Original Article

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# Prevalence and Causes of Poisoning in Patients Admitted to Shahid Beheshti Hospital of Babol in 2011-2012

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## ABSTRACT

**BACKGROUND AND OBJECTIVE:** Poisoning is one of the most common causes of patient referrals, and the mortality rate in poisoning has been estimated at 2%. Due to the different epidemiological features and health consequences of poisoning in the world, this study aimed to investigate the prevalence and causes of poisoning in patients admitted to Shahid Beheshti Hospital of Babol during 2011-12.

**METHODS:** In this cross-sectional, prospective study, data of the patients admitted due to poisoning were recorded from 22 June 2011 to 20 June 2012. In addition, demographic features including the cause of poisoning, patient and family history of poisoning or suicide and treatment side effects were collected using prepared checklists.

**FINDINGS:** Out of 635 patients, 265 (41.7%) were male and 370 (58.3%) were female with the mean age of 28.12±12.35 years. Rate of poisoning was significantly higher within the age range of 16-25 years among married subjects, housewives and self-employed patients ($p<0.001$). The most common agent of poisoning was drug consumption (73.3%), and benzodiazepines (31.3%) were the most frequent class of drugs to cause poisoning. In addition, suicide was the most common cause of poisoning (76.9%), and the majority of suicide cases had occurred by the use of drugs (88.9%). Benzodiazepines were the most commonly used agents in the suicide cases in this study (39.3%). Eventually, 524 patients were discharged willingly, 93 of whom (14.6%) recovered, and 4 cases (0.6%) were referred to another center. Moreover, 6 patients (0.9%) suffered several complications, and 8 subjects (1.3%) died because of poisoning.

**CONCLUSION:** According to the results of this study, the highest rate of poisoning was observed in young adults, and the most common cause of poisoning was suicide. Furthermore, benzodiazepines were the main class of drugs to cause poisoning in the studied patients.

**KEY WORDS:** Poisoning causes, Drug toxicity, Suicide.

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## Introduction

Deliberate or unintentional poisoning and the subsequent mortality and morbidity have imposed financial burdens on the health care system of different countries. According to statistics, 2-5 million poisoning cases occur in the U.S every year, and patient treatments cost about 4.33 billion dollars (1,2).

In addition, poisoning accounts for 5-10% of emergency referrals and 5% of all adult patient admissions to intensive care units (ICUs)(3). While the total mortality rate due to poisoning has been estimated at 0.5%, this figure reaches 2% in case of hospitalized patients(4).

Unfortunately, accurate statistical data is scarce on the level of poisoning and the associated causes in published reports. In hospital sections and ICUs, the mortality rate in poisoning has been estimated at 8 out of 1000 cases and 209 out of1000 patients, respectively. Poisoning is the most frequent cause of hospitalization and the second cause of death in hospitals in Iran (5).

Generally, poisoning could occur at different ages; however, people within the age range of 15-40 years are most commonly referred to medical centers due to poisoning(6). Poisoning could be caused by various materials such as analgesics (10.6%), cleaners and detergents (9.5%), cosmetics (9.2%), external objects (5.1%), herbal compounds (4.7%), sedative drugs (4.4%) and adult colds and cough medicine (4.3%). Furthermore, carbon monoxide, antidepressants, narcotics, cardiovascular drugs and alcohol are among other causes of death due to intoxication.

A large proportion of deaths due to drug toxicity are the result of analgesic consumption (e.g. acetaminophen, oxycodone and salicylates) (7); however, there is insufficient data on this issue in Iran. In one study conducted on the effects of sedatives, benzodiazepines and narcotics were observed to be the major contributing factors to poisoning and deaths due to intoxication in Iran (8). Despite the heavy costs and high mortality rates of poisoning in different countries, the patients differ largely in terms of demographic features, associated causes and nature of poisoning (e.g. deliberate, criminal, unintentional or career-based). Therefore, treatment outcomes also vary in different countries based on cultural habits and lifestyles. In this regard, adequate epidemiological information about the patients and common causes of poisoning could yield a better understanding of this condition, while providing efficient prevention plans. This study aimed to present a yearly investigation of the prevalence and causes of poisoning in patients admitted to Shahid Beheshti Hospital of Babol during 2011-12.

## Methods

This cross-sectional, prospective study was conducted on all the patients referred to Shahid Beheshti Hospital due to poisoning from 22 June 2011 to 20 June 2012. Demographic features of the patients including the cause of poisoning, patient and family history of poisoning or suicide and side effects of treatment were recorded for each patient using prepared checklists.

In addition, patient files were completed after reviewing the medical records, and subjects with incomplete data were excluded from the study. Data analysis was performed using T-test, Mann-Whitney test, Chi-square test and Fisher's exact test (if necessary) in SPSS16, and $p<0.05$ was considered as significant.

## Results

In total, 635 patients were enrolled in this study, 265 of whom were male (41.7%) and 370 were female (58.3%)with the mean age of 28.12±12.35 years (youngest patient: 3 years old, eldest patient: 83 years old) (table1). Rate of poisoning was significantly higher within the age range of 16-25 years ($p=0.032$), married subjects, housewives, and self-employed patients ($p<0.001$). No significant correlation was found between gender, residence, cause of referral and educational status of the patients in this study, and drug intoxication accounted for the majority of poisoning cases (73.3%).

**Table 1. Demographic Features of Poisoned Patients admitted to Shahid Beheshti Hospital of Babol during 2009-2010**

| Variable | Male(N=265) N(%) | Female(N=370) N(%) | P-value | Total N(%) |
|---|---|---|---|---|
| Age (Year) (Mean±SD) | 30.35±14.18 | 26.52±10.59 | <0.001 | 35.12±12.28 |
| <7 | 1(0.4) | 1(0.3) | 1 | 2(0.3) |
| 8-15 | 5(1.9) | 17(4.6) | 0.06 | 22(3.5) |
| 16-25 | 116(43.8) | 188(50.8) | 0.08 | 304(47.9) |
| 26-35 | 81(30.6) | 110(29.7) | 0.82 | 191(3.1) |
| 36-45 | 32(12.1) | 32(8.6) | 0.15 | 64(10.1) |
| >45 | 30(11.3) | 22(5.9) | 0.02 | 52(8.2) |
| **Marital Status** | | | | |
| Married | 145(55.3) | 256(69.8) | <0.001 | 401(63.8) |
| Single | 117(44.7) | 111(30.2) | <0.001 | 228(36.2) |
| **Residence** | | | | |
| City | 155(60.5) | 239(66) | 0.12 | 394(63.8) |
| Village | 101(39.5) | 123(34) | 0.16 | 224(36.2) |
| **Occupation** | | | | |
| Unemployed | 14(9.5) | 2(0.8) | <0.001 | 16(4.1) |
| Self-employed | 116(78.4) | 22(9.2) | <0.001 | 138(35.7) |
| Employee | 2(1.4) | 10(4.2) | 0.11 | 12(3.1) |
| Housewife | 1(0.7) | 148(61.9) | <001 | 149(38.5) |
| Student | 15(10.1) | 57(23.8) | <0.001 | 72(18.6) |
| **Education Status** | | | | |
| Illiterate | 6 (6.5) | 7(7.3) | 0.74 | 13(4.6) |
| Below Diploma | 45 (48.4) | 95(49.7) | 0.009 | 140(49.3) |
| Diploma | 34 (36.6) | 55(28.8) | 0.19 | 89(31.3) |
| Above Diploma | 8 (8.6) | 34(17.8) | 0.04 | 42(14.8) |
| **Season of Referral** | | | | |
| Spring | 91(34.3) | 115(31.1) | 0.39 | 206(32.4) |
| Summer | 72(27.2) | 85(23) | 0.23 | 157(24.7) |
| Autumn | 55(20.8) | 77(20.8) | 0.97 | 132(20.8) |
| Winter | 47(17.7) | 93(25.1) | 0.027 | 140(22) |

Causes of poisoning among the studied patients are shown in figure 1. According to these findings, benzodiazepines (31.3%), acetaminophen and adult colds (17.5%) were the most frequent drugs to cause intoxication (fig 2).

Moreover, suicide was the main cause of poisoning in 450 patients (76.9%), and other causes were overdose (14.2%), unintentional (5.1%), occupational (2.4%), iatrogenic (1.2%) and criminal (0.2%). Among suicide cases, there were 319 women (70.9%) and 131 men (29.1%) (p<0.001), and gastric lavage was the most frequent treatment received by these patients (77%). Use of activated charcoal (75.6%) and monitoring (27.9) were other common procedures in these patients, and 44.3% of the subjects were followed-up as well. Furthermore, antidote therapy was performed on 94 patients (14.8%) (table 2).

On the other hand, use of naloxone (23.1%), N-acetylcysteine (17.3%), atropine (13.5%), ethanol (10.6%), oxygen (8.7%), glucose (6.7%), pralidoxime (5.8%), dialysis (5.8%), vitamin K (4.8%) and polyvalent (3.7%) were other exclusive patient treatments used in this study.

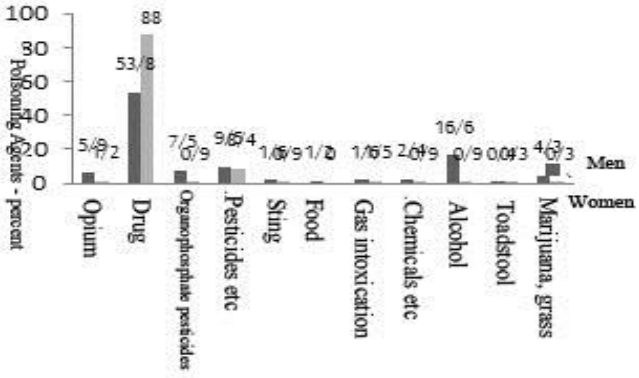


**Figure 1. Distribution of Contributing Factors to Poisoning based on the Gender of Patients**

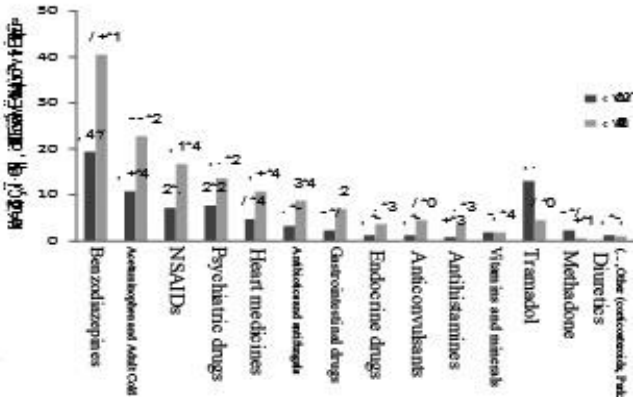


**Figure 2. Distribution of Drug Intoxication based on the Gender of Patients**

Among the studied patients, 37 cases (5.8%) were in need of ICU admission, 25 of whom were male and 13 were female. Mean length of ICU stay was 3 days, and no significant difference was observed between men and women regarding the length of hospitalization. In this study, suicide was the most common cause of poisoning (62.2%), and benzodiazepines were the most frequent agents of intoxication (32.1%) and ICU admission. Moreover, mean length of hospital stay was 1.9±4.25 days, while the median length of hospitalization was estimated to be one day.

The rate of hospitalization was significantly higher among men compared to women (p<0.001). After therapeutic interventions, 524 patients (82.5%) were discharged willingly, 93 patients (14.6%) recovered and 4 patients (0.6%) were referred to other medical centers. In addition, 6 patients (0.9%) faced complications and 8 patients (1.3%) died due to poisoning.

The most common side effects of poisoning were cardiovascular (50%), visual (33.3%) and neurological complications (33.3%), and patients poisoned for other reasons than suicide were observed to make a better recovery compared to suicidal subjects (OR=3.33, CI: 95%, 2.12-5.22) and were able to be discharged willingly (P<0.001) (OR= 0.32, CI: 95%: 0.21-0.49) (Table 2). Furthermore, a significant relationship was observed between the gender and medical consequences of the studied patients (p<0.001) (table 2).

**Table 2. Medical Consequences based on the Gender of Patients**

| Medical Consequence | Male (n=365) N(%) | Female N=370 N(%) | P-value |
|---|---|---|---|
| Recovery | 52(19.6) | 41(11.1) | 0.003 |
| Referred to other centers | 3(1.1) | 1(0.3) | 0.18 |
| Complications | 5(1.9) | 1(0.3) | 0.04 |
| Death | 6(2.3) | 2(0.5) | 0(0.6) |
| Personal Consent | 199(75.1) | 325(87.8) | <0.001 |

## Discussion

According to the results of this study, the rate of poisoning among the studied patients was estimated at 2.15%, which is indicative of an increase in the level of poisoning in the city of Babol compared to the previous reports in this city (1.13%) (9). Additionally, poisoning was observed to be more prevalent among women and married subjects, while the highest rate of poisoning was observed within the age range of 16-25 years. These findings are similar to the results of previous studies in this regard. For instance, Moghadamnia et al. (1998) reported that poisoning was more prevalent among women in Babol, and the highest rate of poisoning was observed within the age range of 16-25 years (9).

In another study, Farzaneh et al. reported the number of poisoned male patients to be higher in the city of Ardebil, and the age range of 21-30 years was most affected by this condition (10). In addition, Eixara et al. stated that women were more exposed to poisoning than men (mean age: According to the results of this study, the rate of poisoning among the studied patients was estimated at 2.15%, which is indicative of an increase in the level of poisoning in the city of Babol compared to the previous reports in this city (1.13%) (9). Additionally, poisoning was observed to be more prevalent among women and

married subjects, while the highest rate of poisoning was observed within the age range of 16-25 years. These findings are similar to the results of previous studies in this regard. For instance, Moghadamnia et al. (1998) reported that poisoning was more prevalent among women in Babol, and the highest rate of poisoning was observed within the age range of 16-25 years (9).

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The differences between the results of the present study and the study of Farzaneh et al., which was conducted in Ardebil, could be due to the differences in the study populations, cultural diversities, different climates of Babol and Ardebil and the role of environmental factors in the incidence of poisoning.

In the current study, the highest rate of poisoning was reported during spring; however, there was no statistically significant difference between the occurrence of poisoning in spring and other seasons. Conflicting results have been reported in previous studies regarding the incidence of poisoning in different seasons. In two separate studies performed during the 1990s and 2000s in Mazandaran region, the highest rate of poisoning was reported in the summer (9, 14). In one study conducted in Turkey, Baydin et al. mentioned summer to be the most frequent season in terms of the occurrence of poisoning (15), while in another study in Turkey, the highest rate of poisoning was observed in the spring (13). In another study performed in Spain, it was suggested that the majority of poisoning cases occurred during weekends and summer (16).

The differences between the results of the present study and the findings of foreign studies could be due to larger sample sizes in the Turkish and Spanish investigations. Furthermore, regarding the fact that the city of Babol has a humid, subtropical climate, and the majority of the residents are farmers, the high rate of poisoning in the spring could be associated with the presence of organophosphates used in the agriculture.

According to the other results of this study, drug intoxication was the most common cause of poisoning, and benzodiazepines were the most significant agents of poisoning. This finding is compatible with the results of previous studies (12, 13, 17); however, the agents of drug intoxication were reported differently in other studies. For instance, in a study by Sarjami et al. in Tehran, psychiatric drugs were reported to be the most significant agents of poisoning among the subjects (17). On the other hand, Moghadamnia et al. denoted diazepam to be the major cause of drug intoxication in Mazandaran region (14). In two other studies performed in Turkey, psychoactive drugs and tricyclic antidepressants were observed to be the most significant agents of drug intoxication (13, 15). Similarly, Poplas-Susic reported psychiatric drugs to be the most frequent causes of drug intoxication in Slovenia (18).

The inconsistencies between the findings of the present study and other studies around the world could be due to the differences in drug classifications, as well as in sample sizes. In the current study, benzodiazepines were the most frequent class of drugs to cause poisoning, while in other studies, psychiatric drugs and tricyclic antidepressants were reported to be the main agents of drug intoxication.

These drugs are normally used by individuals suffering from mental disorders; therefore, their classification as psychiatric drugs may vary from one study to another. Moreover, age distribution could be another reason for the differences between our findings and the results of the aforementioned studies. While there were no specific inclusion criteria for the current study, the sample sizes of previous studies included only adults or children presented with poisoning.

Suicide was the major cause of poisoning among the subjects of the present study (76.9%), and women were more affected by this parameter compared to men. Furthermore, benzodiazepines were the most frequent drug class used for suicide. Similarly, suicide accounted for 66.7% of poisoning cases in the study of Farzaneh et al. in Ardebil, and benzodiazepines were most frequently used in suicide attempts (10). The findings of Satar et al. in

Turkey also indicated suicide to be the main cause of poisoning among their subjects (76.4%) (13).

Additionally, Baydin et al. reported suicide to be the major cause of poisoning among their patients (68.6%) (15), and the prevalence of suicide among the patients with acute poisoning was reported to be 66.1% in a study by Lee et al. conducted in Taiwan (19). It seems that the rate of suicide was noticeably higher in the current study, which is an alarming sign emphasizing the need for future studies on this issue. Similar to previous studies, women were more likely to commit suicide than men in our study, which could be due to their unique mental and emotional state.

The majority of the patients in this study were discharged either willingly or after complete recovery, and long-term complications were observed in only 6 patients (0.9%). In addition, the mortality rate in poisoning was estimated at 1.3% in the current study, while Jalali et al. reported this rate to be 0.97% in Tehran (8). In a similar study in Hamedan, the mortality rate of poisoning was reported to be 3.8% (20), while other studies conducted in European countries, such as Greece and Spain, had a lower death rate (0.2% and 0.9%, respectively) (11, 16).

The differences in the mortality rate reported by various studies could be due to the presence of various causes of poisoning. For instance, insecticides and pesticides have been considered as the most frequent causes of poisoning in several studies, and since such compounds may lead to the death of patients in most cases, the obtained results of a study might be affected. The younger generation account for the highest rate of suicide attempts, and benzodiazepines are widely used by suicide victims. Therefore, raising awareness and devising prevention plans in order to decrease the rate of suicide among the youth is of paramount importance. Given the importance of poisoning and the available epidemiological findings, developed countries have managed to organize special sections for dealing with poisoning cases since 50 years ago aiming to provide appropriate services to reduce patient treatment costs and mortality (21-23). Moreover, with respect to the adverse effects of suicide among young adults, it is recommended that analytical studies be conducted on the causes and motivations of the younger generation to commit suicide.

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