

## Original Article

# Retrospective Analysis of Poisoning Cases Admitted to the Emergency Medicine

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## Abstract

**Background:** We aimed herein to assess demographic, etiological, and clinical characteristics of patients presenting to our hospital's emergency department with acute poisoning.

**Method:** This study included a total of 509 (0.27%) patients diagnosed with poisoning at our emergency department within a 3-year period. This was a retrospective study.

**Results:** Seventy-one point three (n = 363) percent of the patients were female. The majority of the victims were in the 18-25 years age group ( $P < 0.001$ ). The poisoning incident was for suicidal purposes in 83.7% of patients. Among the patients presenting with prescription drug poisoning, 92.9% were poisoned in a suicide attempt while 73.2% of patients presenting with poisoning with non-medical substances were poisoned accidentally. Suicidal poisonings were more common in young age group and females ( $P < 0.001$ ). The most common poisoning agent was antidepressants (17.6%) followed by analgesics (12.8%), and other psychotropic drugs (6.1%). Antidepressant drugs were the most common prescription drugs taken for suicidal purposes ( $P < 0.001$ ). Poisonings occurred with a single agent in 72.5% of cases and with two or more agents in 27.5% of cases.

Analysis of duration of hospital stay revealed that 52.6% (n = 60) of patients stayed in hospital for 2 days. The mortality rate was 0.4%.

**Conclusion:** The majority of poisonings were with prescription drugs, for suicidal purposes, in young age group, and in females. In our study, the three most common agents causing poisoning were antidepressants, analgesics, and other psychotropic substances.

**Keywords:** Adult, emergency, poisoning

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## Introduction

Poisoning is a heterogeneous subject that involves various pharmaceutical and chemical compounds in different combinations.<sup>1</sup>

Technological and social advancements may lead to changes in habits of utilizing chemical substances and therapeutic and illegal drug use over time.<sup>2</sup> Poisoning cases have been on increase with each passing day owing to changes in lifestyle and social behaviors.<sup>3</sup> It has been reported that the rate of poisoning is between 0.07% and 0.7% in developing countries.<sup>4</sup> Poisonings constitute a major public health problem worldwide and they are one of the major causes of patient admissions to emergency departments and intensive care units, especially in developing countries.<sup>5</sup> Poisoning is the most common cause of non-traumatic coma before 35 years of age and forms nearly 10% of emergency department presentations and 5%–10% of intensive care admissions.<sup>6</sup> The etiological and demographic characteristics of poisoning cases differ even in different geographical regions of the same country.<sup>7</sup>

Therefore, it is essential for each country to determine its own

poisoning profile and take necessary measures against possible risks and threats.

In this study, we aimed to explore the demographic, etiological, and clinical characteristics of cases presenting to our emergency department with poisoning.

## Materials and Methods

Our study included 509 patients aged 18 years or older who were admitted to the emergency department of Mersin University Faculty of Medicine with poisoning between 01.01.2009 and 31.12.2011. Five hundred nine cases (constituting 0.27%) of 187,028 adult patients referring to the Emergency Service at Mersin University, Faculty of Medicine Hospital in the three-year period diagnosed with poisoning were included in the study. The cases were retrieved by making a search in our hospital's (Nucleus Medical Information System) automation system using the following keywords: poisoning, prescription drug, alcohol, carbon monoxide, and organophosphate. Data were extracted from charts coded as T36-60.9, X40-49, Y10-19 (poisoning by drugs, medicaments, biological substances and toxic effects of substances chiefly non-medicinal as to the source), and X60-69 (intentional self-harm) with the ICD 10 system of nomenclature. The patient data were obtained retrospectively from the computer records. Food poisonings and animal/insect bites were excluded. An ethics committee approval (No: 2013/17, Date: 10.01.2013) was obtained.

The poisoning cases were analyzed by age, sex, admission time,

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way of poisoning (accident or suicide attempt), number of pharmacological agents causing poisoning (single agent versus two or more agents), type or name of the pharmacological agent responsible for poisoning, route of exposure (oral, inhalation, transdermal, parenteral etc.), interventions applied to prevent absorption of the culprit agent (nasogastric lavage, activated charcoal), consulted departments, outcome (hospital admission, discharge, referring to another institution, leaving hospital at own risk, death etc.), admission department (intensive care unit or regular ward), admission rates of patients destined for hospitalization, and duration of hospital stay. Based on the age groups, the patients were grouped into 6 groups: 18–25 years, 26–34 years, 35–43 years, 44–54 years, 55–64 years, and over 65 years age groups. Time of admission was classified according to season of admission (Autumn: September–November; Winter: December–February; Spring: March–May; Summer: June–August), and time of the day of admission (00:00–06:59, 07:00–12:59, 13:00–18:59, 19:00–23:59). The responsible pharmacological agents were grouped according to their frequency based on the classification in the prescription drug index. Carbon monoxide (CO), organophosphate, and alcohol intoxications were also added. Less frequent drugs (myorelaxants, hormones, vitamins, and antidiabetics) were classified as the “other group”. Based on their general status at the time of admission to the emergency department, the patients were grouped into well (fully awake), moderate (somnolent-confused), and poor (stupor, coma etc.) groups.<sup>8</sup>

#### Statistical analysis

Statistical analysis of the study data was performed with SPSS (Statistical Package for the Social Sciences) version 16.0 software package. The numerical data were presented as mean  $\pm$  standard deviation (mean  $\pm$  SD) (minimum–maximum) and the categorical variables were expressed as number and percentage (%). The numerical data were compared across the groups using Student's *t* test, with comparisons of more than 2 groups being performed with the ANOVA test. The categorical variables were compared with the Chi-square test. A *P* value less than 0.05 was considered statistically significant.

## Results

A total of 509 (0.27%) of 187,028 adult patients presenting to the emergency department of Mersin University Faculty of Medicine between January 1, 2009 and December 31, 2011 were admitted for poisoning. Of these, 28.7% (*n* = 146) were male and

71.3% (*n* = 363) were female. The difference between the sexes was statistically significant (*P* = 0.004). The overall mean age of the patients was  $28.77 \pm 12.11$  years. The mean age was  $27.45 \pm 10.78$  years for female patients and  $32.03 \pm 14.41$  years for the males (*P* = 0.001). The 18–25 years age group was admitted to the emergency department significantly more commonly than the other age groups (*P* < 0.001) (Table 1). It was noted that the number of poisonings decreased significantly as the patient age increased (*P* = 0.004).

Analysis of way of poisoning showed that the poisonings in a suicide attempt were significantly more common than the accidental poisoning cases (*P* < 0.001). Suicide attempt in female poisoning cases constituted 87.6% (*n* = 318) of cases while 74% (*n* = 108) of male poisonings were the result of a suicide attempt. In both sexes, poisonings in suicide attempts were significantly more common (*P* < 0.001). Seventy percent of cases over 65 years of age were poisoned accidentally, while other age groups suffered poisoning in suicide attempts at a rate of 83.6% – 87% (Table 1). The mean age of 83 patients poisoned accidentally was  $34.67 \pm 16.59$  years while 426 patients poisoned in a suicide attempt had a mean age of  $27.62 \pm 10.67$  years. Younger patients suffered poisoning significantly more common in suicide attempts (*P* < 0.001).

The route of exposure to agents causing poisoning was oral route in 95% (*n* = 484) of patients, inhalation route in 2.4% (*n* = 12), intravenous route in 1.7% (*n* = 9), and transdermal route in 0.9% (*n* = 4). Patients poisoned in a suicide attempt used the oral route significantly more commonly than any other group (*P* < 0.001).

Assessment of the agents and causes of poisoning revealed that the majority of poisoning cases occurred in suicide attempts and with drugs (*P* < 0.001). There was also a significant difference between poisonings with a single or multiple agents (*P* = 0.002). The reason of poisoning was a suicide attempt in 90.3% of cases who took a single prescription drug while 98.6% of cases who took multiple prescription drugs did so to commit suicide. Of the patients presenting with drug-induced poisoning, 92.9% were poisoned in a suicide attempt while 73.2% of cases presenting to the emergency department were poisoned accidentally (Table 2).

The distribution of the agents causing poisoning was so that 72.5% (*n* = 369) of cases were poisoned by a single agent and 27.5% (*n* = 140) by two or more agents. All poisonings with multiple agents were with prescription drugs. Additional information and analysis on multiple agents results are given in Table 3. The order of the poisoning agents by descending frequency was as follows: antidepressant drugs (17.6%, *n* = 90); analgesics (12.8%, *n*

**Table 1.** Distribution for causes of poisoning by age group and gender.

		Accidental <i>n</i> (%)	Suicide attempt <i>n</i> (%)	Total <i>n</i> (%)	<i>P</i> -value
Age groups	25–18	34 (13.0)	228 (87.0)	262 (100)	<i>P</i> < 0.001
	34–26	18 (14.2)	109 (85.8)	127 (100)	
	43–35	11 (16.4)	56 (83.6)	67 (100)	
	54–44	10 (34.5)	19 (65.5)	29 (100)	
	64–55	3 (21.4)	11 (78.6)	14 (100)	
	>65	7 (70.0)	3 (30.0)	10 (100)	
Gender	Female	45 (12.4)	318 (87.6)	363 (100)	<i>P</i> < 0.001
	Male	38 (26.0)	108 (74.0)	146 (100)	
<b>Total</b>		<b>83 (%16.3)</b>	<b>426 (%83.7)</b>	<b>509</b>	

**Table 2.** Factors and causes of poisoning.

Factors	Causes of poisoning		P-value
	Accidental n (%)	Suicide attempt n (%)	
Drug	Single drug	29 (34,9)	P < 0.001
	Multiple drugs	2 (2.4)	
Non-medical substances		52 (62,7)	19 (4,5)
<b>Total</b>		<b>83 (%100)</b>	<b>426 (%100)</b>

**Table 3.** Distribution of multiple agents.

Multipl agents	n (%)
Analgesic drugs without paracetamol + Alcohol	12 (8.6)
Antidepressant drugs without tricyclics + Alcohol	8 (5.7)
Analgesic drugs without paracetamol + Other	8 (5.7)
Antidepressant drugs without tricyclics + Other psychotropic drugs	15 (10.7)
Antidepressant drugs without tricyclics + Paracetamol	13 (9.3)
Analgesic drugs without paracetamol + Anti-flu drugs	22 (15.7)
Antihistaminics + Alcohol	4 (2.9)
Antidepressant drugs without tricyclics + Antibiotics	5 (3.6)
Paracetamol + Antibiotics	18 (12.9)
Analgesic drugs without paracetamol + Antibiotics	10.7))15
paracetamol+ Analgesic drugs without paracetamol	13 (9.3)
Antihypertensives + Antidepressant drugs without tricyclics	7 (5.0)
<b>Total</b>	<b>140 (100)</b>

**Table 4.** Distribution of causative agents that lead to poisoning.

Causative agent	n (%)
<b>Multiple agents</b>	140 (27,5)
<b>Single agent</b>	
Antidepressant drugs without tricyclics	59 (11.5)
Analgesic drugs without paracetamol	38 (7.5)
Tricyclic antidepressant	31 (6.1)
Other psychotropic drugs	31 (6.1)
Corrosive substance intake	28 (5.4)
Paracetamol	27 (5.3)
Other	20 (4.0)
Antibiotics	19 (3.6)
Opiate	14 (2.7)
Anti-epileptics	13 (2.6)
Antihistaminics	12 (2.4)
Organophosphates	11 (2.2)
Antihypertensives	11 (2.2)
Anti-flu drugs	11 (2.2)
Other pesticides	11 (2.2)
Alcohol	10 (2.0)
Salicylate	7 (1.3)
Antiulcer	6 (1.2)
Carbon monoxide (CO)	6 (1.2)
Antispasmodics	4 (0.8)
<b>Total</b>	<b>509 (100)</b>

= 65); other psychotropic agents (6.1%, n = 31); corrosive substances (5.4%, n = 28); and antibiotics (3.6%; n = 19) (Table 4). The ratio of antidepressant drugs was significantly greater than other drugs in poisonings in a suicide attempt ( $P < 0.001$ ). Seventy point one percent (n = 357) of the cases were poisoned by their own prescription drug(s) while 29.9% (n = 152) were poisoned with other people's drug(s) or with non-medicines.

Analysis of the admission hours of the poisoning cases revealed that most patients (44.6%) were admitted between 19:00–23:59

and the least number (9%) of patients were admitted between 07:00 and 12:59 (Figure 1). Admissions between 19:00 and 23:59 were significantly more common than other hours ( $P < 0.001$ ). Seasonal distribution of the cases was so that 27.1% (n = 138) of the patients were admitted in winter, 26.3% (n = 134) in summer, 25.3% (n = 129) in autumn, and 21.2% (n = 108) in spring. There was no significant difference in seasonal distribution of the cases ( $P = 0.2404$ ).

The intervention to prevent absorption of the culprit agent was

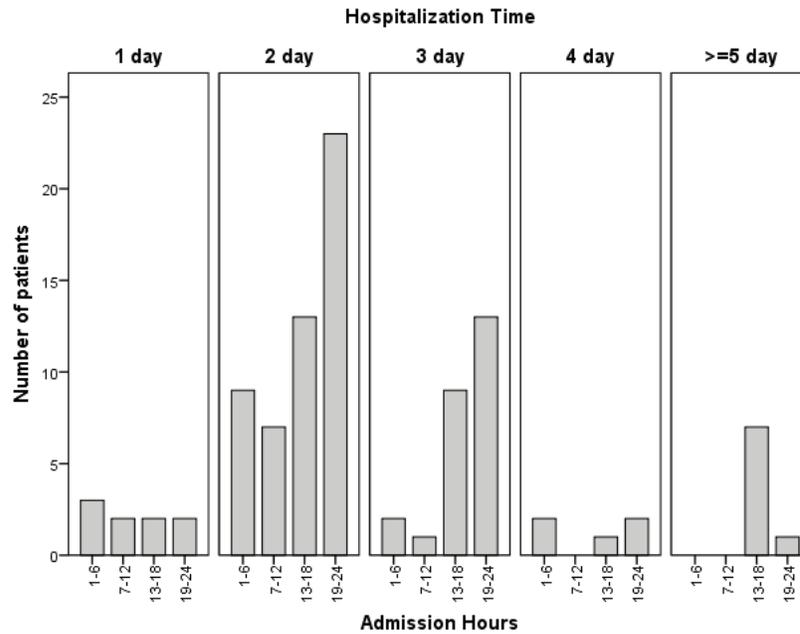


Figure 1. Distribution of cases according to admission hours and hospitalization time.

nasogastric lavage in 64.6% (n = 329) of the cases and activated charcoal in 63.9% (n = 325) of the cases.

At the time of admission, 89.6% (n = 456) of the patients were in well, 8.8% (n = 45) in moderate, and 1.6% (n = 8) in poor general status.

A consultation from other departments was obtained in 70.9% (n = 361) of cases. Of these, 46.8% (n = 202) were obtained from the psychiatry department, 46.4% (n = 201) from the anesthesia and reanimation department, 5.1% (n = 22) from the gastroenterology department, 1% (n = 4) from the cardiology department, 0.5% (n = 2) from the chest diseases department, and 0.2% (n = 1) from the plastic and reconstructive surgery department. Hospital admission was recommended in 36% (n = 183) of patients. The consulting department that recommended hospital admission was anesthesia and reanimation department in 91.8% (n = 168) of cases, psychiatry department in 5.5% (n = 10) of cases, gastroenterology department in 2.2% (n = 4) of cases, and cardiology department in 0.5% (n = 1) of cases. Of those recommended to be admitted to hospital, 90.2% (n = 165) had poisoning in a suicide attempt ( $P = 0.01$ ).

Hospital admission occurred in 22.4% (n = 114) of the cases. Of those who were hospitalized, 92.8% (n = 104) were admitted to an intensive care unit (anesthesia and reanimation) while 7.2% (n = 10) to a regular ward. Of those who could not be hospitalized for any reason, 43.5% (n = 30) were referred to other institutions and the remaining patients were followed in the emergency department. The duration of hospital stay was 2 days in 52.6% (n = 60) of the cases and 3 days in 2.54% (n = 29) of the cases (Figure 1).

The outcomes of the patients in hospital included a successful discharge in 83.7% (n = 426), referral to another institution due to lack of any spare hospital bed in 5.9% (n = 30), discharge at a patient's own risk in 7.7% (n = 39), leaving the hospital without former notification of healthcare staff in 2.4% (n = 12), and death in 0.4% (n = 2). Both patients who died were poisoned as a result of a suicide attempt and were exposed to the poisonous agent via oral route. One of them was poisoned by an organophosphate

compound and the other by a combination of an antihypertensive drug and an antidepressant.

## Discussion

Poisonings are a universal public health problem that threaten the wellbeing of human population and are one of the commonest causes of emergency department admissions. Their annual prevalence varies by country and even province within a given country. Four studies from the Great Britain and United States have reported quite varied rates, ranging from 1% to 29.7%.<sup>9-12</sup> The figures from our country range between 0.7% and 2.4%.<sup>2,6,8,13,14</sup> We found that 0.27% of emergency department admissions were due to poisoning for a 3-year period. The discrepancy between our and other studies' results probably stems from the number and region of hospitals as well as the differences of the aim of hospitals in a particular city.

Similar to previous domestic and foreign studies, our study found that the majority of the poisoning cases occurred in young age groups<sup>1,2,14,15-18-21</sup> and women.<sup>1,2,14,17-19</sup> The female/male ratio was 2.4/1 in our study.

It has been reported that the rate of poisoning in a suicide attempt ranges between 46% and 97.2%.<sup>1,2,7,17,18,20</sup> Also in our study the majority of poisonings (83.7%) occurred in a suicide attempt. Wang, et al., advocated that the number of suicide attempts peak especially in seasons when the atmospheric pressure and temperature are high.<sup>15</sup> The differences in the rate of suicide attempts may be attributed to many factors including seasonal characteristics, differences in socioeconomic level, increasing unemployment rates, and increasingly oppressive attitude towards women.

In agreement with the previous studies, the majority of the poisoning cases in our study occurred via the oral route.<sup>14,18,22</sup> This occurrence may be linked to domestic availability of medications such as analgesics, antibiotics, and antidepressants as well as prescription-free drug sale in pharmacies in our country.

The majority of the poisonings were with prescription drugs. A

single agent was responsible for poisoning in 72.5% of our cases while 27.5% of the patients were poisoned by two or more agents. In line with our results, Köylü, et al., reported that 59.9% of cases were poisoned by a single agent.<sup>7</sup> Lund, et al., reported a rate of 56%, Singh, et al., reported a rate of 23% for poisonings by two or more agents.<sup>18,20</sup>

In the United States, among all agents causing poisoning, sedative hypnotics and antipsychotic drugs are responsible for 10.5% cases and the antidepressants for 8.1% (23). Lund, et al., reported that 18% of the cases occurred with ethanol and 15% with benzodiazepines while Sorodoc, et al., reported that the poisoning incidents most commonly occurred with benzodiazepines (13.69%) followed by antiepileptics.<sup>17,20</sup> Avşaroğullari, et al., found that 18.5% of patients were poisoned by antidepressants and 16% by analgesics.<sup>2</sup> Köylü, et al., reported a rate of 57.2% for analgesic-induced poisoning and 25.4% for antidepressant-induced poisoning.<sup>7</sup> Göksu, et al., reported a rate of 42.4% for analgesic-induced poisoning.<sup>13</sup> In our study, the most common agents responsible for poisoning were antidepressants (17.6%; 11.5% non-tricyclic antidepressants and 6.1% tricyclic antidepressants) followed by analgesics (12.8%; 5.3% paracetamol and 7.5% non-paracetamol), other psychotropic agents (6.1%), corrosives (5.4%), and agricultural substances (4.4%). These results suggest that the prescription-free sales of tricyclic antidepressants (TCAs) that are publicly known as “sleep medications”, and selective serotonin reuptake inhibitors (SSRIs) that are publicly known as stress-relieving drugs, a lower price and a wider availability of TCAs compared to other antidepressant drugs, and emotional fluctuations of patients treated with these drugs increase the risk of suicide attempts and/or poisoning.

Hawton, et al., reported that the rate of paracetamol as a cause of poisoning has recently increased.<sup>21</sup> Thomas, et al., reported that paracetamol is the most common poisoning agent in England and the neighboring regions.<sup>24</sup> We also found that the rate of poisoning caused by paracetamol was high on the list. Wider use of paracetamol and other analgesics, the broad perception of the persons committing suicide for a secondary gain that paracetamol and other analgesics are the drugs that are associated with the lowest fatality, and lower cost and prescription-free sales of these drugs may explain our findings.

Avşaroğullari, et al., Baydin, et al., and Kristinsson, et al., reported corrosive-induced poisoning rates of 4%, 2.2%, and 2%, respectively (2,25,26). In our study, the most common poisoning agents after drugs taken via oral route were corrosives (5.4%). Of 28 cases presenting to the emergency department with corrosive-induced poisoning, 82.1% (n = 23) were accidentally exposed to the culprit agent while 17.9% (n = 5) took the agent intentionally. Corrosive agents are found in houses as cleansing agents. Corrosive agents purchased from street vendors that are stored in water or beverage bottles may be drunk mistakenly by the household. Therefore, corrosive-induced poisoning is one of the most common forms of poisonings via oral route. Being cheap and widely available makes these agents an attractive option for suicide attempts.

The rate of alcohol-induced poisoning ranges from 0.9% to 2.69% in different regions of Turkey.<sup>2,8,27</sup> This figure ranges between 18% and 30% in foreign countries.<sup>1,18,20,28</sup> In our study, 2% of the cases were poisoned by alcohol. Alcohol consumption varies by country and place of residence. The discrepancy between our results and results of foreign studies may be due to low alcohol

consumption in our country due to religious beliefs and traditions.

Serinken, et al., reported that 23% of cases were admitted to the emergency department between 20:00 and 22:00.<sup>29</sup> In our study, the majority of cases (44.6%) presented to the emergency department between 18:00 and 24:00 followed by the time period of 13:00 to 18:00 (26.1%). The most common admissions occurred during working hours. This is possibly because the individuals commit suicide at their leisure time after school or work, or the victims could be brought to hospital by their relatives only after the latter arrived at home after school or work.

Krenzelok, et al., recommended use of gastric lavage, active charcoal, and cathartics as needed in life-threatening cases.<sup>30</sup> Ardagh, et al., reported that gastric lavage and activated charcoal were used at rates of 5% and 52%, respectively.<sup>31</sup> Weir, et al., reported use of gastric decontamination in 61% and activated charcoal use in 54%.<sup>32</sup> Köylü, et al., reported use of gastric lavage and activated charcoal at a rate of 50.7%.<sup>7</sup> Assessment of the interventions performed to prevent absorption of the culprit agent revealed that a gastric lavage via a nasogastric tube was performed in 64.6% of cases and activated charcoal was used in 63.9%. Both interventions were used at varied rates. A too liberal use of these interventions may have been due to the fact that the patients did not specify the time they took the agent or gave an inconsistent history.

Litovitz, et al., showed that the majority of patients presenting to the emergency department with poisoning were not in critical state.<sup>33</sup> Sorodoc, et al., reported that the general status of 51.9% of cases was well and 19.7% of cases were in coma.<sup>17</sup> In our study, the general status was well in 89.6% of cases and poor in 1.6%. The finding that the majority of cases were of mild to moderate severity can be explained by the possibilities that the amount of the exposed agents was not sufficient to cause poisoning, the patients were admitted to the emergency department at an early stage, the majority of poisoning cases were suicide attempts and/or most of the suicide attempts were done for secondary gain with a smaller amount of substance than stated by the patient.

We found that a consultation was requested from other departments in 70.9% of cases, the majority of which were obtained from departments of psychiatry and anesthesia and reanimation. In our hospital, in-hospital management and follow-up of poisoning cases are undertaken by the anesthesia and reanimation department. In addition, a psychiatry consultation was obtained for the majority of cases to prevent future suicide attempts.

Potter, et al., reported that 29% of patients with acute poisoning were admitted to the intensive care unit and 23% to the psychiatry department.<sup>34</sup> The admission rate has ranged between 8,1% and 47% in the previous studies performed in our country.<sup>2,35,36</sup> We observed that 22.4% of our cases could be hospitalized, while 13.6% could not be admitted to hospital owing to inadequate number of vacant hospital beds. The majority (92.8%) of the cases were followed at the anesthesia and reanimation department. Hospital admission rates may vary depending on the clinical state of the patient, physical structure of regular wards and intensive care units of a given hospital, availability of adequate staff, and hospital bed vacancy. Since the anesthesia and reanimation department undertakes management and follow-up of poisoning cases, the admission rate of this department is higher.

According to our results, the majority (52.6%) of the patients stayed in hospital for 2 days, followed by 3 days (25.4%). These rates were in agreement with previous reports.<sup>1,17</sup>

In our study, 83.7% of the poisoned patients were discharged. Previous reports have reported a poisoning-related mortality rate of 0%-2.8%.<sup>2,8,13,26</sup> We lost only 2 patients (0.4%). We observed that the majority of patients presenting with poisoning were discharged. The higher rate of suicide attempts for secondary gain may explain the lower rate of critical cases. The low mortality rates observed in our study may have stemmed from a lower number of cases with severe poisoning, a timely and high-quality management offered in our emergency department, and adequate follow-up and management of cases admitted to the anesthesia and reanimation department.

## Conclusion

In conclusion, it was found in our study that the majority of poisoning cases occurred with drugs, for suicidal purposes, in young age group and women. The three most common agents causing poisoning were antidepressants, analgesics, and other psychotropic agents. Based on the results of the present study, we may suggest that women of young age comprise the major risk group. We believe that our results would be a useful guide for future activities including preventive measures, professional education, public education, and novel research projects to prevent suicidal and accidental poisoning cases. We believe that future countrywide studies are needed in this field.

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