

DRUG INTOXICATIONS IN BRAZILIAN TERRITORY: A COMPARISON BETWEEN PERIODS PRE, DURING AND POST COVID 2019 PANDEMIC

**INTOXICAÇÕES POR MEDICAMENTOS NO TERRITÓRIO BRASILEIRO: UMA
COMPARAÇÃO ENTRE OS PERÍODOS ANTES, DURANTE E APÓS A
PANDEMIA DE COVID 2019**

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ABSTRACT

To analyze the clinical and epidemiological drug poisoning profile from 2018 to 2023 registered in Brazilian territory. It was conducted a retrospective epidemiological study with a quantitative approach, using secondary data extracted from the Sistema de Informação de Agravos de Notificação (SINAN), about exogenous poisoning registered from the years 2018 to 2023. Important changes in pattern of drug intoxication occurred in studied period as a well as clinical and epidemiological traits. Stands out the prevalence of suicide attempt during and post pandemic period, compared to previous years, with the 20-to-39 age group predominating in these cases of intoxication. These data reflect the impact of the pandemic as a disruptive factor for mental health problems, with possible repercussions even after it ends. Effective policies for the prevention of fatal and non-fatal outcomes related to the use of medications are necessary, as well as looking at the social and epidemiological factors that affect the physical and mental health of the Brazilian population.

Keywords: Poisoning; Clinical Epidemiology; COVID 19 Pandemic; Drugs; Health Impact Assessment.

RESUMO

O trabalho teve como objetivo analisar o perfil clínico e epidemiológico de intoxicação por medicamentos de 2018 a 2023 registrado no território brasileiro. Foi realizado um estudo epidemiológico retrospectivo com abordagem quantitativa, utilizando dados secundários extraídos do Sistema de Informação de Agravos de Notificação (SINAN), sobre intoxicações exógenas registradas nos anos de 2018 a 2023. Mudanças importantes no padrão de intoxicação por drogas ocorreram no período estudado, assim como nas características clínicas e epidemiológicas. Destaca-

se a prevalência da tentativa de suicídio durante e após a pandemia, em comparação com o período anterior, com a faixa etária de 20 a 39 anos predominante nesta circunstância de intoxicação. Esses dados refletem o impacto da pandemia como um fator disruptivo para problemas de saúde mental, com possíveis repercussões mesmo após seu término. Políticas eficazes para a prevenção de desfechos fatais e não fatais relacionados ao uso de medicamentos são necessárias, assim como a análise dos fatores sociais e epidemiológicos que afetam a saúde física e mental da população brasileira.

Palavras-chave: Envenenamento; Epidemiologia Clínica; Pandemia de COVID-19; Medicamentos; Avaliação do Impacto na Saúde.

1. INTRODUCTION

The advent of the pharmaceutical industry coincided with profound social and economic transformations worldwide, which changed the way the population dealt with the consumption of medications and the risks inherent to their use ⁽¹⁾. The effects of these changes persist to this day, with modern societies frequently reporting self-medication and significant adverse events related to its indiscriminate use. Among these adverse events are medication poisonings, which are among the leading causes of exogenous poisonings in several countries, including Brazil. These poisonings can result from the interaction of multiple factors, such as sociodemographic characteristics and factors that trigger poisoning (self-medication, suicide attempts, accidental consumption, etc.), for example.

Self-medication was a practice that gained even more notoriety due to its risks during the COVID-19 pandemic, in which the lack of

medications to combat infection by the SARS-CoV-2 virus and its complications drove the search for treatment options, for which efficacy, safety, and dosing regimens were not well established. In addition to the irrational use of medications, the pandemic period imposed conditions that favored mental health problems due to social isolation, worries and uncertainties about the future, financial problems, among other factors that resulted in an increase in depression and anxiety rates. This emotional illness represents a major global concern due to its biopsychosocial impacts and its association with fatal consequences (suicide). In Brazil, suicide attempts occur in a considerable portion of the population through intentional poisoning by ingesting large quantities of medication, especially among young adults. ⁽²⁾

Other cases occur as a consequence of self-medication or accidental poisoning, affecting different age groups. Since the pandemic led to an increase in medication consumption in Brazil and also impacted the mental health of the general population, the impact of this scenario on the profile of medication poisonings is questionable. Thus, this study aimed to analyze the profile of medication poisonings in the periods before, during, and after the COVID-19 pandemic, outlining their sociodemographic and clinical-epidemiological profiles in Brazil.

2. THEORETICAL FOUNDATION

2.1. Exogenous Intoxication: Concepts and Public Health Relevance

Exogenous intoxication consists in a set of clinical or biochemical manifestations of harmful effects that appear in the living organism

from the contact or interaction of a biological system with contaminating chemical, physical, or biological agents. According to national guidelines ⁽³⁾, this condition consists in an imbalance in the organism's homeostasis produced by the interaction with a foreign chemical substance to the body. In the particular case of drug intoxications, the nocive effects frequently results from exposure to a drug in doses substantially higher than those recommended for prophylactic, diagnostic, curative, palliative, or physiological function-modifying purposes, surpassing the safe limit of the therapeutic window and generating tissue and systemic toxicity ⁽⁴⁾.

According to the guidelines of the Ministry of Health and specialized literature reviews in clinical toxicology ^(4,5), intoxications are classified according to the clinical course and exposure time as:

- Single acute: when contact with the toxic agent occurs in a single exposure within a period of less than 24 hours, requiring immediate emergency medical intervention;
- Repeated acute: episodes in which successive acute exposures occur within a short period of time;
- Chronic: characterized by continuous and cumulative absorption of the toxic agent over weeks, months, or years, leading to progressive and delayed damage to multiple physiological systems, such as the neurological, renal, hepatic, and immune systems;
- Acute on chronic: when an individual already subjected to cumulative chronic exposure suffers a sudden overdose of the same agent ⁽⁴⁾.

Regarding intentionality, poisonings are classified as voluntary (such as suicide or abortion attempts) and involuntary (which include domestic accidents, administration errors, inappropriate therapeutic use, and occupational contaminations) ⁽³⁾. The comprehension of these concepts is fundamental to the development of prevention strategies, as well as to the investigation and management of poisoning cases.

Regarding morbidity and the impact on hospitalization rates, a nationwide epidemiological study found that prescription medications accounted for 97% of all SUS hospital admissions due to drug poisoning between 2009 and 2018, with a mortality rate approximately 50 times higher than that resulting from the improper use of over-the-counter medications (OTC) ⁽⁶⁾. This scenario reveals that, although over-the-counter medications are widely used in daily life, prescription drugs are the ones associated with greater severity and lethality, resulting in significant impacts on the healthcare system. It is worth noting that, depending on the type of substance involved in the poisoning and the pattern of exposure, the consequences can be irreversible or fatal, result in lasting impairments (such as hepatic, renal, or neurological damage), or necessitate hospitalization ⁽⁷⁾. Each of these outcomes entails direct and indirect social impacts.

Direct impacts include increased mortality rates from preventable causes, where the loss of a family member causes emotional and even financial distress to the family (especially regarding economically active individuals); when lasting impairments occur, the individual's quality of life may be affected, requiring long-term specialized healthcare ⁽⁸⁾. These situations—along with cases requiring hospitalization—impose direct burdens on public funds

and increase direct and indirect costs for the victim and their family⁽⁹⁾. Such facts underscore the importance of studies that not only outline the epidemiological profile of exogenous poisonings in the country but also demonstrate how events such as the pandemic can impact the misuse of medications—and, consequently, poisonings involving these products. Understanding the predominant—and therefore most vulnerable—groups, as well as the outcomes of medication poisoning cases, is essential for strengthening effective prevention strategies against this type of health issue.

2.2. Epidemiological Profile of Medication Poisonings In Brazil

Ecological investigations of time series based on the Notifiable Diseases Information System (SINAN) indicate a continuous increase in the incidence of medication poisonings in the country⁽¹⁰⁾. When assessing national fluctuations, the national survey with SINAN microdata shows that the behavior of this condition presented a significant volume of records in all Brazilian macroregions, totaling hundreds of thousands of notifications of confirmed cases between 2018 and 2023^(10,11). However, the analysis of the death profile reveals severe asymmetries: the majority of deaths confirmed from medication poisoning are concentrated among males and in the young adult age group.

Regarding sex, national scientific productions and official reports from SINAN shows that female sex is predominant in notifications of medication poisoning. This profile differs markedly from other intoxications circumstances, such as occupational accidents with pesticides or plant poisonings, where cases involving men sex is most prevalent. Men sexes are also predominant in fatal outcomes, exhibiting significantly higher mortality rates than the female,

indicating that, although men do not account for the largest share of poisoning cases, they also constitute a group requiring care aimed at reducing the fatality rate associated with exogenous poisonings ⁽¹²⁾.

Regarding age, the literature points out a bimodal distribution in intoxications cases involving medication. The main strata of notifications is concentrated in the age group of 20 to 39 years (young and economically active population). In second, it is observed that a great prominence occurs in early childhood, with special focus on children aged 1 to 4 years ⁽¹³⁾. While intentional episodes prevail in adults, in the pediatric population exposure occurs almost exclusively accidentally and in a domestic setting.

Concerning instruction level, patients with lower education levels are statistically more associated with poisonings due to administration errors and inappropriate therapeutic use ⁽¹⁴⁾. Low education acts as a vulnerability factor for the incorrect interpretation of package inserts, prescriptions, and labels. However, studies on the macro-regions of Minas Gerais highlight that the completion of the education variable in SINAN shows extremely high rates of incompleteness and omission — with an average of 41.3% of data left blank or ignored — which hampers the statistical validation and precise social stratification of this indicator ⁽¹⁵⁾.

Finally, regarding notifications by race/color, higher reporting rates are observed among individuals who self-identify as white, followed by those who identify as *pardo* (mixed-race). A cross-sectional study covering a ten-year period (2014–2023) focused on poisonings resulting from self-medication indicated that 44.3% of patients were white and 37.7% were *pardo* ⁽¹⁶⁾. In contrast, Black and Indigenous

populations show very low percentages in federal databases, reflecting severe disparities in physical access to health services and structural barriers to diagnosis within primary care for these communities ⁽¹⁷⁾.

2.2.1. Main Circumstances of Drug Intoxications

- **Suicide Attempt**

In Brazilian territory, suicide by drug self-poisoning is the most common circumstance of deaths and hospitalizations due to chemical agents ⁽¹⁸⁻²¹⁾. Medications are among the primary agents used in suicide attempts due to the misconception that they are less violent methods, as well as their widespread availability in the home and ease of access ⁽¹⁸⁾. In the context of mental health issues (such as depression), the presence of various types of drugs in most households can facilitate impulsive acts during moments of crisis. Furthermore, individuals undergoing treatment for mental disorders or chronic pain may have greater access to psychotropic substances—medications capable of causing severe adverse effects, particularly in cases of overdose—thereby increasing the risk during periods of emotional instability ⁽²²⁾.

It is known that mental disorders have a high prevalence in the global population and that socioeconomic and public health scenarios—such as a pandemic—can exacerbate mental health issues ⁽²⁾. Corroborating this information, a national retrospective epidemiological study analyzed data from the Mortality Information System (SIM) covering a 20-year historical series (2003 to 2022), where were identifying 9,123 confirmed deaths resulting from intentional drug self-poisoning in the country ⁽¹⁸⁾. The study revealed

an exponential increase in mortality rates in years marked by economic and health crises, where in comparison to the baseline year of 2003, deaths from medicated suicide grew by 41.0% in 2015, 181.0% in 2021 (critical phase of the pandemic), and reached a historic jump of 264.0% increase in the year 2022 (first post-pandemic year) ⁽¹⁸⁾. The epidemiological profile of the victims showed a predominance of women (55.5%), individuals aged 30 to 49 years (47.2%), single people (52.4%), and white race/color (53.2%), with 67.0% of deaths occurring within hospital facilities, indicating that the doses consumed exceeded the capacity for emergency resuscitation ⁽¹⁸⁾.

- **Self-medication**

According to the World Health Organization, self-medication consists of the selection and use of medications by individuals to treat self-diagnosed diseases or symptoms, without the prescription, supervision, or evaluation of a qualified health professional ⁽²³⁾. Irrational use of medications is manifested by the improper choice of the drug, incorrect dosage, inadequate duration of treatment, therapeutic underestimation, disregard of contraindications, and polypharmacy without clinical monitoring ⁽²⁴⁾.

This practice is culturally established in the Brazilian population. Nationwide studies indicate that 79% of Brazilians over 16 years old routinely practice self-medication ⁽²⁵⁾. Catalyzing factors include the ease of selling over-the-counter drugs (OTCs) in pharmacies, the strong incentive from commercial advertising campaigns, and bureaucratic or geographic barriers to accessing medical consultations and emergency services in the SUS ^(24,25). A retrospective cross-sectional study that evaluated 23,859 confirmed

cases of self-medication poisoning reported to SINAN over a decade (2014 to 2023) ⁽¹⁶⁾. The results showed that the national incidence of this type of poisoning registered a sharp and statistically significant increase in the post-pandemic years of 2022 and 2023 ⁽¹⁶⁾. Multiple correspondence analysis (MCA) revealed that the pandemic changed the dynamics of exposure to self-medication, which shifted from isolated acute events in the pre-pandemic period to a profile of repeated and chronic exposures in the final phase, with a higher risk of severe and fatal outcomes in the elderly population ⁽¹⁶⁾.

- **Inadequate Therapeutic Use and Administration Errors**

They occur frequently in the elderly population due to the complexity of polypharmacy and deficiencies in adherence or prescription interpretation ⁽¹⁴⁾. In population-based studies, factors such as unemployment, sleep problems during the pandemic (which increased the chances of improper medication use by 4.47 times), and chronic pain were associated with medication errors in primary care ⁽²³⁾. Children are another demographic frequently encountered in this context, due to the complexity of dose adjustment or calculation combined with age-related physiological immaturity; this renders them more vulnerable to adverse events resulting from inappropriate use or medication administration errors, which can even lead to cases of poisoning ^(26,27).

- **Domestic Accidents**

This etiology predominates almost entirely in the pediatric age groups. In a historical cohort observational study using data from the Information and Toxicological Assistance Center of Santa Catarina (CIATox/SC), 4,839 cases of childhood drug poisoning were

analyzed ⁽²⁸⁾. The profile showed that the vast majority of cases involved accidental ingestion by children under 3 years old occurring at home, with paracetamol and benzodiazepine anxiolytics standing out as the main agents ingested due to the ease of access to improperly stored bottles ⁽²⁸⁾. Factors such as curiosity, exploratory behavior, and the inability to assess the risks inherent in the consumption of certain substances are among the factors that explain this prevalence ^(26,29).

- **Drug Abuse**

Drug abuse is defined as the excessive or inappropriate consumption of a specific substance or substances, leading to tangible negative consequences in the user's life—such as family problems, a decline in work performance, or involvement in accidents, for example ⁽³⁰⁾. The context of substance abuse fosters a scenario of intoxication, driven both by excessive use and by the fact that most substances used as drugs of abuse—whether legal or illicit—carry the potential for fatal outcomes or severe adverse reactions ⁽¹⁾.

The inappropriate use of psychoactive substances, alcohol, and illicit drugs recorded a significant increase during the COVID 19 pandemic. An ecological and interrupted time series study covering the years 2015 to 2022 with data from the national SIM revealed that overall deaths related to alcohol and drug abuse in Brazil increased by 18.3% in 2020, 22.4% in 2021, and 26.0% in 2022 ⁽³¹⁾. The most significant increases occurred in the states of the Northeast region (with a rise of 31.8% in 2022), South (rise of 35.2% in 2022), and

Southeast (rise of 21.0% in 2022), affecting both sexes (AAPC for men 3.6%; AAPC for women 4.6%) ⁽³¹⁾.

2.3. Impacts of The COVID-19 Pandemic on Medication Use

The outbreak of the COVID-19 pandemic in March 2020 initiated a multidimensional health crisis and a phenomenon of global infodemic, characterized by the mass dissemination of false or clinically unvalidated information. The fear of contagion led to an unprecedented population rush for the acquisition of ineffective off-label therapies against the SARS-CoV-2 virus, which made up the so-called "COVID kit" (hydroxychloroquine, chloroquine, ivermectin, and azithromycin) ⁽²⁵⁾. These medications were consumed concomitantly and—almost invariably—without supervision, constituting self-medication.

The absence of pharmacological monitoring directly exposes patients to the risk of severe toxicities. The analgesic and antipyretic paracetamol is the main reference case in the Brazilian scientific literature. A study that evaluated retrospective epidemiological data on paracetamol in Brazil documented a total of 492 deaths, 5,666 hospital admissions within the SUS, and 17,031 emergency visits due to intoxication associated with this drug ⁽³²⁾. The authors demonstrated that paracetamol accounts for 3.3% of all registered drug intoxications in the country, with deaths mostly associated with suicide attempts in adults (37.3%) and hospitalizations resulting from cumulative accidental overdoses (80.2%) ⁽³²⁾.

Studies on drug sales have shown an expressive rise in the commercialization of these drugs in the Brazilian territory. Market data revealed that ivermectin recorded a sales increase of 829%,

rising from a turnover of 44 million reais in 2019 to 409 million reais in 2020 ⁽²⁵⁾. Hydroxychloroquine and chloroquine, in turn, increased their revenue from 55 million to 91.6 million reais from one year to the next ⁽²⁵⁾. In a detailed retrospective assessment of spontaneous reports registered in the national pharmacovigilance system (VigiMed/Anvisa) during the pandemic, researchers indicated the risks of this practice, analyzing physical sales from March 2019 to February 2021 and the corresponding adverse drug reactions notified ⁽³³⁾:

- Hydroxychloroquine: National sales exploded from an average of 72g before the pandemic (restricted to specific rheumatological treatments in the Northeast and Southeast) to 7,816,738.60g (7.8 tons) in 12 months, corresponding to an increase of 10,856,481.39% ⁽³³⁾. ADR reports, which were null pre-pandemic, jumped to 150 serious cases ⁽³³⁾;
- Ivermectin: National consumption rose from 1.22g to 150,444.65g (an increase of 12,291,129.32%) ⁽³³⁾. The system recorded 6 reports of serious ADRs associated with drug-induced injuries and acute hepatitis;
- Azithromycin: Sales increased by 69.75% nationwide, raising the report of serious ADRs from 16 to 80 occurrences ⁽³³⁾.

Parallel analyses of multivariable logistic regression conducted on hospitalized patients in Brazil showed that the use of chloroquine was statistically associated with the risk of serious adverse reactions with an odds ratio of $OR = 5.4$ (95% CI: 1.9-15.6), while hydroxychloroquine had $OR = 2.1$ (95% CI: 1.2-3.6) ⁽³⁴⁾. The reactions occurred mainly in the cardiac system (38.8% of cases, due to

cardiotoxicity and QT interval prolongation), as well as acute liver damage (8.9%) and gastrointestinal damage (14.4%) ⁽³⁴⁾.

On the other hand, the emotional suffering caused by social isolation, loss of income, and collective mourning altered the consumption of psychotropic drugs. National epidemiological studies identified a drastic increase in the dispensing and use of benzodiazepines and antidepressants (such as clonazepam, sertraline, and amitriptyline) ⁽³⁵⁾. A study focused on the municipality of Rio de Janeiro evaluated the distribution of medicines through Primary Health Care (PHC) from 2019 to 2021, showing that while drugs aimed at birth control (such as ethinylestradiol) experienced a sharp drop in distribution due to the suspension of preventive appointments, diazepam showed an uninterrupted growth trajectory throughout all the years studied ⁽³⁶⁾. It is worth noting that psychotropic drugs are among the primary classes of medications involved in cases of exogenous poisoning ⁽³⁵⁾—particularly in suicide attempts, which constitute the leading circumstance for such poisonings ⁽¹⁸⁾. Consequently, the pandemic scenario introduced a range of factors capable of increasing the number of cases of medication poisoning, especially intentional ones, which reinforces the relevance of the present study.

3. METHODS

3.1. Study Design

A retrospective epidemiological study with a quantitative approach was conducted, using secondary data extracted from the Notifiable Diseases Information System (SINAN), ⁽⁴⁾, a database from the Brazilian Ministry of Health. The data from SINAN, the system used in

the study, are made available by the Department of Informatics of the Unified Health System (DATASUS).

3.2. Ethical Aspects

The research does not require submission to the Research Ethics Committee (CEP), considering that the study is carried out with secondary data available on a public data platform, which does not identify the individuals corresponding to the data.

3.3. Data Collection Method

The obtained sample was composed of the years 2018 to 2023. Sociodemographic information was collected (that is, sex, age group, education level, etc.) and clinical-epidemiological data, including the circumstances of the intoxication, the type of intoxication, and the clinical outcome.

3.4. Data Analysis Method

The obtained data were organized in Microsoft Office Excel 365® software. The limitations of this study include possible underreporting and variations in data quality, which depend on the accuracy and availability of complete information in the reports. Additionally, missing or blank responses for some variables limit the analysis of cases in certain aspects.

3.5. Inclusion and Exclusion Criteria

Cases of exogenous intoxication from all regions of the country were included, but only cases of drug intoxication. Records with incomplete essential data, such as sex and age, were excluded from

the analysis. Notification forms that were incorrectly filled out were also excluded.

4. DEVELOPMENT

4.1. Results

4.1.1. Total of Cases and Patient Sociodemographic Data in Each Period Studied

Sociodemographic and clinical-epidemiological data from 180,418 cases of drug poisoning reported to SINAN in Brazil, in the period 2018 and 2019, were analyzed. The sample was predominantly composed of female individuals, representing 73.2% (n = 132,233) of the cases, while males corresponded to 26.6% (n = 48,164) (table 1).

Table 1. Sociodemographic data of drug intoxication cases reported to SINAN from 2018 to 2023, grouped in pre, during and post-pandemic period, Brazil.

	n	%	n	%	n
Sex					
Male	48,164	26.68	43,541	26.43	65,082
Female	132,233	73.31	121,155	73.55	184,413
Ignored	21	0.01	25		60
Age Group					

⚠ Esta tabela possui muitas colunas e foi cortada para impressão. Para visualizá-la completa, acesse o artigo original em: <https://revistatopicos.com.br/artigos/drug->

Source: *Ministry of Health/SVSA – SINAN Net.*

Regarding age group, most cases occurred in adults aged 20 to 59 years, representing 58.9 (n= 106,418) of the total notifications, followed by ages 15 to 19 years, with 19.3% (n= 34,907). Other age groups included children under 1 year (1.7%; n= 3,180); 5 to 9 years (2.4%; n= 4,344); 10 to 14 years (6.6%; n= 12,003); 60 to 79 years (2.4%; n= 4,441); 80 or older (0.4%; n= 879); cases with blank or unknown information represented 0.01% (n= 19).

In this study, the years 2020 to 2021 were considered the pandemic period, with the first being when cases began to emerge in the country and the second still marked by periods of isolation, with the year 2021 ending without reaching 100% vaccination coverage. The total number of reported cases of drug poisoning from 2020 to 2021 corresponded to 164,721. The sample was predominantly composed of female individuals, representing 73.55% (n = 121,155) of the cases, while males corresponded to 26.4% (n = 43,541). Regarding the age group for the years 2020 and 2021, most cases occurred among young people and adults aged 15 to 39 years, representing 62.8% (n= 103,530) of the total notifications, followed by ages 40 to 59 years, with 16.5% (n= 27,240), and 10 to 14 years, with 7% (n= 11,566). Other age groups included children under 1 year old, with 1.5% (n= 2553); 1 to 4 years, with 6.5% (n: 10,816); 5 to 9 years, with 2.1% (n= 3,486); 60 to 79 years, with 2.9% (n= 4,805); 80 years or older, with 0.4% (n= 723); cases with blank or unknown information accounted for 0% (n=1).

In the period from 2022 to 2023 (here considered post-pandemic period), 249,555 cases of drug poisoning were recorded (table 1). The

number of notifications of cases of drug poisoning registered per year in Brazil during the post-pandemic period increased in relation to previous years. For example, comparing the years 2020 and 2021 with the years 2022 and 2023, there was an increase in these notifications of 51,5% (n = 84,834); and comparing the years pre pandemic (2018 and 2019), there was an increase of 38.3% (n= 69,137).

Regarding education, the predominant records from 2018 and 2019 period was "not applicable" 10.3% (n= 18,748) and "blank/unknown" 36.1% (n= 65,229). It is essential to highlight that the adequate completion of sociodemographic information, such as education, gender and age group, is fundamental both for understanding public health problems and for directing the planning of health actions, in accordance with the characteristics of the target populations ⁽⁷⁾. When education was reported, in the period from 2018 to 2019, the most recorded were incomplete elementary education, with 14.5% (n= 26,212) of cases and 15.8% (n= 28,571) of completed high school. The others included incomplete secondary education with 10.7% (n= 19,408), followed by complete and incomplete higher education with 6.2% (n= 11,304) and complete elementary education with 5.6% (n= 10,212). Cases involving illiterates represent 0.4% (n= 734).

From 2020 to 2021, the data for "not applicable" were 9.94% (n= 15,351) and "blank/unknown" 41.26% (n= 63,734). When education was informed, the most recorded were 18.2% (n= 28,191) with complete high school, and incomplete elementary school, with 14.18% (n= 21,906). Others included incomplete high school with 10.84% (n= 16,747), followed by complete and incomplete higher education with 5.8% (n= 9,649) and complete elementary school with 5.1% (n= 8,563). Cases involving illiterates represent 0.38% (n= 580).

Finally, between 2022 to 2023 years, when reported, there was a predominance of complete secondary education (19.2%; n = 47,979), followed by incomplete elementary education (12.08%; n = 30,169), and incomplete secondary education with 10.8% (n= 27,094). Cases involving illiterate people represent 0.28% (n = 707), while 5.01% (n = 12,496) had completed elementary education and 6.3% (n = 15,918) had complete/incomplete higher education.

Regarding race, in 2018 and 2019 years, most cases occurred in individuals classified as white, totaling 46.8% (n=84,453), followed by brown individuals with 34.7% (n=62,636). Cases involving black individuals correspond to 4.4% (n=7,996), while the yellow and indigenous races were recorded in 0.6% (n=1,106) and 0.2% (n=386) of cases, respectively. In 13.2% (n=23,841) of cases, the race variable was recorded as blank or unknown. This profile may reflect the level of access of the different population strata to health services, including the availability of professionals trained to identify and record cases of plant poisoning ⁽¹⁷⁾.

From 2020 to 2021, a predominance in races like that of the years 2018 to 2019 was documented, with most cases occurring in individuals classified as white, totaling 45% (n=74,217), followed by brown individuals at 36% (n=59,374). Cases involving black individuals accounted for 4.8% (n=7,905), while yellow and indigenous races were recorded in 0.9% (n=1,592) and 0.2% (n=341) of cases, respectively. The race variable was recorded as blank or unknown in 12.9% (n=21,292) of cases.

Finally, between 2022 to 2023 years, concern the race. There was also the predominance of individuals classified as white, totaling 44.2% (n=110,356), followed by brown individuals with 40.7% (n=101,745).

Cases involving black individuals correspond to 5.3% (n=13,252), while the Asian and indigenous races were recorded in 1.1% (n=2,816) and 0.25% (n=633) of the cases, respectively. For 8.3% (n=20,752) of the cases, the race variable was recorded as blank or unknown.

4.1.2. Clinical-Epidemiological Data of Reported Cases in Each Period Studied

Between the types of intoxication, there is a prevalence of single acute cases. From 2018/2019 years, these cases corresponded to 66.5% (n= 120,116), followed by repeated acute cases, with 15.7% (n= 28,455), in 2018 and 2019. The type of poisoning was blank or unknown in 15.6% (n= 28,167) of the reports. (table 2)

Table 2. Clinical-epidemiological data of drug intoxication cases reported to SINAN from 2018 to 2023, Brazil.

	n	%	n	%	n
Circumstance					
Accidental	17304	9.5	15122	9.18	18,118
Habitual Use	6029	3.3	5733	3.18	8,888
Envenoma	50	0.0	65	0.03	91

⚠ Esta tabela possui muitas colunas e foi cortada para impressão. Para visualizá-la completa, acesse o artigo original em: <https://revistatopicos.com.br/artigos/drug-intoxications-in-brazilian-territory-a-comparison-between-periods-pre-during-and-post-covid-2019-pandemic?noblockage>

Source: Ministry of Health/SVSA - SINAN Net.

During pandemic period (2020/2021), there was also prevalence of single acute cases, which corresponding to 63% (n= 103,859), followed by repeated acute cases, with 16.9% (n= 27,927). The type of poisoning was blank or unknown in 18% (n= 29,717) of the reports. In the post-pandemic years (2022/2023), single acute cases were predominant, which corresponding to 60.3% (n= 150,646), followed by repeated acute cases, with 18.7% (n= 46,817).

Concerning intoxications circumstances, in all periods, attempted suicide was the main poisoning cause, perfazing 69.2% (124,910), 71.7% (n= 118,132) and 73.7% (184,034), in pre, pandemic and post pandemic period respectively. The second cause from 2018/2019 years was related to accidental cases, with a percentage of 9.5% (n= 17,304), whereas from 2020/2021 period 9.18% (n= 15,122) and between 2022 to 2023 7.2% (n= 18,118). Most of the results were without sequela, regardless of the circumstances (accidental, therapeutic use, self-medication, and attempted suicide), with 81% (n= 146,318), 78.4% (n= 129,160) and 78.3% (n= 195,216) respectively. The mortality rate due to exogenous poisoning is very low, but it is more significant among cases of attempted suicide (table 2). We emphasize that, in the post-pandemic phase, there was an increase in reports of self-medication poisoning, since comparing the years 2018 and 2019 with those of 2022 and 2023 there was an increase of in notifications of self-medication poisoning of 43% (n= 4,234).

4.2. Discussion

As mentioned in results section, the number of notifications of cases of drug poisoning registered per year in Brazil during the post-

pandemic period increased in relation to previous years. This continuous progression may be a reflection of the health crisis caused by SARS-CoV-2, where the use of medication without the supervision of healthcare professionals, being a trend that intensified during and after the pandemic. In fact, the context of the pandemic crisis contributed to the increase in cases of self-medication, beyond to creating a condition of fear and uncertainty that aggravated or triggered mental health problems, these are two components that can explain the prevalent circumstances of intoxication observed (suicide attempt, accidental and self-medication).⁽²⁾

Indeed, an epidemiological study showed that 30.8% of respondents said they self-medicated during the pandemic, with the main medications used being ivermectin (52.8%) and azithromycin (14.2%) being the most mentioned⁽³⁷⁾. This increase may be even more significant due to cases of underreporting during the COVID-19 pandemic, when public health information systems were going through moments of crisis. From 2020 to 2022, there was a 23.4% decrease in the number of records of notifiable diseases in general, contrasting with fragile mental health context of Brazilians in the post-pandemic period, that led to an increase in cases of suicide attempts, accidental intoxication and self-medication as showed in the results section.

Concerning socio-epidemiological data, the data obtained in the present study points that females are more involved in cases of drug intoxication. El Zahran⁽¹²⁾ also describe in their study the predominance of female individuals in cases of intentional poisoning, major related to use of

sedatives/hypnotics/antipsychotics, antihistamines and melitracen/flupentixol.

Towards age, it was observed prevalence of poisoning among young adults aged 20 to 59 in all periods, which could be directly related to their condition, as economically active individuals, which facilitates the acquisition of medications, both OTC and prescription. This situation makes them more predisposed to the inappropriate use of medications and self-medication or accidental use, thus increasing the likelihood of poisoning-related incidents. Furthermore, easy access to over-the-counter (OTC) medications, often used without proper guidance regarding treatment duration, adequate dosage, and potential drug interactions, contributes significantly to the high prevalence of poisoning in the age group ⁽⁶⁾. Therefore, the implementation of strategies to prevent the indiscriminate use of medications without prior medical evaluation is essential to reduce cases of drug poisoning. Our data reinforce that indiscriminate or careless access still figures as an important cause of poisoning, since in all periods, self-medication and accidental poisoning together accounted for about 14% of poisonings, this is without taking into account cases of attempted suicide.

Regarding race, accordingly the 2022 Brazilian Census, the self-declared white population is 43.5% and black or indigenous people are, 10.2% and 0.6% respectively, which can explain the relative difference in poisonings due to attempted suicide prevalence in white people regardless of the period evaluated. In all periods, indigenous people have a very low representation within the ethnicity table. This fact represent a lack in information about exogenous poisoning in both populations and and from the understanding of the socio-epidemiological factors involved.

Relative instruction level, among the cases whose this information was reported, there was a predominance of individuals with low levels of education, with complete and incomplete elementary education plus incomplete and complete high school education in all periods studied. The profile observed is consistent with the major age group in the study, according to analyses of the National Household Sample Survey , which observed that this is the predominant education profile in this portion of the population. Self-medication, by itself, already constitutes a health risk, and when associated with a lack of access to adequate information about dosage and administration, the influence of advertising, and the complexity of certain drug formulations, it becomes an even more relevant factor. Thus, low levels of education, linked to social issues, may be associated with a greater propensity for health problems, mainly because these people have less access to essential information on how to prevent and treat diseases.

When it comes to cases of poisoning by common substances in everyday life, it is crucial to implement health actions to guide the population, especially the most vulnerable groups. Other account that was common in all periods it was the accidental use of medication by children under 9 years old. This high number may be explained by the increase of unsupervised contact between children and easily accessible drugs at home, especially under the age of three, when preschoolers start to be more active and put things in their mouths to understand their surroundings (MATALOVA, et al., 202). Additionally, in this age stage, in which cognitive and motor development are rapidly expanding, where children tend to explore the environment intensely ⁽²⁹⁾. This exploratory behavior can lead to accidental manipulation of medications stored in accessible places. The fact that more than half of the cases of accidental medication

poisoning occur in this age group suggests a relationship with the home environment itself and the way it is organized, contributing to greater risks ⁽²⁶⁾.

Contrasting, cases involving accidental use in adolescents aged 10 to 19, adults aged 20 to 59 and elderly people over 60 years, may be attributed to the mistaken and accidental use of medications due to lack of attention or instruction, whereas poisonings caused by drugs for therapeutic use is common among with adults or elderly people. Despite the intoxications from therapeutic use are more common in adults between 20 and 59 years old, but it holds significant numbers at all ages. The lack of understanding and requests about the instructions on the use of medication leads to errors in medication administration, increasing complications in therapeutic use ⁽²⁴⁾. The scarcity of pediatric studies in the development of a medication makes children susceptible to complications, mainly due to dosage issues. In the elderly, the main factors behind these cases are memory disorders, the use of many medications and difficulty reading the packaging, leading to administration errors.

With respect to intoxications circumstances, despite extensive reports of self-medication during the pandemic, there has been a reduction in the number of reported cases provoked by this type of poisoning (. According to SINAN, in comparison between 2018 and 2019, there was a decrease of 8.7% (n = 15,697) in cases of poisoning by self-medication (table 2). However, this finding may be linked to underreporting of cases, since during the pandemic the search for medications that would alleviate symptoms associated with the context of the health crisis and a wave of misinformation with fake news about drugs increased cases of self-medication during the pandemic period.

When properly and regularly filled, notification systems are essential to demonstrate the reality of drug poisoning ^(38,39), but this analysis becomes a challenge due to underreporting of cases, especially during the pandemic, a period of instability in health services. In addition, reported cases that are not filled in correctly with gaps in some variables such as age, sex, and education make it difficult to perform an adequate analysis ⁽³⁸⁾, as shown by an epidemiological study on drug poisoning notifications with 61.7% of data omission regarding the State of Ceará between 2017 and 2021 ⁽⁴⁰⁾. This negligence distorts the real scenario and disturbs the understanding of the poisoning situation.

Although the relevance of others intoxications circumstances, suicide attempts were the leading cause of drug poisoning, accounting more than 50% of total poisoning cases circumstance. In all periods, the age group most affected are adults aged 20 to 39 years (48.8%), although rates remained high from the beginning of adolescence to the beginning of senescence (aged 10 to 64 years). Each age group has specific psychological and social aspects for understanding this epidemiological configuration, and all of them must be treated with due relevance in order to prevent deaths and injuries ⁽²¹⁾. Thus, these data corroborate the profile of national and global studies, with premature deaths by suicide being more prevalent in the second and third decades of life. However, it is worth highlighting the high occurrence of intentional poisoning among the elderly, followed by poisoning by therapeutic drugs and self-medication ^(20,22).

It worth mentioning that the suicide rates increased considerably in the post-pandemic period, which may reflect the state of mental health of the population after the period of uncertainty, financial

crises, and the social isolation imposed by the inherent health conditions with a global increase of approximately 51.4% in suicide cases compared to the previous periods. Therefore, this expressive increase in cases after pandemic years suggests that the effects of the health crisis extended beyond the infectious context, reflecting deeply on mental health and the population's relationship with medication use ⁽¹⁹⁾. As for the outcome's reports, most cases did not present sequelae or were fatal, the reporting rates, especially in suicide attempts and accidents in children, draw attention to the health risks of medications when not handled properly.

In conclusion, the epidemiological transition between the three-time windows demonstrates a break in patterns. The pre-pandemic baseline period already exhibited chronic vulnerabilities, which suffered severe distortions in the 2020-2021 biennium due to the health crisis, the shift of hospital care focus to acute respiratory syndromes, and the epidemic of self-medication with the COVID kit. In the post-pandemic period (2022-2023), a "rebound effect" occurred, characterized by the exponential increase in fatal outcomes from self-poisoning and a national rise in hospitalizations, suggesting that the emotional suffering and the habit of chronic self-medication acquired during the crisis became consolidated in the population in the long term ^(16,18).

Finally, the predominant sociodemographic profile in this study consisted of women, aged between 20-59 years, with low levels of education, of mixed race, and related to suicide attempts (acute pattern). The identification of this profile suggests the need for actions aimed at this population, in order to prevent these events, focusing both on strengthening guidance about the risks inherent in medication use and on mental health issues, since suicide

attempts were the predominant form of poisoning. Furthermore, the importance of practices aimed at combating self-medication and preventing accidental incidents involving medications is reinforced, especially in age groups more prone to negative outcomes, such as children and the elderly.

5. CONCLUSION

The analysis of data on drug intoxications in Brazil between 2018 and 2023 reveals a worrying and growing public health issue, directly influenced by social, cultural, and psychological factors within the population. It was observed that the COVID-19 pandemic had a significant impact on the profile of intoxications, intensifying self-medication practices and, most notably, suicide attempts—particularly among women and young adults. Furthermore, the sharp increase in cases during the post-pandemic period suggests that the effects of the health crisis extended beyond the infectious context, reflecting deeply on mental health and the population's relationship with medication use. It's even important point the vulnerability of children and the elderly to intoxication. Self-medication, misinformation, and the easy access to potentially lethal substances have become the ingredients of a silent tragedy. In light of this, it is essential to strengthen prevention strategies, including health education, tighter regulation of drug sales, and expanded access to mental health services. Only through integrated and effective actions will it be possible to mitigate the impacts of drug intoxications and promote the rational use of medications in the country.

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