

Epidemiological profile of exogenous intoxications occurred in the State of Rio Grande do Sul between the years 2007 and 2020

Perfil epidemiológico das intoxicações exógenas ocorridas no estado do Rio Grande do Sul entre os anos de 2007 e 2020

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ABSTRACT

Introduction: Exogenous intoxication occurs when humans eat, inhale or are exposed to chemicals that can harm their health. **Objective:** To characterize the epidemiological profile of cases of exogenous intoxications reported to the epidemiological surveillance of the State of Rio Grande do Sul between 2007 and 2020. **Method:** For this, data from the Notifiable Diseases Information System (Sinan-Net) were used. The information collected was evaluated in terms of socioeconomic characteristics and aspects related to the intoxication event itself. **Results:** The confirmed cases were 34,953 during the period evaluated. The most affected people were: female, people with incomplete primary education, people aged between 20 and 39 years who lived in cities. About the intoxications themselves, the most prevalent toxic agents were medicines and the category of circumstance of intoxication with the highest incidence was the suicide attempt. Most cases were clinically confirmed and were not related to work exposure, and 73.30% of cases were cured without sequelae. However, there was a high number of information described as ignored for several categories. Information like schooling is usually not filled because it is not relevant to diagnosis. **Conclusions:** Therefore, it is necessary to improve the quality of information, so that it is possible to identify the most affected categories and develop adequate prevention measures.

KEYWORDS: Exogenous Intoxication; Epidemiological Profile; Rio Grande do Sul; Public Health

RESUMO

Introdução: Intoxicação exógena ocorre quando o ser humano ingere, inala ou é exposto a substâncias químicas que podem prejudicar sua saúde. **Objetivo:** Caracterizar o perfil epidemiológico dos casos de intoxicações exógenas notificados à vigilância epidemiológica do estado do Rio Grande do Sul entre 2007 e 2020. **Método:** Foram utilizados dados do Sistema de Informação de Agravos de Notificação (Sinan-Net). As informações coletadas foram avaliadas quanto às características socioeconômicas e aos aspectos relacionados ao próprio evento de intoxicação. **Resultados:** Os casos confirmados foram 34.953 no período avaliado. As pessoas mais acometidas foram: do sexo feminino, pessoas com ensino fundamental incompleto, com idade entre 20 e 39 anos e que residiam em cidades. Sobre as intoxicações propriamente ditas, os agentes tóxicos mais prevalentes foram os medicamentos e a categoria de circunstância da intoxicação com maior incidência foi a tentativa de suicídio. A maioria dos casos foi confirmada clinicamente e não estava relacionada à exposição ao trabalho, sendo que 73,30% dos casos foram curados sem sequelas. No entanto, houve um elevado número de informações descritas como ignoradas para diversas categorias. Informações como escolaridade geralmente não são preenchidas porque não são relevantes para o diagnóstico. **Conclusões:** É necessário melhorar a qualidade da informação para que seja possível identificar as categorias mais afetadas e desenvolver medidas de prevenção adequadas.

PALAVRAS-CHAVE: Intoxicação Exógena; Perfil Epidemiológico; Rio Grande do Sul; Saúde Pública

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INTRODUCTION

Exogenous intoxication is a public health problem and can be defined as a clinical manifestation of the harmful effects produced by some (exogenous) chemical substance in a living organism¹. Several toxic agents are associated to exogenous intoxication. Accidental or intentional ingestion and super dosage of drugs and pesticides can lead to controversial diagnoses and motivate cases of underreporting due to the lack of information by the population about the danger of intoxications.

In the world, among the most frequently involved substances in intoxications are pesticides, which in developing world countries correspond to 90% of cases of intoxication. In developed countries the use of medicines reaches 60% of cases². In Brazil, the suicide attempt by exogenous intoxication is alarming. In the years 1998 to 2009, poisoning by ingestion of toxic products corresponded to approximately 70% of the total reported cases. Of the 112,295 hospitalizations due to attempted suicide, 78,606 were due to exogenous intoxication³. Accidental poisoning in children generates a high rate of deaths every year⁴. In 2013 at least 50% of poisonings recorded in Fiocruz's National System of Toxic-Pharmacological Information (Sinitox) occurred in children under 20, with 29% of cases in children from one to four years old⁵.

People under 40 years old seem to be more vulnerable to poisoning, and females have a higher incidence among cases. Medication intake has become one of the most prevalent causes in recent years in the state of Rio Grande do Sul, followed by pesticides. The lack of information about the use of medicines can lead to accidental poisoning, especially in homes, as a result of error in administration. Pesticides are easily accessible and when used improperly they can expose human to serious poisoning. However, the main and most worrying factor is suicide attempts using drugs and other chemicals, in cases of intentional causes.

Due to the population's lack of information on the subject and the importance of studying aspects of exogenous intoxications in Brazil, in addition to determining which are the main toxic agents responsible for cases of poisoning, this study also aimed to identify which categories of the population are most affected and under what circumstances these intoxications occur.

The investigation was carried out through notifications of confirmed cases of poisoning reported to epidemiological surveillance of Rio Grande do Sul between 2007 and 2020. Thus, with the knowledge of which part of the population is the most affected by this important public health problem, it is possible for the state to direct its resources more effectively, guiding those who are more susceptible to poisoning and preventing more cases from occurring.

METHOD

A cross-sectional observational analytical quantitative study of cases of exogenous intoxication reported to surveillance of Rio

Grande do Sul in the period between 2007 and 2020 was carried out, using data from the Notifiable Diseases Information System (Sinan-Net). This system incorporates a list of notifiable diseases and conditions, using a standardized form in which data on the individual, symptoms, need for hospitalization, laboratory tests and final classification of the case are recorded. The registration instrument is the Sinan-Net notification form, which is filled in by health professionals and later sent to the epidemiological surveillance centers.

Data collection

Secondary data, obtained from the investigation of confirmed cases of exogenous intoxications reported to surveillance of Rio Grande do Sul in the period between 2007 and 2020, were collected. The information was tabulated and evaluated as socioeconomic characteristics (gender, age group, education, area of residence and state administrative area) and aspects related to the intoxication event itself (toxic agent, circumstances of intoxication, exposure at work, confirmation criteria, final classification and evolution of the patient's condition). The analysis and interpretation of variables were performed in an Excel spreadsheet, calculating the annual frequency of the criteria evaluated.

Descriptive data analysis

Some of the agents involved in cases notified to Sinan-Net were: medicines, agricultural pesticides, household pesticides, public health pesticides, rodenticides, veterinary products, household products, cosmetics, chemicals, metal, drugs of abuse, toxic plants, food, drinks, among others. The socioeconomic data analyzed in this study were: sex, education, age group, area of residence and state administrative division. The aspects of intoxication researched were: toxic agent, circumstances of intoxication, exposure at work, confirmation criteria, final classification of intoxication and evolution of the condition.

Ethical considerations

This research was carried out with secondary data, collected and used only for its purposes, with the information being presented collectively, without any prejudice to the people involved, especially with regard to the mention of people affected. These data will be under the custody of the researchers, their secrecy and confidentiality being guaranteed.

RESULTS AND DISCUSSION

Exogenous intoxication occurs when humans eat, inhale or are exposed to chemicals that can harm their health. This study aimed to characterize the epidemiological profile of cases of exogenous intoxications reported to the epidemiological surveillance of the State of Rio Grande do Sul between 2007 and 2020. For this, data from the Sinan-Net which made it possible to identify an epidemiological profile of the cases involved.



The total of confirmed cases of exogenous intoxication reported in Rio Grande do Sul was 34,953 (Figure 1). The years that present the highest rates of reported cases were 2019 (22.97% that were 8,032 of 34,953 cases); 2018 (18.57% that were 6,493 of 34,953 cases) and 2017 (14.44% that were 5,049 of 34,953 cases) (Figure 1).

The socioeconomic characteristics evaluated were sex, age group, schooling, residence (urban, rural or periurban) and state administrative area (Figure 2). In the sex category, 59.59% were the female (20,831 of the 34,953 cases), while 40.38% were male (14,116 of the 34,953 cases) (Figure 2A). Only 0.01% of the cases reported was ignored or did not respond (6 of 34,953 cases) this characteristic. During the study period, with the exception of the year 2013, all the others presented the highest occurrence in females.

The schooling of confirmed cases of exogenous intoxication is higher in elementary school, which corresponded to 14.96% (5,232 of the 34,953 cases), followed by complete high school education corresponding to 13.31% (4,655 of the 34,953 cases) (Figure 2B). The age groups evaluated in the study ranged from over 1 year to over 80 years of age, and the highest rates occurred between 20-39 years, about 42.36% of cases (14,809 of 34,953 cases), followed by age between 40-59 years, 23.67% (8,275 of 34,953 cases), and 14.03% (4,907 of 34,953 cases), between 15-19 years old (Figure 2C).

Regarding the area of residence, 80.35% of cases are in urban areas (28,085 of the 34,953 cases), and 15.16%, in rural areas (5,302 of the 34,953 cases) (Figure 2D). About regions of state that occurs the notification, Passo Fundo presented 15.80% of all cases (5,523 of 34,953 cases), followed by Caxias do Sul, with 11.53% of cases (4,033 of 34,953 cases) and Lajeado, 9.75% (3,410 of 34,953 cases) (Figure 2E).

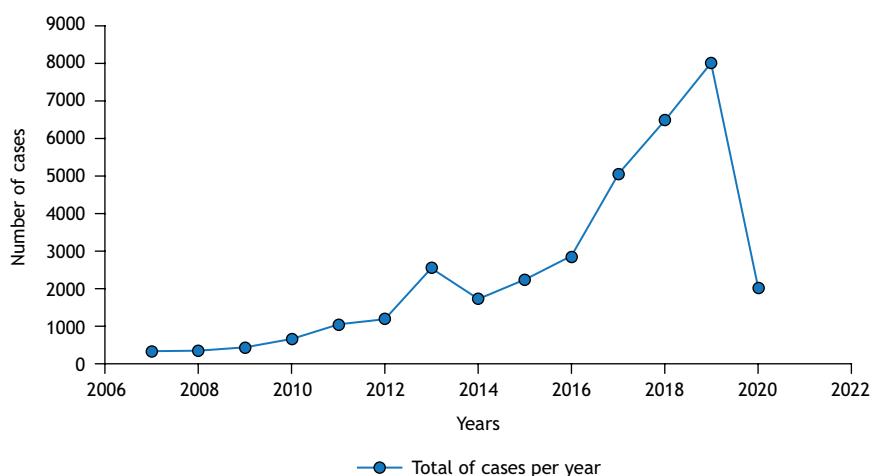
As to the characteristics of the intoxication itself, the results were sequenced in: toxic agent, circumstances of intoxications,

exposure at work, confirmation criteria, final classification and evolution of the patient's condition (Table).

Among the data obtained for the category of toxic agent, the 15 main associated with the analyzed cases of exogenous intoxication were cited (Table). The toxic agents with the highest reported incidence were drugs, corresponding to 50.04% (17,492 of the 34,953 cases), which were more evident in 2019, with 4,613 reported cases. Agricultural pesticides accounted for 8.38% of cases (2,931 of 34,953 cases), and in 2019, they affected 607 patients. Suicide attempt, of the 14 circumstances listed, had the highest incidence, 46.84% of the cases (16,375 of the 34,953 cases). There were 4,406 reported cases in 2019 attributed to this circumstance. The circumstance of accidental form corresponded to 22.90% of the cases (8,005 of the 34,953 cases), and ingestion of food corresponded to 1.85% of the cases (647 of the 34,953 cases).

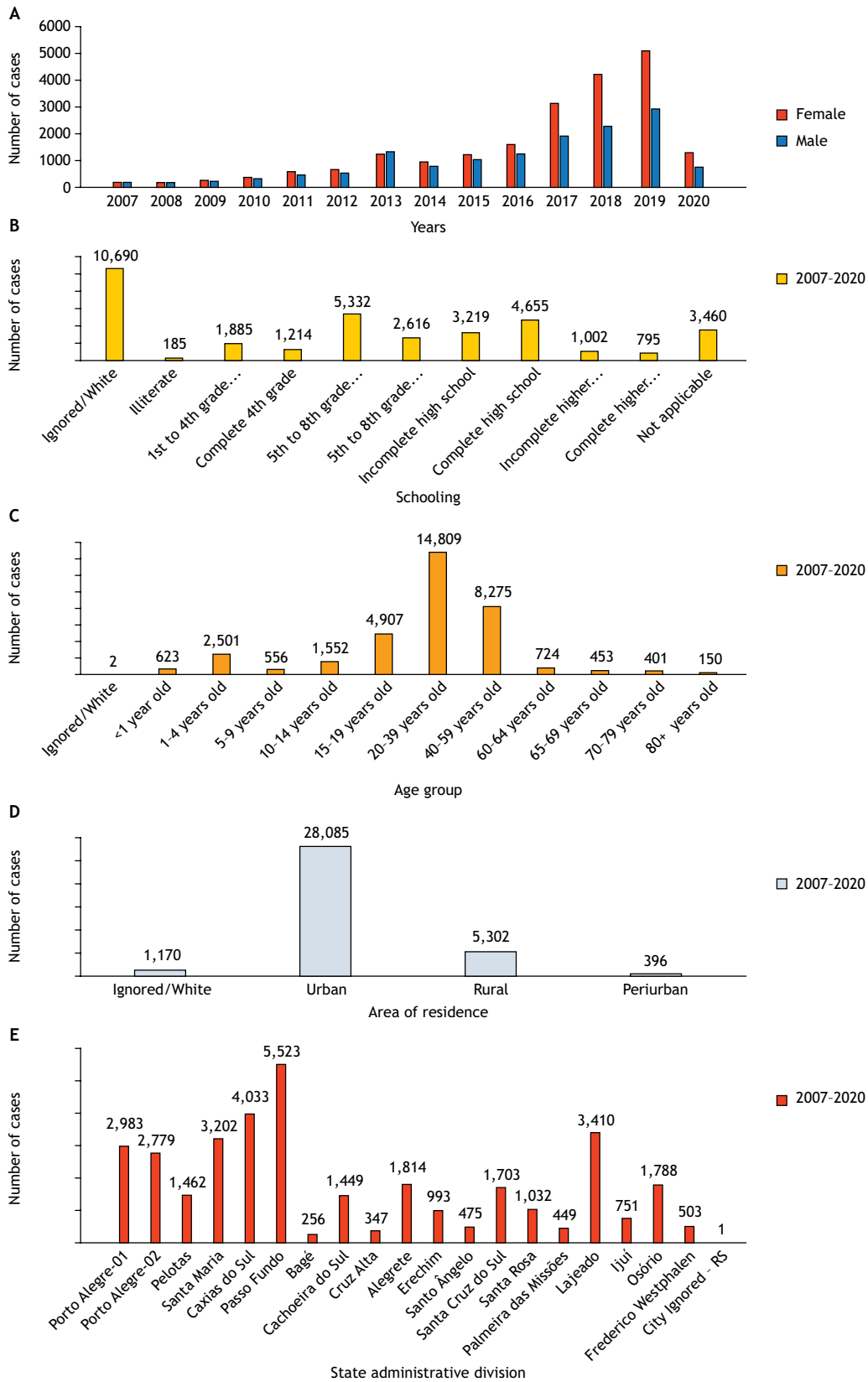
Work exposure to intoxicating agents happened in 14.78% of the cases (5,169 of the 34,953 cases). The confirmation criterion category shows that 57.98% of the cases (20,267 of the 34,953 cases) were only clinically confirmed, 22.70% (7,936 of the 34,953 cases) were clinically-epidemiologically confirmed, and 5.85% (2,045 of the 34,953 cases) were clinical-laboratory form. In the final classification category, confirmed intoxication corresponds to 57.57% of the cases (20,123 of the 34,953 cases), while exposure alone corresponds to 26.73% (9,343 of the 34,953 cases). Regarding the evolution of the patient's condition, 73.30% (25,623 of the 34,953 cases) were cured without sequelae, while death from exogenous intoxication corresponded to 1.51% of the cases (530 of the 34,953 cases), with its highest peak in 2013, with 265 patients.

As mentioned, the evaluation of the results indicated high rates of suicide attempts by medication, especially in females, which was also reported in other studies carried out in Brazil. Using research platforms like Web of Science and Scopus, which presented information collected in the Sinan-Net database, studies were obtained in the states of Minas Gerais⁶, Mato Grosso¹, Pernambuco⁷, Tocantins⁸ and Rio Grande do Sul⁹. Data from other



Source: Elaborated by the authors, 2022.

Figure 1. Total of confirmed cases of exogenous intoxication reported in Rio Grande do Sul per year (2007-2020).



Porto Alegre-01: Vale do Paranhana, Costa da Serra, Vale dos Sinos, Vale do Caí Metropolitana;
 Porto Alegre-02: Carbonífera/Costa Doce, Capital/Vale do Gravataí.

Source: Elaborated by the authors, 2022.

Socioeconomic characteristics evaluated were sex (A), age group (B), schooling (C), area of residence (urban, rural or periurban) (D) and state administrative area (E) notified in the period from 2007 to 2020.

Figure 2. Socioeconomic characteristics of patients involved in confirmed cases of exogenous intoxication reported in Rio Grande do Sul.



Table. Aspects of exogenous intoxications considering toxic agent, circumstances of intoxication, exposure at work, criteria of confirmation, final classification and evolution of sickness, by year.

First year of symptom(s)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Toxic agent															
*Ign/white	44	48	43	64	115	110	193	255	242	289	543	642	934	278	3,800
Drug	143	140	183	279	432	536	536	711	880	1,313	2,758	3,805	4,613	1,163	17,492
Agricultural pesticide	41	52	88	100	157	121	100	164	185	263	422	491	607	140	2,931
Domestic pesticide	10	9	11	21	20	12	12	27	50	65	88	110	118	22	575
Pesticides public health	-	-	1	1	3	1	1	2	2	39	9	11	20	6	96
Rodenticide	16	8	20	18	26	19	43	45	46	74	127	171	198	31	842
Veterinary prod.	4	10	6	11	10	15	19	20	30	33	68	82	92	16	416
Home use prod.	9	16	9	26	19	30	50	60	66	114	187	239	242	56	1,123
Cosmetic	2	-	3	2	1	6	2	6	9	9	19	21	30	5	115
Chemical prod.	9	8	6	24	71	37	76	115	203	242	234	251	285	67	1,628
Metal	3	1	1	3	8	6	-	2	13	7	7	4	16	3	74
Drugs of abuse	12	14	19	30	63	53	59	56	83	109	178	251	304	94	1,325
Toxic plant	1	2	9	2	9	7	10	29	38	28	43	70	84	25	357
Food & Drink	28	29	29	69	82	188	222	184	146	115	131	109	206	50	1,588
Other	14	6	9	10	32	39	1,231	50	242	148	235	236	283	56	2,591
Circumstances of intoxication															
*Ign/white	28	40	42	43	82	68	103	151	154	169	307	336	467	149	2,139
Usual use	32	10	25	53	90	91	92	136	226	297	349	462	550	127	2,540
Accidental	84	90	137	168	187	172	1474	363	593	764	1,065	1,223	1,378	307	8,005
Environmental	8	8	7	9	24	42	13	49	47	51	87	95	115	24	579
Therapeutic use	4	2	2	1	8	8	7	2	8	15	22	24	51	8	162
Prescription	-	-	1	2	1	1	1	2	-	2	2	1	2	-	15
Administration error	6	5	6	17	8	15	15	23	39	56	84	44	92	22	432
Self-medication	10	5	9	15	17	31	35	42	57	92	138	166	204	67	888
Abuse	36	37	43	92	115	129	173	122	116	139	225	294	471	122	2,114
Food intake	20	10	11	12	49	82	64	87	76	57	34	45	76	24	647
Suicide attempt	105	135	150	238	441	509	527	678	797	1,124	2,542	3,607	4,406	1,116	16,375
Attempted abortion	-	-	1	1	4	3	4	5	12	11	12	7	15	4	79
Violence/homicide	-	-	2	3	4	9	15	10	6	14	35	33	39	12	182
Other	3	1	1	6	18	20	31	56	104	57	147	156	166	30	796
Exposure at work															
*Ign/white	44	35	39	46	115	94	180	197	192	235	358	480	728	263	3,006
Yes	49	39	79	114	184	149	330	273	555	590	725	806	1056	220	5,169
No	243	269	319	500	749	937	2,044	1,256	1,488	2,023	3,966	5,207	6,248	1,529	26,778
Confirmation criteria															
*Ign/white	47	33	43	59	144	101	614	209	286	429	619	843	965	313	4,705
Clinical-laboratory	9	11	17	32	47	48	103	105	151	176	228	309	628	181	2,045
Clinical-epidemiological	78	126	222	286	246	279	534	340	416	574	1,007	1,618	1,840	370	7,936
Clinical	202	173	155	283	611	752	1,303	1,072	1,382	1,669	3,195	3,723	4,599	1,148	20,267
Final classification															
*Ign/white	65	63	29	53	111	75	163	228	242	383	633	828	1,071	367	4,311

Continue



Continuation

Confirmed intoxication	164	189	282	443	727	867	2,023	1,054	1,223	1,467	2,660	3,698	4,380	946	20,123
Exhibition only	68	69	113	143	171	200	330	383	668	876	1,597	1,781	2,317	627	9,343
Adverse reaction	37	19	8	10	18	17	15	44	76	79	101	121	186	53	784
Other diagnosis	2	3	4	10	20	16	16	14	26	42	55	56	68	19	351
Withdrawal syndrome	-	-	1	1	1	5	7	3	-	1	3	9	10	-	41
Evolution of the patient's condition															
*Ign/white	69	92	74	71	182	144	772	320	401	640	1,073	1,413	1,832	485	7,568
Cure without sequelae	249	246	349	561	816	1,002	1,201	1,352	1,770	2,087	3,780	4,865	5,907	1,438	25,623
Cure with sequelae	6	1	8	11	26	17	310	20	24	53	72	75	125	25	773
Death from exogenous intoxication	3	4	4	13	19	12	265	20	9	34	42	43	54	8	530
Death from another cause	2	-	1	2	1	1	1	2	5	11	17	18	7	1	69
Loss of follow-up	7	-	1	2	4	4	5	12	26	23	65	79	107	55	390
Total	336	343	437	660	1,048	1,180	2,554	1,726	2,235	2,848	5,049	6,493	8,032	2,012	34,953

Source: Elaborated by the authors, 2022.

*Ign: Ignored.

Yellow: Main results identified and described in the text; Orange: Identified result and topic of discussion.

reviews and case reports that could help in the study of exogenous intoxications were also extracted.

Analyzed the temporal trend of suicide mortality in the city of Uberaba, Minas Gerais, between 1996 and 2014⁶. This study analyzed 169 suicide attempts and 11 deaths from suicide. In female suicide attempts, the use of medication and poisoning between 15 and 29 years old stood out, and deaths by suicide in both sexes occurred mainly between 30 and 59 years old. For men, the main means of aggression were hanging followed by self-intoxication. The ingestion of medication in households as a suicide attempt was 5.1 times more frequent in females compared to males.

In the state of Mato Grosso, an epidemiological study of children and adolescents in the municipality of Barra do Garças was carried¹. The age group was from 0 to 19 years and the period studied was from 2008 to 2013. Of the 125 cases of exogenous intoxication reported, 77 were in children and 48 in adolescents. The main toxic agents responsible for intoxications were food and beverages (38.4%), and medicines (24.0%). These results may be associated to the average temperature is high throughout the year, with a minimum average temperature of 12°C in July and an average maximum of 34°C, favoring microbial contamination and degradation of food. The age groups most affected by poisoning were: 0-4 years (43.2%) and 10-14 years (19.7%). Regarding the circumstances, intoxications occurred due to attempted suicide (16.8%) and accidental (23.2%), the study showed a higher frequency of poisoning in females.

In a study carried out in the Municipality of Moreno (state of Pernambuco), during the period from 2012 to 2015, the age, sex, type of toxic agent, use of pesticides and reason for exposure of individuals were analyzed affected by exogenous intoxications registered in Sinan. There were 109 cases of exogenous intoxication reported from 2012 to 2015, with the highest frequencies

found in adults (51.1%). The main toxic agents corresponded to medicines (41.3%) and agricultural pesticides (12%). Of the 109 cases of exogenous intoxication, 37 (33.9%) occurred due to attempted suicide⁷. Also, in the state of Pernambuco, cases of exogenous intoxication occurred in adolescents notified by the Centro de Assistência Toxicológica at a hospital in Recife/PE and, of the 25 cases of suicide attempts in the period from March to May 2010, 21 were female adolescents aged between 13 and 19 years. The exogenous intoxication by the use of pesticides was the most frequent (61.9%). These toxic substances are easily accessible, and their lack of control from production to commercialization increases the chances of intoxication¹⁰.

In Tocantins, in 2010 to 2014, a study identified the age groups between 20-29 years and 30-39 years as the most affected by pesticides for agricultural use. The most common toxic agents were insecticides (29.28%) and herbicides (27.07%). The most frequent activities were spraying (29.28%) and dilution (15.47%), and the main routes of exposure/contamination were digestive and respiratory. As foreexposure/contamination, the most common were accidental (49.17%), attempted suicide (32.60%) and environmental (14.64%)⁸.

In Rio Grande do Sul, an assessment of cases of exogenous drug intoxication was carried out in individuals between 20 and 39 years of age, notified in Sinan over the years 2011 to 2015. In this study, 1,278 cases of intoxication notifications exogenous causes caused by drugs were found. Among these notifications, 76.29% were female, 25.98% had incomplete elementary education and 85.52% lived in urban areas. Of the total number of reported cases, 1,038 cases (81.28%) of attempted suicide stand out⁹.

In the city of Varna, Bulgaria, a study was carried out on acute intoxications by narcotic drugs between 1991 and 2015. This study reported that of the 677 patients intoxicated by narcotics,



546 (80.6%) were male and 131 (19.4%) were female. The largest number of poisonings occurred in the age group up to 24 years (66%). Death was recorded in six (0.9%) patients. Most of the intoxications by narcotic drugs were in patients up to 44 years old, due to accidental or systematic use of narcotics. Opioids, like heroin, were the most cause of hospitalizations for drug poisoning in this study period¹¹.

More than 1,000,000 children die each year worldwide due to preventable accidents. This author examined complaints of poisoning in people aged 0 to 18 years registered in a pediatric emergency department between January 1, 2017 and December 31, 2017. The study included 453 patients, of which 202 (46.4%) were female and 233 (53.6%) were male. Of the 453 cases, 47.6% were exposed to household cleaning products, 36.5% to medications, 5.3% to insecticides and pesticides, 3.3% to inhaled toxic gases, 2.5% to cosmetic products and 1.8% of patients were exposed to narcotics. It was also found that 377 (83.2%) cases were accidental, and 47 (10.4%) cases were suicide attempts¹².

Drug use is also an important cause of exogenous intoxication and corresponded in this study to 3.80% of the cases (1,334 of the 35,030 cases). A study carried out with a case report of fatal intoxication by GHB (γ - hydroxybutyric), called "drug of abuse", analyzed the victim's hair through the Institute of Loyal Medicine in Bonn, which found frequent use of this substance by the victim, at least 4 months before death. The pharmacological effects of exogenous GHB ingestion are dose dependent. Ingestion of low doses of GHB leads to euphoria, pain relief and antidepressant effects. High doses of GHB cause nausea, vomiting and loss of consciousness¹³. In cases of overdose of this drug, respiratory depression is frequently reported¹⁴. High consumption of alcohol can generate cross-reactivity in tests to detect GHB, and can influence to generate a false positive, as was the case of a 14-year-old patient transferred from another clinic to the pediatric intensive care unit with loss of consciousness, confirmed ethanol (alcoholic beverage) intoxication (3.3 g/L), and severe amnesia¹⁵. A similar case where ethanol resulted in a concentration of GHB much higher than expected was described¹⁶. This is important to realize when interpreting the results of the analysis, as the majority of patients ingesting GHB also ingested ethanol¹⁵. The discoloration of urine in acute cases of intoxication leaves it with a greenish appearance. Various data compiled from case reports, articles and reports point out that green discoloration can be caused by some substance abuse such as propofol, biliverdin, metoclopramide, amitriptyline, methocarbamol, indomethacin, promethazine, cimetidine, among other factors¹⁷. Some cases of drug capsule shell dyes may show signs of overdose, such as the suspicion of a case of intoxication by excessive ingestion of benzodiazepines carried out by the study by in which one patient showed the condition of green colored urine¹⁷.

Some athletes who practice strength sports, such as bodybuilding, are at greater risk of abusing drugs and hormones, such as exogenous insulin, a drug fraudulently used as an ergogenic resource with the aim of improving sports performance and recovery after exercise. However, when administered in high doses, athletes

can enter into a condition of hypoglycemia¹⁸. Another important factor is hormone replacement therapy and the use of oral contraceptives, which are factors that can increase the risk of venous thromboembolism (VTE), and the risk depends on the dose of estrogen administered. Exogenous estrogen significantly increases the risk of VTE, whereas the amount of endogenous estrogen and testosterone does not increase the risk of embolism. Pulmonary embolism can be the result of a single intake of exogenous estrogen when administered in high dose, and may increase the risk of triggering VTE even in patients who are on therapeutic use. Therefore, it is important to question the use of these hormones in people who seek medical care with symptoms similar to pulmonary embolism¹⁹.

Exogenous intoxication from heavy metal poisoning (defined as the accumulation of any element that exhibits metallic characteristics at toxic levels in the soft tissues of the human body) can result in morbidity and mortality if not properly treated. Even though this study showed a low incidence, approximately 0.21% (75 of 35,030 cases), this is an important contamination to be studied due to its cumulative effects on the body. The diagnosis is unusual in clinical practice, due to its complexity in the variations of symptoms presented by different types of metals, and the non-specific signs that can be confused with common diseases, making it an unfamiliar subject in the medical routine. Inhalation of heavy metals such as lead and cadmium can occur through smoking, an exogenous source of contamination²⁰. The rapid exchange between blood lead contents with the cardiovascular system and soft tissue components allows, on average, 90% to 99% of body lead to be associated with red blood cells, and the other part is closely related to environmental exposure. This freely accessible part has toxic effects on various biological systems, inducing acute intoxication in organs^{20,21}. Another commonly detected intoxication is by inadequate use of supplements. Vitamin D intoxication is considered rare in children and adolescents, and is often associated with errors in handling and the amount ingested daily. In the case reports²², in which the dose ranged from 40,000 to 560,000 IU/day, patients had severe hypercalcemia, hypercalciuria and nephrocalcinosis²². However, there are cases of vitamin D intoxication, even with consumption within the recommended daily dose²¹. Acute hypercalcemia in childhood can be due to several factors, ranging from inflammatory and infectious causes, as well as exogenous vitamin D intoxication²³. In Brazil, a patient of 64-year-old retired woman was admitted to the emergency department with postprandial food vomiting of undigested content and abdominal pain that worsened on palpation. Concomitantly, onset of sporadic frontal headache, fatigue, hyporexia, weight loss of 18 kg in the same period, intense pruritus, musculoskeletal pain in limbs and nocturia. Physical examination revealed hypertension (160/80 mmHg) and itchy macules on the lower limb. The dosage of vitamin D 25 OH and the diluted vitamin D test confirmed the diagnosis of hypervitaminosis D²⁴.

Brodifacoum is a potent pesticide used to kill mice. Due to its anticoagulant effect, intoxication by this substance and vitamin K deficiency appear similarly in laboratory tests²⁴. In a case



report, in which a woman was admitted to the hospital with persistent abdominal pain, diarrhea with no defined etiology, hematuria and anemia, after sending serum samples to the laboratory, levels of this rodenticide were found²⁴. Patients who present disproportionate bleeding from an injury suffered, with elevated prothrombin time (PT) and partial thromboplastin time (PTT), without signs of disseminated intravascular coagulation and without a factor inhibitor as a cause, should be investigated for the possibility of poisoning by rodenticides²⁵.

The high toxicity of pesticides in general is considered a public health problem. The organophosphates (OPP) that are used in plant protection, and their use as a source of poisoning, make them a constant danger. According to the study²⁶, carried out in Bulgaria, despite modern methods of treatment, acute exogenous intoxication caused by this pesticide exhibits a high fatality rate and generates serious problems in clinical toxicology. Aimed to develop a prediction of results of organophosphate poisoning with the aid of clinical criteria, it was observed that some of the most evaluated signs in patients aged between 14 and 86 years after contamination were consciousness (no change, obtundation, drowsiness, stupor and coma), pulmonary edema, shock syndrome, spasm and failure of multiple organs. With this analysis performed through scores, it is possible to build estimates designed for the application of practices that improve and speed up the care of lethal cases of intoxication²⁶. The decisive diagnosis is made through blood or urine tests in cases of recent exposure²⁶. In Brazil, in the state of Rio Grande do Norte, a study described two outbreaks of exogenous poisoning by brown sugar (rapadura) contaminated with methamidophos (a pesticide used in agriculture) and sulfite (SO₂). The outbreaks presented accidental and occupational circumstances (in which they were intoxicated by physical proximity with or without handling the packaging of the food involved). The amount of methamidophos present in brown sugar consumed was 3,000 times greater than the acceptable daily intake for this substance in humans (0.004 mg/kg/day)²⁷. The presence of sulfite in this product was due to the intentional and illegal addition of sodium hydrosulfite in the production of rapadura, for whitening²⁷.

Food poisoning is very common, especially among children. The study²⁸ showed a case report of a 6-year-old girl who ingested about 10 beans of bitter lupine beans. When seeking care 1 hour after ingestion, the symptoms presented were headache, blurred vision, photophobia and nausea. The child recovered in approximately 12 hours, was discharged 24 hours after entering the Emergency Room, and in the one-month follow-up period remained asymptomatic²⁸. Lupine beans are a food whose use is widespread throughout the world. Despite containing in its composition many nutrients such as proteins, fibers and vitamins, the bitter varieties of this food are rich in a kind of alkaloid, which are capable of causing acute anticholinergic syndrome in children and adults²⁸. Therefore, the correct treatment of this food is important. The necessary recommendations for the correct handling of the bitter lupine are its immersion in water for 12 hours, followed by its cooking and, finally, washing for about 30 seconds, three times a day

for five days before its consumption²⁹. Intoxication caused by the ingestion of mushrooms can cause irritating gastroenterocolitis³⁰. In Bulgaria, acute food poisoning has a high frequency and is responsible for 10.7% of hospitalizations. They affect both sexes and different ages to the same extent³⁰. Poisoning by *Amanita pantherina* and *Amanita muscaria* mushrooms have a good prognosis, but poisoning by *Amanita phalloides* is more dangerous, causing life-threatening organ damage and high lethality. Mushroom poisoning is responsible for 11.4% of acute case fatality in Bulgaria³⁰.

Salt can also cause poisoning. Compulsive salt intake (154 g of sun-dried salt) reported in a 26-year-old man diagnosed with Crohn's Disease (CD), triggered generalized edema, sudden weight gain, 10 kg in 2 weeks, and personality changes with aggressive behavior³¹. The man also had hypernatremia (high concentration of sodium in the blood) caused by intoxication, which when not correctly identified can lead to a high fatality rate³¹. Some serious complications may appear due to electrolyte disturbance without adequate water homeostasis, evolving to hemorrhages, thrombosis and cerebral edema, resulting from the inadequate rate of sodium correction³¹. CD-associated mucosal inflammation can also cause hyponatremia due to reversal of sodium-water flow in the colonic epithelium. Hypernatremia caused by disruption of water homeostasis is a commonly encountered electrolyte disturbance that often progresses to serious complications such as hemorrhage, thrombosis, and cerebral edema, resulting not from the hypernatremia itself, but from its inadequate rate of sodium correction.

Tetrodotoxin toxin (TTX) is produced by marine bacteria that are mainly consumed by fish of the *Tetraodontidae* family and other aquatic animals. TTX occurs mainly naturally in contaminated pufferfish, widely consumed in Japanese cuisine. It is detected in various marine organisms such as pufferfish, starfish, sunfish, starfish, frogs, crabs, snails, Australian blue-ringed octopus and bivalve molluscs. This neurotoxin causes food poisoning and poses an acute risk to public health. Clinical symptoms of TTX intoxication depend on the amount of toxin consumed and clinical manifestations are rapid. Death is caused by respiratory and cardiac failure³². In October 1996, in Nagasaki, a 48-year-old man caught a wild *Takifugu poecilonotus* and ingested it. After 30 to 60 minutes, he began to experience numbness in his hands and limbs, followed by cyanosis and respiratory failure. Although immediately hospitalized, he died within an hour, and it was concluded that the cause of his death was TTX contained in the liver of wild *T. poecilonotus*³³.

One of the limitations faced in the data collected for this study, was the high number of information described as 'ignored', for several variables of the mentioned categories. This becomes an obstacle for substantiating the data. Some of the possible reasons may be related to registration problems, such as carelessness on the part of the professional responsible for filling in the intoxication form available or the population's absence of information. Thus, it is necessary to improve the quality of the registration of information so that underreported cases can be related to various social and cultural issues, among



others. Exogenous intoxications are a public health problem, and anyone can be exposed to the risks of contamination, so it is essential to properly record data in order to draw an epidemiological profile of intoxications so that prevention measures can be developed.

CONCLUSIONS

Exogenous intoxications are a relevant public health problem, and it is essential to identify which part of the population is most affected, as well as the circumstances of intoxication with the highest incidence, so that adequate prevention measures can be developed. Suicide attempt was the circumstance of intoxication with the highest number of cases reported to Sinan-Net, followed by accidental intoxications. Thus, to avoid an increase in the number of cases of exogenous intoxication, the State of Rio Grande do Sul must provide psychological assistance to the population most susceptible to intoxication by suicide attempt, as well as alert and guide the population about the risks of accidental intoxication. This support is necessary for all those

affected as a result of damage to the physical, mental and social health of each individual. It is also possible to reduce the number of information described as “ignored”, which often occurs due to the population’ absence of information. Such registration problems were one of the limitations faced during data collection in this study, as they may contribute to the diagnosis of some intoxications in which the symptoms are confused with other diseases. In addition to the population’ lack of knowledge, the carelessness of the professional responsible for filling in the poisoning form is a factor that favors the lack of information about the cases. Therefore, it is also necessary to improve the quality of the registration of information in order to avoid underreporting and errors in the notification records. However, despite the registration problems, the article was successful in characterizing the epidemiological profile of cases of exogenous intoxication that occurred in the State of Rio Grande do Sul during the period studied, between 2007 and 2020. Still, more studies are needed about the subject that bring more information and enrich the discussion about this relevant public health problem so that it can be prevented.

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Authors' Contribution

Pinto AT - Conception, planning (study design) and writing of the work. Goulart JQ - Conception, planning (study design), analysis, interpretation of results and writing of the work. Matias CL, Prado PC, Weber C - Analysis, interpretation of results and writing of the work. Weber C - All authors approved the final version of the work.

Conflict of Interest

Authors have no potential conflict of interest to declare, related to this study's political or financial peers and institutions.



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