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Original Article

Drug-Related Poisonings among Chilean Adult Population

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Abstract

Background: Poisonings is a preventable public health problem that globally affects the population. We aimed to characterize drug-related acute poisonings occurred in Chile between the years of 2016 and 2020.

Methods: A retrospective study of poisonings among hospitalized patients was carried out. Data were obtained from the Medical Outcome Statistical Report database. Inclusion criteria were cases of patients admitted into either public or private healthcare settings with diagnosis of drug-related poisoning according to the WHO ICD-10 codes T30-T50. Statistical analyses were run to establish either significant associations or differences between variables selected in the study.

Results: Overall, 12,975 poisonings were identified during the 2016-2020 period. These events corresponded to 0.16% of all national hospital admissions in the study period. Women represented 71.1% of the cases. 76.7% of events were related to intentional poisonings while 7.3% and 16% were accidental and undetermined poisonings respectively. 44.6% of accidental and intentional poisonings occurred at the age of 18-29 yr old. Benzodiazepines (22.8%), antidepressants (11.2%), and acetaminophen (5.1) were the most common drugs associated with poisonings. Average length of hospitalization was between 3.3 and 8.2 days. 0.6% of poisonings resulted in deaths.

Conclusion: Poisonings were characterized by patients' sex and age, circumstance of exposure, length of hospitalization, and outcome. Poisoning rates were stable along the years with a slight decrease in 2020. Intentional poisonings among young women and men were more common. Most of the cases had favorable outcome for patients.

Keywords: Drug-related poisoning; Epidemiology; Poisoning intent; Chile

Introduction

Poisoning is a common public health problem since it is considered a cause of morbidity and mortality. Poisonings may result from exposures to almost any chemical (e.g. drugs, cosmetics, gases) and they are usually classified as accidental or intentional events (1).

The epidemiology of poisonings may differ around the globe according to the characteristics and distribution of populations and it depends on some factors such as composition of families, education and income level, proportion of immigrants, industrial activities, and geographical location (2). Thus, the most common poisoning

agents differ between developing and developed countries, with pesticides being the most common cause of poisoning in developing countries and drugs being the leading cause in developed countries (3).

Poisonings are responsible for approximately 1 million cases of illness per year, affecting people of all ages around the globe (4). In developed and developing countries including Chile, drugs or medications are the main cause of acute poisonings (5). These drugs are important therapeutic tools used for the prevention and treatment of health conditions. Unfortunately, there is a large percentage of patients who irrationally use them, generating negative consequences (e.g. worsening or masking health conditions, poisonings, and death) (6).

The National Poison Control Center receives 34,000 phone call per year. Most of these phone calls are associated with human exposures to chemicals of which 58.1% are drugs or medicines (7). In addition, the work of Aguilera et al characterized intentional medication overdose cases admitted into a Chilean public hospital between the years 2008 and 2010, finding that benzodiazepines and antidepressants accounted for 87.2% of all cases (8). Moreover, poisonings are one of the three main causes of suicide among young populations (9).

Considering that poisoning is a preventable cause of disease and death, availability of updated information about demographics of the affected population, as well as identification of drugs involved in poisonings is an important approach to improve public health by means of providing patients with accurate diagnosis, adequate medical treatments, and proposing poisoning prevention strategies to local health authorities focused on specific aged-based groups (10). Therefore, we aimed to characterize drug-related acute poisonings occurred in Chile between the years of 2016 and 2020 to contribute with more update epidemiological information of drug-related poisonings among adult population.

Materials and Methods

A retrospective study of drug-related poisonings among adult patients (i.e. ≥ 18 yr old) hospitalized in Chilean public and private hospitals in Chile was carried out between the years 2016 and 2020.

Inclusion criteria

Cases of adult patients (≥ 18 yr old) who were admitted into either public or private healthcare settings with main clinical diagnosis of drug-related poisoning according to the WHO International Classification of Diseases ICD-10 (WHO ICD-10). Thus, codes T30-50 were considered as first diagnosis. Moreover, codes X40-49 (accidental/unintentional poisoning), X60-69 (intentional poisoning), and Y11-14 (undetermined poisoning) were related to the circumstance of exposure (11).

Exclusion criteria

All cases that were not associated with drug-related poisonings, involved pediatric patients, and presented adverse drug reactions (e.g., physiological alteration caused by drugs administered at therapeutic level).

Data collection and processing

Data were obtained from the Annual Medical Outcome Report (AMOR). AMOR is released by the Department of Statistics and Health Information of the Chilean Ministry of Health. It compiles all medial discharge reports associated with patients admitted into healthcare settings in the country. Information contained in the AMOR between the years 2016 and 2020 was filtered by considering the inclusion and exclusion criteria. Consequently, all cases that fell into the inclusion criteria were tabulated on a Microsoft Excel® spreadsheet to facilitate data processing.

Variables of the study

Selected data were sorted by taking into account the following variables: patient's sex and age,

circumstance of exposure (accidental, intentional, and undetermined events).
Age of patients: this variable was classified as follows: 18-29, 30-39, 40-49, 50-59, 60-69, 70-79, 80-89, and ≥ 90 yr old.

Circumstance of exposure
Regarding the circumstance of exposures, these were categorized as accidental, intentional or undetermined (12).

Length of hospitalization
The number of day's patients remained hospitalized because of poisoning.

Medical outcome
Two outcomes were considered, alive or death.

Ethical considerations
AMOR's information is publicly available except for patients' sensitive data (e.g. name, social security number, address). Consequently, no ethical committee approval was required to conduct this work.

Statistical analysis
Statistical analysis was performed by using Infostat® software (Universidad de Cordoba, Cordoba, Argentina). Categorical data are presented as absolute frequencies and percentages. Associations between categorical variables was made by employing the Pearson Chi-square test. Also, comparison of proportions was carried out by using the one-sided proportion test. Also, descriptive statistics was utilized (e.g. mean, range) for presenting continuous data. The Mann-Whitney U-test was used to compare day of hospitalization medians. A p- value < 0.05 was considered statistically significant.

Results

Overall, 12,975 poisonings were identified during the 2016-2020 period. This represented 0.16% of nationwide hospital admissions. Poisoning rate was 1.4 per 10,000 individuals. In Tables 1 to 4 we display our findings regarding annual distribution of poisonings; events categorized by sex, age, and circumstance of exposure; drugs associated with cases; and deaths during the study period.
Drug-related poisoning rates during the study period remained stable. Women represented 71.1% of total poisonings. Women/men ratio was 2.5. Table 1 shows annual distribution of poisonings.

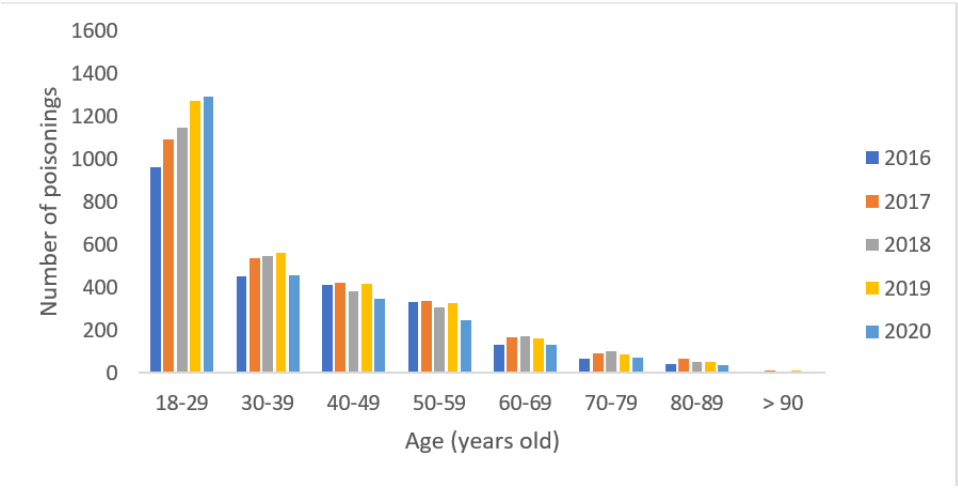
Table 1: Annual distribution of drug-related poisonings

Year	*Total Admissions*	*Poisonings*	*Rate (*)*	*Women (%)*	*Men (%)*
2016	1,637,265	2,317	1.3	1,687 (72.8)	630 (27.2)
2017	1,637,150	2,645	1.4	1,898 (71.8)	747 (28.2)
2018	1,669,602	2,661	1.4	1,869 (70.2)	792 (29.8)
2019	1,636,509	2,831	1.5	1,991 (70.3)	840 (29.7)
2020	1,330,478	2,521	1.3	1,783 (70.7)	738 (29.3)
Total	7,911,004	12,975	-	9,228 (71.1)**	3,747 (28.9)**

*Per 10,000 individuals
**One-sided proportion test (women/men) $P<0.0001$

Figure 1 represents annual distribution of poisonings based on patients' age intervals. According that, poisonings related to young adults (18-29 yr old) increased over the years. In 2020, first year of the COVID-19 pandemic we identified the largest number of poisonings (10%) among these

individuals. The rest of the age groups presented some variability in the number of cases during the entire period of study with lower incidence during 2020. Table 2 displays information of poisonings segregated by sex, age and circumstance of exposure.



N = 12,975

Fig. 1: Poisonings' annual distribution according to age of patients during the 2016-2020 period

Table 2: Poisoning distribution according to patients' sex, age and circumstance of exposure during the 2016-2020 period

	Women			***Men***		
Age (yr)	Intentional (%)	Accidental (%)	Undetermined (%)	Intentional (%)	Accidental (%)	Undetermined (%)
18 – 29	3,243 (25.0)	156 (1.2)	489 (3.9)	1,359 (10.5)	111 (0.9)	272 (2.1)
30 – 39	1,443 (11.1)	68 (0.5)	247 (1.9)	541 (4.2)	58 (0.4)	136 (1.0)
40 – 49	1,183 (9.1)	93 (0.7)	199 (1.5)	317 (2.4)	50 (0.4)	90 (0.7)
50 – 59	932 (7.2)	69 (0.5)	164 (1.3)	220 (1.7)	58 (0.4)	62 (0.5)
60 – 69	349 (2.7)	63 (0.5)	114 (0.9)	117 (0.9)	32 (0.2)	65 (0.5)
70 – 79	124 (1.0)	60 (0.5)	64 (0.5)	47 (0.4)	48 (0.4)	59 (0.5)
80 – 89	41 (0.3)	44 (0.3)	57 (0.4)	30 (0.2)	24 (0.2)	39 (0.3)
≥ 90	0 (0.0)	11 (0.1)	15 (0.1)	2 (0,0)	6 (0.0)	4 (0.0)
Total	7,315 (56.4)	564 (4.3)	1,349 (10.4)	2,633 (20.3)	387 (3.0)	727 (5.6)

N= 12,975

We established statistically significant associations between the variables patients' sex (women) and circumstance of exposure when considering all ages (Chi-Square test, $P<0.0001$). Moreover, odd

ratio for intentional poisonings women/men was 1.9 (95% CI 1.6-2.1).

Table 3 shows frequency and distribution of drugs involved in the poisoning events along with days of hospitalization. There were no statistically significant differences between medians of days of hospitalization related to intentional and accidental poisonings when considering poisoned female and male patients (Mann-Whitney Test P=0.5752).

Table 3: Distribution of drugs causing poisonings and length of hospitalization during the 2016-2020 period

	Accidental			***Intentional***			***Total***
Medicine/class	N (%)	Hospitalization mean (days)	Hospitalization range (days)	N (%)	Hospitalization mean (days)	Hospitalization range (days)	N (%)
Benzodiazepine [a]	99 (0.9)	6.1	1-226	2,390 (21.9)	5.4	1-88	2,489 (22.8)
SSRI [b]	23 (0.2)	5.2	1-62	690 (6.3)	5.6	1-726	713 (6.5)
Acetaminophen [c]	17 (0.2)	3.8	1-12	542 (5.0)	4.2	1-83	559 (5.1)
Tricyclic antidepressant [d]	21 (0.2)	4.6	1-14	496 (4.6)	5.3	1-129	517 (4.7)
Antiepileptic [e]	20 (0.2)	3.8	1-20	474 (4.3)	4.8	1-54	494 (4.5)
Insulin and oral hypoglycemic [f]	52 (0.5)	4.1	1-43	271 (2.5)	6.4	1-171	323 (3.0)
Antipsychotic [g]	52 (0.4)	8.2	1-84	274 (2.5)	5.7	1-45	315 (2.9)
NSAID [h]	51 (0.5)	3.3	1-5	207 (1.9)	4.1	1-30	258 (2.4)
Other [i]	498 (4.6)	5.4	1-45	4,733 (43.4)	5.4	1-156	5,231 (48.0)

N= 10,899 Accidental and intentional poisonings only.
SSRI: Serotonin Selective Reuptake Inhibitor
NSAID: Nonsteroidal Anti-Inflammatory Drug
ICD-10 codes: a (T42.4), b (T 43.2), c (T39.1), d (T43.0), e (T42.6), f (T38.3), g (T43.5), h (T39.3), i (T43.3, T50.9, T42.1, T45.5, T42.0, T42.7, T45.0, T39.0, T42.3, T43.6, T46.0, T43.8, T39.8, T44.7, T48.1, T43.9, T46.5)

Table 4 represents fatalities encountered in the studied period. 73 (0.6%) deaths were detected. Among the most frequent drugs involved in the events, we found antidiabetics (19%) and benzodiazepines (14%). This is considering accidental and intentional poisonings only.

Women presented a higher relative percentage of deaths associated with intentional poisonings when compared to men with 46.5% and 36.9% respectively. 25% of all fatalities, including women and men, occurred at the ages of 18-29 and 30-39 yr old. Interestingly, deaths among men

presented the highest percentage (13.7%) at 30-39 yr old, while women showed peaks at 18-29 (12.3%), and 70-79 (15%) yr old.

Table 4: Deaths associated with poisonings during the 2016-2020 period

Year	*Accidental*		*Intentional*		
	Women	Men	Women	Men	Total
2016	0	0	3	3	6
2017	0	1	4	11	16
2018	2	2	8	6	18
2019	3	3	9	5	20
2020	1	0	10	2	13
Total	6	6	34	27	73

N= 10,899

Discussion

Poisonings identified during 2016-2020 among Chilean adult population showed common features when compared with similar national and international studies. Most drug-related poisonings were associated with women and concentrated at the young adult stage (18-29 yr old). Similar results have been published at national (8) and international level (13-15).

According to the recently published the WHO's document "Mental Health and COVID-19: Early evidence of the pandemic's impact" (16), data indicated a higher risk of suicidal behavior among young populations. In our study, we corroborated that particular trend at ages between 18 and 29 yr old. For the rest of the age groups, we found variability in number of events, but lower incidence of occurrence in 2020. A decrease was described in the number of drug-related poisonings in patients older than 19 yr old during the first year of the COVID-19 pandemic (17).

In regard to the circumstance of exposure, young women and men presented the largest number of intentional events as it has been reported in previous works in Chilean adult population. (18, 19). Moreover, the probability for a woman of developing intentional poisonings was two-fold higher than men.

As for drugs involved in the poisonings, benzodiazepines, tricyclic and selective-serotonin-reuptake inhibitor antidepressants, and acetaminophen were the most frequent with 22.8%, 11.2%, and 5.1% respectively. The study of Aguilera et al, showed similar results at local level (8), while Gummin et al, established that non-steroidal analgesics, household and cosmetic products are the main cause of acute poisonings, followed by antidepressants and benzodiazepines in the United States (20).

As for length of hospitalization, we found comparable means to those reported in other works (5, 8). Furthermore, we identified 0.6% of fatalities associated with drug-related poisonings during the study period. This percentage is larger compared to the other works (8, 14), and similar to that reported by Friedman et al (21).

Limitations

Our study relies on the annual medical outcome reports that are publicly available on a local free database. There might be an underestimation of drug-related poisonings despite there is mandatory to report these types of incidents. Another limitation is that linked to those cases categorized as undetermined poisonings (16% of all poisonings). This situation may have underestimated the total number of either accidental or intentional cases.

Additionally, ICD-10 codes are a general approach to categorize initial poisoning diagnosis,

therefore more adequate and comprehensive strategies should be desirable.
Moreover, doses and number of drugs that patients were exposed to is not identified. This condition might also impact on poisoning severity, clinical management, length of hospitalization and outcome.
In regards with length of hospitalization, the information contained on the AMOR data base is not sufficient to assure that poisoned patients remained hospitalized due to drug-related poisoning diagnosis only.

Conclusion

This study provides updated information about identification of drug-related poisonings during the 2016-2020 period. Poisonings were characterized by patients' sex and age, circumstance of exposure, length of hospitalization, and outcome. National poisoning rates were stable along the years with a slight decrease in 2020. Women had a larger proportion of cases when compared with men in the entire period of study. Intentional poisonings were more common among women and men, especially at the age of 18-29 yr old. The majority of the cases had favorable outcome for patients. Finally, our findings may contribute to create effective poisoning prevention strategies at national level.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare that there is no conflict of interests.

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