

Survey and Characterization by Regions and States of Brazil of the Main Causes of Death from Intoxication in the Period 2010 - 2018

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Abstract

The adverse effects obtained by various types of agents foreign to the human organism may be associated with intoxication events. Drugs, ethanol and pesticides can be examples of exogenous causative agents, so research related to interactions from exogenous intoxications seeks to improve the use of such substances, being able to obtain knowledge of all possible incompatibilities in the human organism. This study aimed to analyze data on deaths from poisoning in Brazil from 2010 to 2018, in order to understand its causes and seek possible solutions. To achieve the proposed objective, a compilation, analysis and calculation of death rates from poisoning per 100 thousand inhabitants was carried out at national, regional and state levels, made available in the database on Mortality Information System (MIS) - DATASUS in the public domain in periods. Through the study, it was found that at the national level, the years 2014 to 2016 had high death rates compared to other years provided, while at the regional level, the North region stood out in all years from 2012. Following in this region, the state of Amazonas was also highlighted in all years, leading upwards until the year 2017. At the end of this work it was possible to realize that the indiscriminate use of toxic agents, such as the indiscriminate use of medicines, becomes a major public health problem. It is also necessary to try to guarantee the correct and rational use of these and, thus, contribute to the reduction of cases of intoxication in Brazil, especially in the North region and in the aforementioned states.

Keywords: Intoxication; Mortality Information System (MIS); Death from Poisoning; Drugs; Self-Medication

Abbreviations

MIS: Mortality Information System; HSS/MH: Health Surveillance Secretariat of the Ministry of Health; DC: Death Certificates; ICD-10: International Classification of Diseases in its tenth version; BIGS: Brazilian Institute of Geography and Statistics

Introduction

Intoxication is associated with adverse effects obtained by various types of toxic agents, such as exposure to compound substances, drugs or chemical compounds foreign to the human body. For intoxication to occur, a number of factors influence this condition, as the agent administered can be harmful or even lethal depending on its concentration and exposure time [1].

Intoxications cause several symptoms after ingestion, inhalation, or topical use and such manifestations are linked to the dose, which in most cases is used in larger quantities than for therapeutic purposes. Each xenobiotic has its uniqueness in a framework of different signs and symptoms with different characteristics according to each case the patient, and may present mild symptoms, moderate or even sequelae of intoxication or death [2].

There are specific rules and protocols for treatment aimed at each type of intoxication, with the need for certain conducts for immediate and effective help for victims. The identification of the intoxicating agent and the determination of concentrations are essential information for an adequate treatment, but it is not always possible to obtain them [3].

In cases where it is not possible to obtain such information, it is necessary to recognize the neurotoxic syndromes, which allows monitoring the clinical picture and formulating the appropriate treatment, however, there is not always time to identify these syndromes. Most of these cases are caused by self-medication and this is due to the lack of regularization of publicity and advertisements, lack of educational programs and the ease of access to over-the-counter medications, culminating in indiscriminate use [4].

Regarding self-medication, several factors can be influenced, as described in the article by Limaye., *et al.* [5], among them we can highlight: the lack of access to health services; value of medical appointments; time limitation; lack of trust in the prescribing physician. In addition to these, there is also the risk of masking diseases, leading to inaccurate diagnosis, increased morbidity, antibiotic resistance, drug interactions and the waste of health resources as a consequence of self-medication.

Faced with this problem, the pharmacist's role is to promote educational activities, whether individual or collective, providing the user with guidance, involvement in programs for the rational use of medicines and being actively involved in the dispensing at drugstore counters, in order to reduce cases of intoxication caused by poor orientation, whether medication or not [6].

In this scenario, the most suggested action is information or direct guidance to patients, as this way, the risks can be reduced by improving the quality of information, solving the disease of the population in a more clear and adequate way, avoiding inconvenience for the patient and health system [7].

In a research by Xavier., *et al.* [8], he mentions that in Brazil it is necessary to design strategies to control self-medication and other potentially toxic substances, which should be focused on evaluating and understanding the way in which the population acquires, stores and uses these substances, drawing a profile of people and knowing the reasons that lead them to this practice. Therefore, the role of the multidisciplinary team acting as health providers and providing adequate information to patients is of great importance [8].

In this context, this research sought to quantitatively demonstrate updated data on deaths from poisoning in Brazil between 2010 and 2018. With the achievement of such results, it was possible to infer the need for pharmaceutical care and how it would help to reduce cases of this type of mortality.

Materials and Methods

Data collection, organization and compilation

A descriptive study was carried out with data from the Mortality Information System MIS, managed by the Health Surveillance Secretariat of the Ministry of Health (HSS/MH) and fed by death certificates (DC). The data indicated are for the period from 2010 to 2018 (last year made available during the study). Data were visualized through the numerical observation of causes of death records, classified as "Poisoning, intoxication or exposure to the harmful substance", showing the group belonging to categories X40-49 of the International Classification of Diseases in its tenth version (ICD-10). In this group we have mostly the cause correlated with medications, such as:

analgesics; antipyretics; antirheumatics; anticonvulsants; sedatives; hypnotics; antiparkinsonians. In addition to these, this group also includes deaths from intoxication by ethanol, pesticides and exposure to toxic gases (drugs or not) and unclassified substances (drugs or not).

Death rate calculations per 100,000 population

The raw population data residing in Brazil, in each of the regions and states in the listed years were captured in the database of the Brazilian Institute of Geography and Statistics (IBGE) to perform statistical calculations according to the number of inhabitants. After obtaining the following calculations were applied for each analyzed parameter:

$$\text{Death rate per 100,000 inhabitants} = \frac{\text{number of deaths}}{\text{number of inhabitants}} \times 100,000$$

Such calculations are recommended by the Ministry of Health, for the investigation of the specific mortality rate due to selected causes, thus the numbers of deaths from poisoning per 100,000 inhabitants were obtained for each analyzed parameter. All calculations and graphs generated were developed using Excel software [9].

Results and Discussion

Death rate from poisoning in Brazil between 2010 and 2018

From the data obtained, it was possible to obtain the rate of death from poisoning per 100,000 inhabitants in Brazil, by regions and states of the nation in the years 2010 to 2018. Observing the national death rate in the 8 years subsequently (Figure 1) it was possible to observe an increase in mortality from this cause. An example title, in 2010, the first year analyzed, this rate was 0.2, as the years passed the national death rate gradually increased from the year 2011 (0.2), reaching the rate 0.5 in the years 2014 to 2016, culminating in 2017 and 2018 with a rate of 0.4, the double presented in the initial year and this is also presented as the national average. This fact can be attributed in principle to two: improvements in the death notification system over the years and an increase in psychological pathologies related to depression and related pathologies [10].

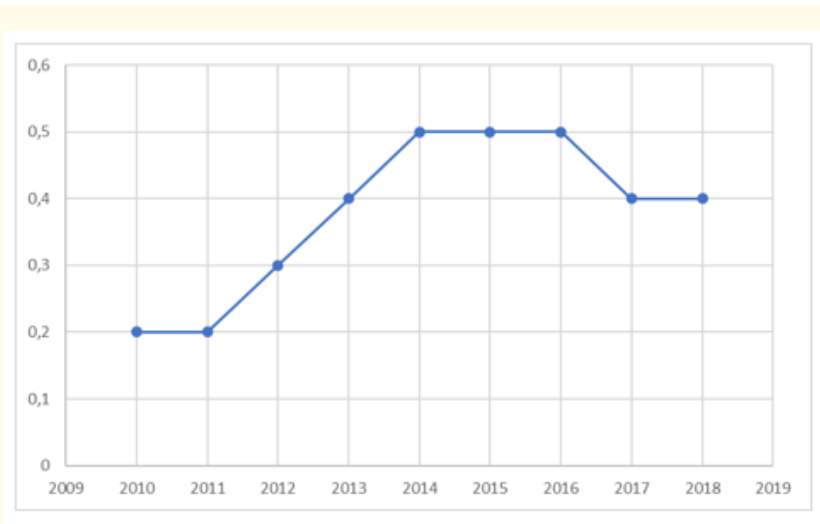


Figure 1: Poisoning death rate per 100,000 inhabitants in Brazil (2010 - 2018).

Source: Author's own compilation (2021).

Death rate from poisoning in the regions of Brazil between 2010 and 2018

After observing the national evolution of death rates over the years in Brazil, the analysis of the regions began. For the comparative pattern, existing analytical data were used, where in figure 2 it is characterized as gray columns. In the years 2010 and 2011, only the Midwest region (0.5) rates above the national average considered expressive (Figure 2).

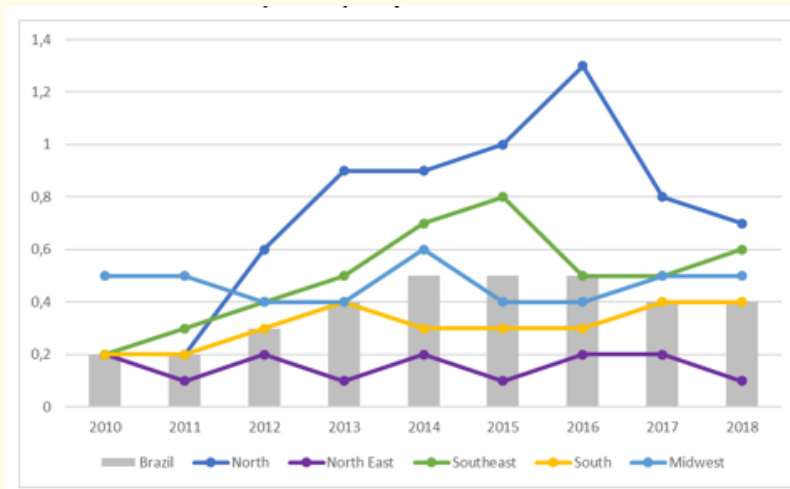


Figure 2: Death rate from poisoning per 100,000 inhabitants in the regions of Brazil (2010 - 2018).

Source: Author's own compilation (2021).

We can observe in the year 2012 a pronounced change in the indexes of the regions. In this context, the North region (0.6) is above the national average, as a consequence, some states present in this region also present altered rates. Followed by the North region, the Southeast and Center-West regions (0.4) are also above the national average, leaving only the South (0.3) and Northeast (0.2) regions within the average (Figure 2).

In 2013, the section table by regions changed, two index regions above the national average (0.4) and they are: North region (0.9) and Southeast region (0.5). The regional picture in 2014 remains similar to the previous year, with a dissipation above the national rate (0.5) in the North (0.9), Southeast (0.7) and Midwest (0.6) regions. In 2015, the regions remained above the national average, they are: North (1.0), Southeast (0.8) and Midwest (0.4) (Figure 2).

In 2016, the regional picture changes. The national rate is presented at 0.5, the North region (1.2) high regional rates for the first time, above 1.0. Other rates equal to or below the national average. In the penultimate year analyzed (2017), the regional picture remained like most years, the North region (0.8) returned to a level below 1.0 and the Southeast (0.5) and Midwest (0.5) indexes slightly increased in relation to the national rate of that year (0.4).

And finally, the last year analyzed was 2018. At the regional level, the picture remained close to previous years, with no pronounced changes. The regions with a rate above the national average (0.4) were: North (0.7), Southeast (0.6) and Midwest (0.5) (Figure 2).

It was possible to notice that the region that stood out the most in almost every year was the North region of the country, which remained at high levels to be considered. In 2012, the North region had a death rate of 0.6 per 100,000 inhabitants and increased until the year 2018, the last year made available by presenting (0.7) (Figure 2).

The year that stood out the most in this region was 2015, which obtained the maximum value when compared to the other regions (1.0). The initial years, 2010 and 2011, were highlighted by the Midwest region, which obtained a maximum value of 0.5, decreasing its values in subsequent years. On the other hand, the region that had the lowest rates of deaths from poisoning in all years analyzed was the Northeast region, with a death rate of 0.1 in 2015 (Figure 2).

This is due to the fact that in places where the health system is unsatisfactory and the contextual aspects of the illnesses go unnoticed, the medication assumes a central role and begins to be seen as a solution to the problem, and the irrational use of medication can cause the death, culminating in increased rates in these regions, as well as indiscriminate contact with other intoxicating substances [11].

Death rate from poisoning in Brazilian federation units between 2010 and 2018

In relation to the states, some from different regions had high rates in 2010 when compared to the national rate (0.2) (Table 1 p. 22). They are: Roraima (3.7), Amapá (1.7), Federal District (1.3), Mato Grosso do Sul (0.7), Espírito Santo (0.6), Maranhão (0.4), Tocantins (0.4), Mato Grosso (0.3) and Santa Catarina (0.3). The other states had values equal to or below the national rate in 2010. Within this table, it was possible to infer that the states of Roraima, Amapá and the Federal District are noteworthy because they had rates above 1.0, considered to be at least five times above of the national rate for the year analyzed (Table 1).

States	2010		2011		2012		2013		2014		2015		2016		2017		2018	
	nº	DR	nº	DR	nº	DR	nº	DR	nº	DR	nº	DR	nº	DR	nº	DR	nº	DR
Brazil	414	0,2	454	0,2	642	0,3	839	0,4	989	0,4	1069	0,5	942	0,4	899	0,4	938	0,4
Acre	0	0	4	0,5	2	0,3	1	0,1	0	0	2	0,2	0	0	0	0	1	0,1
Alagoas	2	0,1	0	0	2	0,1	3	0,1	4	0,1	3	0,1	4	0,1	0	0	2	0,1
Amapá	12	1,7	0	0	0	0	0	0	0	0	1	0,1	0	0	0	0	0	0
Amazonas	1	0,03	6	0,2	73	2	136	3,6	145	3,8	151	3,9	210	5,3	133	3,3	114	2,8
Bahia	28	0,2	30	0,2	32	0,2	25	0,2	12	0,1	18	0,1	27	0,2	26	0,2	14	0,1
Ceará	6	0,1	16	0,2	10	0,1	12	0,1	12	0,1	12	0,1	32	0,4	25	0,3	23	0,3
Distrito Federal	33	1,3	35	1,3	17	0,6	19	0,7	25	0,9	17	0,6	22	0,8	32	1,1	31	1
Espírito Santo	23	0,6	16	0,4	11	0,3	25	0,7	24	0,6	46	1,2	30	0,8	26	0,7	44	1,1
Goias	14	0,2	23	0,4	21	0,3	22	0,3	39	0,6	27	0,4	16	0,2	22	0,3	34	0,5
Maranhão	29	0,4	17	0,3	19	0,3	13	0,2	19	0,3	13	0,2	14	0,2	13	0,2	17	0,2
Mato Grosso	9	0,3	5	0,2	8	0,3	5	0,2	7	0,2	3	0,1	3	0,1	5	0,1	7	0,2
Mato Grosso do Sul	18	0,7	17	0,7	14	0,5	20	0,8	14	0,5	21	0,8	17	0,6	19	0,7	10	0,4
Minas Gerais	25	0,1	18	0,1	19	0,1	28	0,1	27	0,1	38	0,2	58	0,3	49	0,2	66	0,3
Pará	1	0,01	0	0	12	0,2	11	0,1	10	0,1	13	0,2	8	0,1	6	0,1	6	0,1

Paráíba	4	0,1	2	0,1	13	0,3	6	0,2	5	0,1	6	0,2	5	0,1	3	0,1	5	0,1
Paraná	17	0,2	14	0,1	23	0,2	51	0,5	54	0,5	38	0,3	38	0,3	53	0,5	60	0,5
Pernambuco	4	0,04	7	0,1	12	0,1	8	0,1	10	0,1	9	0,1	16	0,2	7	0,1	12	0,1
Piauí	7	0,2	4	0,1	7	0,2	10	0,3	19	0,6	11	0,3	18	0,6	16	0,5	11	0,3
Rio de Janeiro	39	0,2	35	0,2	42	0,3	67	0,4	157	0,9	220	1,3	210	1,2	275	1,6	276	1,6
Rio Grande do Norte	5	0,2	1	0,03	2	0,1	0	0	3	0,1	2	0,1	0	0	1	0,03	1	0,03
Rio Grande do Sul	14	0,1	21	0,2	25	0,2	45	0,4	18	0,2	28	0,3	36	0,3	33	0,3	27	0,2
Rondônia	1	0,1	3	0,2	3	0,2	5	0,3	3	0,2	4	0,2	3	0,2	4	0,2	5	0,3
Roraima	17	3,7	11	2,3	4	0,8	5	1	4	0,8	1	0,2	1	0,2	2	0,4	1	0,2
Santa Catarina	19	0,3	20	0,3	27	0,4	23	0,3	25	0,4	20	0,3	26	0,4	31	0,4	22	0,3
São Paulo	78	0,2	146	0,3	238	0,6	295	0,6	350	0,8	362	0,8	144	0,3	111	0,2	143	0,3
Sergipe	3	0,1	1	0,05	4	0,2	1	0,05	3	0,1	2	0,1	1	0,04	4	0,2	0	0
Tocantins	5	0,4	2	0,1	2	0,1	3	0,2	0	0	1	0,1	3	0,2	3	0,2	6	0,4

Table 1: Absolute poisoning deaths and death rate per 100,000 inhabitants in the states of Brazil (2010-2018).

DR = Death rate from poisoning/100,000 inhabitants. n° = Absolute number of deaths from intoxication.

Death rate values above the respective national rates highlighted in yellow. Source: Author's own compilation (2021).

In 2011 the national rate remained at 0.2, the states, Roraima (2.3), Federal District (1.3), Mato Grosso do Sul (0.7), Acre (0.5), Espírito Santo (0.4), Goiás (0.4), Maranhão (0.3), Santa Catarina (0.3) and São Paulo (0.3) were above the national rate in 2011. Compared to the year Previously, all the states that remained in the upper range showed a considerable drop, only the state of Acre was an exception, as in the previous year it did not present its rate above the national average (Table 1).

In 2012, the states with rates above the national rate (0.3) this year were: Amazonas (2.0), Roraima (0.8), Distrito Federal (0.6), São Paulo (0.6) and Mato Grosso do Sul (0.5). We can particularly highlight the sharp increase in the state of Amazonas and the presence of the state of São Paulo with rates above the national rate (Table 1).

In 2013 it was possible to observe a sharp increase in the state of Amazonas (3.6) and the states that showed an increase compared to the 2013 national rate (0.4) were: Roraima (1.0), Mato Grosso do Sul (0, 8), Federal District (0.7), Espírito Santo (0.7), São Paulo (0.6) and Paraná (0.5). In 2014 the state of Amazonas (3.8) continued to show high rates and Roraima (0.8) continued to show a year-on-year decline.

The other states that showed rates above the national average were: Mato Grosso do Sul (0.5), Paraná (0.5), Piauí (0.6), Goiás (0.6), Espírito Santo (0.6), São Paulo (0.8), Federal District (0.9) and Rio de Janeiro (0.9). At this point, we emphasize the state of São Paulo, which has had a strong accession over the years presented, and the state of Rio de Janeiro, appearing for the first time above the national average and with a pronounced rate (Table 1).

In 2015, the state of Amazonas (3.9) remains with high rates and, for the first time, throughout the temporal analysis, the state of Roraima (0.2) has an index below the national rate in 2015 (0.5). The states of Espírito Santo (1.2) and Rio de Janeiro (1.3) presented rates above 1, a number that is accentuated in view of previous years, corroborating the temporal rise of cases. The other cases that presented rates above the national average were: São Paulo (0.8), Mato Grosso do Sul (0.8) and Distrito Federal (0.6). In 2016, the national rate of 0.4 was observed. The rate in the state of Amazonas (5.3) strikes us, as it increased by approximately 28% in one year. The states of Espírito Santo and Distrito Federal (0.8), Rio de Janeiro (1.2), Piauí (0.6) and Mato Grosso do Sul (0.6) remained with rates above the national average (Table 1).

In 2017, with a national rate of 0.4 as well, the state of Amazonas (3.3) still had high rates, but it did not follow the trend of sharp increase over the years. The other states that were above the national average were: Rio de Janeiro (1.6), Federal District (1.1), Mato Grosso do Sul (0.7), Espírito Santo (0.7), Piauí (0.5) and Paraná (0.5). At this point, it is possible to bear in mind that the state of Rio de Janeiro presents an upward trend in rates in the last three years. Finally, the year 2018 remained the same national rate as the previous year and little changed in relation to the general picture of states, maintaining a high rate for the state of Amazonas (2.8), the states of Espírito Santo (1.1) and Rio de Janeiro (1.6) maintained the trend above 1.0 and the states of Paraná (0.5), Goiás (0.5) and Distrito Federal (1.0) also presented rates above this year's national rate (0.4) (Table 1).

When performing a comparative analysis, it was noted that, according to Silva, *et al.* (2020), between 2000 and 2016, in Brazil, cases of poisoning ranged from 25% to 35%. The years 2000, 2006, 2007 and 2015 had the highest percentage rates among the years analyzed. In 2016, the highest percentage peak of all years was recorded, accounting for 35.78%, corroborating the indices presented in this study for the state of Amazonas. Another factor that the author shows that according to the temporal analysis of gender shows that, in all years, the main cause of intoxication is the female masses. From 2000 to 2016, the female audience has always exceeded 60%. In 2008 alone, this proportion was 58.57%, so this year the male audience reached 40.79%.

It is known that Brazilians have the habit of stocking medicines, which can favor suicide attempts and intoxication by self-medication, which is the main cause of intoxication in Brazil. Even observing the advances achieved in the health area, the public and private sectors still have difficulties in accessing services, delays and poor quality of medical services. In addition to these aspects, the placement of advertisements for over-the-counter medications in the media, the existence of medications at home and the belief that medications solve everything, being an important factor in the practice of self-medication. Currently, Brazil is undergoing many changes in the health field. Brazil has invested in financing and infrastructure to increase the supply of health services, especially in the area of primary health care, family health strategy and in the area of drug assistance, to ensure that the entire community has free access and rational use of medicines. These changes vary from region to region, but even with obvious regional inequality, greater access to medical services can reduce self-medication and, consequently, the death rates presented previously [12].

Conclusion

At the end of this work, it was possible to conclude that the indiscriminate use of drugs and other toxic agents becomes a major public health problem, which, as described in the data above, represents large numbers of human intoxications registered in the regions and states of Brazil. Medications are very lethal when they are not administered in a way to guarantee their potential effects, since what differs from saving a patient's life or killing him is the dose. In this scenario, pharmaceutical monitoring is necessary in order to ensure the quality of the individual's drug treatment, as well as to adopt restrictive measures in relation to possible poisoning by other agents.

From the data presented, we can conclude that the North region showed higher rates of deaths from poisoning, highlighting the states of Roraima between 2010 and 2014 and the State of Amazonas between 2012 and 2018. It is essential that the responsible authorities take measures in order to reduce such percentages, which, each year, have increased more and more. It should also seek to ensure the

correct and rational use of medicines and other toxic substances and, in this way, contribute to the reduction of cases of intoxication in Brazil, especially in the North region and in the aforementioned states.

Conflict of Interest

Declare if any financial interest or any conflict of interest exists.

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