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# EPIDEMIOLOGY OF ACCIDENTS WITH VENOMOUS ANIMALS THAT OCCURRED IN THE FEDERAL DISTRICT BETWEEN 2010 AND 2020

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## ABSTRACT

The present study analyzed and traced the epidemiological profile of accidents with venomous animals that occurred and were reported in the Federal District, Brazil, between 2010 and 2020. This is an epidemiological, observational, descriptive and retrospective study. Which analyzed the data obtained directly by the health department of the Federal District, including all data on accidents with venomous animals (snakes, spiders, scorpions, bees and caterpillars) that occurred between the years 2010 and 2020. A total of 3,159 accidents were recorded and reported in the period, 241 with snakes, 201 with spiders, 2445 with scorpions, 176 with bees and 94 with caterpillars. The prevalence of accidents occurred with people aged between 20 and 29 years, in urban areas. The results are in accordance with the national standard. Brazil is a reference in the diagnosis and treatment of accidents with venomous animals. Each year the number of accident records has been increasing progressively, the data reveal an inclination in the increase in the number of registered cases of accidents with venomous animals, but we can see that, even in 2020, a lot of information was filled in in an ignored or no information (empty) in the notification forms. It is of paramount importance that the data be described from the outside completely for better future epidemiological analyses.

**Keywords:** Venomous. Snake. Spider. Scorpion. Bee.

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## INTRODUCTION

Currently, Brazil has more than 400 species of snakes, only 20% of which are considered of medical importance, with some potential to cause envenomation in humans (BRASIL, 2001; COSTA & BÉRNILS, 2018). This portion of the diversity is represented by members of the following families: *Viperidae* with three genera: *Bothrops*, *Crotalus* and *Lachesis*; *Colubridae*, which has two genera of medical importance, *Philodryas*, *Clelia* and *Elapidae*, which is represented only by the genera *Micrurus* and *Leptomicrurus*. Most snakebite accidents in Brazil are caused by the genus *Bothrops* (LUCAS, 2009), which in addition to having a great diversity of species, has an abundant population that is easy to adapt to urban and peri-urban areas (COSTA & BÉRNILS, 2018). In general, the occurrence of these accidents is directly related to climatic factors, as well as planting and harvesting times in rural areas (PINHO, 2004). For this reason, the most affected public is that of workers in rural areas, male and of productive age (between 15 and 49 years old) (PINHO, 2001).

Arachnidism is the accidents caused by arthropods of the class *Arachnida* that includes spiders and scorpions (CARDOSO, 2009). There are more than 36 thousand described species of spiders, although many experts believe that this number may exceed 100 thousand (LUCAS, 2009). These animals inhabit practically all regions of the earth, they are found in the most different places, even in the water (LUCAS, 2009). The World Health Organization only considers four genera of spiders with species that can cause serious accidents in humans (*Latrodectus*, *Loxosceles*, *Phoneutria* and *Atrox*), in Brazil spiders of medical interest belong to the first three genera totaling 20 species (LUCAS, 2009).

Scorpions are chelicerate arthropods included among the arachnids. All species of scorpions of medical interest are of the *Buthidae family*, the only one that has a distribution on all continents of the planet (LOURENÇO, 2009). It is estimated that there are around 550 species, but only 25 of them have the capacity to cause a serious or fatal accident in humans (LOURENÇO, 2009). In Brazil, the scorpions that cause accidents belong to the genus *Tityus* with the following species, *Tityus stigmurus Complex* (*Tityus stigmurus*, *Tityus serrulatus* and *Tityus lamottei*), *Tityus bahiensis*, *Tityus costatus* and *Tityus trivittatus* (LOURENÇO, 2009).

Some insects are also considered venomous and some of them are of medical importance, as they can cause serious complications in humans. Some caterpillars and

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bees can lead to a person's death if there is a complicating factor such as an allergy. An accident with bees and wasps can be classified in two ways, the person can be stricken or attacked by a swarm (MEDEIROS, 2009).

In 2020 alone, 254,524 cases of accidents with venomous animals were recorded in Brazil (BRASIL, 2020). This high number is expected since about 250 thousand accidents are reported annually in the country. Among the main aggravating factors of this situation is the distance between the place where the accident occurred and hospital care, the lack of specific serum for treatment, and the difficulty in identifying the causative animal, especially by health professionals.

In Brazil there are serum therapies for the treatment of most cases involving venomous animals, some are still in the testing phases. Brazil is one of the pine trees in the development of serums for these treatments, such as antivenoms (BUTANTAN, 2022). The distribution of sera occurs in Brazil through the analysis that is carried out by the epidemiological surveillance of the data provided by SINAN (Notifiable Diseases Information System) that come from hospital information, where they evaluate the type and quantity of serum that will be distributed to each region of the country (CITELI, 2018).

The adequate distribution of serums and the treatment of the patient can be aggravated by the lack of qualified health professionals in identifying venomous animals, in addition to incomplete completion and lack of information in the SINAN form (BERNARDE, 2014). Only with this correct and complete data can we outline strategies for a better distribution of serums, creation of emergency care units, zoonoses control planning, among other public strategies.

## METHODOLOGY

This is a descriptive, observational, and retrospective epidemiological study of accidents that occurred and were recorded in the Federal District between 2010 and 2020. The raw data were provided by the Department of Health of the Federal District. The collected data were processed in Microsoft Excel 2019 software with the creation of graphs and tables as presented in this work.

## RESULTS

It was found that only in the Federal District there was an increase in cases of accidents with venomous animals, registered in the last decade. An evolution from 21 cases

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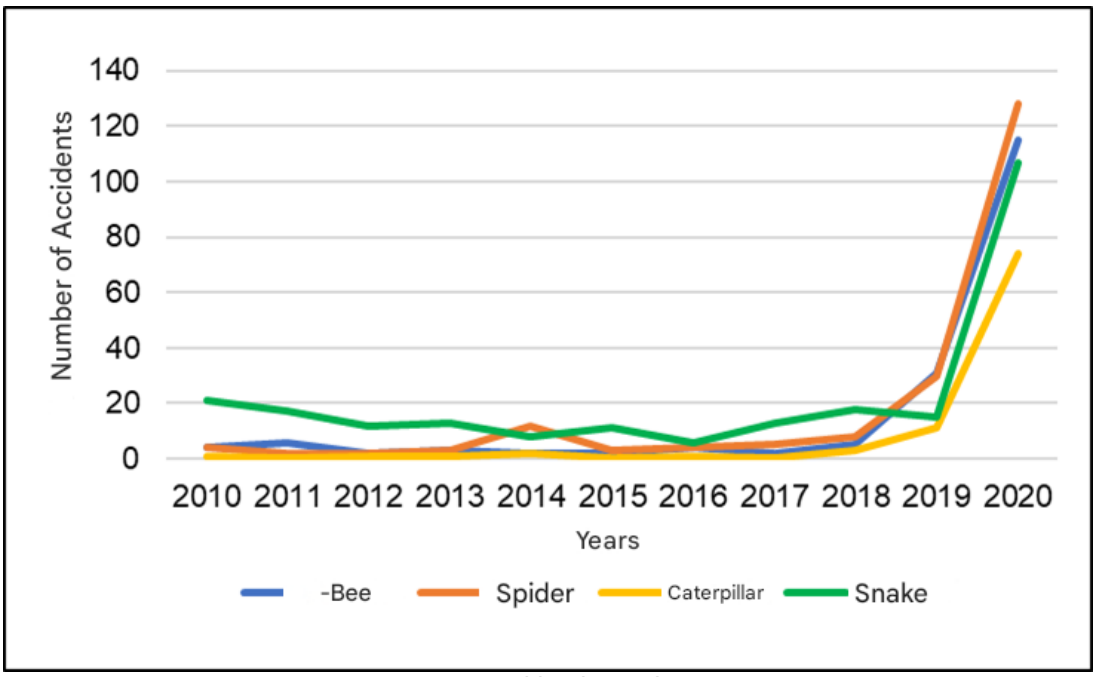
registered in 2010 to 1837 cases registered in 2020 for accidents with scorpions (Figure 1). A total of 176 (Bees), 201 (Spiders), 2445 (Scorpions), 94 (Caterpillars) and 241 (Snakes) cases were recorded in the period from 2010 to 2020 in the Federal District (Figures 2 and 3). The accidents occurred throughout the year following seasonal variations with different indices for each type of accident (Figures 4 and 5).

Figure 1: Number of accidents per year with scorpions in the Federal District between the years 2010 and 2020.




Source: Prepared by the author, 2024.

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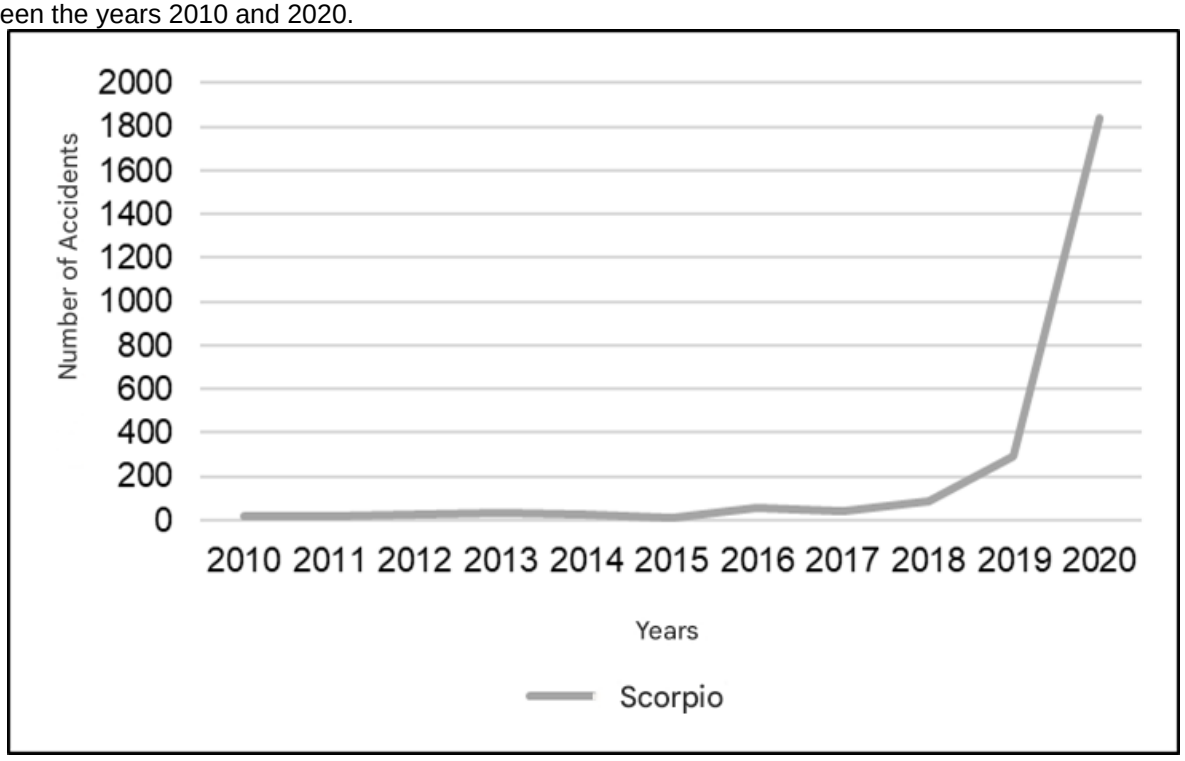
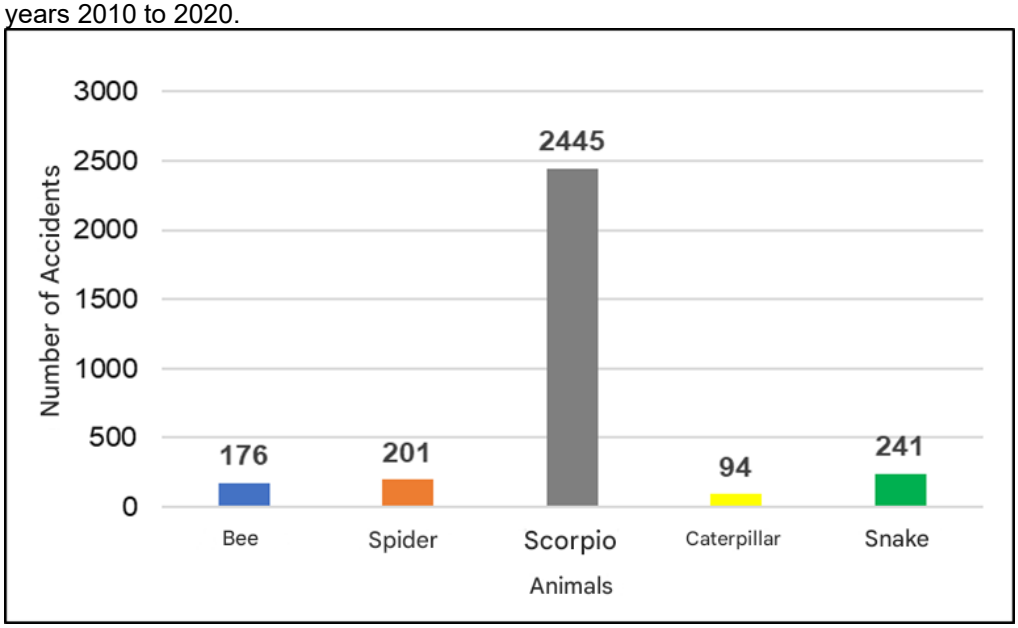
Figure 2: Number of accidents per year with bees, spiders, caterpillars and snakes in the Federal District between the years 2010 and 2020.




Source: Prepared by the author, 2024.

Figure 3: Total number of accidents that occurred in the Federal District with bees, spiders, caterpillars and snakes in the years 2010 to 2020.




Source: Prepared by the author, 2024.

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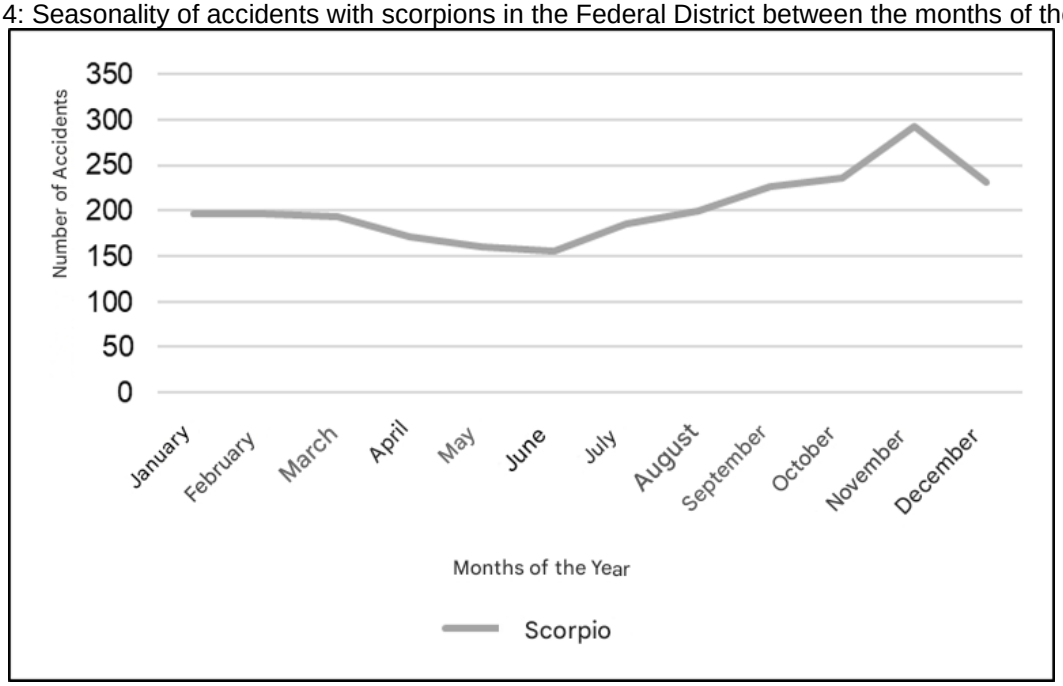
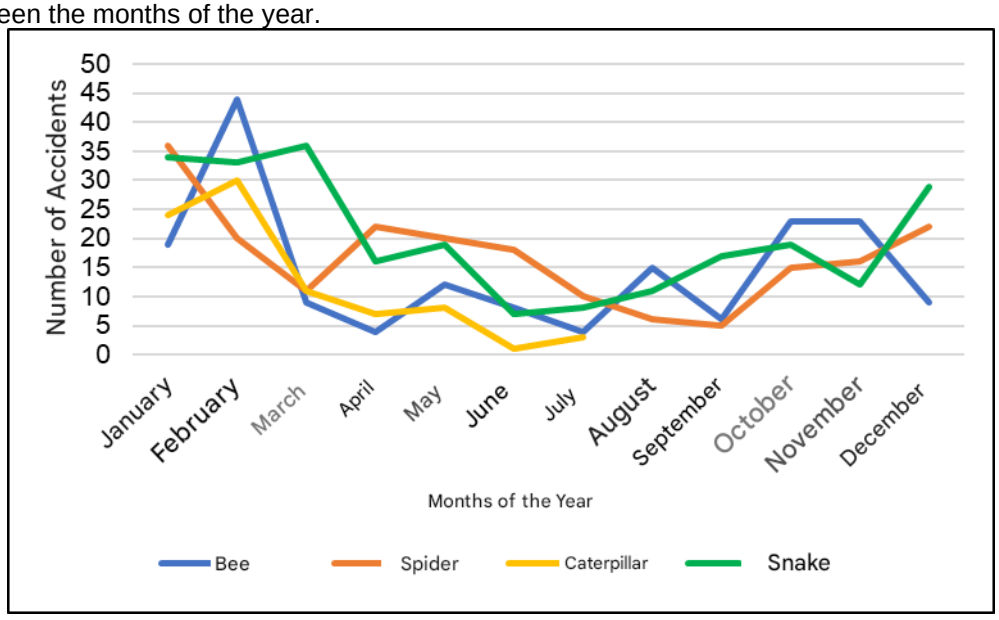
Figure 4: Seasonality of accidents with scorpions in the Federal District between the months of the year.




Source: Prepared by the author, 2024.

Figure 5: Seasonality of accidents that occurred with bees, spiders, caterpillars and snakes in the Federal District between the months of the year.




Source: Prepared by the author, 2024.

Throughout the period, it was observed that females were the ones who suffered the most accidents with scorpions (51.49%), spiders (51.74%) and caterpillars (52.13%), and males with bees (69.89%) and snakes (79.25). The age group of 20 to 29 years had the highest number of accidents recorded, as shown in Table 1. The area where the most accidents occurred were urban areas for bees, spiders, scorpions and caterpillars, unlike snakes that had more records of accidents in rural areas (Table 1).

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Table 1: Sociodemographic information on accidents that occurred with venomous animals in the Federal District between 2010 and 2020.

| Age group | Bee | | Spider | | Scorpion | | Caterpillar | | Snakes | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| 1 to 4 | 17 | 9,66 | 14 | 6,97 | 90 | 3,68 | 19 | 20,21 | 8 | 3,32 |
| 5 to 9 | 16 | 9,09 | 10 | 4,98 | 131 | 5,36 | 9 | 9,57 | 11 | 4,56 |
| 10 to 14 | 8 | 4,55 | 11 | 5,47 | 166 | 6,79 | 7 | 7,45 | 20 | 8,30 |
| 15 to 19 | 11 | 6,25 | 19 | 9,45 | 199 | 8,14 | 3 | 3,19 | 25 | 10,37 |
| 20 to 29 | 34 | 19,32 | 39 | 19,40 | 474 | 19,39 | 8 | 8,51 | 49 | 20,33 |
| 30 to 39 | 35 | 19,89 | 33 | 16,42 | 420 | 17,18 | 10 | 10,64 | 41 | 17,01 |
| 40 to 49 | 23 | 13,07 | 26 | 12,94 | 349 | 14,27 | 16 | 17,02 | 32 | 13,28 |
| 50 to 59 | 10 | 5,68 | 24 | 11,94 | 327 | 13,37 | 10 | 10,64 | 33 | 13,69 |
| 60 to 69 | 10 | 5,68 | 16 | 7,96 | 162 | 6,63 | 8 | 8,51 | 14 | 5,81 |
| 70 to 79 | 7 | 3,98 | 8 | 3,98 | 74 | 3,03 | 2 | 2,13 | 4 | 1,66 |
| 80 or + | 2 | 1,14 | 1 | 0,50 | 34 | 1,39 | 0 | 0,00 | 3 | 1,24 |
| | | | | | | | | | | |
| No Information | 3 | 1,70 | 0 | 0,00 | 19 | 0,78 | 2 | 2,13 | 1 | 0,41 |
| | | | | | | | | | | |
| Accident Zone | Bee | | Spider | | Scorpion | | Caterpillar | | Snakes | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Rural | 19 | 10,80 | 40 | 19,90 | 229 | 9,37 | 13 | 13,83 | 149 | 61,83 |
| Urban | 118 | 67,05 | 132 | 65,67 | 1870 | 76,48 | 65 | 69,15 | 57 | 23,65 |
| Peri-urban | 3 | 1,70 | 6 | 2,99 | 79 | 3,23 | 2 | 2,13 | 11 | 4,56 |
| | | | | | | | | | | |
| Ignored | 34 | 19,32 | 19 | 9,45 | 216 | 8,83 | 13 | 13,83 | 23 | 9,54 |
| | | | | | | | | | | |
| No information | 2 | 1,14 | 4 | 1,99 | 51 | 2,09 | 1 | 1,06 | 1 | 0,41 |

Source: Prepared by the author, 2024.

Table 2 shows that in most cases, with a rate of 47.43%, the patient obtained medical attention within 0 to 1 hour after the accident, and the most affected region of the body was variable according to the type of accident. Most accidents were classified as mild in all types of accidents. Serum therapy was used in cases of accidents with spiders (3.98%), scorpions (10.55%), caterpillars (5.32%) and snakes (77.18%). 02 deaths were recorded as accidents with scorpions in the period, with 141 (bees), 169 (spiders), 2036 (scorpions), 81 (caterpillars) and 192 (snakes) cases evolving to cure.

In 89.05% of the cases, the patients had local manifestations and only 6.82% had systemic manifestations (Table 3). Most patients had no systemic complications or local

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complications (Table 3). Blood coagulation was normal in 159 of the cases, but it was not performed in most occurrences (2667 cases) as shown in Table 3. 4.53% and 52.77% were recorded as work-related accidents, 39.91% were recorded as unknown, and 2.79% as total cases without information.

Table 2: Epidemiological information on accidents with venomous animals in the Federal District between 2010 and 2020.

| Time to Medical Care | Bee | | Spider | | Scorpion | | Caterpillar | | Snakes | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| 0 - 1h | 73 | 46,79 | 47 | 27,17 | 1043 | 47,87 | 28 | 34,15 | 111 | 50,92 |
| 1 - 3h | 18 | 11,54 | 37 | 21,39 | 666 | 30,56 | 24 | 29,27 | 63 | 28,90 |
| 3 – 6h | 0 | 0,00 | 0 | 0,00 | 0 | 0,00 | 0 | 0,00 | 0 | 0,00 |
| 12 - 24h | 9 | 5,77 | 3 | 1,73 | 44 | 2,02 | 5 | 6,10 | 9 | 4,13 |
| 24 - +h | 11 | 7,05 | 33 | 19,08 | 27 | 1,24 | 1 | 1,22 | 3 | 1,38 |
| | | | | | | | | | | |
| Ignored | 45 | 28,85 | 53 | 30,64 | 333 | 15,28 | 24 | 29,27 | 32 | 14,68 |
| | | | | | | | | | | |
| No information | | | | | 66 | 3,03 | | | | |
| | | | | | | | | | | |
| Sting Location | Bee | | Spider | | Scorpion | | Caterpillar | | Snakes | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Head | 52 | 29,55 | 11 | 5,47 | 72 | 2,94 | 2 | 2,13 | 6 | 2,49 |
| Arm | 10 | 5,68 | 9 | 4,48 | 134 | 5,48 | 9 | 9,57 | 6 | 2,49 |
| Forearm | 4 | 2,27 | 7 | 3,48 | 53 | 2,17 | 6 | 6,38 | 3 | 1,24 |
| Hand | 28 | 15,91 | 43 | 21,39 | 516 | 21,10 | 36 | 38,30 | 28 | 11,62 |
| Fingers | 5 | 2,84 | 19 | 9,45 | 356 | 14,56 | 13 | 13,83 | 14 | 5,81 |
| Thigh | 2 | 1,14 | 8 | 3,98 | 101 | 4,13 | 1 | 1,06 | 1 | 0,41 |
| Leg | 6 | 3,41 | 18 | 8,96 | 182 | 7,44 | 5 | 5,32 | 41 | 17,01 |
| Foot | 15 | 8,52 | 37 | 18,41 | 541 | 22,13 | 10 | 10,64 | 113 | 46,89 |
| Toes | 1 | 0,57 | 13 | 6,47 | 169 | 6,91 | 1 | 1,06 | 7 | 2,90 |
| Trunk | 14 | 7,95 | 11 | 5,47 | 157 | 6,42 | 5 | 5,32 | 0 | 0,00 |
| | | | | | | | | | | |
| Ignored | 39 | 22,16 | 25 | 12,44 | 164 | 6,71 | 6 | 6,38 | 22 | 9,13 |
| | | | | | | | | | | |
| Accident Classification | Bee | | Spider | | Scorpion | | Caterpillar | | Snakes | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Serious | 0 | 0,00 | 8 | 3,98 | 31 | 1,27 | 0 | 0,00 | 25 | 10,37 |
| Moderate | 13 | 7,39 | 20 | 9,95 | 207 | 8,47 | 5 | 5,32 | 78 | 32,37 |
| Lightweight | 146 | 82,95 | 6 | 2,99 | 2114 | 86,46 | 81 | 86,17 | 131 | 54,36 |
| | | 0,00 | 13 | 6,47 | | 0,00 | | 0,00 | | 0,00 |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Ignored | 14 | 7,95 | | | 64 | 2,62 | 8 | 8,51 | 5 | 2,07 |
| | | | | | | | | | | |
| No information | 3 | 1,70 | 154 | 76,62 | 29 | 1,19 | | 0,00 | 2 | 0,83 |

Source: Prepared by the author, 2024.

Table 3: Information on manifestations and complications of accidents that occurred with venomous animals in the Federal District between the years 2010 and 2020.

| Local Events | Bee | | Spider | | Scorpion | | Caterpillar | | Snakes | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Yes | 156 | 88,64 | 179 | 89,05 | 2242 | 91,70 | 90 | 95,74 | 200 | 82,99 |
| No | 8 | 4,55 | 6 | 2,99 | 95 | 3,89 | 0 | 0,00 | 33 | 13,69 |
| | | | | | | | | | | |
| Ignored | 12 | 6,82 | 14 | 6,97 | 103 | 4,21 | 4 | 4,26 | 7 | 2,90 |
| No information | 0 | 0,00 | 2 | 1,00 | 5 | 0,20 | 0 | 0,00 | 1 | 0,41 |
| | | | | | | | | | | |
| Systemic Manifestations | Bee | | Spider | | Scorpion | | Caterpillar | | Snakes | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Yes | 12 | 6,82 | 13 | 6,47 | 239 | 9,78 | 2 | 2,13 | 43 | 17,84 |
| No | 119 | 67,61 | 147 | 73,13 | 1849 | 75,62 | 74 | 78,72 | 166 | 68,88 |
| | | | | | | | | | | |
| Ignored | 45 | 25,57 | 38 | 18,91 | 346 | 14,15 | 16 | 17,02 | 32 | 13,28 |
| No information | 0 | 0 | 3 | 1,49 | 11 | 0,45 | 2 | 2,13 | | 0,00 |
| | | | | | | | | | | |
| Local complications | Bee | | Spider | | Scorpion | | Caterpillar | | Snakes | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Yes | 3 | 1,70 | 11 | 5,47 | 5 | 0,20 | 0 | 0,00 | 7 | 2,90 |
| No | 125 | 71,02 | 151 | 75,12 | 2006 | 82,04 | 76 | 80,85 | 181 | 75,10 |
| | | | | | | | | | | |
| Ignored | 44 | 25,00 | 37 | 18,41 | 383 | 15,66 | 17 | 18,09 | 48 | 19,92 |
| No information | 4 | 2,27 | 2 | 1,00 | 51 | 2,09 | 1 | 1,06 | 5 | 2,07 |
| | | | | | | | | | | |
| Systemic Complications | Bee | | Spider | | Scorpion | | Caterpillar | | Snakes | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Yes | 0 | 0,00 | 1 | 0,50 | 391 | 15,99 | 0 | 0,00 | 2 | 0,83 |
| No | 125 | 71,02 | 153 | 76,12 | 1 | 0,04 | 73 | 77,66 | 180 | 74,69 |
| | | | | | | | | | | |
| Ignored | 46 | 26,14 | 41 | 20,40 | 1962 | 80,25 | 18 | 19,15 | 49 | 20,33 |
| No information | 5 | 2,84 | 6 | 2,99 | 91 | 3,72 | 3 | 3,19 | 10 | 4,15 |
| | | | | | | | | | | |
| Blood Coagulation | Bee | | Spider | | Scorpion | | Caterpillar | | Snakes | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |

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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Normal | 1 | 0,57 | 8 | 3,98 | 85 | 3,48 | 7 | 7,45 | 58 | 24,07 |
| Changed | 2 | 1,14 | 6 | 2,99 | 35 | 1,43 | 3 | 3,19 | 28 | 11,62 |
| Not Realized | 155 | 88,07 | 173 | 86,07 | 2129 | 87,08 | 82 | 87,23 | 128 | 53,11 |
| | | | | | | | | | | |
| Ignored | 0 | 0,00 | 0 | 0,00 | 0 | 0,00 | 0 | 0,00 | 0 | 0,00 |
| No information | 18 | 10,23 | 14 | 6,97 | 196 | 8,02 | 2 | 2,13 | 27 | 11,20 |

Source: Prepared by the author, 2024.

## DISCUSSION

Brazil is a reference in the diagnosis and treatment of accidents with venomous animals (BRAGA, 2021), a pioneer in the treatment of snakebite accidents with the use of antivenoms. The country has four notification systems for records of poisonings and lethality, the most used is SINAN (National System of Toxic-Pharmacological Information) (BRAGA, 2021).

Each year the number of accident records has been increasing progressively, the data reveal a slope in the increase in the number of registered cases of accidents with venomous animals in the Federal District, but it is not possible to confirm that the increase in cases is real, or if over the years the notification systems have been improving and the health professionals indicating more completely the cases that have been attended. We can verify that, even in 2020, a lot of information was filled in in an ignored way or without (empty) information in the notification forms, and it is possible that there is still a large number of underreporting according to other studies (VIEIRA, 2018; GOMES, 2021). More training and information is needed for these health professionals on the importance of correctly and completely filling out the notification forms for future reliable epidemiological panoramas.

Regarding the areas of the body that are affected by accidents, the lower limbs are the most vulnerable in some types of accidents. This information reinforces the importance of using protective equipment, such as boots, leggings, gloves, among others. Especially for people who work or transit in an area at risk of accidents with these animals. It is very important to carry out awareness programs with the communities where these accidents happen, so that there is a decrease in the number of accidents.

Mortality among cases of accidents in the Federal District is very low, because in addition to the small territory, the reference hospitals for the treatment of poisonings and primary medical care are easily accessible and well distributed within this federative unit.

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The time elapsed between the accident and medical care is extremely important for the evolution of the case and to avoid amputations, sequelae and even the death of the patient (LADEIRA & MACHADO, 2017).

## CONCLUSION

Accidents with venomous animals show an increasing trend in the Federal District. The epidemiological profile demonstrates the predominance of middle-aged men and women, affected by accidents in rural and urban areas, with local complications and low rates of systemic manifestations/complications, since the time elapsed from the accident to medical care was on average 1 to 3 hours after the event, which favors a good evolution of the patient's condition. The diagnosis of the type of accident is also essential for the best resolution of the case. The correct and complete completion of notification forms is of paramount importance to provide data to better plan public health policies for the population.

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