

Exogenous intoxication in patients treated at the Toxicological Information and Assistance Center during the COVID-19 pandemic

Intoxicação exógena em pacientes atendidos no Centro de Informação e Assistência Toxicológica em tempos da pandemia da COVID-19

Intoxicaciones exógenas en pacientes atendidos en el Centro de Asistencia e Información Toxicológica en tiempos de la pandemia COVID-19

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Abstract

Poisoning is defined as an adverse event resulting from the action of chemical substances that induces a pathology in an individual. The World Health Organization (WHO) has reported three million hospital admissions occurring annually due to toxic exposure worldwide. The growth of SARS-CoV-2 infection cases in 2020 also significantly increased calls to Poison Centers due to exposure to cleaning products, hand sanitizers, and disinfectants in early March 2020 in the United States. Based on this scenario, it was hypothesized that the pattern of exogenous intoxication has changed. Therefore, the aim of this study was to analyze the epidemiological profile of exogenous intoxications recorded by CIATOX-DF from March 2020 to February 2021, during the COVID-19 pandemic. At that time, there was an increase in accidental, environmental, venomous, and non-venomous animal cases, especially in babies, pre-adolescents, adolescents (11 to 15 years old), and women, due to the greater exposure of this age group and gender who have spent more time in rural environments. Most poisonings were accidental. It was observed that there was a decrease in suicide cases, but within these cases, there was a trend increase in poisoning in pre-adolescents and adolescents (11 to 15 years old) compared to other ages, which can be related to an increase in anxiety within this age group. The main toxic agents were venomous and non-venomous animals. The pattern of high frequency in cases involving medicines, pesticides, and household cleaning products was maintained, with a significant increase in cases involving 70% alcohol. It was found that patients living in towns further away from the Pilot Plan in Brasilia suffer

accidents involving venomous animals. Accidental and attempted suicide cases occurred more frequently in cities closer to the Pilot Plan region. We concluded that these changes were explained by the new pattern of social behavior during the pandemic.

Keywords: Intoxications; Suicide; COVID-19; Federal District.

Resumo

Intoxicação é definida como um evento adverso decorrente da ação de substâncias químicas que geram uma patologia ao indivíduo. A OMS reportou que três milhões de admissões hospitalares ocorrem anualmente devido à exposição tóxica em todo o mundo. Com a progressão dos casos de infecção pelo SARS-CoV-2 em 2020, as ligações para os Centros de Intoxicações, devido exposição à produtos de limpeza, álcool em gel e desinfetantes, aumentaram rapidamente no início de março de 2020 nos EUA. Diante dessa observação, foi levantada a hipótese que o padrão de intoxicação exógena mudou para outros agentes tóxicos. Por isto este trabalho teve como objetivo analisar o perfil epidemiológico das intoxicações exógenas registradas pelo CIATOX-DF, durante os meses de março de 2020 até fevereiro de 2021, período vigente a pandemia por COVID-19. Durante a pandemia de COVID-19, observou-se um aumento dos casos acidentais, ambientais, de animais peçonhentos e não peçonhentos, especialmente os bebês e pré-adolescentes e adolescentes (11 a 15 anos) e em mulheres, devido a maior exposição desta faixa etária e gênero que ficaram mais no ambiente rural. As intoxicações apresentam em sua maioria como acidentais, que intensificaram. Foi possível observar diminuição dos casos de suicídios, mas dentro dos casos de suicídios houve tendência de aumento dos casos de intoxicações por pré-adolescentes e adolescentes (11 a 15 anos) em relação as outras idades, sendo explicado pelo aumento da ansiedade dentro desta faixa etária. Os principais agentes tóxicos foram os animais peçonhentos e não peçonhentos. Continuou com alta frequência dos casos de medicamentos, agrotóxicos e domissanitários, com aumento significativo dos casos com álcool a 70%. Observa-se que pacientes moradores em cidades mais afastadas do plano sofrem acidentes com animais peçonhentos. Os casos acidentais e de tentativas de suicídios ocorrem mais em cidades mais próximas ao plano piloto. Conclui-se que estas mudanças se explicam pelo novo padrão de comportamento social durante a pandemia.

Palavras-chave: Intoxicação; Suicídio; COVID-19; Distrito Federal.

Resumen

El envenenamiento se define como un evento adverso resultante de la acción de sustancias químicas que causan patología en el individuo. La OMS informó que anualmente se producen tres millones de ingresos hospitalarios debido a la exposición a sustancias tóxicas en todo el mundo. Con la progresión de los casos de infección por SARS-CoV-2 en 2020, las llamadas a los centros de toxicología debido a la exposición a productos de limpieza, desinfectantes para manos y desinfectantes aumentaron rápidamente a principios de marzo de 2020 en EE. UU. Dada esta observación, se planteó la hipótesis de que el patrón de intoxicación exógena cambiaba con otros agentes tóxicos. Por lo tanto, este trabajo tuvo como objetivo analizar el perfil epidemiológico de las intoxicaciones exógenas registradas por CIATOX-DF, durante los meses de marzo de 2020 a febrero de 2021, período en el que estuvo vigente la pandemia de COVID-19. Durante la pandemia de COVID-19 se observó un aumento de casos accidentales y ambientales de animales venenosos y no venenosos, especialmente en bebés y preadolescentes y adolescentes (11 a 15 años) y en mujeres, debido a una mayor exposición a esta enfermedad, grupo de edad y género que permanecieron más en el medio rural. La mayoría de las intoxicaciones son accidentales, lo que se intensifica. Se pudo observar una disminución en los casos de suicidio, pero dentro de los casos de suicidio hubo una tendencia al aumento de los casos de intoxicaciones por parte de preadolescentes y adolescentes (11 a 15 años) en relación a otras edades, explicado por el aumento en ansiedad dentro de este rango de edad. Los principales agentes tóxicos fueron los animales venenosos y no venenosos. Continuó habiendo una alta frecuencia de casos relacionados con medicamentos, pesticidas y productos de limpieza del hogar, con un aumento significativo de los casos relacionados con alcohol al 70%. Se observa que los pacientes que viven en ciudades más alejadas del plan sufren accidentes con animales venenosos. Los casos de accidentes e intentos de suicidio ocurren más en las ciudades más cercanas al plan piloto. Se concluye que estos cambios se explican por el nuevo patrón de comportamiento social durante la pandemia. Palabras clave: Intoxicación; suicidio; COVID-19; Distrito Federal.

Palabras clave: Intoxicación; Suicidio; COVID-19; Distrito Federal.

1. Introduction

Poisoning is defined as an adverse event resulting from the action of chemical substances that generate a pathology in an individual (Almeida et al., 2012). When there is a suspicion of poisoning, the case is potentially serious because even patients who do not show symptoms can have a hazardous outcome (Hernandez et al., 2017). Consequentially, delayed transfer or inappropriate management can lead to serious complications (Fayed & Sharif, 2021). Also, human poisoning can result in significant costs for the health system due to prolonged periods of hospitalization, complex procedures, specialized care, and

demands for guaranteed supplies (medication and diagnostic support) (Coutinho & Fook, 2017). Therefore, understanding the dynamics of poisoning helps reduce costs.

The World Health Organization has reported three million hospital admissions occurring annually due to toxic exposure worldwide (Fayed & Sharif, 2021). Developed countries have an annual incidence of poisoning between 0.2 and 0.9 per 1,000 people, an incidence that is continually increasing (Toscano et al., 2016). In Brazil, around 1.5 to 3% of the population is exposed to toxic agents, and there are 4,800,000 annual cases of exogenous poisoning (Maraschin et al., 2020).

The United States of America (USA) already had household cleaning products as the second most frequently involved substance category in toxic exposure among humans in 2018 (Gummin et al., 2019). With the growth of SARS-CoV-2 infection cases in 2020, there was a rapid increase in calls to Poison Centers starting in early March. This rise was particularly associated with exposure incidents involving cleaning products, hand sanitizers, and disinfectants (Chang et al., 2020). Notably, this was observed in other countries. In Croatia, poisonings from exposure to disinfectants doubled and exposure to cleaning products increased ninefold in the first half of 2020 (Babić et al., 2020). Italy recorded an overall 5% increase in calls compared to 2019, and most of the inquiries were related to poisoning from cleaning products (Soave et al., 2021). Brazil recorded a more substantial increase, it was also found that after the cleaning recommendations for disinfecting objects and surfaces, the Poison Centers recorded a 22.30% increase in cases of poisoning by cleaning products from January to April 2020, compared to the same period in 2019 (ANVISA, 2020).

Another important aspect of poisoning profiles is the exposure type, and accidental poisoning is the most important in reports from several countries (Babić, Turk, Macan, 2020; SINITOX, 2017). However, attempted suicide is a predominant condition pointed out by previous studies (Zhang et al., 2018; Maria et al., 2018; Chelkeba et al., 2018).

It is known that during epidemics and isolation periods, the incidence or worsening of mental health conditions tends to increase (Barro et al., 2020). Hence, it is also important to evaluate this aspect, since the unpredictability and uncertainty of the COVID-19 pandemic, the fear of infection, and environmental changes are stress factors that can be a key risk factor for suicidal ideation (Zhang et al., 2018; Kahil et al., 2020), and one of the ways in which an individual can carry out a suicide attempt is through intoxication.

Therefore, considering that with the COVID-19 pandemic there has been an increase in exposure to cleaning products and in the risk of suicide attempts, it is expected that the profile of poisonings has changed. Accordingly, this study aimed to assess the epidemiological profile of exogenous poisonings during the pandemic and determine whether the behavioral pattern of poisonings treated at the Federal District Poison Center (CIATOX-DF) had changed between March 2020 and March 2021. It also sought to show the applicability of this study for potential preventive measures.

To analyze the epidemiological profile of exogenous intoxications recorded by CIATOX-DF from March 2020 to February 2021, during the COVID-19 pandemic onset in Brazil.

2. Methodology

Systematic analysis

The bibliography was obtained through a systematic review.

Study Design

A descriptive, cross-sectional, and analytical study was carried out.

Data collection

The data on poisoning cases from 2004 to 2019 and March 2020 to March 2021 were taken from the CIAT DF program version 01, exported to Excel, and evaluated using descriptive frequency analyses and multivariate analyses.

The statistical program used was the Système Portable d'Analyse (SPAD) package, version 7.4 (Lebart, Morineau, Lambert, 2010). This is the professional version, which can work with a larger number of individuals and variables, from the manufacturer Coheris, a version created in 2010.

The variables used were age, sex, toxic agent, active ingredient, satellite cities, time of most frequent attendance, and their correlation with the poisoning type or exposure with the Human Development Index (HDI).

Statistical analysis

The data found were counted and presented in graphs and tables in descriptive frequency analysis.

The data were run to multivariate data analysis: Multiple Correspondence Analysis (MCA) and Hierarchical Cluster Analysis (HCA), constructing a dendrogram (Everitt & Dunn, 2001).

The groupings in the analysis of all the patients have a p-value less than 0.05.

Descriptive frequency analysis

The data were counted and grouped as graphs and tables.

Multiple Correspondence Analysis (MCA)

The MCA general conception, among other aspects, is the inclusion of categorical variables appropriate for nominal data, as it can transform qualitative data into data frequencies, i.e., quantitative data, which can be calculated by HCA. It is named MCA because it studies the correspondence between variables and individuals (rows and columns). This method allows the graphical visualization of the important relationships between a large set of variables (categorical and continuous categorical or continuous illustrative) (Carvalho & Struchiner, 1992).

MCA starts from a data matrix and converges to a graph that displays the rows and columns of the matrix as points in a vector space with a smaller dimension than the original one. To establish correlation between rows, columns and between rows and columns that can be interpreted (Greenacre & Hastle, 1987; Abdi & Valentin, 2007; Greenacre, 2007), it also calculates the eigenvalues and determines the amount of information present on each axis of the graph (Abdi & Valentin, 2007). This amount of information, represented by the percentage of information, must be re-evaluated to discount the overestimation of coding present in each variable (Greenacre, 2007).

Hierarchical Cluster Analysis (HCA)

HCA was used to study the similarities between samples based on the distribution of variables. The nearest neighbor technique using the Benzecri Algorithm (Abdi & Valentin, 2007) was applied to verify this similarity, and hierarchical clusters were formed according to Ward's Minimum Variance Method (Ward, 1963).

HCA seeks to group samples into classes based on the similarity of individuals or patients. The graphical representation obtained is named a dendrogram or decision tree, a two-dimensional graph that represents the grouping of individuals into clusters (Gower, 1966; Hair, Anderson, Tatham, 2007; Sharaf, Illman, Kowalski, 1986; Beebe, Pell, Seasholtz, 1998; Correia & Ferreira, 2007; Kinggerndorf, Gaul, Eollweber, 2011; Beckstead, 2002).

Ethical aspects

This study complies with the requirements of CNS Resolution 466/12 and its complements. The risks of identifying the research subjects were avoided by the researcher in charge, who listed only their initials. The project was submitted to the FEPECS/SES-DF Research Ethics Committee (CEP), CAAE 557292211.1.0000.5553.

3. Results

Systematic Analysis

To carry out the systematic analysis, the following descriptors were used: intoxication, COVID, pandemic, medicines, pesticides, drugs of abuse, household cleaning products, bleach, suicides, children, venomous animals, cosmetics, plants, industrial chemicals, 70% alcohol, vacations, social distancing, anxiety, depression, and toxic substances. With these descriptors, 1313 articles were found. By evaluating the abstracts, the articles were reduced to 41, which were included in the bibliography of this study.

Table 1 - Articles found by alternating descriptors.

| Descriptors | Total articles searched |
|--|--------------------------------|
| Poisoning; Covid; Pandemic; Medicines | 184 |
| Poisoning; Covid; Pandemic; Pesticides | 29 |
| Poisoning; Covid; Pandemic; Drugs of abuse | 71 |
| Poisoning; Covid; Pandemic; Household cleaning products | 17 |
| Poisoning; Covid; Pandemic; Bleach | 4 |
| Poisoning; Covid; Pandemic; Suicide | 93 |
| Poisoning; Covid; Pandemic; Children | 179 |
| Poisoning; Covid; Pandemic; Venomous Animals | 8 |
| Poisoning; Covid; Pandemic; Cosmetics | 24 |
| Poisoning; Covid; Pandemic; Plants | 95 |
| Poisoning; Covid; Pandemic; Industrial Chemicals | 46 |
| Poisoning; Covid; Pandemic; 70% alcohol | 116 |
| Poisoning; Covid; Pandemic; Vacation | 8 |
| Poisoning; Covid; Pandemic; Social distancing | 118 |
| Poisoning; Covid; Pandemic; Anxiety | 154 |
| Poisoning; Covid; Pandemic; Depression | 167 |

Source: Authors.

Descriptive analysis

This study compared the pattern of poisoning cases during and before the pandemic.

There was an increase in the number of cases from 2004 to 2019, with a drop in 2016 and 2017. Comparing the pandemic period with 2018 and 2019, there were fewer cases during the pandemic. Comparing the pandemic with the years prior to 2017, there were a higher number of cases during the pandemic.

Table 2 - Poisoning cases registered by CIATOX-DF (2004 – 2019) and during COVID-19 (March/2020 - February/2021).

| Year | Poisonings Cases (n) | % |
|------------------------------------|----------------------|------------|
| 2004 | 288 | 0.89 |
| 2005 | 443 | 1.37 |
| 2006 | 1,023 | 3.17 |
| 2007 | 1,396 | 4.33 |
| 2008 | 1,444 | 4.48 |
| 2009 | 1,680 | 5.21 |
| 2010 | 1,423 | 4.41 |
| 2011 | 2,307 | 7.16 |
| 2012 | 2,863 | 8.88 |
| 2013 | 2,990 | 9.28 |
| 2014 | 2,906 | 9.02 |
| 2015 | 2,849 | 8.84 |
| 2016 | 1,699 | 5.27 |
| 2017 | 2,118 | 6.57 |
| 2018 | 3,493 | 10.84 |
| 2019 | 3,292 | 10.21 |
| Total | 32,214 | 100 |
| COVID-19 Pandemic | | |
| 2020 (March - December) | 2,301 | 77.16 |
| 2021 (January and February) | 681 | 22.83 |
| March/2020 to February/2021 | 2,982 | 100 |

Source: Authors.

It was found that during the pandemic there were more cases of scorpion and spider bites, non-venomous animals, other venomous or poisonous animals, and snake bites. The other agents had a lower percentage of occurrences. There was a significant decrease in domestic pesticides, raticides, drugs of abuse, agricultural pesticides, and veterinary products.

Table 3 - Frequency of cases distributed by toxic agents (2004 – 2019) and during COVID-19 pandemic (March/2020 – February/2021).

| Toxic Agent | 2004 to 2019 | % | March/2020 to February/2021 | % |
|---|--------------|-------|-----------------------------|-------|
| MEDICINES | 12,280 | 38.78 | 1,082 | 40.20 |
| HOUSEHOLD CLEANING PRODUCTS | 4,028 | 12.72 | 326 | 12.11 |
| VENOMOUS ANIMALS (SCORPIONS) | 1,789 | 5.65a | 279 | 10.36 |
| INDUSTRIAL CHEMICALS | 2,715 | 8.57 | 196 | 7.28 |
| NON-VENOMOUS ANIMALS | 672 | 2.12a | 124 | 4.60 |
| PESTICIDES/DOMESTIC USE | 1,624 | 5.12 | 113 | 4.19 |
| OTHER POISONOUS/VENOMOUS ANIMALS | 480 | 1.51a | 100 | 3.71 |
| VENOMOUS ANIMALS (SNAKES) | 857 | 2.70a | 84 | 3.12 |
| COSMETICS | 850 | 2.68 | 70 | 2.60 |
| RATICIDES | 1,175 | 3.71b | 68 | 2.52 |
| PLANTS | 707 | 2.23 | 60 | 2.22 |
| VENOMOUS ANIMALS (SPIDERS) | 513 | 1.62 | 44 | 1.63 |
| DRUGS OF ABUSE | 660 | 2.08b | 36 | 1.33 |
| PESTICIDES/AGRICULTURAL USE | 1,471 | 4.64b | 32 | 1.18 |
| OTHERS | 675 | 2.13 | 28 | 1.04 |

| | | | | |
|---------------------------|---------------|-------|--------------|------|
| UNKNOWN | 370 | 1.16 | 21 | 0.78 |
| VETERINARY PRODUCTS | 349 | 1.10b | 10 | 0.37 |
| VENOMOUS ANIMALS (LONOMY) | 109 | 0.34 | 8 | 0.29 |
| FOOD | 142 | 0.44 | 5 | 0.18 |
| METALS | 196 | 0.61 | 5 | 0.18 |
| TOTAL | 32,214 | | 2,982 | |

*a.: Chi-square analysis of significant upward change in pattern; *b.: Chi-square analysis of significant downward change in pattern (p<0.05). Source: Authors.

The pattern of cases between the sexes shows an increase in cases occurring with females. Poisoning increased in the urban area. There was an increase in cases that progressed to a cure and a decrease in deaths, as shown in figure 3.

Table 4 – Description of sex, area of occurrence and evolution of poisoning cases assisted at CIATOX -DF.

| Sex | 2004 - 2019 | % | March/2020 - February/2021 | % |
|----------------------|---------------|--------------|----------------------------|--------------|
| Female | 13,816 | 51.05a | 1,150 | 53.66a |
| Ignored | 28 | 0.10 | 1 | 0.04 |
| Male | 13,217 | 48.84 | 992 | 46.29 |
| Not informed | 5,153 | - | 839 | - |
| Total | 32,214 | | 2,982 | |
| Region | 2004 - 2019 | % valid data | March/2020 - February/2021 | % valid data |
| Ignored | 238 | 1.12 | 7 | 0.32 |
| Rural | 2,000 | 9.41b | 171 | 8.01b |
| Urban | 25,003 | 89.47a | 1,956 | 91.65a |
| Not informed | 10,973 | - | 848 | - |
| Total | 32,214 | | 2,982 | |
| Poisoning Evolution | 2004 - 2019 | % valid data | March/2020 - February/2021 | % valid data |
| Death | 172 | 0.61 | 7 | 0.32 |
| Death (Other reason) | 21 | 0.07 | 1 | 0.04 |
| Cure | 19,292 | 69.20a | 1,679 | 77.44a |
| Supposed cure | 5,678 | 20.36 | 351 | 16.19 |
| Ignored | 804 | 2.88 | 40 | 0.18 |
| Other | 976 | 3.50 | 76 | 3.50 |
| Sequelae | 168 | 0.60 | 14 | 0.64 |
| Not informed | 5,103 | - | 814 | - |
| Total | 32,982 | | 2,982 | |

*a.: Chi-square analysis of significant upward change in pattern; *b.: Chi-square analysis of significant downward change in pattern (p<0.05). Source: Authors.

During the pandemic, however, there was an increase in cases of poisoning in babies (months) and pre-adolescents and adolescents (11 to 15 years old) when looking at the group of the 20 ages with the most cases.

Table 5 - Distribution of cases considering the 20 most frequent ages.

| Age (years) | 2004 - 2019 | % | Age (Years) | March/2020 - February/2021 | % |
|--|-------------|--------|---------------------------------------|----------------------------|--------|
| It is not among the 20 most frequent. | | | Months of age | 169 | 5.65a |
| 1 - 5 | 10030 | 31.13b | 1 - 5 | 794 | 26.61b |
| 6 - 10 | 829 | 2.57 | 9 | 35 | 1.17 |
| 11 -15 | 697 | 2.15a | 11 -15 | 93 | 3.11a |
| 16- 20 | 1919 | 5.94b | 16 - 20 | 96 | 3.21b |
| 21 - 25 | 1874 | 5.8 | 21 - 25 | 129 | 4.31 |
| 30 | 333 | 1.03b | It is not among the 20 most frequent. | | |

*a.: Chi-square analysis of significant upward change in pattern; *b.: Chi-square analysis of significant downward change in pattern (p<0.05). Source: Authors.

Accidental cases were the most frequent. Environmental cases also increased, as represented by accidents involving venomous animals. Occupational cases showed a decline.

Table 6 - Circumstances of poisoning cases treated at CIATOX - DF.

| Circumstances | 2004 - 2019 | % | March/2020 - February/2021 | % valid data |
|--------------------------------|---------------|------------|----------------------------|--------------|
| ABSTINENCE | 10 | 0.03 | 0 | 0 |
| ABUSE | 391 | 1.22 | 19 | 0.64 |
| ACCIDENTAL | 20,261 | 63.56a | 2,083 | 70.41a |
| FOOD | 160 | 0.50 | 3 | 0.10 |
| ENVIRONMENTAL | 998 | 3..3a | 162 | 5.47a |
| AUTOMEDICATION | 165 | 0.51 | 6 | 0.20 |
| ADMINISTRATION ERROR | 978 | 3.06 | 44 | 1.48 |
| IGNORED | 496 | 1.55 | 18 | 0.60 |
| FOLK MEDICINE | 46 | 0.14 | 1 | 0.03 |
| OCCUPATIONAL | 797 | 2.50b | 25 | 0.84b |
| OTHER INTENTIONAL | 298 | 0.93 | 15 | 0.50 |
| OTHER UNINTENTIONAL | 282 | 0.88 | 27 | 0.91 |
| INADEQUATE PRESCRIPTION | 57 | 0.17 | 5 | 0.16 |
| ATTEMPTED ABORTION | 25 | 0.07 | 0 | 0 |
| ATTEMPTED SUICIDE | 5,623 | 17.64 | 491 | 16.59 |
| INAPPROPRIATE USE | 518 | 1.62 | 24 | 0.81 |
| THERAPEUTIC USE | 706 | 2.21 | 31 | 1.04 |
| VIOLENCE/HOMICIDE | 66 | 0.20 | 4 | 0.13 |
| Total | 31,877 | 100 | 2,958 | 100 |

*a.: Chi-square analysis of significant upward change in pattern; *b.: Chi-square analysis of significant downward change in pattern (p<0.05). Source: Authors.

Multivariate analysis

The data submitted to the Multiple Correspondence Analysis obtained an accumulated percentage of 70.4% in the first three factorial axes. The cases were subdivided into 7 or 18 clusters, according to the dendrogram. All the data for the significant variables presented had a p-value less than 0.05.

The second factorial axis separated the cases of sodium hypochlorite, raticides, antidepressants, and 70% alcohol from the cases of snakes, scorpions, plants, and non-venomous animals.

The main observations in Figure 01 explain the impact of the pandemic on poisoning cases in the Federal District and are presented in the following clusters:

Cluster 1 shows a correlation between cases of information-seeking between traditional venomous animals such as scorpions and other venomous animals, which occurred in homes in the afternoons and evenings with a concentration between the months of June and August.

Cluster 2 confirms that during the pandemic there were significant cases of non-venomous animals in rural areas, in the cities of Sobradinho and Valparaíso de Goiás, occurring between the months of January, February, and April, in 2021.

Cluster 3 displays cases of scorpion incidents, with higher occurrences during the pandemic, particularly affecting babies. Descriptive data pointed to a concentration in Planaltina, Paranoá, and Valparaíso de Goiás, occurring in December and January.

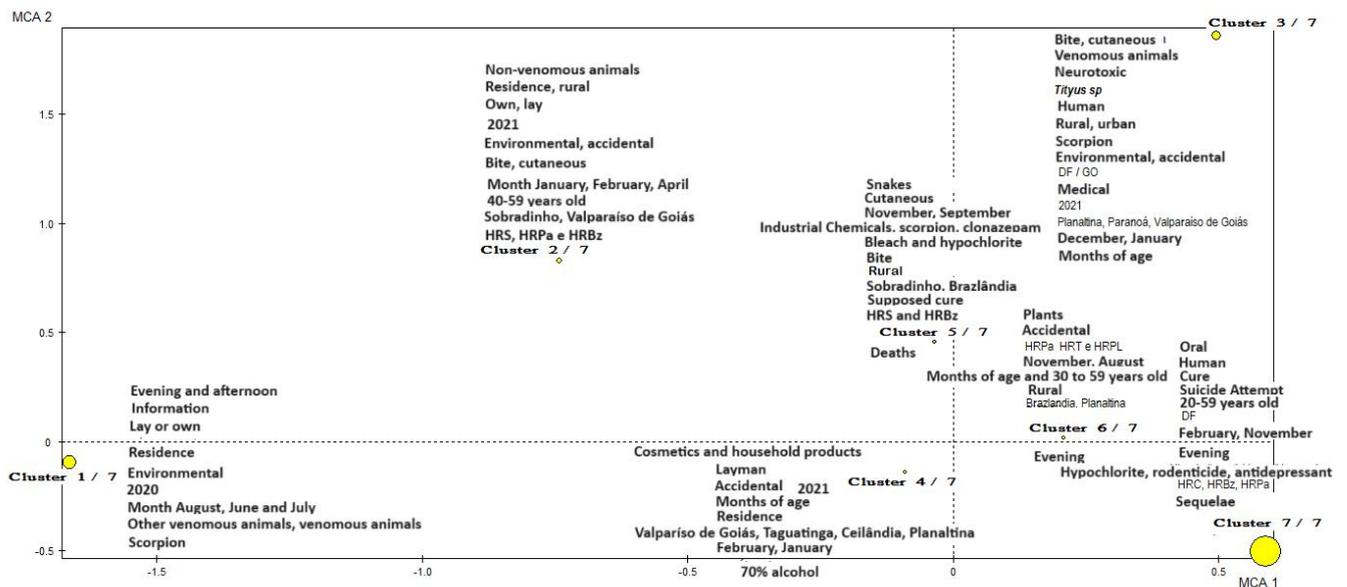
Cluster 4 highlights poisoning by household products or cosmetics, such as 70% alcohol, mainly in babies, accidentally, corroborating the data in Table 5. These events occurred between the months of January and February.

Cluster 5 separates cases related to snakes in Brazlândia and Sobradinho. These cities, known for a history of snake accidents, experienced an increase in the number of cases in September and November, as shown in Table 6 of environmental cases.

Cluster 6 isolates cases of accidental plant poisonings affecting both babies and adults in the rural areas of Brazlândia and Planaltina. These events occurred more frequently in August and November.

Cluster 7 comprises the most serious cases, involving sequelae. This cluster includes cases of poisoning with hypochlorite, raticides, and antidepressants by attempted suicide during the evening, with a slightly lower percentage during the pandemic but with a decrease in the age pattern, according to Tables 5 and 6. These events occurred in February and November.

Figure 1 - MCA graph with seven clusters.



Source: Authors.

Cluster 7, considered the most serious, was subdivided into 9 clusters, from 10 to 18 clusters, observed in Figure 02.

Cluster 10 isolates the cases of poisoning by raticides, chumbinho, attempted suicide, in women, in Valparaíso de Goiás and São Sebastião and Paranoá, in patients aged 10 to 39 in 2021.

Cluster 11 shows cases of pesticides, bleach, clonazepam, and 70% alcohol in women treated at the HRSM in July, aged between 20 and 49.

Cluster 12 shows cases of attempted suicide in Paranoá, Planaltina, and São Sebastião, in females, in the evening, aged 50 to 59, with clonazepam and lead.

Cluster 13 isolated patients from Brazlândia, treated at the Brazlândia hospital in November and March, in the , aged 50 to 59, accidentally and with pesticides and glycolic acid. This cluster represents cases of accidents at work among rural workers.

Cluster 14 separated patients from Paranoá who attempted suicide, aged between 20 and 59, female, with drugs.

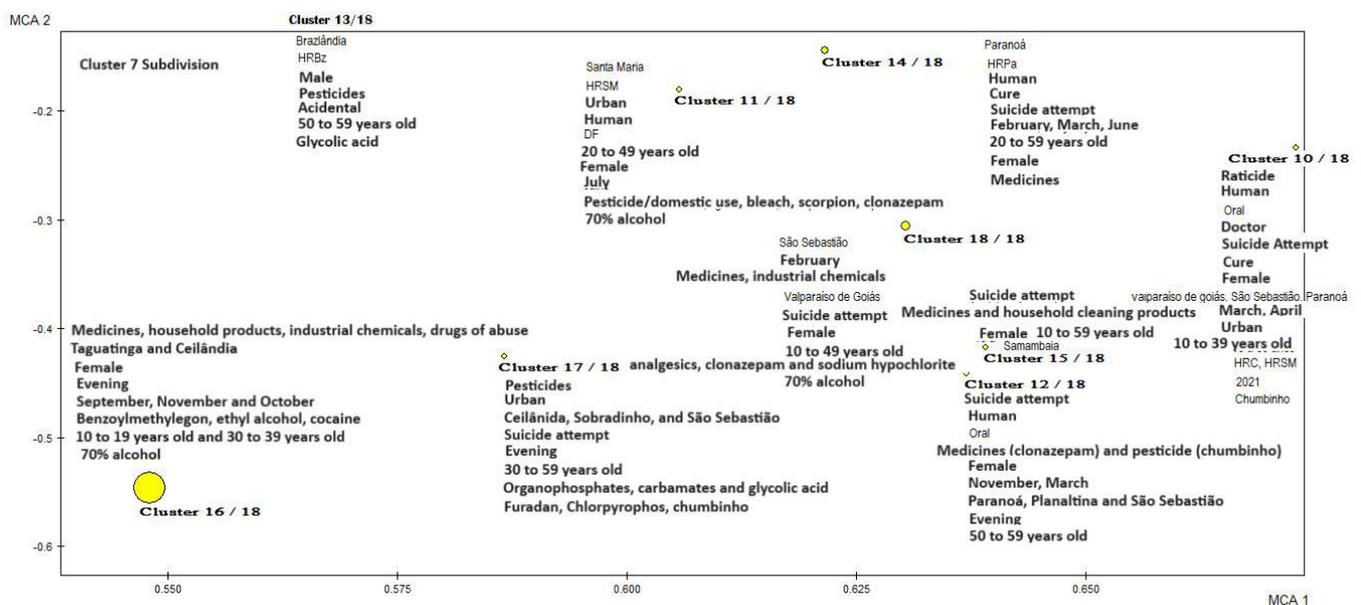
Cluster 15 represents cases of attempted suicide in Samambaia, with medicines and household cleaning products, among women aged 10 to 59.

Cluster 16 represents recreational poisoning with medicines, household cleaning products, industrial chemical products (ICP), and drugs of abuse, occurring in Taguatinga and Ceilândia, in females, in the evening, in September, November, and October, with benzoyl methylegon, ethyl alcohol, 70% alcohol, and cocaine, in patients aged 10 to 19 and 30 to 39.

Cluster 17 shows cases of pesticides in attempted suicide, with organophosphates, carbamates, and glycolic acid, such as furadan, chlorpyrophos, and chumbinho, in Ceilândia, Sobradinho and São Sebastião, in the evening, in patients aged 30 to 59 years old.

Cluster 18 shows cases of attempted suicide in São Sebastião and Valparaíso de Goiás, in February, in women aged 40 to 49, with analgesics, clonazepam, hypochlorite, and 70% alcohol.

Figure 2 - Subdivision of cluster 7.



Source: Authors.

4. Discussion

The growing number of poisoning cases from 2004 to the present day suggests that exogenous poisoning is an important public health problem. Souza and collaborators (Souza et al., 2018) also describe this importance in their study.

During the pandemic, there was an increase in environmental cases of poisoning, specifically through venomous and non-venomous animals, from June to August and from December to January. They appear in clusters 1, 2, 3, 5, and 6 (Figure 1 and Table 3).

Environmental cases occurred mainly in children and women (Tables 4 and 5), confirming the results presented by Brito and Martins (2015). This is due to the exposure of children to residential and rural environments due to the lack of a school environment. A new behavior pattern influences the profile of cases as it exposes the population to a new reality (Pac-Kozuchowska et al., 2016). Children staying at home more often favor the permanence of female caregivers in the home, which also explains the increase in cases among women and confirms the data observed in the literature (Souza et al., 2018; Gummim et al., 2019; Brito & Martins, 2015; Pac-Kozuchowska et al., 2016). Pac-Kozuchowska and colleagues (2016) argue that children living in urban areas are more exposed to poisoning than those living in rural areas (Table 4), especially from medicines and alcohol, confirming the increase in cases of poisoning in urban areas in times of pandemic found in this study. For babies, clusters 3 and 4 were significant for females, especially those in cluster 7.

A decline in suicide cases was observed, but among those cases, pre-adolescent and adolescent poisoning (ages 11 to 15) were found increased compared to other age groups (Gummin et al., 2019), as can be seen in the clusters when subdividing cluster 7, specifically clusters 10, 15, and 16, according to Figure 2 and Table 3. In absolute numbers, Shannon et al. (2021) reported an increase in elevated levels of anxiety and depression in children and adolescents; however, in their study, they did not show an increase in suicide attempts or self-harm. Another study observed that COVID-19 Pandemic led to a decrease in the use of illicit drugs by young people (Layman et al., 2022). Bodan and Saraga (2022) found that alcohol consumption among young people decreased. Kersten et al. (2023) found an increase of more than 23% in intoxication among adolescents in the Netherlands.

In this study, we observed an increase in cases in women, with less severity in times of pandemic (Table 4), confirming the trend already described in the literature that most poisoning cases occur in women and tend to be less severe than in men (Souza et al., 2018). As already described in almost all the clusters in the subdivision of cluster 7 (clusters 10, 11, 12, 14, 15, 16, and 18).

There was a drop in occupational cases during the pandemic, contrasting with results found in previous years, according to work by Magalhaes and Caldas (Magalhaes & Caldas, 2019) and presented in this work in table 6 and cluster 13.

Environmental cases have increased due to the domestic environment, as shown by Vilaça et al. These findings justify prioritizing preventive actions (Vilaça et al., 2019). They appeared in Table 6 and in clusters 2, 3, 5, and 6.

The event region was significant in this study, as we observed from the change in behavior, confirming the findings in the Ministry of Health's Epidemiological Bulletin (Boletim Epidemiológico do Ministério da Saúde 2018), which points out that location is a determining factor for certain events to occur, as shown in table 4. As in the cases that occurred in rural areas, in cities further away from the pilot plan region, according to cluster 2.

Cluster 4 shows a significant increase in 70% alcohol poisoning in children, as shown in figure 1. This is explained by the increased use of this product during the pandemic. This observation did not occur before the pandemic (Maior, Castro, Andrade, 2020).

Other observations in different clusters present data already found in the literature, such as the Ministry of Health's Epidemiological Bulletin (Boletim Epidemiológico do Ministério da Saúde 2018), not being differential or impacted by the COVID-19 pandemic.

5. Conclusion

Poisoning cases have been a serious public health problem that demands continuous research efforts, pointing to the risk factor identification that can change in times of health crisis, which can lead to strategies in search of prevention, health promotion, and assistance.

During the COVID-19 pandemic, in the period studied from March 2019 to February 2020, there was an increase in accidental, environmental, venomous, and non-venomous animal cases, especially in babies and pre-adolescents and adolescents (11 to 15 years old) and in women, due to the greater exposure of this age group and gender who stayed more in the rural environment during the pandemic period.

Most poisonings were accidental, increasing during the pandemic.

It was observed a decrease in suicide cases, but within these cases there was a tendency for pre-adolescent and adolescent (11 to 15 years old) poisoning compared to other ages, which is explained by the increase in anxiety within this age group during this period.

The main toxic agents were venomous and non-venomous animals, which also intensified during the pandemic. There continued to be a high frequency of cases involving medicines, pesticides, and household cleaning products, with a significant increase in cases involving 70% alcohol.

It was evident that patients living in cities further away from the Pilot Plan region suffer accidents involving venomous animals. Accidents and cases of attempted suicide occur more in cities closer to this region.

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