Tabari Biomedical Student Research Journal

Original Article

Prevalence of self-poisoning among patients referred and admitted to hospitals in Tonekabon and Ramsar from 2005 to 2015

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According to studies conducted in different countries, the establishment of a poison control center has been successful in the reduction of mortality, length of hospital stay, and medical costs, as well as the provision of educational and research opportunities to extend the knowledge of emergency medical care. With this background in mind, a poison control center is urgently needed in the West of Mazandaran given the high population density of nearly 500,000 inhabitants in that region. In an attempt to investigate the necessity of establishing a poisoning center in the West of Mazandaran, this cross-sectional observational study was conducted to describe and analyze the prevalence of self-poisoning among patients referred and admitted to hospitals in Tonekabon and Ramsar within 2005-2015. Data were analyzed in SPSS software version 20. The present study was performed on 7240 subjects, out of whom 42.3% were male and 57.7% were female. The mean of suicide attempts differed significantly between males and females ($P<0.05$). The highest prevalence was reported as 34.4% in the age range of 20-29 years. In addition, 58.45% of patients were single. Moreover, most suicides were attempted by people without a high school diploma (47.1%), and the lowest rate of suicide attempts was related to those with postgraduate and higher education. In addition, most of the suicide attempts were attributed to the unemployed (32.5%), housewives occupied the second place with 21%, and the lowest rate was observed in the retired (0.6%). According to the results of the current study which are indicative of the high prevalence of suicide attempts by self-poisoning as well as the findings of studies conducted around the world, a poisoning center needs to be established in the west of Mazandaran due to high population density (500,000) in this region.

Keywords: Poisoning, Suicide, Ramsar, Mazandaran

How to cite this article: Makhtoomi M, Jafarnejad S, Shafiei B. Prevalence of self-poisoning among patients referred and admitted to hospitals in Tonekabon and Ramsar from 2005 to 2015. Tabari Biomed Stu Res J. 2019;1(3):14-20.

Introduction

After World War II, the widespread proliferation of medications and chemical substances and the rise of suicide and intoxication in children moved the medical community to set up poison control centers in a response to deliberate and accidental poisoning events [1, 2]. Not only does this center address the consequences of suicide for individuals and society, but it can also deal with the risks and threats posed to the country's national security, at a higher level. Ba'athist Iraqi regime attacked our country in the 1980s and this regime killed thousands of Iranian soldiers on the battlefields, as well as civilians in different areas of the country using chemical and microbial weapons provided by the West. Even today, the threat posed by the emergence of terrorist groups in neighboring countries and their access to chemical weapons calls for an ongoing defense against bioterrorism [3, 4].

Self-poisoning with toxins and drugs has been reported as the most frequently used method of suicide in the country. Moreover, poisoning with substances of abuse is the third leading cause of suicide. Suicide rates in Iran within 2010-2012 was reported as 6035, 6167, and 5414, respectively. They lost their lives due to different kinds of

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poisonings, which showed a two-fold increase in mortality, as compared to previous years with substance abuse as the leading cause of poisoning. In this regard, intoxication has been reported as the second leading cause of death in different countries [5-7].

The high prevalence of poisoning in the country demands the adoption of drastic measures for the provision of appropriate diagnostic-therapeutic services in health facility centers. Therefore, it is necessary to establish a poison control center in order to take appropriate therapeutic measures. The number of active poison control centers in the country has increased to 20 among which Loghman Poison Control Center in Tehran with more than 65 years of experience in managing intoxicated patients has always mirrored the social problems. There exists no center in the country for the registration of poisoning-related information and this center can successfully fill this void with the provision of epidemiological information. Based on the statistics of various studies conducted on intoxicate patients treated in these centers, the mortality rate was extremely low, highlighting the critical role of these centers in the treatment and healthcare of patients [8].

The increasing prevalence of poisoning in society calls for the establishment of a poisoning center and the efficiency of this center requires specialists, training of qualified staff and appropriate facilities. The presence of general practitioners in poisoning emergencies is of paramount importance in all medical centers. In this regard, it is necessary to improve general practitioners' skills through training courses to enhance the quality of diagnosis, initial measures, and timely referral of intoxicated patients to the poison control unit. Referred patients need a more rigorous diagnostic examination that calls for the presence of specialists in their respective fields. Along with above-mentioned factors, some well-equipped facilities, such as poisoning care services (ICU-PICU), forensic toxicology laboratory and pharmacy, endoscopy and bronchoscopy department, radiology department, dialysis unit, drug abuse treatment unit and department of emergency medicine and drug information unit are required [9,10].

Regarding the limitations and drawbacks of the present study, disease severity was not generalizable to all patients due to unrecorded electronic data, the data collection from the emergency department and the small study population. Moreover, other significant points include the absence of information on the psychiatric history of patients and the short follow-up [11, 12].

According to studies conducted in different countries, the establishment of a poison control center has been successful in the reduction of mortality, length of hospital stay, and medical costs, as well as the provision of educational and research opportunities to extend the knowledge of emergency medical care. With this background in mind, a poison control center is urgently needed in the West of Mazandaran given the high population density of nearly 500,000 inhabitants in that region [13-15]. To investigate the necessity of establishing a poisoning center in the west of Mazandaran province, this cross-sectional observational study was conducted to describe and analyze the prevalence of self-poisoning among patients referred and admitted to hospitals in Tonekabon and Ramsar within 2005-2015. It is expected that the result of the present study be a considerable step toward the need assessment of poison control center establishment in the west of Mazandaran with the aim of reducing referrals to other medical centers located in the center of the province, reducing the rate of deaths and admissions to the emergency department, and costs of treatment, as well as the provision of educational and research opportunities.

Materials and Methods

This cross-sectional observational study was conducted to describe and analyze the prevalence of self-poisoning among patients referred and admitted to hospitals in Tonekabon and Ramsar within 2005-2015. Convenience sampling was used to select the medical records of all patients. It is worthy to note that medical records without blood tests confirming poisoning were excluded. Data extracted from hospital records (by medical record experts and under the supervision of the researcher) were recorded and collected in a data sheet. Variables included demographic information (i.e., age, gender, educational level, marital status, occupational status, and place of residence), clinical characteristics (i.e., history of physical and mental illnesses, symptoms of poisoning, outcome of poisoning including patient death, and reason of referral), kind and method of exposure to toxic substances, as well as the data related to hospitalization and referral process (e.g., length of hospital stay, time and distance of transfer to other hospitals).

It is worthy to mention that researchers were morally and legally permitted to use patient's personal and clinical information upon obtaining written consent from all of them. All information

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extracted by colleagues was kept confidential. This study did not involve human subjects, whereas it used all medical records at the archive.

Data were analyzed in SPSS software version 20. Frequency distribution indices were used to describe the qualitative data. On the other hand, for quantitative data, mean, standard deviation, median, and interquartile range were used in terms of type and statistical distribution. Furthermore, Kolmogorov-Smirnov, Student's t-test, Mann-Whitney U-test, One-way ANOVA, and Chi-square tests were used for statistical inference. P-value less than 0.05 was considered statistically significant.

Results

The present study was performed on 7240 subjects, out of whom 42.3% (n=3062) were male and 57.7% (n=4178) were female. The mean of suicide attempts differed significantly between males and females (P-value=0.0001). The highest prevalence was reported as 34.4% in the age range of 20-29 years. In addition, 58.45% of patients were single. Moreover, most suicides were attempted by people without a high school diploma (47.1%), and the lowest rate of suicide attempts was related to those with postgraduate and higher education. In addition, most of the suicide attempts were attributed to the unemployed (32.5%), housewives occupied the second place with 21%, and the lowest rate was observed in the retired (0.6%). Accordingly, there was a significant relationship between gender, age group, education level, marital status, and job status with suicide attempts (P-value <0.05). Furthermore, 83% of patients referred to emergency poisoning made the suicide attempt for the first time, 8.6% for the second time, and 4.4% had the history of attempted suicide three times or more. Suicide attempt associated with benzodiazepine usage was reported as 15.5% and alcohol poisoning was 0.8%.

According to medical records, 80% of intoxicated patients referred to the emergency department were healthy (i.e., physical illness), 5.8% had a past surgical history of, 3% were afflicted with specific diseases, and 11.2% were confirmed to have chronic diseases. In addition, emotional problems were reported to be the main impetus of suicidal attempt accounting for 43.6% of all suicides, family problems (family disagreements and disputes) ranked second, and 2.2% of them attempted suicide with unknown motivations. Moreover, regarding mental disorders leading to suicide, psychiatric substance use disorders (25.5%) were found to be the most leading cause, and emotional disorders with depression as the most typical symptom (mood disorders) ranked second. Among people referred to poisoning emergency, 83.4% of cases were treated with gastric lavage and other medical measures, 9.5% of them died, and 7.1% of patients were sent to other neighboring provinces due to poor equipment and facilities (often referred to Rasht in such cases). The mean of suicide attempts significantly differed between men and women (P-value = 0.000).

Table 1. Frequency distribution and percentage of demographic factors.

Variable		Frequency	Percentage
Gender	Male	3062	42.3
	Female	4178	57.7
Age groups	Under 20 years	1886	26
	20-29	2489	34.4
	30-39	721	10
	40-49	1072	15
	50-59	715	9.9
	60-69	212	3
	Over 70 years	145	2
Marital status	Single	4228	58.8
	Married	2170	30
	Divorced/widowed	362	5
	Non-specified	480	6.6
Education	Under diploma	3411	47.1
	Diploma	2628	36.3
	over diploma	1201	16.6
Occupation	Jobless	2326	32.5
	Housewife	1518	21
	High school student	1290	17.7
	University student	814	11.2
	Soldier	20	0.3
	Employed	1230	17
	retired	42	0.6
Method	Benzodiazepines	1129	15.5
	Other medications	2282	31.5
	Acute aluminum phosphide	608	8.4
	Psychedelic drugs	896	12.4
	Agricultural and Animal Pesticides	778	10.7
	Detergents	516	7.2
	Opioids	658	9.1
	Alcohol	61	0.8
	Unknown	322	4.4
Consequence	Survival	6034	83.4
	Death	694	9.5
	Referral to more well-equipped centers in other cities	512	7.1
History of attempted suicide	The first time	6031	83
	The second time	622	8.6
	The third time or more	317	4.4
Health condition	Healthy	5787	80
	Surgical history	419	5.8
	Afflicted with specific diseases	218	3
	Afflicted with chronic diseases	816	11.2
Total		7240	100

Moreover, there was a significant relationship between the time interval between intoxication and medical center presentation and the chance of recovery. Based on the results demonstrated in (Table 1), the correlation between the time interval between intoxication and medical center presentation and health risk is reported to be -0.749. In other words, the sooner a patient is referred to a specialist medical center in the nearest western region of Mazandaran, the greater is his or her chance of survival and recovery (Table 2).

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Table 2. Correlation between time interval between intoxication and medical center presentation and health risk.

The time interval between intoxication and medical center presentation and health risk	the correlation coefficient (r)	P-value
	-0.749	0.000

In addition, there is a significant relationship between lack of specialized facilities and the emergence of adverse effects in patients. Based on the severity of the correlation between these two variables (-0.192), it can be concluded that there is a significant inverse relationship between the lack of specialized medical facilities and the level of patient recovery. In this regard, non-specialized facilities pose a risk to patient health and the likelihood of adverse consequences, as well as the risk of death (Table 3).

Table 3. Correlation between time interval between intoxication and medical center presentation and lack of facilities

time interval between intoxication and medical center presentation and lack of facilities	Correlation coefficient (r)	P-value
	-0.192	0.000

Discussion

Suicide rates, especially by poisoning, are steadily on the rise in the country, and this high prevalence requires taking drastic measures to provide medical centers with appropriate diagnostic-therapeutic services. Self-poisoning with toxins and drugs has been reported as the most frequently used method of suicide in the country. Moreover, poisoning with substances of abuse is the third leading cause of suicide [16]. Accordingly, due to the importance of this issue and high population density in the West of Mazandaran, the current study aimed to describe and analyze the prevalence of self-poisoning among patients referred and admitted to hospitals in Tonekabon and Ramsar within 2005-2015, in an attempt to provide accurate and reliable statistics for taking necessary steps in this region.

The results of the current study revealed that females showed a higher rate of suicide attempts, as compared to men. Therefore, there was a significant relationship between gender and suicide attempt (P = 0.0001), which was in line with the results of several studies in different parts of the world. Many studies have been conducted on the impact of gender differences in suicide rates. Different rates of suicide and suicidal behavior have been reported for men and women [17]. The result of studies indicated that although suicidal ideations and attempts are higher in women, suicidal men are far more likely to take their own lives [18]. This is identified as a gender paradox of suicidal behavior [19]. According to international statistics, deaths by suicide occurred about 1.8 times more often among males in 2008 and 1.7 times in 2015 [20, 21]. Therefore, gender can be considered a major risk factor for suicide.

Regarding age grouping, the results showed that the highest rate of suicide attempts occurred in the age group of 29-20 (34.4%) and there was a significant relationship between suicide attempt and age group (P=0.002) which were in accordance with the results of previous studies performed in Iran [22, 23]. Given the significant effects of such factors as economic status, educational status, and ethnicity on suicide attempt, different studies around the world have reported conflicting results which are not in agreement with the results of the present study. For instance, the results of the study conducted by Kablo et al. are suggestive of the high rates of suicide attempts among middle-aged and older people in Europe [24]. However, suicide attempts, especially by self-poisoning, seem to be most prevalent among adolescents and youth in most parts of the world, [25-27]. Accordingly, preventive measures, such as psychiatry courses in schools can be effective in the reduction of suicide attempts among young adults.

Furthermore, the current study suggested that among those referred to poisoning emergency, the highest rate of suicide attempt was pertinent to single people (58.4%) and there was a significant association between suicide attempt and marital status (P <0.0001). These results were roughly comparable with the results of the study conducted by Ahmadi et al. (80.8%) who investigated the toxicity of tramadol [28]. In addition, international statistics indicated that suicide rates are much higher among single people, and it is worthy to note that marriage has been identified as an effective factor in the reduction of suicide rates [29, 30].

Studies on the level of education of patients referring to the poisoning ward signified that the highest rate of suicide attempts was observed in the group of people with high school diplomas (36.3%) and under diploma (47.1%). On the other hand, the lowest rate was associated with those with postgraduate and higher academic degrees. Moreover, the analysis of the results demonstrated a significant relationship between suicide attempts and education (P <0.001) indicating that the probability of suicide in low educated individuals is higher, as compared to high educated ones. The results of our study are harmonious with the results of the study performed by Phillips et al. which investigated the relationship between education levels and suicide attempts in the US. This study which was conducted

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between 2000 and 2014 reported the highest suicide rate among individuals with high school education and the lowest rate of suicide among people with an academic degree [31]. However, a review study was performed by Promopilia et al. on the Italian Mortality Database to investigate whether education level affects suicide rates. Contrary to our findings, they found that a person with higher academic achievements could be at higher risk of suicide confronting failure, general shame, and diseases [32].

Our investigations on the occupational status of suicidal people revealed that most of the suicides were attempted by unemployed people (32.5%). Accordingly, people without a specific job or those who have just lost their jobs are at a higher risk of suicide, as compared to others (P = 0.001). The results of this study and many other studies throughout history have confirmed this fact pinpointing the crucial importance of job security. Accordingly, lack of job security, unemployment, or job loss exerts significant impacts on suicide attempt especially in older people who must support a family [33, 34].

Drug overdose was the most common cause of acute poisoning (31.5%). Intentional self-poisoning is one type of suicide attempt accomplished by using high-speed toxins, such as hydrogen cyanide or other substances which are known to be highly toxic to humans. Pesticide self-poisoning account for 30% of suicides globally. However, the use of this method varies from 4% in Europe to over 50% in the Pacific region [35]. Furthermore, drug overdose is also a method of suicide poisoning, which involves the ingestion or application of a drug in quantities greater than recommended or inappropriate medication combination that cause harmful effects or increase the potency of one or more substances. In addition, the studies which specifically investigated the suicide attempts by drug overdose reported that young adults, as well as single women, fall prey to this method of suicide attempt, with benzodiazepines being the most used drug [36]. In the present study, 15.5% of people attempted suicide using benzodiazepines.

Based on the findings of the current study, 83.4% of people survived suicide attempts which were in accordance with the results of studies conducted over the world. This is suggestive of the fact that medical treatments save the lives of most suicidal people [37-39]. Regarding the history of suicide attempts, the majority (83%) of the people referred to the poisoning emergency department were first-time suicide attempters. A common yet highly inaccurate belief is that people who survive a suicide attempt are unlikely to try again. According to previous studies, within the first 12 months following a suicide attempt, people are at the highest risk of a second attempt. In addition, re-attempted suicide is associated with a history of psychiatric and personality disorders, alcohol use, and a young age. Therefore, the proper evaluation of the history of mental disorders, season, and method of suicide attempt, gender, and timely diagnosis of disorders would be of great help for the prevention of re-attempted suicide [40, 41].

Based on international statistics, the most relevant risk factors for suicide attempts include psychiatric disease, depression, substance use disorders, and psychosis Although 80% of suicide attempters in our study had no history of physical illness, most of them suffered from psycholeptic use disorders (25.5%) and emotional disorders (24%) which agreed with international statistics [42]. This result was expected since 43.6% of suicides were reported to be attempted due to emotional problems. Most of these people have been suffering from hidden mental disorders which manifested themselves in suicide. They may have refrained from referral to psychologist or psychiatrist due to stigma surrounding seeing a psychologist in our culture. Therefore, removal of the public stigma associated with seeking professional services to treat mental illness and resolve family problems can exert a significant impact on the reduction of suicide rates especially in young adults [43].

Furthermore, the results of the current study with a focus on the problems of medical centers revealed a significant relationship between time interval of intoxication and medical center presentation with patients' health risk (P<0.001), as well as between the lack of specialized facilities and the occurrence of adverse consequences for the patient (P<0.00).

According to studies in different countries, poison control centers could manage to dramatically reduce mortality, length of hospital stay, and medical costs. Moreover, these centers were successful in the provision of educational and research opportunities to broaden the knowledge of emergency medical care [8, 44]. For instance, Henry Spiller and Jill Girifth conducted a review study on the US poison control centers highlighting the importance of the advancements in the system of the US poison control center. This study pinpointed the crucial role of poison control centers in the reduction of emergency room visits, length of hospital stay, and medical costs of more than $5 million annually. On the other hand, the absence of a poison control center in the states of Louisiana, Michigan, and California increased the rate of

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emergency referral by 4% and the inappropriate use of this unit for the treatment of poisoning [45]. In addition, Galloway et al., in a retrospective three-year cohort study entitled ‘‘Impact of Poison Control Center on Inpatient Patients” at the poisoning center of Sao Paulo Hospital in Brazil revealed that intoxicated patients receiving medical care in poison control center had a shorter hospital stay, as compared to those who did not [46].

Conclusion

According to the results of the current study which are indicative of the high prevalence of suicide attempts by self-poisoning as well as the findings of studies conducted around the world, a poisoning center needs to be established in the West of Mazandaran due to high population density (500,000) in this region.

Conflicts of interest

None.

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