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Original Article

Which pharmaceutical agent is most commonly used for suicide? An epidemiological investigation in Loghman Hakim Hospital, 2018 - 2019

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ABSTRACT

Introduction: Acute accidental and deliberate poisoning by medications and pharmaceuticals is the third cause of death in suicides after hanging and self-immolation. To determine the common pattern of intentional drug poisoning in Tehran, this descriptive and retrospective study has reviewed and analyzed the data related to the records of patients admitted due to intentional drug poisoning, 2018-2019 at Loghman-Hakim-Hospital-Poison-Center (LHHPC).

Methods: This is an epidemiological, cross-sectional investigation based on the medical profile of 9245 patients who were admitted to LHHPC for intentional drug poisoning from May 2018 to May 2019. The verified variables included: age, gender, type of drug used, previous history of mental health problems, presence or absence of a previous history of suicide, the outcome of hospitalization and time of emergency visit. All inquiry data were coded and statistically analyzed using SPSS Version 26 software.

Results: The average age of the admitted cases was 29.3±12.4, with a minimum age of 12 years. The greatest proportion of poisoning occurred between the ages of 21-30 years. About 17.10% of patients had a previous history of self-harm and 57.77% had mental disorders. The most common pharmaceuticals for deliberate poisoning were anti-epileptics-sedative-hypnotics, antipyretics-non-opioid-analgesics, narcotics- hallucinogens and antidepressant-antipsychotic. Mortality was significantly higher in men and also following methadone and benzodiazepines.

Conclusion: The high prevalence of intentional poisoning and its resulting mortality among young adults requires considerable attention and further studies to understand the underlying causes. Besides, strict rules need to be enforced regarding the sale of central nervous system drugs and opioids.

Keywords:
Intentional drug poisoning
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Introduction

Suicide is defined as a conscious act of self-destruction, which in the most optimistic case can be considered as a multifaceted discomfort in weak-minded people who consider suiciding the best way of solving their problem (Shneidmann, 1996). Therefore suicide is not an accident, but a way to get rid of a challenging and unbearable issue. It can also be defined as an act of intentional self-harm leading to death. Suicide is derived from two Latin words, Sui meaning self and Caedere meaning killing (Sarvestani, 2019). Other studies show that most suicides occur as a result of frustration or being in a state of mental disorder such as depression, schizophrenia, bipolar disorder, alcoholism and drug abuse. Likewise, other unfavorable situations for instance financial problems, failed relationships and family disputes, also play an important role in this issue (Chang et al., 2011). According to the World Health Organization, the standard rate of suicide based on age in 2016 in the world was 10.5 people per 100,000 population, resulting in the death of about 800,000 people per year. Suicide is currently one of the top 20 causes of death in the world after malaria, breast cancer, war and murder (WHO, 2019).

Most suicide death occurs in low- and middle-income countries, with the world's most significant population. The Iranian Ministry of Health reports show that Lorestan, Mazandaran, and Golestan provinces rank first to third in suicide attempts in Iran, respectively (Rezaeian 2012; WHO, 2019). Suicide methods are very wide in the world, the most common include hanging, drug poisoning, firearms, high jump and self-immolation (Ajdacic-Gross et al., 2008). After hanging and self-immolation, drug poisoning is the third leading cause of death from suicide (Pajoumand, 2007). Due to easy access to toxins and drugs, also a lack of medical facilities, intentional poisoning has become an epidemic with high mortality in some parts of developing countries (Eddleston, 2000; Murray and Lopez, 1996).

Therefore, this study aimed to evaluate the drugs used for suicide in patients referred to the Loghman Hakim Hospital Poison Center (LHHPC) in Tehran, 2018-2019. We hope the results can be used to evaluate and determine the most common drugs used for suicide in Iran since knowledge of the general pattern of poisoning in an area can lead to early diagnosis and appropriate treatment of patients and ultimately reduce mortality and complications from poisoning.

Material and methods

This study is a descriptive, epidemiological, retrospective cross-sectional investigation based on hospital information recorded from patients who had been referred to LHHPC due to intentional drug poisoning and had been hospitalized in either the toxicology wards or medical ICUs admitted to the LHHPC from May 2018 to May 2019. Thus the target population was those patients who had used pharmaceuticals to commit suicide. The evidence was collected using a questionnaire and reviewing the files of patients. All patients were evaluated (the sampling method was census).

Variables included age, gender, season time, the hour of the emergency visit, presence or absence of the previous self-harm, former history of mental health problems, type of drug used for suicide and the outcome of hospitalization. Inclusion criteria were patients who had intentionally taken medication for suicide. Moreover, the patients who have been accidentally poisoned for various reasons and by other non-pharmaceutical methods, also under the age of twelve have been excluded from the study. Furthermore, the cases of drug abuse for recreational purposes but becoming symptomatic due to the drug side effects were considered as accidentally poisoned patients and excluded from this study.

We should mention that conferring the subject of the study, which was suicide, the ethical principles, privacy, confidentiality and trustworthiness were observed with great care and attention. Also in reviewing the results and reporting them, honesty and lack of bias in data analysis have been thoroughly considered.

Statistical analysis

The obtained data were analyzed via SPSS software version 26. The quantitative data were reported by mean±SD and qualitative data, through distribution and frequency percentage. The population normality was assessed using the Kolmogorov-Smirnov test, then t-test and one-way ANOVA were used for parametric data and chi-square for non-parametric data. The central and descriptive indices were calculated and expressed. The P-value<0.05 was considered to be significant.

Results

We evaluated, 9245 patients, 4418 female (47.79%)

TABLE 1: The Frequency of acute intentional drug poisoning at different ages referred to LHHPC, 2018-2019.

Age/year	Number of patients	Percentages
<21	2547	27.55%
21-30	3218***	34.81%
31-40	2070	22.39%
41-50	739	7.99%
51-60	335	3.62%
61-70	243	2.63%
>70	93	1.01%

Chi-square test was performed for analysis. ***P<0.001

TABLE 2: The rate of acute intentional drug poisoning in different seasons,

Seasons	Number of patients	Percentages
Spring	2271	24.56%
Summer	2529 ***	27.35%
Autumn	2246	24.30%
Winter	2199	23.79%

Chi-square test was performed for analysis. ***P<0.001

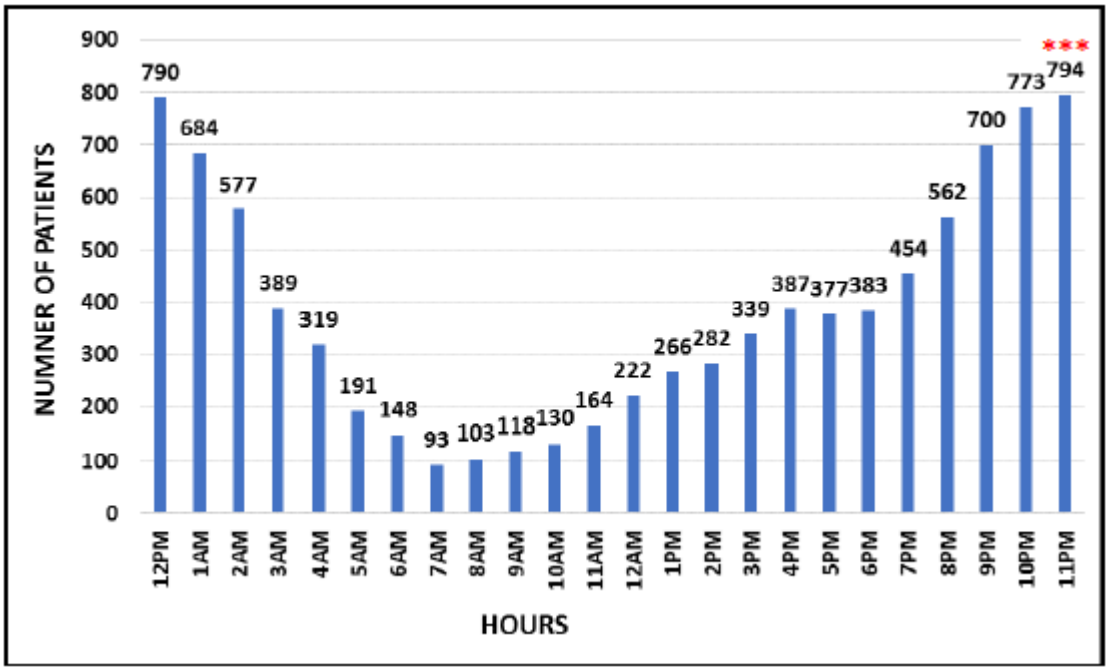

FIGURE 1. The number of patients referred to the LHHPC with intentional drug poisoning at different hours of the day, according to the chi-square test. ***P<0.001.

and 4827 male (52.21%), with acute intentional drug poisoning, referred to LHHPC, 2018-2019. The average age of attended patients was 29.3±12.4, with a minimum age of 12 and a maximum age of 94 years. The frequency of acute intentional drug poisoning at different ages during 2018-2019 referred to LHHPC was significant (P<0.001). The maximum frequency of acute intentional drug poisoning was in the age of 21-30 years

TABLE 3: The frequency of the previous history of self-harm and mental disorders.

	Percentage	Number of patients
Previous history of self-harm	17.1%	1581
Previous history of mental disorders	57.77%	5341

TABLE 4: Comparison of the frequency of drugs, based on ICD-10-CM Codes (S00-T88/T36-T50, Poisoning by, adverse effects of and underdosing of drugs, medicaments and biological substances T36-T50) used in suicide attempts in patients admitted to LHHPC, 2018-2019.

Code	Description Poisoning by, adverse effect of & underdosing of	Hospital admission (%)	Mortality (%)
T36	systemic antibiotics	96 (1.04%)	0 (0%)
T37	other systemic anti-infectives and antiparasitics	46 (0.50%)	1 (0.74%)
T38	hormones and their synthetic substitutes and antagonists, not elsewhere classified	175 (1.89%)	1 (0.74%)
T39	nonopioid analgesics, antipyretics and antirheumatics	1726 (18.67%)	11 (8.15%)
T40	narcotics and psychodysleptics [hallucinogens]	1305 (14.11%)	32 (23.70%)
T41	anesthetics and therapeutic gases	5 (0.05%)	0 (0%)
T42	antiepileptic, sedative-hypnotic and antiparkinsonism	3005 (32.50%) ***	23 (17.04%)
T43	psychotropic drugs, not elsewhere classified	1271 (13.75%)	31 (22.96%)
T44	drugs primarily affecting the autonomic nervous system	555 (6.00%)	4 (2.96%)
T45	primarily systemic and hematological agents, not elsewhere classified	225 (2.43%)	3 (2.22%)
T46	agents primarily affecting the cardiovascular system	154 (1.67%)	7 (5.19%)
T47	agents primarily affecting the gastrointestinal system	86 (0.94%)	12 (8.89%)
T48	agents primarily acting on smooth and skeletal muscles and the respiratory system	161 (1.74%)	0 (0%)
T49	topical agents primarily affecting skin and mucous membrane and by ophthalmological, otorhinolaryngological and dental drugs	13 (0.14%)	0 (0%)
T50	diuretics and other and unspecified drugs, medicaments and biological substances	422 (4.57%)	10 (7.41%)

Chi-square test was performed for analysis. $^{***}P<0.001$

followed by those under 21 and the minimum frequency was after 70 years old (Table 1). The rate of acute intentional drug poisoning in different seasons was significant ($P<0.001$). The suicide rate in different seasons showed that the highest number was reported in summer (27.35%) and the lowest in winter (23.79%, Table 2).

Regarding the hours of the day, the maximum number of suicide attempts has been reported in the last hours of the night (9PM to 2AM) and the deepest number in the morning (7 to 10AM). There was a significant difference in the frequency of referrals due to acute intentional poisoning in patients at different hours of the day with a peak at 11PM ($P<0.001$, Figure 1). The frequency of the previous history of self-harm and mental disorders in patients is verified in Table 3. About 17.10% of patients had a previous history of self-harm and about 57.77% of patients had mental disorders.

In addition, according to the International Classification of Diseases, version 10 which has the codes T36-T50 for drug poisoning (ICD-10 2014) and shown

TABLE 5: The most common pharmaceutical agents used for suicide that led to death in patients admitted to the LHHPC, 2018-2019.

Drugs name	Number of Deaths	Percentages
T40.3 (Methadone)	22 ***	16.29%
T42.4 (Benzodiazepines)	18 ***	13.33%
T43.3 (Phenothiazines, Antipsychotics & Neuroleptics)	12	8.88%
T43.2 (Other Antidepressants)	11	8.14%
T50.9 (Other Drugs & Unknown Biologics)	7	5.18%

Chi-square test was performed for analysis. ***$P<0.001$

in Table 4 with our data, the most commonly used drugs for suicide were T42 group (including anti-epileptics, sedative-hypnotics and anti-parkinsonism drugs, 32.50%) followed by the T39 group (non-opioid-analgesics, antipyretics and anti-rheumatics, 18.67%) and T40 group (narcotics and psycholeptics [hallucinogens], 14.11%) (Table 4).

During this period, 1.46% of patients were deceased who were mostly males (63.70%) and young adults (21-30 years, 25.18%). Most deaths were due to the use of the T40 group (narcotics and psycholeptics [hallucinogens], 23.70%) followed by the T42 group consisting of anti-epileptics, sedative-hypnotics and anti-parkinsonism drugs (22.96%). One-on-one examination of the pharmaceuticals showed that the mortality rate was significantly higher with methadone and then benzodiazepines (Table 5).

Discussion

In this study, the highest number of patients with acute intentional drug poisoning were males (52.21%) almost between 21 and 30 years old, which is consistent with most previous studies (Hassanian-Moghaddam et al., 2014; Shadnia et al., 2007). However, some studies have shown that women are more likely than men to use drugs to commit suicide (Callanan and Davis, 2012; Larney et al., 2012; Pajoumand et al., 2012; Sorodoc et al., 2011; Spiller et al., 2010). Furthermore, this study showed for the first time that suicide attempts are more likely to happen in summer and the last hours of the night. This finding can be used by health organizers and medical staff for future planning.

According to the International Classification of Diseases (ICD-10 code), the most commonly used drugs for suicide in our study are T42 poisoning (including anticonvulsants, sedatives-hypnotics and anti-Parkinsonism, 32.50% of cases) and then, the T39 group (antipyretics [especially Acetaminophen] and anti-rheumatics, 18.67% of cases) followed by T40 group (narcotics and psycholeptics [hallucinogens], 14.11% of cases). Compared to previous studies (Hassanian-Moghaddam et al., 2014; Shadnia et al., 2007), T42 and T39 groups are among the most common drugs in intoxication due to easy access to drug compounds, increased sales of over the counter drugs and increased prescription of drugs affecting the central nervous system (CNS) by physicians, especially benzodiazepines. Also, the use of CNS affecting drugs is more common in those people who suffer from psychosocial problems and depression, and these problems also increase the tendency to suicide in these people. However, the drugs in the T40 group, especially tramadol and methadone, which had a lower percentage in earlier studies, were the third leading cause of intentional drug poisoning in this study. Likewise, in the 6-year study by Hassanian Moghadam et al. (2014) conducted at the LHHPC from 2006 to 2011, comparing the first and last years of their study, we noticed an increase in opium poisoning in the beginning but, methadone poisoning at the end of the year. This confirms the data gathered during 2003 in LHHPC by Shadnia et al. (2007). Thus nowadays methadone and tramadol account for a larger proportion of intentional poisoning than opium and this ratio is increasing. As a consequence, more serious attention, stricter regulations and more precise control over the supply and distribution of methadone and tramadol are required in our community.

In other studies, Kavak et al. (2019) reported that more than half (59.6%) of the patients had attempted suicide by taking non-psychiatric drugs, while 17.8% had com-

mitted suicide by psychiatric drugs. Several studies have suggested that alcohol consumption may be a factor in suicide attempts and that alcohol increases the risk of suicide (Bagge et al., 2013; Borges and Loera, 2010). In our study, the overall mortality rate was 1.46% and was significantly higher following methadone and benzodiazepines. The mortality rate in other studies has been reported differently. For instance, in a study directed by Taqhdosi Nejad et al., the mortality rate was 17.7% probably due to conducting the study in an intensive care unit (Taghadosi Nejad et al., 2015). The mortality rate in the study of Karbakhsh and Zandi (2008) was 11.7% because all patients were over 60 years old. In the study of Masoumi et al. (2012) in Isfahan, the mortality rate was reported to be 2% and in the study of Ahmadi et al. (2010) in Sari, it was 1.3%. The reason for these low numbers was that in these two studies all age groups and different types of poisoning were involved. In our study, 135 patients died from acute intentional drug poisoning, thus the mortality rate was much lower (1.46% of all patients).

The highest rate of suicide attempts with drugs was in summer (27.34%) and the lowest rate was in winter (23.79%), which also matched with studies by Ahmadi et al. (2010) in Sari and Kazemifar et al. (2020) in Qazvin. In contrast, a study by Zakharov et al. (2013) on people aged 9-18 who committed suicide found that most cases occurred in the spring.

In a Turkish survey, 43.2% of studied people had a previous mental disorder. Our study also showed that more than 57% of people have a history of mental illness. Another study found that depression, psychosis, mania, post-traumatic stress disorder and general anxiety disorder were associated with high-intensity suicidal ideation (Ashrafioun et al., 2016). In our study, the most common disorders were severe depression (51.32%), followed by bipolar disorder (12.68%) and unspecified mood affective disorder (11.29%), correspondingly.

Poisoning is one of the reasons for the frequent referral of patients to the emergency department of hospitals and is an important issue for the health sector around the world, especially in developing countries. In Iran, due to the increased accessibility of drugs, especially over the counter drugs, drug poisoning is the most common cause of poisoning (Moradi et al., 2016). But the rate and risk of recurrence of intentional poisoning are higher and unfortunately, most studies on suicide attempts, especially by poisoning, show that the rate of suicide attempts for cultural, social, political and taboo reasons is less calculated and reported among individuals and in general public it is mostly denied (Moradinazar et al., 2017). Therefore, knowledge of the general pattern of poisoning in an area and changes in lifestyle and social behavior can lead to early diagnosis and appropriate treatment of patients and ultimately reduce mortality and complications from poisoning. This study was able to create awareness in one year for the city of Tehran, which can be used by local health and wellness community planners, and of course, for other places and different times, additional studies are needed.

Conclusion

This study showed that during the year, 2018 - 2019, the most common causes of intentional poisoning in Tehran, are sedative-hypnotics, especially benzodiazepines, antipyretics (acetaminophen) and opioids (methadone), respectively. Men are more likely than women to be hospitalized and deceased, and the majority of patients are young people, with a history of mental disorders and suicide can be a side effect of the drugs used to treat their disorders. Therefore, it is necessary to control, identify, treat and support high-risk groups (adolescents, young people, patients with psychiatric problems and a previous history of suicide, etc.). About 1.46% of patients died of intentional drug poisoning and the mortality was higher in the elderly, so with age, the risk of death due to drug poisoning increases. Almost 17.10% of patients had a previous history of suicide. This finding doubles the importance of supporting, following up and rehabilitating patients who attempt suicide. It is hoped that the results of this study can reduce the complications and deaths due to poisoning and highlights the fact that early diagnosis and treatment of the underlying cause can reduce the incidence of suicide in the future. Furthermore, severe guidelines are required concerning the transaction of over the counter CNS drugs and opioids.

Competing interests

The authors declare that they have no competing interests.

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