7)</sup>.

Although almost all of the individuals in this study have been discharged after treatment completion, it was not possible to analyze the presence or absence of sequelae resulting from these accidents. In some cases of accidents by snakes there is the possibility of sequels, due to local complications, in about 10% of accidents by genus *Bothrops*, mainly associated with the use of a tourniquet, piercing bite site and delay in administration of antivenomous serotherapy<sup>(20)</sup>.

Two patients died due to accident by bees, and in this type of accident the victim may die even if just a few bites, by strong allergic reaction (anaphylactic

shock). In the case of multiple bites, there might be more serious toxic manifestations, which can be fatal<sup>(17)</sup>.

### FINAL CONSIDERATIONS

The profile of hospitalizations due to accidents with venomous animals showed a higher incidence of cases in the economically active population and in males. Regarding the animal aggressor, the results show that the percentage of hospitalization differed from morbidity data by these accidents, giving snakebites the utmost gravity. It is also worth mentioning the severity of accidents caused by bee stings, since they were responsible for the deaths identified in this study.

Seasonality was another important finding, since a higher incidence of hospitalizations was revealed in the months corresponding to summer and spring, thus requiring greater attention to these accidents in these periods. We also observed the variation in the frequency of hospitalizations with regard to the animal aggressor and the time of year, being able to identify the season in which each animal caused more accidents.

Health professionals should be trained to care for victims of accidents with venomous animals, given the severity that can happen in certain cases. We also emphasize that nursing professionals, besides providing specialized and quality care to these patients in emergency services and inpatient, should use the epidemiological data for developing educational and prevention actions of these accidents.

From the results obtained, we hope to contribute to the planning of preventive and care actions, in order to assist in the care performed and minimize the use of hospital beds. Thus, we suggest that further studies are carried out to investigate in more depth the impact of seasonality in hospitalizations resulting from accidents with venomous animals, since these variables were closely related.

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Received: Oct. 4<sup>th</sup> 2012  
Accepted: Dec. 5<sup>th</sup> 2012