

## Perfil de intoxicações em adolescentes por substâncias nocivas no Nordeste do Brasil de 2015 a 2021

*Poisoning profile in adolescents by harmful substances in the Northeast of Brazil from 2015 to 2021*

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### RESUMO

Objetivos: Analisar o perfil das intoxicações e a sua mortalidade na população adolescente do Nordeste. Metodologia: Trata-se de um estudo ecológico de série temporal, utilizando dados do Departamento de Informática do Sistema Único de Saúde (DATASUS). A população do estudo incluiu indivíduos de 10 a 19 anos de idade, vítimas de envenenamento/intoxicação, da classificação acidental X40-X49 presentes na CID-10 (envenenamento [intoxicação] acidental por exposição a substâncias nocivas) e intencional X60-X69 (lesões autoprovocadas intencionalmente) e residentes no Nordeste no período de janeiro de 2015 a dezembro de 2021. Resultados: O maior número de intoxicações aconteceu em 2019 (incidência 2,59). A categoria com mais intoxicações acidentais (n=105, 31%) foi envenenamento por outras drogas, medicamentos e substâncias biológicas não especificadas (CID10-X44), destacando-se a Bahia (n=67, 66%). Nas intoxicações intencionais, o maior número de internações (n=302, 47%) foi devido aos medicamentos e substâncias biológicas (CID10-X64), sendo liderada pela Bahia com 117 internações, principalmente na faixa etária de 15 a 19 anos. Dentre as intoxicações acidentais, os envenenamentos por exposição a narcóticos e psicodislépticos (CID10-X42) destacou-se na faixa etária entre 15 e 19 anos, principalmente em Pernambuco (5 óbitos e FR=0,6). Para os óbitos por intoxicações intencionais, o maior número (n=100, 47%) foi por envenenamento por pesticidas (CID10-X68). Conclusão: Concluiu-se que as substâncias com maior incidência de intoxicações nos adolescentes do Nordeste, sendo maior número de casos intencionais e, portanto, maior risco de tentativas de suicídio. Dessa forma, traz informações relevantes para estudos futuros e incentiva a maior assistência à saúde desse grupo.

**Palavras-chave:** Adolescente; Intoxicação; Mortalidade.

### ABSTRACT

Objectives: To analyze the profile of intoxication and mortality from those in the adolescent population of the Northeastern Region of Brazil. Methods: This is an ecological time series study, using data from the Department of Informatics of the Unified Health System (DATASUS). The study population included individuals from ages 10-19, victims of poisoning, present at International Classification of Diseases (ICD-10), related with codes X40-X49 and X60-X69 (poisoning [accidental poisoning] by exposure to harmful substance), residents of the Northeast from January 2015 to December 2021. Results:



This study demonstrates that the peak of poisonings occurred in 2019 (incidence 2.59). The substance with most accidental intoxications (n=105, 31%) was poisoning by other drugs and medicines, medicines and unspecified biological substances (CID10-X64), highlighting the state of Bahia (n=67, 66%). In intentional intoxications and poisonings, the highest number of hospitalizations (n=302, 47%), mainly among 15-19 years of age, were due to use of medicines and biological substances (ICD10-X64), being led by Bahia with 117 hospitalizations and RF=0.43. Among accidental intoxications, poisoning by exposure to narcotics and psychodysleptics (ICD10-X42), in the age range of 15-19 years, Pernambuco stood out (5 deaths and RF 0.6). In intentional poisoning deaths, the highest number (n=100, 47%) came from pesticide poisoning (ICD10-X68). Conclusion: This study allowed us to verify the substances with the highest incidence of intoxication among adolescents in the Northeast of Brazil, and to verify the highest number of intentional cases and, therefore, the risk of suicide attempts. Thus, it provides relevant information for future studies and encourages greater health care for this group.

**Keywords:** Adolescent; Poisoning; Mortality.

## INTRODUCTION

Acute intoxications are a clinical consequence of exposure (LOPES; FERNANDES; LUCIO NETO, 2020), ingestion or inhalation of a harmful substance, causing signs, symptoms and deterioration of organs and tissues, which can lead to death (ZAMBOLIN, et al.; 2008). These substances can be found in the environment (air, water, food, plants, poisonous animals, etc.) or isolated (pesticides, medicines, products for industrial use, products for domestic use, etc.) (AMORIM, 2017). Because it is a preventable disease, the prevalence of poisoning in the pediatric population remains a concern (BOCHNER, 2006).

According to Ordinance No. 1061, of May 2020, cases of intoxication are classified as mandatory notification. Brazil has two national systems that contain data on toxic events: the Notifiable Diseases Information System (SINAN) and the National Toxic-Pharmacological Information System (SINITOX). SINAN collects, mainly, information on diseases, injuries and other harmful situations, and public health occurrences of compulsory notification. SINITOX, on the other hand, organizes and makes available information from the network formed by the Information and Toxicological Assistance

Centers (CIATox), present in most states of the country (MAGALHÃES; CALDAS, 2018).

According to the World Health Organization (WHO), accidental and intentional intoxications are causes of health deterioration due to ineffective control and lack of prevention strategies (BOCHNER, 2006). Accidental intoxications are the main causes of care in emergency units, of which children aged 0 to 12 years are the most common group (TAVARES, 2013). The factors that contribute to the occurrence of this type of intoxication are the caregivers' lack of knowledge about the agents' toxicity, lack of attention to risks, lack of supervision and inadequate storage of household products and medicines (AMORIM, 2017). Alternatively, intentional poisonings can happen from the experience of an anguish situation and are often characterized by suicidal attempts, with adolescents being the most vulnerable group (VIEIRA et al, 2007).

Throughout the world, in 2017, there were more than 2 million notifications, and more than half of the number of cases of acute poisoning were reported in children under 13 years of age (MELO, 2022). In Brazil, childhood accidents, including poisoning, are the

main cause of death among the pediatric population, from early childhood to adolescence (TAVARES, 2013), and have been increasing every year (AMORIM et al., 2017). The Northeast Region draws attention because it is the second most populous in the country and the one with the lowest Human Development Index (HDI). Its main economic activities are agriculture and livestock, with a significant occurrence of pesticide poisoning (TEIXEIRA et al, 2014), which represents, among medicines, the highest number of poisonings in the age group of 10 to 19 years. The second most frequent cause in this group was drug addiction intoxication (SINITOX, 2021).

Considering the lack of extensive studies evaluating poisoning in the pediatric population of the Northeast, the present study aims to analyze the profile of poisoning and mortality of people in the population aged between 10 and 19 years, between January 2015 and December 2021. Moreover, it seeks to identify the main substances that cause intoxication, describing their incidence and comparing their mortality and intoxications through the following categories: state, year, age group, and intentional or accidental causes. In this sense, it can serve as an important tool to support actions that aim to promote, prevent and protect the population from these preventable health issues and minimize the emergence of new cases, as well as to adding knowledge for future studies.

## **METHODOLOGY**

The present study is an ecological time series study, using data from the Department of Informatics of the Unified Health System (DATASUS). The study population has as inclusion criteria: individuals aged 10 to 19 years, victims of poisoning, with pathological conditions included in the International Classification of Diseases database (ICD-10), related to codes X40-X49 and X60-X69, living in Northeast Brazil from January 2015 to December 2021. The information in this

research was accessed between June 2021 and April 2022. Individuals whose age and place of residence were unknown were excluded from the study.

The study used a sample of aggregate data, composed of cases of poisoning in adolescents, collected through the Hospital Information System of the Unified Health System (SIH-SUS) and the Mortality System (SIM), in the aforementioned period. The quantitative variables of the study are number of hospitalizations and number of deaths. The qualitative variables are age group, state and year.

Data on hospitalizations were obtained by accessing the item "Health information (TABNET)" in "Epidemiology and morbidity" and selecting the topic "External causes by place of residence - from 2008 on" and "Brazil by region and federative unit". The following categories: age group from 10 to 19 years, the period from 2015 to 2021, one of the two classification causes, accidental (X40-X49) or intentional (X60-X69), and the Northeast Region were selected. The number of deaths was obtained by selecting the topic "Mortality from 1996 to 2019 on the CID-10 database" and then selecting the topics "General mortality" and "Brazil by region and federative unit".

The analysis of the qualitative variables was done by absolute and relative frequency and the quantitative variables were analyzed by calculating the incidence on the Microsoft Excel application. The incidence rate was calculated by the number of new cases divided by the total number of the Brazilian population in this age group multiplied by 104. This study was carried out in accordance with the Code of Medical Ethics and the Declaration of Helsinki. In its elaboration, secondary data were used to investigate questions different from those that were collected, thus eliminating submission to the Ethics Committee in Research on Human Beings. For this purpose, the recommendations of Resolution 510/16 (CONEP - CNS/MS) were implemented.

## RESULTS

The presented sample consists of adolescents aged 10 to 19 years residing in the Northeast Region and the results refer to the total of this age group. The population which has been decreasing since 2015, and had registered a total number of 10,053,298 adolescents, in 2021 sums up to a total of 9,036,824 according to the demographic projections of the Brazilian Institute of Geography and Statistics - IBGE (Table 1).

**Table 1:** Study population and incidence of intoxication by year of hospitalization (n=12 months).

Table 1							
	2015	2016	2017	2018	2019	2020	2021
<b>Total Morbidity</b>	160	156	156	217	240	170	178
<b>Population from 10-14</b>	4,822,996	4,750,423	4,685,892	4,618,037	4,545,473	4,452,967	4,362,642
<b>Population from 15-19</b>	5,230,302	5,166,400	5,059,849	4,946,738	4,835,958	4,744,999	4,674,182
<b>Adolescent population</b>	10,053,298	9,916,823	9,745,741	9,564,775	9,381,431	9,197,966	9,036,824
<b>Incidence</b>	1.59	1.57	1.60	2.26	2.55	1.84	1.96

Over the years of the study, the highest number of poisoning cases occurred in 2019, with an incidence of 2.55. The lowest incidence was recorded in 2016 (1.57). Due to the COVID-19 pandemic, the analysis may have been impaired since 2020, thus interfering with the population's access to health and, consequently, with data records (Table 1).

Comparing the total numbers of intoxication from ICD 10-X40 to X49 substances, the highest number of accidental intoxication cases (n=105, 31%) belonged to category X44-intoxication by other drugs and medicines, and medicines and unspecified biological substances. It is observed that the incidence of cases showed a greater difference in the years of 2016, 2017 and 2020, mainly through the population aged between 15 and 19 years old. The results for the year 2016 showed the highest recorded rates (n=29, 28%), while the results for the year 2020 showed the lowest absolute number with only 5 cases. It's been observed that, in 2021, accidental cases did not change significantly. On the other hand, intentional

cases had the highest number of reported cases throughout the study period (Table 2).

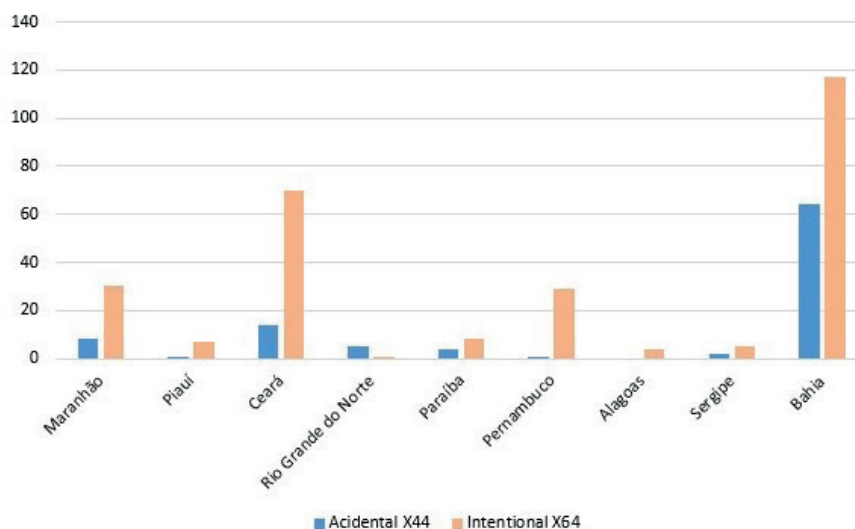
When analyzing the occurrences of accidental poisoning by state, Bahia had the highest number recorded in the studied period, with 67 hospitalizations and a relative frequency (RF) of 0.64, followed by Ceará with a RF=0.14. No cases were registered in the state of Alagoas and in Piauí only 1 case was registered over these 5 years and 11 months (Figure1).

Regarding cases of intentional poisoning, the substances from ICD-X60 to X69 were compared and again the highest rate of hospitalizations (n=302, 47%) came from the category of poisoning by other drugs and medicines, and biological substances (ICD 10-X64). The 15-19 age group had the highest incidence in all years, with a progressive increase until 2021, which was the year with the highest number of reported hospitalizations (n=72, 23%). In 2015, the lowest number of cases was recorded (n=21, 6,8%) (Table 2).

**Table 2:** Cases of accidental poisoning ICD 10-X44 and cases of intentional poisoning ICD 10-X64 in adolescents aged 10-19 years from 2015-2021 – both ICD related to unspecified drugs.

Age Group (years old)		2015	2016	2017	2018	2019	2020	2021
10 to 14	accidental X44	8	14	4	7	9	2	6
	accidental incidence	0.16	0.29	0.09	0.15	0.19	0.04	0.14
	X64 intentional	4	2	8	12	16	13	23
	intentional incidence	0.09	0.04	0.17	0.26	0.35	0.29	0.53
15 to 19	accidental X44	10	15	10	5	8	3	4
	accidental incidence	0.20	0.29	0.20	0.1	0.16	0.11	0.08
	X64 intentional	17	22	20	28	48	45	49
	Intentional Incidence	0.33	0.43	0.40	0.57	0.99	0.95	1.05
Total	accidental X44	18	29	14	12	17	5	10
	accidental incidence	0.17	0.29	0.14	0.12	0.18	0.08	0.11
	X64 intentional	21	24	28	40	64	58	72
	intentional incidence	0.22	0.24	0.29	0.42	0.68	0.63	0.8

When analyzing the cases of intentional poisoning by state in the studied period, Bahia also leads the number of hospitalizations with 125 registered cases and an RF=0.41, followed by Ceará with 82 hospitalizations and an RF=0.27. Only in 2018 did Ceará surpass Bahia, with 13 and 10 cases, respectively. The lowest number of hospitalizations occurred in Rio Grande do Norte, with only 2 cases having been registered (Figure 1).



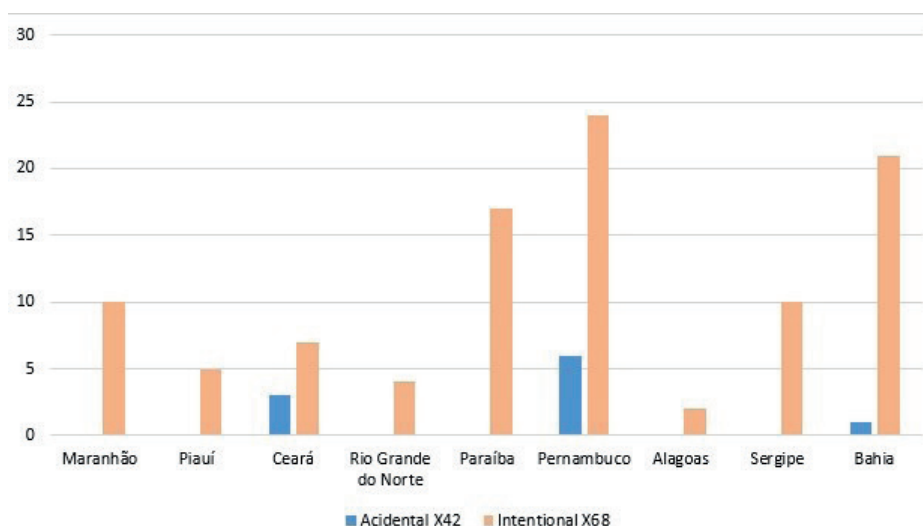
**Figure 1.** Total number of cases of accidental and intentional poisoning by other drugs and medicines and unspecified medicines in the studied period, per state, in Northeast Brazil.

Regarding poisonings that resulted in death, data were only found up to the year 2019. Through the studied period, the total death tolls up to the reference year was of 211. The overall mortality rate was highest in 2017, with a value of 0.53 (Table 3).

**Table 3:** General Mortality of 10-19 years old due to intoxication in the Northeast Region.

	2015	2016	2017	2018	2019
<b>Total Population 10-19 years old</b>	10,053,298	9,916,823	9,745,741	9,564,775	9,381,431
<b>number of deaths</b>	48	46	52	36	29
<b>Overall mortality rate</b>	0.48	0.46	0.53	0.38	0.31

Among the causes of accidental intoxication analyzed, the highest number of deaths occurred in the category of intoxication due to exposure to narcotics and psychodysleptics (hallucinogens) classified as CID 10-X42. With 4 cases and a mortality rate of 0.08, the results for 2018 pointed to the most serious scenario, in contrast to 2015, in which no deaths were recorded. There were no deaths in several states. The highest number of deaths was registered in the state of Pernambuco (6 deaths – RF=0.6) (Figure 2).



**Figure 2.** Total number of deaths from accidental and intentional poisoning by narcotics and psychedelics (ICD10-X42) and pesticides (ICD10-X68), during the period studied in Northeast Brazil.

It is worth mentioning that, in terms of the number of deaths due to intentional poisoning, the pesticides category (ICD 10-X68) registered the most relevant numbers. Deaths occurred in both age groups analyzed, with the highest number of records having occurred in the 15-19 age group. The mortality rate was higher in 2015, with a value of 0.5. In 2016 and 2017, the same number of deaths from this cause (n= 23; 23%) were recorded, with a mortality rate of 0.45 (Table 4).



**Table 4:** Mortality from intentional self-poisoning ICD 10-X68 in adolescents aged 10-19 years from 2015-2019.

Age Group (years old)	2015	2016	2017	2018	2019
10 to 14	4	2	2	1	1
15 to 19 years	22	21	21	15	11
Total	26	23	23	16	12
Mortality rate	0.50	0.45	0.45	0.32	0.25

Data was recorded from the nine states of the Northeast Region, showing deaths from intentional poisoning, with Pernambuco being the state with the highest number of cases (n=24, 24%), and RF=0.24, followed by Bahia (n=21, 21%) with RF=0.21. Alagoas was the state with the lowest recorded mortality (n=2; 2%) over the years analyzed (Figure 2).

## DISCUSSION

Poisoning is a worldwide health problem and adolescence is a phase that presents a higher risk of using harmful substances, due to the possibility and desire to live new sensations, emotions and experiences (AMORIM, et al., 2017). Substance use by this group ranges from experimentation with low doses, to the use of hazardous substances in high doses, which can lead to dependence and even death (MSD MANUAL, 2021). It is known that the motivations for use and abuse change with age, but that the risks remain (LOPES et al., 2020), such as the risk of suicidal acts that increases in this age group (SILVA, 2019).

It was observed that the highest number of cases of intoxication was due to the use of medicines, medicines and unspecified substances (ICD 10-X44 and ICD 10-X64), being higher in 2019 as compared to other years. This reflects the fact that, in recent years, many adolescents, without a good support network, end up seeking refuge and support in other ways. The use of alcohol and drugs is

presented to these individuals as a source of escape from problems and ends up exposing them to the risk of chemical dependency, intoxication and other accidents (PETRONE, 2021). The indiscriminate use of non-prescribed medicines, in turn, is also frequent and, although it is lower when compared to other age groups, a significant percentage of individuals aged between 12 and 17 years have already used these substances (MINISTÉRIO DA SAÚDE, 2021).

Over the studied years, the largest number of cases of intoxication occurred in individuals aged 15 to 19 years and there was a higher incidence of cases in the period from 2020 to 2021 (DATASUS, 2021). This data draws attention to the increase in the number of cases of self-medication that occurred during the pandemic, especially with regard to the use of drugs and medicines without scientific evidence, widely used during this period (MELO, 2022).

Over the years analyzed on this study, the incidence of intentional intoxications was higher than accidental ones, which draws attention to the high risk of suicidal acts in this population (DATASUS, 2021). Suicide attempts in this population have occurred frequently in recent years, mainly due to consequences such as: daily stress, depression, social isolation, physical or sexual abuse, alcohol and drug use, precedent of suicide in the family, prejudice against homosexuality, poverty and low self-esteem (FILHO, 2022; MELO, 2022). In the literature, the pharmacological classes most related to suicidal motivation are antidepressants, followed by anticonvulsants, anxiolytics, antipsychotics and psychotropics (SILVA, 2019).

Among the nine states in the Northeast, Bahia was the state with the highest incidence of cases of both accidental and intentional poisoning, 4.6 times higher than the second state on this list, Ceará (DATASUS, 2021). The higher incidence of cases in



Bahia could be explained by the facts of: having the largest population in the region, presenting, consequently, more cases in comparison with other states with smaller populations (IBGE, 2021), as well as being a state where a greater number of case notifications are generated, thus allowing strategies to be formulated to improve health care for its population and epidemiological monitoring to be carried out by the government.

Overall mortality from poisoning in adolescents suffered a decrease in the Northeast over the years studied (DATASUS, 2021). This shows that, during this period, there was an improvement in health care for this population and expansion of prevention strategies for this condition. Mortality due to poisoning using narcotics and psychodysleptics corresponded to the highest number of accidental deaths. The use of pesticides, on the other hand, corresponded to the highest number of intentional cases, even if, in absolute and comparative data, the number of cases of this type of poisoning has decreased (DATASUS, 2021).

According to the data found, the states with the highest mortality related to psychodysleptics were Pernambuco, Ceará and Bahia respectively. Such results may be related to the greater number of notifications registered in these states (DATASUS, 2021). These substances with hallucinogenic properties are often called psychomimetics, since they mimic typical symptoms of psychoses, such as distortions in sensory perception. In acute intoxication, the individual may lose the sense of reality, thus exposing himself to dangerous situations. Synthetic hallucinogens such as ecstasy (psychodysleptic methamphetamine) can cause immediate and greater physical risks and lead to dehydration and even death (SUS SANTA CATARINA, 2021). In addition, adolescents who use opiates may have serious behaviors and emotional

consequences, as they may be exposed to situations such as: running away from home, substance abuse, high-risk sexual acts, acts of delinquency and thievery (YIN, 2022).

In this study, cases of deaths due to intentional poisoning, with use of pesticides in the category CID 10-X68 stood out. These are composed of chemical substances used to control pests, which have toxic properties and are highly harmful to the environment and human health (SECRETARIADO DA SAÚDE DO PARANÁ, 2021). Pesticides are made up of a wide variety of chemical substances or biological products and were developed to interfere with natural biological processes (SECRETARIADO DA SAÚDE DO PARANÁ, 2018). Among the pesticides most used in Brazil are the organophosphates, which bind irreversibly to the enzyme cholinesterase, causing the accumulation of acetylcholine and can cause from a headache to a cholinergic crisis, justifying its lethality (ELIAS, 2022).

Brazil is the largest consumer of pesticides in the world (TEIXEIRA, 2014), due to agriculture playing a prominent role in the economy, especially in this study region (CASTRO, 2015). Deaths due to intentional pesticide poisoning were recorded in the nine states of the Northeast, with Pernambuco being the state with the highest number of cases (DATASUS, 2021). The practice of agriculture and the consequent use of pesticides is frequent in the Northeast, which contributes to greater availability of this substance and its use for intentional poisoning. However, there are indications that these cases are underreported, since only about 20% of pesticide poisonings are actually reported (MELO, 2022).

The cited data are similar to a study carried out for the years 1999 to 2009, which showed that the state of Pernambuco had the highest number of pesticide poisonings in the region, followed by





Ceará and Bahia. Thus, we can see that the state of Pernambuco continues to lead this statistic, in first place, and that Bahia has taken second place. In 2010/2011, the Agricultural and Livestock Plan for the state of Bahia was implemented, which increased progress in the field of agricultural production and, consequently, the use of pesticides (TEIXEIRA, 2014).

The present article is limited by not directly correlating the follow-up of the patient from hospitalization to its destination, be it discharge or death. In addition, the available data underestimate the actual number of cases in the poisoning category due to underreporting of the same, since this category is not one of the top three accidental causes of death and hospitalization of adolescents and, therefore, may end up being neglected by health institutions. However, as previously discussed, the number of poisonings remains very high, even if there are fewer records than there could be, highlighting the importance of the issue as an avoidable affliction and the need for a close look at public health for this problem.

## CONCLUSION

After analyzing the data, it was possible to identify that the category of poisoning by other drugs and medicines, medicines and biological substances (ICD 10-X44 and ICD10-X64) had a higher rate of hospitalizations in cases of intoxication and poisoning, both accidental and intentional, having increased during the COVID-19 pandemic for the years 2020-2021. As for the number of deaths in the intentional poisoning category, pesticide poisoning (ICD 10-X68) was the most relevant, with a predominance of the number of cases in the 15-19 age group.

The present study made it possible to verify that the profile of hospitalizations due to poisoning in adolescents in the Northeast Region is

similar to data found in the scientific literature on the subject, suggesting that poisoning is a persistent public health problem, which requires strategies and actions to reduce these problems. Furthermore, it was possible to identify and reiterate adolescence as the age group in which there is a higher incidence of intentional rather than accidental poisoning, therefore, representing a higher risk of suicide attempts. Health education of the population is necessary, with guidance on the storage of products for domestic use, along with one's attention focused on mental health, thus helping to prevent cases of suicide.

The situation also deems necessary to train health professionals involved in improving prevention and care for the harm caused by poisoning and in strengthening the mandatory reporting system, in order to improve the quality of data. In addition, it is important to strengthen and improve public policies to act on the legislation that regulates the commercialization and use of chemical substances, since restricting access to means of acquisition is a key element in prevention. In this sense, it is recommended that further investigations be carried out on the subject to improve the analysis of the epidemiological profile and to contribute to strategic actions in the Northeast and in other regions of Brazil.

## CONFLICT OF INTEREST STATEMENT:

The authors declare no conflicts of interest for this study.

## REFERENCES

AMORIM, M.L.P.; MELLO, M.J.G.; SIQUEIRA, M.T. Poisoning in children and adolescents reported in a toxicology center in northeastern Brazil. **Brazilian Journal of Maternal and Child Health**, v. 17, n. 4, 2017. DOI : <https://doi.org/10.1590/1806-93042017000400009>.

BOCHNER, R. Profile of poisoning in adolescents in Brazil from 1999 to 2001. **Cadernos de Saúde Pública**, v. 3, n. 22, p. 587-595, 2006. DOI: <https://doi.org/10.1590/S0102-311X2006000300014>.

BRITO, A.R.; FERREIRA, A. L.; WAKSMAN, R. D. Accidents are preventable and most of the time, the danger is indoors! Manual de Orientação da Sociedade Brasileira de Pediatria, ed. 4, p. 1-9, 2020.

CASTRO, C.N. Agriculture in the Brazilian Northeast: opportunities and limitations to development. Institute for Applied Economic Research, p. 1-39, 2015.

DATASUS. Available at: < Health Information (TABNET) – DATASUS (saude.gov.br)>. Accessed on: April 20, 2022.

ELIAS, M. A., SIEGLOCH, A.E. AGOSTINETTO, L. Acute poisoning by organophosphorus pesticides: an integrative review. **Research, Society and Development**, v. 11, n. 9, p. 1-17, 2022. DOI: 10.33448/rsd-v11i9.31606.

FILHO, C.A.L., et al. Profile of exogenous drug intoxications in the Northeast region of Brazil, v. 1, n. 14, p. 1-10, 2022. DOI: <http://dx.doi.org/10.33448/rsd-v11i14.36371>.

MATOS, G.A.S. Socioeconomic Panorama of the Northeast: Evolution and Perspective. BNB Conjuntura Econômica, p. 91-110, 2019. Available at: < Panorama Socioeconômico do Nordeste - Evolução e Perspectivas. pdf>. Accessed on: July 19, 2021.

SUS ESTADO DE SANTA CATARINA. Hallucinogen Abuse Disorders . p. 1-6, 2015. Available at: <(Microsoft Word - Transtornos por abuso de alucin\363genos) (saude.sc.gov.br)>. Accessed on: July 20, 2021.

IBGE. Projection of the population of Brazil and the Units of the Federation. Available at:< <https://www.ibge.gov.br/apps/populacao/projecao/index.html> > Accessed on: July 20, 2021.

LOPES, E.M.S., et al. Poisoning in children and adolescents treated at a poisoning center in Northeast Brazil. **Research, Society and Development**, v. 10, n. 7, p. 1-15, 2020. DOI: <http://dx.doi.org/10.33448/rsd-v10i15.21960>

LOPES, T.M.; FERNANDES, A.B.; LUCIO NETO, M.P. Epidemiological aspects of exogenous poisoning in children under the age of nine in the State of Maranhão in the period from 2010 to 2017. **Research, Society and Development**, v. 9, n. 12, p. 1-13, 2020. DOI: <https://doi.org/10.33448/rsd-v9i12.10706>.

MAGALHÃES, A. F. A; CALDAS, E. D. Two health information systems to characterize poisoning in Brazil—a descriptive study. **Journal of Public Health**, v. 41, n. 1, p. 203-211, 2018. DOI: 10.1093/pubmed/fdy008.

MELO, M.T.B., et al. Epidemiological profile and temporal trend of exogenous intoxications in children and adolescents. **Paulista Journal of Pediatrics**, v. 40, p. 1-10, 2022. DOI: <https://doi.org/10.1590/1984-0462/2022/40/2021004>.

MINISTÉRIO DA SAÚDE-FIOCRUZ. III national survey on drug use by the Brazilian population, 2017. Available at: < III LNUD\_PORTUGUÊS.pdf>. Accessed on: 10 Jan 2022.

MSD MANUAL FAMILY HEALTH VERSION. Substance use and abuse in adolescents - Child health problems. Available at:<<https://www.msdmanuals.com/pt-br/casa/problemas-de-saude-infantil/problemas-em-adolescentes/uso-e-abuso-de-substancias-em-adolescentes>>. Accessed on: 3 Oct. 2021.

PARANÁ HEALTH SECRETARIAT. Technical manual Acute poisoning by pesticides - Initial care of the intoxicated patient, 2018. Available at <[https://www.saude.pr.gov.br/sites/default/arquivos\\_restritos/files/documento/2020-04/intoxicacoesagudasagrotoxicos2018.pdf](https://www.saude.pr.gov.br/sites/default/arquivos_restritos/files/documento/2020-04/intoxicacoesagudasagrotoxicos2018.pdf)>. Accessed on: 09 Dec 2021.

PETRONE, A.C.R, et al. Alcohol and drug use in adolescence, p. 1-10, 2021. Available at: O USO DE ÁLCOOL E DROGAS NA ADOLESCÊNCIA (capes.gov.br). Accessed on: 24 Jan 2023.

SILVA, J.S. Suicidal drug poisoning in Brazil: a public health challenge. **Multidisciplinary Scientific Journal Núcleo do Conhecimento**, v. 4, p. 163–174, 2019.

SINITOX. National Toxicological Information System. Available at: <<https://sinitox.icict.fiocruz.br/dados-nacionais>>. Accessed on: 20 Jul. 2021.

TAVARES, E.O.; et al. Factors associated with childhood intoxication. **Anna Nery School** v. 17, n. 1, p. 31-37, 2013. DOI: <https://doi.org/10.1590/S1414-81452013000100005>.

TEIXEIRA, J.R.B.,et al.. Poisoning by agricultural pesticides in Northeastern Brazilian states, 1999-2009. **Epidemiology and Health Services**, v. 23, n. 3, p. 497-508, 2014. DOI: <https://doi.org/10.5123/S1679-49742014000300012>.



VIEIRA, L.J.E.S., et al. Report of two cases of intentional poisoning in adolescents. **Science Care and Health**. v. 6, n. 3, p. 291-299, 2007.

VILAÇA, L.; CARDOSO, P.R. Poisoning in childhood: overview of the profile of poisoning in different countries. **Revista Medica de Minas Gerais**, v. 24, n. 1, p. 21-25, 2014. DOI: <http://www.dx.doi.org/10.5935/2238-3182.20140012>.

YIN, S. Opioid intoxication in children and adolescents. Update, 2022.

ZAMBOLIM, C.M. et al. Profile of exogenous intoxications in a university hospital. **Medical Journal of Minas Gerais**. v. 18, n. 1, p. 5–10, 2008 .