

## Epidemiological characterization of exogenous poisoning cases in the state of Pará between 2012 and 2021

*Caracterização epidemiológica dos casos de intoxicação exógena no estado do Pará entre 2012 e 2021*

*Caracterización epidemiológica de los casos de intoxicación exógena en el estado de Pará entre 2012 y 2021*

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### Abstract

**Objective:** To characterize the epidemiological profile of exogenous poisoning cases in the state of Pará between 2012 and 2021. **Methods:** Quantitative, descriptive and cross-sectional study, based on data collected from the Notifiable Diseases Information System. **Results:** During this period, 5,803 cases of exogenous poisoning were recorded in Pará. There was a predominance of females (56.92%), aged between 20 and 39 (39.10%) and brown (74.93%). The circumstances that stood out were suicide attempts (32.62%) and accidental use (24.47%), the toxic agents drugs (25.52%) and agricultural pesticides (13.42%), cases of acute-single exposure (58.94%), clinical diagnosis (47.11%) as a confirmation criterion and progression to cure without sequelae (65.88%). When relating circumstances to age group and gender, a high number of suicide attempts were identified among young people and adults (n=1,633), mainly women (n=1,198), while in accidental use, the main victims were children (n=840), especially males (n=740). **Conclusion:** Exogenous poisoning has become a health problem in the state of Pará, with specific characteristics, and it is necessary to promote health education to help alert children, young people, families and the community as a whole.

**Descriptors:** Epidemiology; Health Information Systems; Poisoning.

#### Whats is already known on this?

Exogenous poisoning affects between 1.5% and 3% of the world's population, making it a public health problem. Understanding the epidemiology of this phenomenon is essential for planning coping strategies.

#### What this study adds?

Specific characteristics of cases of exogenous poisoning in the state of Pará, such as the high number of suicide attempts among young people and adults and accidental use among children.



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### Resumo

**Objetivo:** Caracterizar o perfil epidemiológico dos casos de intoxicação exógena no estado do Pará, entre 2012 e 2021. **Métodos:** Estudo quantitativo, de caráter descritivo e delineamento transversal, realizado a partir da coleta de dados no Sistema de Informação de Agravos de Notificação. **Resultados:** Nesse período, foram registrados 5.803 casos de intoxicação exógena no Pará. Houve predominância no sexo feminino (56,92%), faixa etária de 20 a 39 anos (39,10%) e cor/raça parda (74,93%). Sobressaíram-se as circunstâncias de tentativa de suicídio (32,62%) e uso accidental (24,47%), os agentes tóxicos medicamentos (25,52%) e agrotóxicos agrícolas (13,42%), casos de exposição aguda-única (58,94%), diagnóstico clínico (47,11%) como critério de confirmação e evolução para cura sem sequelas (65,88%). Ao relacionar circunstâncias com faixa etária e sexo, identificou-se número elevado de tentativas de suicídio entre jovens e adultos (n=1.633), principalmente mulheres (n=1.198), enquanto que no uso accidental, os principais acometidos foram as crianças (n=840), em especial, do sexo masculino (n=740). **Conclusão:** As intoxicações exógenas surgem como uma problemática de saúde no estado do Pará, apresentando características específicas, sendo necessária a promoção de ações de educação em saúde para servir de auxílio no alerta às crianças, jovens, famílias e à comunidade como um todo.

**Descritores:** Epidemiologia; Sistemas de Informação em Saúde; Intoxicação.

### Resumen

**Objetivo:** Caracterizar el perfil epidemiológico de los casos de intoxicación exógena en el estado de Pará entre 2012 y 2021. **Métodos:** Estudio cuantitativo, descriptivo, transversal, basado en datos recogidos del Sistema de Información de Enfermedades de Declaración Obligatoria. **Resultados:** Durante este período, se registraron 5.803 casos de intoxicación exógena en Pará. Hubo predominio de mujeres (56,92%), con edad entre 20 y 39 años (39,10%) y de color/raza morena (74,93%). Las circunstancias más destacadas fueron tentativa de suicidio (32,62%) y uso accidental (24,47%), agentes tóxicos drogas (25,52%) y plaguicidas agrícolas (13,42%), casos de exposición aguda-singular (58,94%), diagnóstico clínico (47,11%) como criterio de confirmación y progresión a la cura sin secuelas (65,88%). Al relacionar las circunstancias con el grupo de edad y el sexo, se identificó un elevado número de intentos de suicidio entre jóvenes y adultos (n=1.633), principalmente mujeres (n=1.198), mientras que en el consumo accidental, las principales víctimas fueron niños (n=840), especialmente varones (n=740). **Conclusión:** La intoxicación exógena se ha convertido en un problema de salud en el estado de Pará, con características específicas, siendo necesario promover acciones de educación para la salud que ayuden a alertar a los niños, jóvenes, familias y a la comunidad como un todo.

**Descritores:** Epidemiología; Sistemas de Información em Salud; Intoxicación.

## INTRODUCTION

Exogenous poisoning occurs when a living organism comes into contact with toxic substances and/or products, triggering the appearance of clinical symptoms characterized by unfavorable effects. This contact can be intentional or accidental.<sup>(1)</sup> Among the agents that cause these intoxications, the literature points to the following as the main ones: medicines; pesticides; household chemicals.<sup>(2)</sup>

This type of poisoning is a cosmopolitan public health problem. Studies show that there is a continuous annual increase in the number of cases all over the world, highlighting the increase in the degree of morbidity and mortality from this problem. In Brazil, there is a significant number of poisoned people with recorded cases, whether through the ingestion of contaminated food, medicines, the use of pesticides, household cleaning products and/or other chemical substances.<sup>(3)</sup> It is estimated that 1.5% to 3% of the world's population is affected by some form of exogenous poisoning. In Brazil, there are around 4.8 million new cases a year, of which 0.1% to 0.4% progress to death, i.e. around 19,200 become fatal victims.<sup>(4)</sup>

In this context, epidemiology, based on the study of the characteristics surrounding the case in a given population, is a key tool for understanding the factors involved, in order to contribute to planning preventive and/or coping measures.<sup>(5)</sup>

The incidence of poisoning in Brazil was not well known, as these diseases were not considered to be of compulsorily notification by the health system; the various data sources adopted different classifications and none of them covered the entire population. With the creation and implementation of decree no. 2.472, of August 31, 2010, exogenous poisoning are now considered to be diseases that require compulsory notification throughout Brazil, and are catalogued in the Notifiable Diseases Information System (SINAN), according to general rules formulated and implemented by the Health Surveillance Secretariat of the Ministry of Health.<sup>(6)</sup>

According to a clinical and epidemiological study<sup>(7)</sup> carried out in the northern region between 2012 and 2015, using data from SINAN, the state of Pará ranked third in the number of cases of exogenous poisoning, with 1,244 cases in this period, behind Tocantins (4,272 cases) and Amazonas (2,491 cases), and ahead of the states of Roraima (960 cases), Amapá (78 cases) and Acre (36 cases).

Moreover, there is a noticeable lack of studies on this subject, especially in the state of Pará. This was a problem encountered through a free search in databases of articles published in journals, where only one study on exogenous poisoning caused by plants was found.<sup>(8)</sup>

Thus, these occurrences led to a reflection on the knowledge about the cases of poisoning that occur in Pará, the role of health professionals in the field of prevention, health promotion and care directed at these incidents, in addition to the lack of public policies more directed towards prevention, since there is a scarcity of epidemiological studies with data on this state.

Knowing that exogenous poisoning can cause health problems for individuals in all age groups and that these cases can be prevented through basic guidelines, especially when the epidemiological profile is known, this study aims to characterize the profile of cases of exogenous poisoning in the state of Pará, from 2012 to 2021.

## METHODS

This is a quantitative, descriptive and cross-sectional study. The research site is the state of Pará, located in the northern region of Brazil, with a territorial area of 1,245,870.707 km<sup>2</sup> and which, in 2021, had an estimated population of 8,777,124 people, distributed over 144 municipalities, with a demographic density of 7.04 inhabitants/km<sup>2</sup>.<sup>(9)</sup>

The 144 municipalities that make up the state, as defined by the state government, are divided into 12 Integration Regions. The division takes into account the characteristics of population concentration, accessibility, complementarity and economic interdependence.<sup>(10)</sup>

The population of this research corresponds to the data of notified cases of exogenous poisoning in the state of Pará, registered in the SINAN linked to the Department of Informatics of the Unified Health System (DATASUS), from 2012 to 2021. Data was collected in October 2022 on the SINAN/DATASUS website. The variables collected and used in the research were: a) sociodemographic aspects (mesoregion of origin, gender, race, age group and schooling) and b) clinical profile (toxic agent used, circumstance, type of exposure, criteria for confirming intoxication and evolution of the case).

After collection, the data was organized, filtered and tabulated in Microsoft Office Excel® 2019 spreadsheets, which allowed the creation of absolute frequency, percentage, tables and graphs.

The incidence rate of cases per year of the period studied (2012-2021) was calculated by dividing the total number of exogenous poisoning notifications in the state of Pará by the resident population, expressed per 10,000 inhabitants. The study's population data was obtained from intercensal projections carried out by the IBGE.<sup>(9)</sup>

Descriptive statistics were then analyzed using Bioestat® 5.3 software. The inferential analyses took into account the non-homogeneity and non-normal distribution of the data, i.e. non-parametric data. We therefore chose to use the Chi-square, Fisher's exact and Mann-Whitney tests to analyze the statistical differences between the variables, assuming a significance level of 5% ( $p$ -value <0.05).

The data used in the study is secondary, obtained from a public domain database in which the identity of the subjects is not identified. It was therefore not necessary to submit the project to a Research Ethics Committee.

## RESULTS

Between 2012 and 2021, a total of 5,803 cases of exogenous poisoning were recorded on SINAN in the state of Pará. The year 2021 had the highest number of records. Among the state's integration regions, Carajás and Tocantins stand out, with 1,082 and 908 cases, respectively (Table 1). Table 1 shows statistical differences ( $p$ <0.001) for all the years between the integration regions studied.

**Table 1.** Cases of exogenous poisoning in the state of Pará, from 2012 to 2021. Belém, Pará, Brazil, 2022.

Region	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Araguaia	15	22	26	20	76	33	76	110	100	70	548
Baixo Amazonas	73	114	33	20	6	25	25	55	40	68	459
Carajás	28	209	127	68	68	100	84	118	130	150	1,082
Guamá	0	0	1	11	6	42	70	104	116	135	485
Lago de Tucuruí	20	39	29	25	39	46	55	64	47	46	410
Marajó	0	4	3	2	3	8	1	10	7	3	41
Metropolitana	48	49	90	95	87	52	24	33	5	9	492
Rio Caetés	6	7	4	4	16	58	54	54	44	43	290
Rio Capim	6	12	23	10	11	24	57	133	67	104	447

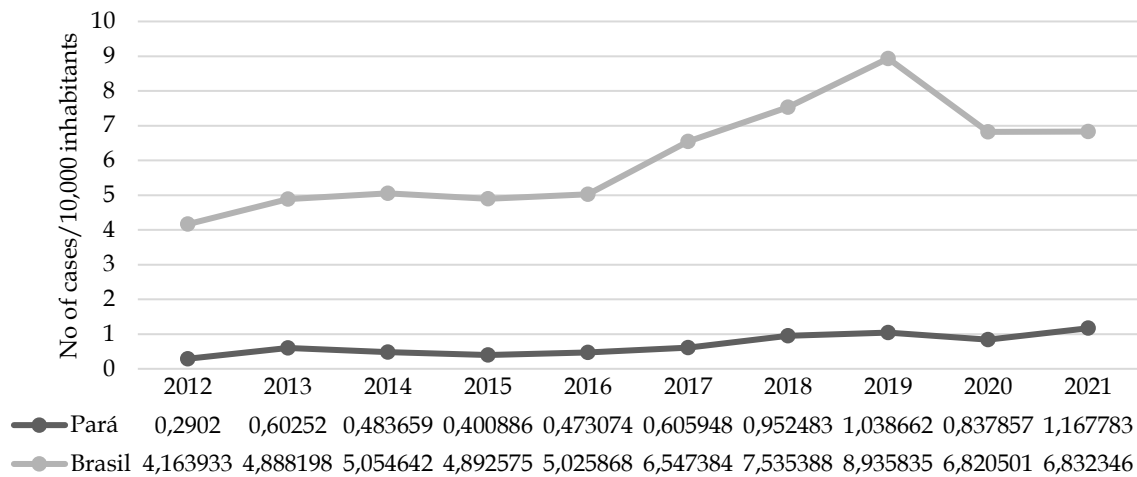
Tapajós	13	16	25	20	16	24	24	65	46	52	301
Tocantins	3	1	1	0	11	67	313	101	95	316	908
Xingu	0	2	5	15	38	20	18	32	19	22	171
Município Ignorado	15	7	25	39	16	10	13	18	15	11	169
<b>Total</b>	<b>227</b>	<b>482</b>	<b>392</b>	<b>329</b>	<b>393</b>	<b>509</b>	<b>814</b>	<b>897</b>	<b>731</b>	<b>1,029</b>	<b>5,803</b>
<i>p-value*</i>	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Note: \**p-value* calculated by the Chi-Square test.

Source: SINAN, 2022.

Graph 1 shows the incidence of cases of exogenous poisoning over the period studied in Pará and Brazil. With regard to Pará, it is possible to follow the increase in the incidence of cases over the years, with a significant increase starting in 2016, a decrease in 2020 and a sharp increase again in 2021, when 1.16 cases per 10,000 inhabitants were recorded. Comparing the incidence rate between Pará and Brazil, it can be seen that the state has lower numbers. However, it is noteworthy that from 2020 to 2021 the incidence rate in Brazil remained almost the same, while in Pará there was a sharp increase. The statistical difference between the incidences was significant (*p-value*=0.0002).

**Graph 1.** Incidence rate of exogenous poisoning per 10,000 inhabitants in the state of Pará and in Brazil, from 2012 to 2021. Belém, Pará, Brazil, 2022.



\**p-value* = 0.0002

Note: \**p-value* calculated using the Mann-Whitney test.

Source: SINAN, 2022.

Table 2 shows the results for sociodemographic data in this study. The prevalence of cases was among females (56.9%), with a difference of *p*<0.0001, and the 20-39 age group was the most frequent (39.1%), followed by the group of children under 10 years old (21.7%). With regard to race/skin color, brown self-declared individuals accounted for the highest prevalence of cases (74.9%), with a difference of *p*<0.0001. As for schooling, 33.5% of cases had this information ignored and 19% did not apply to the variables at the time of notification. However, among the cases (47.5%) who had this variable filled in, people with complete high school education (10.5%) and who had only studied between the 5<sup>th</sup> and 8<sup>th</sup> grades (10%) stood out (Table 2). It should be noted that there was also a statistically significant difference in this variable, as shown in the table 2.

**Table 2.** Distribution of sociodemographic variables of cases of exogenous poisoning in the state of Pará, from 2012 to 2021. Belém, Pará, Brazil, 2022.

Variable	n	%
<b>Sex</b>		
Male	2,500	43.08
Female	3,303	56.92
<i>p-value*</i>	<0.0001	
<b>Age group</b>		

< 10 years	1,263	21.76
10-19 years	1,137	19.59
20-39 years	2,269	39.10
40-59 years	876	15.10
≥60 years	258	4.45
<i>p</i> -value*	<0.0001	
<b>Race/skin color</b>		
White	580	9.99
Black	280	4.83
Yellow	54	0.93
Brown	4,348	74.93
Indigenous	21	0.36
Ignored	520	8.96
<i>p</i> -value*	<0.0001	
<b>Education</b>		
Illiterate	91	1.57
1st to 4th grade	370	6.38
4th grade complete	158	2.72
5th to 8th grade incomplete	595	10.25
Elementary school complete	221	3.81
High school incomplete	463	7.98
High school complete	611	10.53
Higher education incomplete	108	1.86
Higher education complete	135	2.33
Not applicable	1,119	19.28
Ignored	1,932	33.29
<i>p</i> -value*	<0.0001	

Note: \**p*-value calculated by the Chi-Square test.

Source: SINAN, 2022.

Table 3 shows that the main circumstances of poisoning differed statistically ( $p < 0.0001$ ): attempted suicide (32.62%), followed by accidental use (24.50%) of toxic agents. There was also a high number of cases (18.52%) in which this information was ignored at the time of notification. As for the toxic agent involved, drugs (25.52%) and agricultural pesticides (13.42%) stood out. There were also a considerable number of cases (19.14%) in which this information was ignored.

Table 3 also shows that the majority of cases were of acute-single exposure (58.94%) with a difference of  $p < 0.0001$ . With regard to the confirmation criterion, the clinical criterion was the most frequent (47.11%), although there was a considerable percentage of notifications with this information ignored (26.09%), with a difference of  $p < 0.0001$ . Regarding the evolution of the cases, the majority evolved to a cure without sequelae (65.88%), however, during the period studied, 95 deaths (1.64%) were confirmed due to exogenous poisoning, highlighting that there was a difference of  $p < 0.0001$  between the notifications of these cases.

**Table 3.** Distribution of variables related to the clinical profile of cases of exogenous poisoning in the state of Pará, from 2012 to 2021. Belém, Pará, Brazil, 2022.

Variable	n	%
<b>Circumstance</b>		
Habitual use	433	7.46
Accidental use	1,420	24.47
Environmental use	266	4.58
Therapeutic use	30	0.52
Medical prescription	2	0.03
Administration error	85	1.46
Self-medication	153	2.64
Abuse	34	0.59
Food ingestion	269	4.64
Suicide attempt	1,893	32.62
Abortion attempt	9	0.16
Violence/murder	41	0.71
Other	93	1.60

Ignored	1,075	18.52
<i>p</i> -valor*	<0.0001	
<b>Toxic agent</b>		
Medication	1,481	25.52
Agricultural pesticide	779	13.42
Domestic pesticide	267	4.60
Public health pesticide	76	1.31
Rat poison	578	9.96
Veterinary product	120	2.07
Household product	351	6.05
Cosmetic	53	0.91
Chemical product	361	6.22
Metal	13	0.22
Drugs of abuse	61	1.05
Toxic plant	55	0.95
Food and drink	301	5.19
Other	196	3.38
Ignored	1,111	19.15
<i>p</i> -value*	<0.0001	
<b>Type of exposure</b>		
Acute-single	3,420	58.94
Acute-repeated	585	10.08
Chronic	115	1.98
Acute over chronic	26	0.45
Ignored	1,657	28.55
<i>p</i> -value*	<0.0001	
<b>Confirmation criteria</b>		
Clinical-laboratory	302	5.20
Clinical-epidemiological	1,253	21.59
Clinical	2,734	47.11
Ignored	1,514	26.09
<i>p</i> -value*	<0.0001	
<b>Case progression</b>		
Cure without sequelae	3,823	65.88
Cure with sequelae	92	1.59
Death due to exogenous poisoning	95	1.64
Death due to other causes	12	0.21
Loss of follow-up	26	0.45
Ignored	1,755	30.24
<i>p</i> -value*	<0.0001	

Note: \**p*-value calculated by the Chi-Square test.

Source: SINAN, 2022.

In the state of Pará, during the period studied, attention was drawn to the considerable number of suicide attempts due to exogenous poisoning among the young population, aged between 10 and 39 (n=1,633), especially females (n=1,198; 20.6%; *p*-value<0.0001). There was also a considerable number of accidental poisonings among children under the age of 10 (n=840), especially males (n=740; 8.10%; *p*-value<0.0001) (Table 4).

Medicines were the main toxic agents used in suicide attempts among young people and adults: of 1,633 cases among men and women aged 10 to 39, 780 involved the use of medicines. With regard to the agents used by children under the age of 10 (n=870), drugs also stood out (n=194). However, there was a distribution of different chemical agents present in the home, such as household pesticides (n=73), household products (n=161), rodenticides (n=72) and chemical products (n=73).



**Table 4.** Distribution of exogenous poisoning cases by age group and sex according to circumstance, in the state of Pará, from 2012 to 2021. Belém, Pará, Brazil, 2022.

Circumstance	<10 years			10-19 years			20-39 years			40-59 years			≥ 60 years			Total		
	Fem	Mal	p-value*	Fem	Mal	p-value*	Fem	Mal	p-value*	Fem	Mal	p-value*	Fem	Mal	p-value*	Fem	Mal	p-value*
Habitual use	32	26	0.2652	22	25	0.5360	64	110	<0.0001	52	70	0.0212	10	22	0,0027	180	253	<0,0001
Accidental use	370	470	<0.0001	50	46	0.5637	123	172	<0.0001	40	96	<0.0001	17	36	0,0002	600	820	<0,0001
Environmental use	12	15	0.4142	9	17	0.0265	55	46	0.2053	39	45	0.3545	12	16	0,2850	127	139	0,2981
Therapeutic use	5	7	0.4142	3	0	--	8	2	0.0073	2	1	0.4142	2	0	--	20	10	0,0098
Medical prescription	0	0	--	0	0	--	1	1	1.0000	0	0	--	0	0	--	1	1	1,0000
Administration error	10	7	0.3035	1	2	0.4142	20	9	0.0039	18	12	0.1213	3	3	1,0000	52	33	0,0036
Self-medication	9	9	1.0000	35	10	<0.0001	46	23	<0.0001	9	7	0.4795	1	4	0,0578	100	53	<0,0001
Abuse	0	0	--	3	1	0.1573	9	8	0.7316	4	9	0.0499	0	0	--	16	18	0,6276
Food ingestion	30	32	0.7194	31	21	0.0499	54	53	0.8913	10	21	0.0052	10	7	0,3035	135	134	0,9313
Suicide attempt	16	15	0.7995	513	105	<0.0001	685	330	<0.0001	118	77	<0.0001	16	18	0,6276	1.348	545	<0,0001
Abortion attempt	0	0	--	5	0	--	2	1	0.4142	1	0	--	0	0	--	8	1	0,0010
Violence/murder	2	0	--	9	4	0.0499	12	8	0.2059	1	3	0.1573	1	1	1,0000	25	16	0,0468
Other	13	16	0.4308	8	2	0.0073	12	16	0.2858	10	10	1.0000	1	5	0,0209	44	49	0,4634
Ignored	80	87	0.4436	144	71	<0.0001	251	148	<0.0001	132	89	<0.0001	40	33	0,2466	647	428	<0,0001
Total	579	684	<0.0001	833	304	<0.0001	1,342	927	<0.0001	436	440	0.8484	113	145	0,0048	3.303	2.500	<0,0001

Note 1: \**p*-value calculated by Fisher's exact test.Note 2: (--) it is not possible to calculate the *p*-value when one or more samples is zero.

Note 3: Fem=Female; Mal=Male

**Source:** SINAN, 2022.

## DISCUSSION

It was observed in the data from this study that the occurrence of cases began to increase in frequency between 2015 and 2019, followed by a slight drop in 2020 and an abrupt increase in 2021. It should be noted that both the present study and the research carried out in Rondônia<sup>(11)</sup>, had a decrease in notifications in 2020, and this factor can be linked to the overload of the health system due to the COVID-19 pandemic, which ended up affecting the routine and quality of care provided by health teams, since efforts were directed at coping with the new coronavirus.<sup>(12)</sup>

In view of the COVID-19 pandemic, it can be seen that this may have contributed to a decrease in the number of notifications recorded in SINAN, especially in 2020 and 2021, showing a picture of underreporting that would have affected not only the state of the study itself, but several others throughout Brazil.

With regard to sociodemographic variables, epidemiological studies carried out in Rondônia<sup>(11)</sup>, which investigated the profile of exogenous poisoning, and in Espírito Santo<sup>(13)</sup>, which looked at suicide attempts due to exogenous poisoning, obtained similar results to this study: with a prevalence of females; an age range of 20 to 39 years; and brown race/skin color. This finding may be explained by the fact that women are more prone to suicidal behavior through the overuse of medication when compared to men.

Suicide attempts, followed by accidental use, were the main circumstances of intoxication observed in this study. This observation is in line with findings already described in research carried out elsewhere, such as in the states of Santa Catarina<sup>(2)</sup>, Rondônia<sup>(11)</sup>, Tocantins<sup>(14)</sup> and Rio Grande do Sul<sup>(15)</sup>, as well as in the municipalities of Moreno, Pernambuco<sup>(16)</sup> and Ceres, Goiás<sup>(17)</sup>.

Furthermore, among the toxic agents involved in poisoning cases, medicines and agricultural pesticides were the most prevalent. Similar data was found in other epidemiological studies carried out in Rondônia<sup>(11)</sup>, Pernambuco<sup>(16)</sup> and Goiás<sup>(17)</sup>, and on suicide attempts among the elderly, also in Pernambuco<sup>(18)</sup>.

Regarding the type of exposure, the majority of cases were acute, which may be justified by the fact that, in general, the onset of symptoms of intoxication are immediate, which implies an urgent search for health services, with consequent notification.<sup>(19)</sup> On the other hand, cases of chronic intoxication are less frequently reported, because the signs and symptoms are milder, more subtle, non-specific and of longer duration, which makes it difficult to characterize the cases as exogenous poisoning.<sup>(20-21)</sup>

Furthermore, although the effects of acute intoxication are visible, the diagnosis of cases is still considered to be poor, based mostly on clinical history, as was observed in this study. There are still few laboratory tests to prove poisoning in the health services network. However, it should be noted that diagnostic confirmation by laboratory methods would be of great value in prescribing appropriate treatment. An example of this is pesticide poisoning, in which each group of toxic agents has its own specific treatment.<sup>(15)</sup>

With regard to the evolution of the cases, the majority were cured without sequelae. With the majority of cases being acute, it is believed that the timely search for medical assistance is a reality in the scenario studied, contributing to the non-occurrence of fatalities.<sup>(14)</sup> Furthermore, it should be noted that the quantity and type of toxic agent used also influences the severity of the cases.<sup>(2)</sup>

When relating the circumstances of poisoning to the age group and sex of the cases, a high number of suicide attempts were observed among the young population, aged between 10 and 39, especially females. In addition, there was also considerable evidence of accidental use among children under the age of 10, especially males. This finding is in line with data from the World Health Organization (WHO), which lists these two circumstances as the main ones for exogenous poisoning, with attempted suicide being the most common in individuals over the age of 10 and accidental use among those under the age of 10 and rural workers<sup>(22)</sup>.

The practice of self-extermination is understood to be an important and severe health problem worldwide. The WHO estimated that in 2019 more than 700,000 people died by suicide, or one in every 10 deaths worldwide. Thus, more people die from suicide every year than from breast cancer, malaria, homicide or war.<sup>(23)</sup> The motivations for committing suicide are complex, and research has linked it to substance abuse, emotional problems arising from family and/or work issues, self-blame, a family history of mental suffering, etc.<sup>(24)</sup>

In particular, adolescence (10-19 years) should be understood as a sensitive period in terms of emotional abilities, and this group needs to be given as much support as possible.<sup>(23)</sup> Studies show that, in addition to emotional instability, the risk factors for self-extermination in adolescence are: intra-family



violence; alcohol and other drug use; social isolation; bullying; low self-esteem; poor school performance; among others.<sup>(25)</sup>

Furthermore, regarding gender, the literature shows that women are more likely to attempt suicide than men,<sup>(26)</sup> as observed in this study. However, death rates are higher among men, with 12.6 out of every 100,000 men committing self-extermination, compared to 5.4 out of every 100,000 women.<sup>(21)</sup> This observation can be explained by men's preference for using more violent and fatal methods, such as firearms and hanging, while women opt for excessive doses of medication or poisons.<sup>(26)</sup>

With regard to accidental use among children, it should be noted that exogenous poisoning is one of the most common clinical emergencies among pediatric patients, with the majority of cases occurring within the family environment, due to exposure to toxic household products.<sup>(27)</sup> Around 1.5% of the world's population is affected by exogenous poisoning each year, and among children this percentage rises to 7%, which characterizes these accidents as important factors in pediatric morbidity and mortality.<sup>(28)</sup>

With specific regard to pre-school children, as well as spending most of the day at home, they are at a stage of life characterized by exploratory behavior, in transition between crawling and walking, which contributes to them accessing risky places. Associated with this, they often put objects in their mouths, increasing the risk of interaction with toxic substances.<sup>(27,29)</sup>

One observation highlighted in this study is the fact that males prevail among accidental use by children, diverging from all the other circumstances investigated in this research in which females prevail. This observation can be seen from cultural issues, since, socially, male children tend to be less vigilant than females, which results in more accidents and injuries from external causes in boys.<sup>(30)</sup>

Among the products used by the young and adult population for self-extermination, medicines stand out as the main agents of poisoning, given their easy accessibility, which links them to a high number of deaths and hospital admissions. It is important to note that Brazil ranks fifth in the world for drug consumption and first in Latin America, with around 80 million people self-medicating every day.<sup>(31-32)</sup>

The ingestion of drugs in self-extermination attempts is a reality throughout the country. The purchase of drugs in various pharmacies is generally facilitated by the dispensation of a doctor's prescription. In addition, Brazilians have a culture of self-medication, so it's common for them to have numerous medicines in their own homes. Therefore, in cases of exacerbated psychological distress, taking high doses of one or more drugs is a simple and easy way to attempt self-extermination.<sup>(33)</sup>

Based on these analyses, there is an urgent need for interventions. It is essential that the discussion about mental health is encouraged in our society, since it is still poorly addressed and highly stigmatized. The relevant bodies need to take action to promote mental health and develop anti-bullying programs. In addition, it is essential that our health professionals are better qualified in this area, so that they can identify, assess and monitor individuals at risk of self-extermination in their routine work.<sup>(34)</sup>

With regard to the agents involved in accidental use by children, household products such as medicines, household pesticides, rodenticides and other chemical products prevailed. In a study carried out in the state of Tocantins, it was found that toxic products present in the home are the main causes of pediatric poisoning.<sup>(35)</sup>

It can be seen that the improper storage of these products by parents and/or guardians is the main factor in the occurrence of these accidents.<sup>(36)</sup> In addition, there is the visual aspect of some chemical product packaging, such as cleaning products, which are colorful and contain liquids with eye-catching colors and a pleasant smell, attracting children's attention.<sup>(37)</sup>

Therefore, in view of these observations, it is worth emphasizing the need for government agencies to implement programs that work on health education about the correct storage of medicines and chemical products with parents and guardians. Moreover, partnerships between health and education to incorporate the theme of care into schools are also valid, with the aim of making children more aware of various issues, including the undue consumption of toxic substances.<sup>(30,35)</sup>

With regard to the limitations encountered in carrying out this study, we would highlight the high number of incompletely reported data, which were characterized by the frequency of carelessness or even disregard for recording the variables race and schooling, with a high rate of fields not filled in, ignored or not applicable, which is one of the challenges and difficulties of this study, demonstrating weaknesses in the reporting system and alerting us to the need for improvements in the filling-in process.

It is important to carry out studies that corroborate and evaluate the particularities of groups affected by common risk factors and it is expected that this study will contribute not only to other studies

of this nature, but also to health actions and planning, based on existing strategies in the field of action of the Unified Health System.

## CONCLUSION

With regard to the scenario of exogenous poisoning, using epidemiological data from the state of Pará from SINAN/DATASUS, it was possible to identify important data on the frequency of cases in the state. When relating circumstances to age group and gender, a high number of suicide attempts were identified among young people and adults, especially females, while in the case of accidental use, the main victims were children, especially males. The main toxic agents used were those commonly found in the home environment, especially medicines.

It is therefore necessary to promote health education actions to help alert children, young people, families and the community as a whole. These actions need to involve guidance on due care in the prevention of exogenous poisoning, especially with the correct storage of medicines, and also use objective information about the medications used and their adverse reactions, including schools, universities and, above all, health centers as means of spreading knowledge, thus contributing to reducing the incidence and preventing deaths from exogenous poisoning.

## CONTRIBUTIONS

Contributed to the conception or design of the study/research: Batista Neto JBS, Castro TMG, Cantão BCG. Contributed to data collection: Batista Neto JBS, Castro TMG, Silva HRS, Almeida CLS. Contributed to the analysis and/or interpretation of data: Batista Neto JBS, Castro TMG, Silva Filho JA, Borba-Pinheiro CJ. Contributed to article writing or critical review: Batista Neto JBS, Castro TMG, Silva HRS, Almeida CLS, Cantão BCG, Silva Filho JA, Borba-Pinheiro CJ. Final approval of the version to be published: Batista Neto JBS, Castro TMG, Silva HRS, Almeida CLS, Cantão BCG, Silva Filho JA, Borba-Pinheiro CJ.

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