

Analysis of suicide attempts by exogenous poisoning in the metropolitan region of Goiânia, from 2012 to 2017

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ABSTRACT. We aimed to describe the epidemiological profile of suicide victims of exogenous poisoning in the metropolitan region of Goiânia and to propose measures and intervention strategies for the issue in question. This is a cross-sectional, descriptive and quantitative study which assessed data from the Information System for Notifiable Diseases in the metropolitan region of Goiânia, covering the reported cases of exogenous poisoning related to suicide between 2012 and 2017. Furthermore, Google Scholar and PUBMED platforms and also documents from the Ministry of Health were consulted to search for bibliographic references in order to support an intervention proposal. During the analyzed period, 1,829 exogenous poisoning cases were reported in the metropolitan region of Goiânia, corresponding to an average of 305 cases per year, with the female gender being the most affected. It is noteworthy that suicide by exogenous poisoning is a serious public health concern and requires effective measures to reduce the number of cases of individuals from all localities, whether they are residents of rural and urban areas. Measures to reduce these intoxications should also be targeted at specific audiences of different age groups. Thus, it is evident the need for implementing effective public policies that mitigate exogenous poisoning.

Keywords: Toxic substances, Accident prevention, Suicidal ideation

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INTRODUCTION

Suicide is defined as the act of the individual taking his own life. This practice is present in several cultures, whose determinants and motivators have been understood in different ways over time (Cortez, 2019). In this context, one of the most common forms of suicide attempt is through exogenous poisoning (Brasil, 2019). Exogenous intoxications involve various types of substances, including cleaning products, rodenticides, agricultural products and medicines, commonly ingested by individuals in attempts at self-extermination, predominantly because they are easily accessible compounds (Brasil, 2019).

The biomedical model determines suicide and its attempt as a consequence of a psychiatric disorder of biological genesis, disregarding transversal aspects to human life that also interfere in mental health, such as socioeconomic conditions, family structure, stressful events, cultural patterns, drug use, among others that

interact with biological predispositions for the appearance of suicidal behavior (Félix, 2016).

Currently, suicide is a public health concern worldwide. It is worthwhile noting that the mental health of the individuals who compose a society is essential to achieve the maximum potential for social, economic and individual development. Therefore, there is a need to understand that the determinants of mental health are beyond the individual scope, as they include social, cultural, economic, political and environmental factors, including national policies, social protection, living standards, working conditions and community social support (Cratsley, Mackey, 2018).

Brazil figures, in absolute numbers, among the ten countries with the highest number of suicides, reporting more than 10,200 cases, in 2012, thus corresponding to more than 28 daily deaths. The cases of deaths registered by suicide and self-inflicted injuries, in 2012, were 5.3 deaths per 100,000 inhabitants (Fraga, 2016).

Statistical data reveal that approximately 60% of premature deaths in Brazil are due to suicide (Maia et al., 2019). Hanging and the use of firearms are the most common lethal methods for committing suicide at all ages. In turn, the use of toxic agents is characterized as less lethal owing to the greater

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potential for therapeutic assistance in hospital institutions (Rosa, 2015).

Data from the Department of Informatics for the Unified Health System (DATASUS) also showed that the Midwest region had, in 2012, the second highest suicide rate in the country (6.46 cases per 100,000 inhabitants). The state of Goiás reported in 2012 a rate of 6.53 cases per 100,000 inhabitants, a higher number than that found in the Midwest region (Cadurin, 2016). Besides that, during the period from 2011 to 2015, exogenous poisoning was the second main strategy used for suicide by Brazilians of both sexes aged 20 years or over (Brasil, 2019).

In this context, this work aims to raise the incidence of suicide attempts by exogenous poisoning in the metropolitan region of Goiânia during the period from 2012 to 2017, as a way to recognize the characteristics of the populations who experience this type of occurrence, in order to establish strategies for specific and effective prevention and control, besides finding the limitations of the National Suicide Prevention Plan.

METHODS

This is a cross-sectional, descriptive and quantitative study on suicide mortality rates in the metropolitan region of Goiânia, during the period from 2012 to 2017. The analysis was conducted based on data provided by DATASUS and from the Information System for Notifiable Diseases (SINAN) which is under responsibility of the Health Surveillance Secretariat (SVS) and has information regarding the notification and investigation of cases of diseases and conditions that appear on the national list of compulsory notification diseases governed by Consolidation Ordinance 4 (Brasil, 2006).

TabNet was used for selection and assessment of data, which is a DATASUS data tab supported with SINAN information. For this, data referring to suicide by exogenous intoxications were selected, whose notification occurred in the metropolitan region of Goiânia. Subsequently, the following variables were selected in TabNet: gender, race, toxic agent, age, evolution, time of exposure, criteria for confirmation, month of occurrence and municipality. Ignored and/or blank information will be displayed.

After the data collection on the DATASUS platform, information was evaluated using Microsoft Office Excel (2019) software, followed by the construction of graphs and tables.

Additionally, data from the Brazil in Synthesis of the Brazilian Institute of Geography and Statistics (IBGE) were used to obtain demographic data for the region and to calculate the incidence of exogenous poisoning by drugs.

To support an intervention proposal in order to reduce the suicide cases by exogenous poisoning in

the metropolitan region of Goiânia, a literature review was undertaken in the Google Scholar and PUBMED databases, which is detailed in Flowcharts 1 and 2. Moreover, for the gray literature search, the epidemiological Bulletin released in July 2019 of individuals who attempted suicide by exogenous poisoning was used.

Based on the set of highlighted data, articles were systematically searched in the databases, whose content evidenced intervention plans for reduction of the number of intoxications, targeting suicide and its consequences, from death to cure even without sequelae, as it generates costs to the public sector. The search, using the terms "toxic substances", "suicide" and "accident prevention" resulted in 5 articles in PUBMED. The terms "suicide", "toxic substances", "accident prevention", "suicidal ideation" and "dangerous substances" resulted in another 26 articles in Google Scholar. Of these, 16 were selected for meeting the inclusion criteria. Further, the epidemiological bulletin of 2019 - which deals with suicide prevention - from the Ministry of Health was used as the basis for formulating the proposals. At the end of the analysis, 3 articles and the aforementioned Ministry of Health document were considered (Figures 1 and 2). All data used for this study are from secondary databases of public domain, which will be presented in an aggregated form, not allowing the identification of the research subjects. Thus, there is no need for the appraisal of a Research Ethics Committee.

RESULTS

Firstly, it is important to highlight that the metropolitan region of Goiânia is composed of 20 municipalities, has an estimated population of 2 518 775 inhabitants according to 2018 data and a demographic density of 344.32 inhabitants/km². Regarding economy, in 2017, the monthly income per capita was 3.2 minimum wages. The region also reveals an HDI considered high of 0.769 (2010) (BRASIL, 2017).

The agents used for the analysis of exogenous poisoning were: medicines, rodenticides, household products, chemical or metal compounds, drug abuse, agricultural or veterinary products and unspecified harmful substances (DATASUS, 2019).

Figure 3 shows, in gross numbers, the evolution of cases of exogenous intoxication in the metropolitan region of Goiânia that had as circumstances attempts of self-extermination, during the period of 2012-2017.

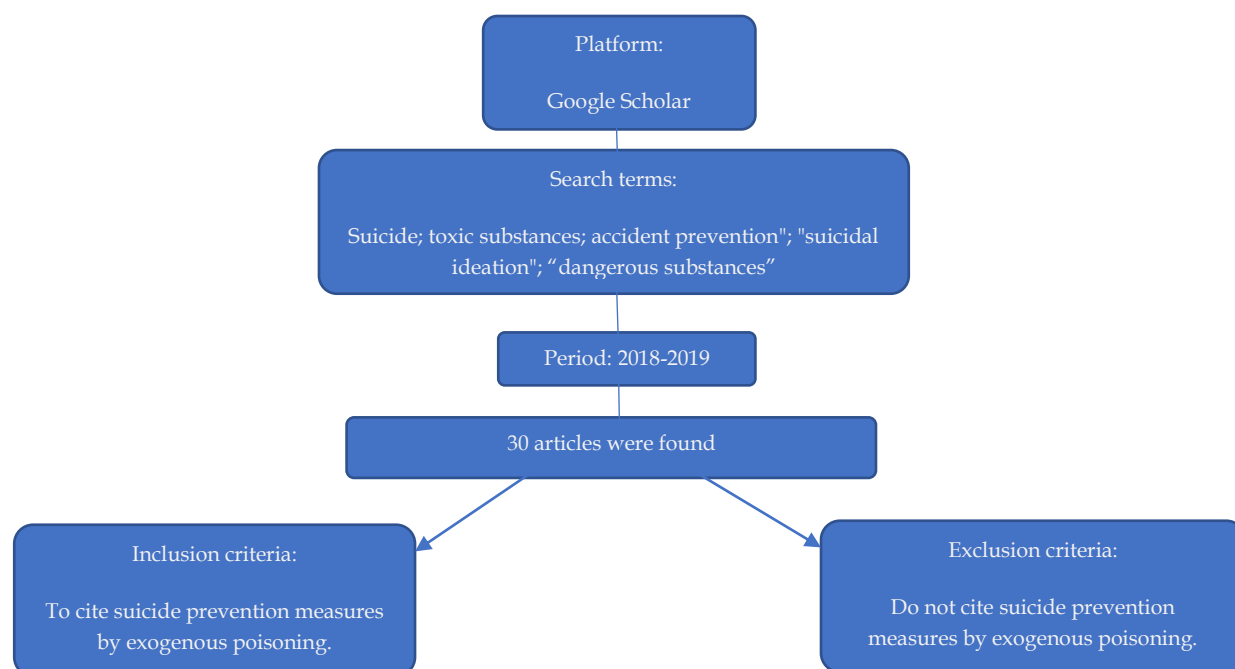


Figure 1. Flowchart of the literature review and selection of papers from Google Scholar to support the intervention proposal, aiming at reducing suicide cases by exogenous poisoning in the metropolitan region of Goiânia.

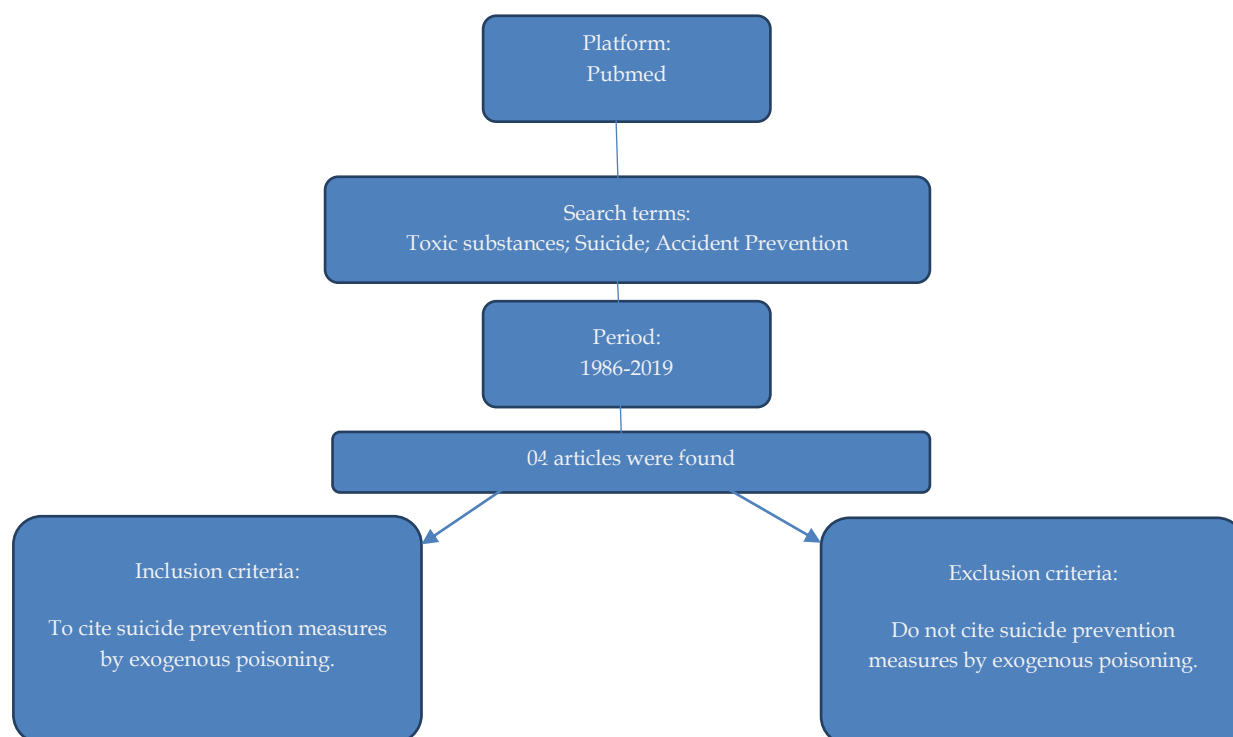


Figure 2. Flowchart of the literature review and selection of papers from PUBMED to support the intervention proposal, aiming at reducing suicide cases by exogenous poisoning in the metropolitan region of Goiânia.

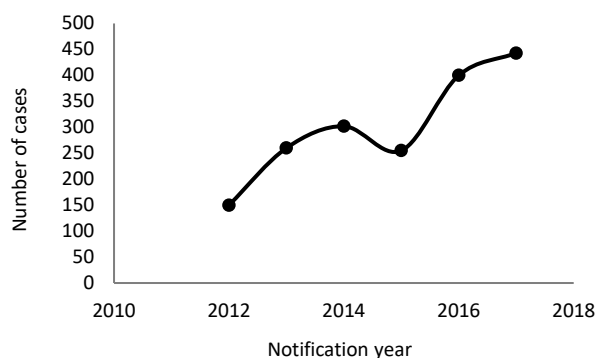


Figure 3. Number of exogenous intoxication cases related to suicide attempt in the metropolitan region of Goiânia from 2012 to 2017. Source: Ministry of Health / SVS - Information System for Notifiable Diseases- SINAN / DATASUS, 2019.

The metropolitan region of Goiânia recorded 6,246 individuals who suffered exogenous intoxication from 2012 to 2017. Among these cases, 29% involved attempted suicide, totaling 1,829 cases of self-extermination attempts by poisoning in this period. The rates varied in the years studied, reporting values equivalent to 6.6; 11.4; 12.9; 10.9; 16.1 and 17.8 per 100,000 inhabitants for the years 2012 to 2017, respectively. Accordingly, the average incidence in this time series was 12.6 cases per 100 thousand inhabitants.

Regarding the intentional autointoxication, the years with the highest number of notifications were 2017 (24.2%) and 2016 (21.7%), followed by 2012 with 16.8% of cases. Considering the total of 1,829 cases, 72.0% were female and 28.0% male. Thus, the average proportion of cases was 2.71 intoxicated women (W) for each man (M), and this rate had its peak in 2012, with a ratio of 3.41 (W / M). Figure 4 depicts the data related to the gender of victims.



Figure 4. Number of cases of exogenous intoxication related to suicide attempt in the metropolitan region of Goiânia, from 2012 to 2017, by gender. Source: Ministry of Health / SVS - Information System for Notifiable Diseases- SINAN / DATASUS, 2019.

Regarding the race of the victims, suicide attempts by poisoning were more common among individuals belonging to the brown (45.3%) and white (27.6%) race. The age group that exhibited higher frequency of incidence was 20 to 39 years old (young adults), representing 52.8% of the cases, followed by

young people aged 15 to 19 years (18.8%), and finally individuals aged 40 to 59, with 341 cases (18.6%). It is noteworthy that in the age range between 15 and 19 years, 344 notifications occurred, a number similar to the much broader age range from 40 to 59 years old. Individuals under 14 years account for 7% of cases of exogenous poisoning involving suicide and surpass individuals over 60, who represent only 2.6% of the total records.

Epidemiological data on the number of exposures to toxic agents in the attempted suicide revealed that 74% of the individuals had only a single exposure to the compound, while the remaining 26% had more than one exposure. With concern to the intoxication confirmation criterion, the absolute majority was only clinical (1,570) considering the total number of cases (1,829). Confirmation of intoxication using laboratory tests as a support occurred in only 29 cases; on 146 occasions, the diagnostic criterion was clinical-epidemiological, and in 85 cases the method used was not recorded.

Regarding the evolution of the clinical picture, most victims evolved to cure without sequelae (79.6%). As for lethality, 40 cases evolved to death and 36 cases were curable, but with sequelae. Lethality and the cure rate without sequelae were extremely heterogeneous between different age groups. Among the elderly, the mortality rate was higher, while among the young individuals and adults, the mortality was very low. Table 1 details the outcome of cases considering the age group of the victim. Remarkably, a significant number of cases revealed unknown outcome, whether due to loss of follow-up or failure to complete the notification form.

The toxic agents most commonly used in exogenous poisoning with a view to suicide were, in decreasing order: medicines (58.8%), rodenticides (15%), household products (including cosmetics and cleaning products in general) (7.1%), unspecified toxic agent (8.3%) and products used in rural areas, such as agricultural pesticides and veterinary products (6.7%). Finally, 1.1% of cases is related to drug abuse and 3.0% to heavy metals, toxic plants, among others (Table 2).

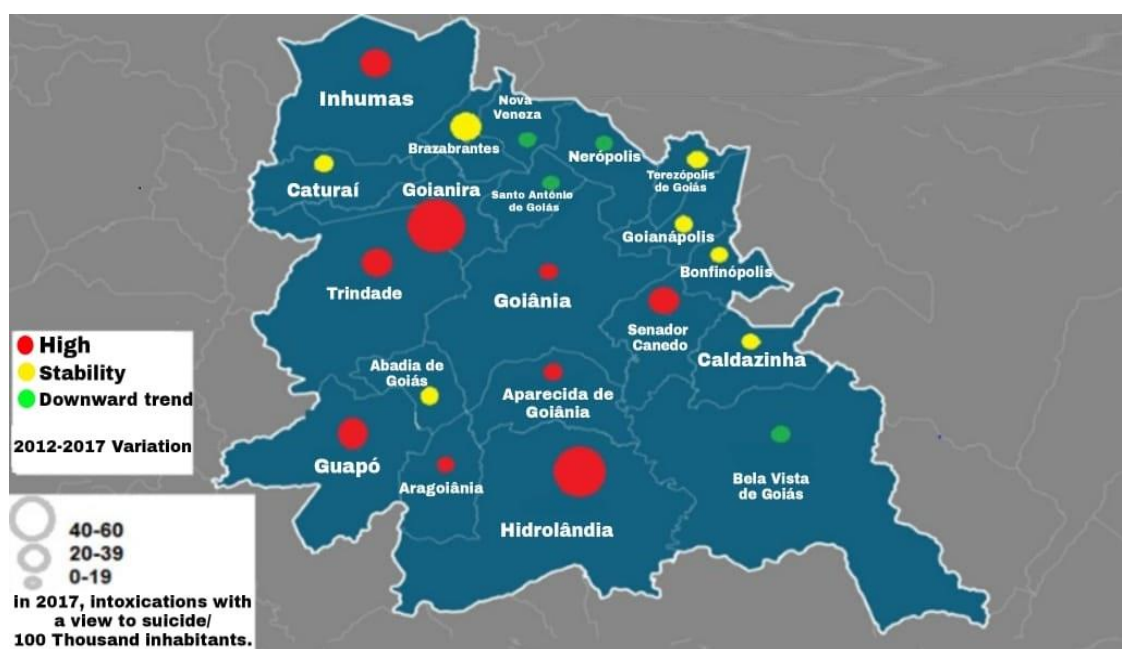
The 20 constituent municipalities of the metropolitan region have variable growth rates for exogenous poisoning involved with suicide. A first group of municipalities has increasing rates of notifications since 2012 (here we include the largest city Goiânia and the second largest Aparecida de Goiânia). Contrarily, smaller cities report stable numbers since 2012. Another group of medium-sized cities already showed a decrease in intoxication-related accidents between 2012 and 2017. Detailed data on each city that composes the metropolitan region of Goiânia are highlighted in the following map. The five municipalities with the highest incidence rates are, respectively: Hidrolândia, Goianira, Senador Canedo, Guapó and Trindade (Figure 5).

Table 1. Frequency and distribution of cases of exogenous poisoning involving suicide according to age group and all registered prognosis. Metropolitan Region of Goiânia, 2012 to 2017.

Evolution	In blank	Age range (years)								Total
		≤ 14	15-19	20-39	40-59	60-64	65-70	70-79	≥ 80	
Ignored	0	19	47	136	54	3	3	2	0	264
Loss to follow-up	0	0	5	20	7	0	0	0	0	32
Curewith sequelae	0	4	8	17	6	1	0	0	0	36
Curewithout sequelae	0	105	284	775	264	11	7	9	2	1457
Death from poisoning	1	2	0	17	10	2	1	4	3	40
Death for another reason	0	0	0	1	103	0	0	0	0	1
Total	1	130	344	966	341	17	11	15	5	0

Table 2. Distribution of the frequency of suicide attempts by exogenous poisoning, by gender and toxic agent, in the metropolitan region of Goiânia during the period from 2012 to 2017.

	Man(n=8.953)		Woman(n=5.504)		Total (n=14.457)	
	n	%	n	%	n	%
Medicines	226	44.1	849	64.5	1075	58.8
Rodenticides	116	22.7	159	12.0	275	15.0
Household products	50	9.8	80	6.0	130	7.1
Chemical or metal products	19	3.7	35	2.7	54	3.0
Drug abuse	9	1.7	12	0.9	21	1.1
Agricultural or veterinary products	47	9.2	76	5.8	123	6.7
Unspecified harmful substances	45	8.8	106	8.1	151	8.3

**Figure 5.** Spatial distribution of suicide attempts by exogenous poisoning in the metropolitan region of Goiânia, in 2017, by municipality. Source: IBGE - Population estimates and Ministry of Health / SVS - Information System for Notifiable Diseases - SINAN / DATASUS, 2019.**Chart 1.** Intervention Proposals, expected results and references consulted for the formulation of the proposal

Intervention Proposal	Expected results	Bibliographic reference
Adequacy of the suicide notification form involving intoxication.	Reduction of underreported cases and blank fields on the form.	(Brasil, 2019)
Training of professionals to manage possible cases of intoxicationinvolving suicide in the elderly.	Improve the identification of elderly people with possible suicidal ideation, thus reducing the high lethality in those over 65 years.	(Sousa, 2019)
Restriction on the number of medicines purchased by each individual in pharmacies, regardless of the type of medication.	Fewer suicide attempts among youth and adolescents, due to the low harmful potential of a smaller amount of drugs.	(Repetto, 1997)
Greater cooperation and integration between government agencies and associations of residents of rural areas.	Knowledge on the part of the control agencies of the major risks to which the residents are exposed, including pesticides and veterinary products.	(Drebes, Bohner, Silveira, 2018)

Chart 1 depicts the intervention proposals, the expected results, the necessary resources, the estimated schedule and the references used. Resources can be financial, human and material.

DISCUSSION

Exogenous poisoning is a serious public health concern in Brazil due to the high frequency and morbidity in Brazilian population (Magalhães et al., 2014). Currently, this life-threatening condition represents the second most prevalent form of suicide attempt in the country (Brasil, 2019).

The metropolitan region of Goiânia revealed 17.8/100,000 suicide attempts by exogenous poisoning in 2017 (Datusus, 2019). Moreover, similarly to other regions, findings unveiled that medicines are the main class of agents used in the suicide attempt. The high number of cases related to this category of agents is directly related to suicide attempts, predominantly by women (64.5%) and generally in the age group of 20 to 59 years. With regard to men, medicines were also the major agent used, but the distribution is more heterogeneous among the various toxic agents. Importantly, men use 1.9 times more rodenticide agents for suicide attempts when compared to women (Datusus, 2019).

The higher use of medicines among women is related to the greater rate of purchase of these agents in pharmacies and drugstores due to the most frequent search for medical services when compared to men (Hernandez, 2001). Conversely, the use of agricultural and veterinary products is more representative among men. These compounds, more commonly found in rural areas, represent only 5.8% of the total products used in exogenous poisoning among women (Datusus, 2019).

Of all the data on the evolution of the picture of victims, it is worthwhile noting that 20% of those over 60 years die when attempting suicide by exogenous intoxication, while among those over 65 the lethality is even higher, reaching 25%, that is, 1 of every 4 suicide attempts by exogenous poisoning has a fatal outcome in this population. Among young adults aged 20 to 39 years, lethality is lower, at 1.7%. These data are extremely valuable, given that although exogenous intoxications are more prevalent in the age group of 20 to 59 years, the highest lethality rates affect individuals over 60 (Datusus, 2019).

The findings of a study performed in João Pessoa, in the state of Paraíba, which aimed to explore the epidemiological profile of suicide attempts in this region, reported that women tend to commit more suicide attempts by self-poisoning than men. Indeed, men had a high rate of suicide attempts by hanging (Nascimento, 2018). Furthermore, an analysis conducted in the state of Tocantins revealed high prevalence of suicide attempts in young adults (Filho

et al., 2019). This reflects a trend pointed out by the literature and verified in this analysis that women commit more suicide attempts through self-poisoning and that the prevalent age group is 20 to 59 years (Datusus, 2019). Notwithstanding, the majority of the reviewed articles deal with the topic in a more general way, not only assessing suicide attempts by exogenous poisoning, thus hindering more reliable comparisons between studies.

In this research, it was also possible to notice that the categories evidenced in the notification form obtained through SINAN, including information about the type of exposure, the criterion for confirming exogenous poisoning, evolution of the case and if the exposure was at work, exhibited high percentage of ignored or blank information. This reflects the underreporting caused by failure to complete the notification form, thereby portraying the lack of training of health professionals regarding the importance of correct filling out the form. Accordingly, these data are pivotal to provide a more appropriate planning of preventive actions and targeting of resources in order to contemplate the best health model (Segre, 1997).

The variables intrinsically related to suicide by exogenous poisoning are mainly the age and gender of the patient. Therefore, the proper filling out of the form is fundamental and has a significant impact on the collection and use of data, thus helping to develop interventionist measures related to these aspects.

In this context, interventions that could be applied to improve the scenario of suicide rates in the metropolitan region of Goiânia must be based on scientific literature, which demonstrated effectiveness in the respective studies. However, during the systematic review, the articles found did not address the implementation of the suggested measures, hence representing a limitation of the study.

Remarkably, there is a need to develop strategies aimed at improving the process of filling the interpersonal and self-inflicted violence notification form, since the exogenous poisoning form must also be filled out if the suicide modality involves chemical substances, and the duplicity of approaches to notify may contribute to the occurrence of underreporting in both surveys. Thus, the dialogue between those responsible for such management instruments is indispensable in order to provide a standardization to reduce the existing underreporting. This action would require resources for training the professionals and would show positive effects in the short term (Brasil, 2019).

Regarding the measures for preventing pesticide poisoning, the Ministry of Health must work with associations of rural producers in a collaborative manner in order to promote support services to community organizations, aiming to develop and test methods for preventing suicide attempts by this agent,

making clear the risk of handling hazardous substances. Interestingly, the access of rural population to psychiatry and psychology services could be expanded, hence allowing adequate monitoring and assistance to individuals who could potentially commit exogenous poisoning by pesticides. This measure requires considerable investment by the government and its benefits would be seen in the medium term (Drebe, Bohner, Silveira, 2018).

Finally, it is essential to invest in Health Surveillance in the continued awareness by Primary Care professionals to improve the notification of this condition, so that intervention measures are updated according to the needs of the population.

CONCLUSION

One of the objectives in constructing a public policy against an injury is the reduction of the incidence. Posteriorly, the aim is to eliminate that injury when possible. In the opposite sense, based on the researched data and the studies analyzed, we found that in the metropolitan region of Goiânia, the annual rate of exogenous poisoning involving suicides has been increasing since 2012.

The findings of this study revealed a high rate of suicide attempts among the female sex. In fact, 72% of the investigated cases involve women, and only 28% of the cases of intoxication are men. Furthermore, most of the cases occurred in brown individuals, aged between 20 and 39 years. Thus, we can draw a profile identifying as a woman, brown, in the age range of 20 to 39 years old as the main victim of exogenous poisoning with a view to suicide in the assessed period.

Importantly, there is an urgency to implement public policies that are effective and that mitigate exogenous poisoning. The intervention projects proposed in this article are aimed at the different age groups affected, since differently from other injuries that are also public health issues, suicide by exogenous intoxication affects several age groups.

Regarding the approach to suicide in elderly, it is essential to train professionals involved in the care of this population to identify and refer cases of suicidal ideation as early as possible, besides to recognize the environments that provide such occurrences. This action is required to reduce the number of suicide attempts by exogenous poisoning in the public over 65 and would have its benefits in the medium term (Sousa, 2019).

Additionally, other measures can contribute to improve this scenario, such as limiting access to medicines without a prescription, thus preventing cases of psychotic outbreaks or other crises from occurring intoxications, since the available dose would be the lowest possible. In fact, this approach aims to reduce deaths due to overdose of medicines. This

would require training of professionals and revisions of legislation that, in the short and medium term, would bring advantages in decreasing suicide attempts by poisoning (Repetto, 1997).

Furthermore, residents of rural areas should also be included in public policies to combat suicide, which unfortunately does not yet occur. Based on the surveyed data, the rate of exogenous poisoning through pesticides and veterinary products is significant in the rural area. In view of the above, it is important to encourage an in-depth analysis of data on intoxication, in order to achieve better elaboration of public policies and projects to reduce suicide rates by exogenous poisoning, which are currently increasing.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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