



## Frequency of Poisoning Leading to Hospitalization in the Intensive Care Units in Northeastern Iran, 2008-2018

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### Abstract

**Background:** Poisoning is a common cause of hospitalization in intensive care units (ICU). The present study aimed to investigate the frequency of poisoning leading to hospitalization in the intensive care units of an educational hospital, Golestan University of Medical Sciences, in Gorgan in 2008-2018.

**Methods:** This cross-sectional study conducted on patients with acute poisoning admitted to the ICUs of 5 Azar Hospital in Gorgan from 20 March 2008, to 20 March 2018. We collected data from all patients' medical record using a checklist. Data was presented in proportions, mean and standard deviation.

**Results:** All of 631 patients with poisoning were admitted to the ICUs were male (61.3%) and 40.3% were in the age range of 20-29 years. The mean length of hospital stay in the ICU was  $4.21 \pm 3.45$  days. The most common type and cause of poisoning were suicide attempt (65.3%) and drugs (65.6%), respectively. The common drugs were used including the benzodiazepines (38.9%) and narcotic drugs (18.6%). The rate of death of poisoning was 11.1%, of which 44.3% was due to aluminum phosphide.

**Conclusion:** Benzodiazepines and aluminum phosphide were the most common causes of poisoning and death due to poisoning in the ICU. Due to the high mortality rate, it seems necessary to provide more education and information via the media, especially in the field of aluminum phosphide hazards.

### ARTICLE HISTORY

Received Oct 10, 2019

Accepted Jul 26, 2020

DOI: [10.29252/jgbfmm.18.1.26](https://doi.org/10.29252/jgbfmm.18.1.26)

### Keywords:

Poisoning  
Hospitalization  
Intensive Care Units  
Gorgan

Article Type: Original Article

### Introduction

Poisoning is an important medical emergency and a common cause of death and infection in many regions of the world. Many people suffer from a wide range of problems due to poisoning, from mild illness to hospitalization in intensive care units, and death that imposes a great economic, physical, and psychological burden on the individual, family, and society (1).

It is estimated that more than half a million people die from poisoning every year in the world (2). In the United States, the poisoning rate was 479 percent in 2011 and the resulting death rate was 17 percent. Intentional drug use is also a major health problem in the Asia-Pacific region with 300,000 deaths per year (3).

In Iran, the majority of poisoning was intentional, mainly at the ages of 21 to 30 years. Furthermore, the death rate from poisoning was reported in 8 per thousand patients in general hospital wards and 109 per thousand patients in intensive care units, the most important causes of which were drugs and pesticides (4).

In general, the prevalence of poisoning is increasing due to changes in their patterns and nature in developed and developing countries, including Iran (5).

The clinical patterns of patients with severe poisoning vary from one place to another. In developed countries, access to drugs has led to a significant increase in the admission of patients with drug poisoning in medical centers. In developing countries, the incidence of pesticide poisoning has increased dramatically in recent decades, with a significant share of poisoning deaths despite access to intensive care facilities (6). In this regard, recent studies indicate an increase in the process of aluminum phosphide poisoning in Iran. Moreover, poisoning with tramadol and opioids is considered as the main challenge caused by poisoning in hospitals and poison control centers (7).

Despite health programs and higher public awareness, poisoning is still a common medical problem and it is the cause of 15% to 20% of visits to emergency departments of hospitals and medical centers according to studies (8).

Among the poisonings admitted to medical centers, there is a group of poisonings that are more important due to the severity and seriousness of damages to patients and need more attention and care. In this regard, many poisoned patients need to be hospitalized in medical centers and hospitals, and

eventually in the intensive care unit. For more than several decades, the use of intensive care unit and its facilities has improved the survival of patients against important and serious problems and diseases, including poisoning. The use of these facilities causes the survival of many patients poisoned with vital and complicated conditions and plays an important role in controlling severe poisoning (9, 10).

According to the above cases, it was found that the increase in the process of poisoning and the resulting death were two main challenges in the field of poisoning (2, 8). Patients with poisoning are sent to the intensive care unit (6). Therefore, given the important and vital role of this issue in the treatment and reduction of deaths due to poisoning, the present study aimed to determine the rate of poisoning leading to hospitalization in the intensive care unit of 5 Azar Hospital in Gorgan in 2008-2017.

### Methods

The present retrospective cross-sectional study examined all patients with acute poisoning hospitalized in the intensive care units of 5 Azar Hospital in Gorgan from the beginning of 2008 to the end of 2018. The diagnosis of poisoning was based on clinical examinations and laboratory findings in the medical records of patients. Inclusion criteria: a medical record in the intensive care units of 5 Azar Hospital and age 12 years and older. Therefore, the data was extracted from 631 patients' medical records admitted to intensive care units using a checklist consisting of 20 items. There were 6 items about demographic characteristics and 14 items about the type and cause of poisoning and the patient's clinical condition in the hospital. SPSS Statistics for Windows, version x.0 (SPSS Inc., Chicago, Ill., USA). The significance level of statistical tests was less than 0.05. All necessary permits for the study and approval of the ethics committee of Golestan University of Medical Sciences (IR.GOUMS.AC.IR.REC.1397.115) were also taken before the study and the patients' data were kept confidential.

### Results

Of 23184 patients were admitted to the intensive care unit of 5 Azar Hospital in Gorgan, from 2008 to 2018, among whom 631 (2.7%) in the intensive care unit had poisoned.

Among 631 patients with poisoning, the majority of patients were male (61.3%), married (51.3%), employed (38.2%), urban residents (78.1%), with

secondary education (42.2%), and belonged to the age group of 20-29 years (40.3%) (Table 1).

Among the poisonings, most cases (30.9%) occurred in summer and spring (26.1%), and then in autumn (22.7%), and winter (20.3%). In 412 patients (65.3%) the poisoning occurred intentionally and as a suicide attempt. Substance and drug abuse (23%), accidental poisoning (6.2%), overdose of drugs (5.4%), and occupational poisoning (0.15%) were also other types of poisoning. The majority of poisonings (93.5%) were oral (Table 2). The mean number of hospitalization days in the intensive care unit was 4.45±152.1 including 4.54±152.1 days in males and 4.16±104.9 days in females respectively.

Table 1. Demographic characteristics of patients in the study

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Variable	N (%)	
Gender	Male	387(61.3)
	Female	244(38.7)
Age group (years)	12-19	115(18.2)
	20-29	254(40.3)
	30-39	112(17.7)
	40-49	69(10.9)
	50-59	32(5.1)
	60 and above	49(7.8)
Marital status	Single	260(41.2)
	Married	324(51.3)
	Divorced/widowed	19(3)
	Unknown	28(4.4)
Occupation	Unemployment	167(26.5)
	Employee	241(38.2)
	Housewife	129(20.4)
	Student	47(7.4)
	University student	13(2.1)
	Unknown	34(5.4)
Educational level	Illiterate	47(7.4)
	Primary school	60(9.5)
	Secondary school	118(18.7)
	High school	266(42.2)
	College	61(9.7)
Residential status	Unknown	79(12.5)
	Urban	493(78.1)
	Rural	138(21.9)

Table 2: The relationship between kind, method, and agent of poisoning with gender

Variable	Total	Female	Male	P-value	
	N (%)	N (%)	N (%)		
Reason of poisoning	Suicide	219 (53.2)	193 (47)	412 (65.3)	0.001
	Overdose	23 (67.6)	11 (32.4)	34 (5.4)	
	Accidental	27 (69.2)	12 (30.8)	39 (6.2)	
	Substance abuse	117(80.7)	28 (19.3)	145 (23)	
	Occupational	1 (100)	0 (0)	1 (0.15)	
	Oral	350 (59.3)	240 (40.7)	590 (53.5)	
Exposure	Injection	20 (95.2)	1 (4.8)	21 (3.3)	<0.001
	Inhalation	13 (86.7)	2 (3.3)	15 (2.4)	
	Dermal	4 (80)	1 (20)	5 (0.8)	
	Recovery	332 (59.2)	229 (40.1)	561 (88.9)	
Death	55 (78.6)	15 (21.4)	70 (11.1)		

Drugs (65.6%) were the most common causes of poisoning in the intensive care. In this regard, aluminum phosphide (13.5%) and opium and its extraction, i.e. Shireh, (9.5%) were in the next ranks. Furthermore, 81.7% of drugs used in men and 96.3% of drugs used in women were alone and without simultaneous use with toxins and other chemical compounds (Table 3).

In terms of drug category, only benzodiazepines or with other pesticides (38.9%) was the widely used drug, followed by narcotics (18.6%) and tramadol (16.9%).

In the field of clinical symptoms, changes in the level of consciousness were recorded in 524 patients (83%). In this regard, 21.1% of patients had GCS of equal to 8 and less. Respiratory problems (30%) and gastrointestinal symptoms (24.7%) were also in the next ranks.

In the field of treatment measures taken in the ICU for the patients, 93% received oxygen therapy, 65.3% intubation and mechanical ventilation, 38% charcoal and sorbitol, 32% lavage, 46.8% inotropic drugs, 29.8% antidote, 32% alkaline diuresis, and 33.8% underwent other treatment methods.

In terms of poisoning outcome, most patients (88.9%) recovered and 70 patients (11.1%) died, among whom 78.6% were males (P<0.001). Aluminum phosphide (44.3%) was the leading cause of death and the second cause of death in the present study medication alone or in combination with other agents (24.3%) (Fig 1).

Table 3: Distribution of poisoning agent by gender

Drug	Male		Female		Total
	One agent	Multiple	One agent	Multiple	
	N (%)	N (%)	N (%)	N (%)	
Drug	183 (81.7)	41 (18.3)	183(96.3)	7 (3.7)	414(65.6)
Food	0 (0)	0 (0)	1(100)	0 (0)	1(0.16)
Plant	0 (0)	0 (0)	1(100)	0 (0)	1(0.16)
Opium	31 (67)	15 (33)	12(85.7)	2 (14.3)	60(9.5)
Pesticide	20 (95.2)	1 (4.8)	12(100)	0 (0)	33(5)
Snake and Scorpio	4 (100)	0 (0)	1(100)	0 (0)	5(0.8)
Aluminum phosphide	55 (88.7)	7 (11.3)	22(95.7)	1 (4.3)	85(13.5)
Rat poison	6 (75)	2 (25)	1(100)	0 (100)	9(1.4)
Carbon monoxide	6 (100)	0 (0)	1(100)	0 (0)	7(1.1)
Alcohol	9 (50)	9 (50)	0(0)	0 (0)	18(2.9)
Detergent	2 (100)	0 (0)	0(0)	0 (0)	2(0.16)
Crack	4 (50)	4 (50)	1(100)	0 (0)	9(1.4)
Methamphetamine	4 (44.4)	5 (55.6)	0(0)	2 (100)	11(1.7)
Hashish	0 (0)	1 (100)	0(0)	0 (0)	1(0.16)
Chloroform	1 (100)	0 (0)	0(0)	0 (0)	1(0.16)

## Discussion

In the present study, which examined the poisonings leading to hospitalization in the care unit of 5 Azar Hospital in Gorgan in 2008-2017, it was found that most of the poisonings were observed in males. Men had a larger share in the disease in a study in Khorramabad (2006-2007) as well as studies in the United States (2015-2016) and some Asian countries (2014) (11-13). In this regard, the greater exposure of men to social and economic problems in society and greater access to toxins and drugs could be effective in their incidence of poisoning compared to women (14).

In the present study, drugs accounted for more than half of all cases of poisoning in the intensive care unit. Similar studies in Tehran (2012), Spain (2013), and Turkey (2006) were also consistent with the present study (5, 6, and 15). On the contrary, a study in the United States (2015-2016) indicated that opium was the main cause of poisoning and drugs were in the fourth place after cocaine and methadone (12). The pattern of poisoning varies according to the type of substance in different countries and societies and factors such as demographic characteristics, social beliefs, culture, education level, and income of households as well as the levels of access. Furthermore, it seems the easier access to drugs in Iran, especially the over-the-counter medications (OTC) as well as their frequent use at home can contribute to enhancing this process (16).

In the present study, it was found that benzodiazepines were the most important drug category leading to hospitalization in the intensive care unit, and narcotics were in the second place. In a study in Tehran (2012), benzodiazepines followed by tricyclic antidepressants were the most important causes of poisoning (6). Consistent with the results of the present study, studies in Birjand (2018) and also in Babol also introduced benzodiazepines as the main causes of drug poisoning in the intensive care unit (17-18). Also, a study in India (2014) indicated that sedative-hypnotic drugs were the main causes of drug poisoning (19). A study in the United States also identified methadone as a major cause of drug poisoning (6). In this regard, factors such as easy access to drugs at home or in pharmacies, no need for the prescription, and lack of restrictions and restrictive laws for such drugs were more effective in its use than other drugs and subsequently its potential toxicity (18, 20).

Regarding the type of poisoning, the present results indicated that intentional poisoning, which all occurred with the motive of suicide attempt, was the most important type of poisoning. A similar process was seen in Babol (2015) (17). A study in two different periods in India was consistent with the present study and reported that intentional poisoning was the most important form of poisoning (21, 13). In general, intentional poisoning occurs in different forms in different regions of the world, and some drugs are at the forefront in many countries and are considered to be the main cause of intentional poisoning (22). Cultural issues and individuals' socio-economic levels can be considered effective in creating this type of poisoning (23).

The findings also indicated that 11.1% of those with poisonings leading to hospitalization in the intensive care unit had died despite the treatment and support measures. Similar studies in Iran reported the death from poisoning in the intensive care unit from 11.6% to 18.6%, and the result was consistent with the death pattern in developing countries (6). On the contrary, in a study in a European country, it was reported to be 0.7% that was lower than the present study and similar studies (24). In this regard, factors such as age, amount of toxic substance used and the severity of toxicity, the level of individuals' general health as well as patients' timely hospitalization, and the adoption of appropriate treatment can be considered effective (16). In addition to the above-mentioned cases, patients with more serious and dangerous conditions are more admitted

and hospitalized in hospitals and medical centers as poison control centers in comparison with the other medical centers, leading to the higher death rate in these wards. Considering the levels of available facilities and equipment for the poison control, different criteria for admission of patients in the intensive care unit in different societies and countries can also contribute in this field (6, 12).

Findings of the present study introduced aluminum phosphide as the main cause of death in the intensive care unit so that it accounted for about half of deaths. In Tehran, a similar study indicated that aluminum phosphide along with other pesticides was the main cause of death (6). In general, the combination of toxins led to a high degree of morbidity and mortality, and studies reported the resulting death rate of 40% to 80% (21). On the contrary, a study in New York (2017) indicated that opioids were the leading causes of poisoning deaths in the intensive care unit (12). In this regard, factors such as differences in levels of access to drugs, narcotics, and pesticides in developed and developing countries might be the reasons for the difference (25).

## Conclusion

The pharmacological agents, especially benzodiazepines and aluminum phosphide were respectively the most common causes of poisoning in the present study. It was also found that aluminum phosphide was the cause of most deaths due to poisoning in the intensive care unit of 5 Azar Hospital in Gorgan. Due to the high mortality from poisoning in the intensive care unit, it seems necessary to provide much education and information via the media, especially in the field of aluminum phosphide.

## Acknowledgements

The present manuscript was derived from a research project approved by Golestan University of Medical Sciences with the code 970606104. The authors are deeply grateful to the research and technology deputy of the University, the Health Management and Social Development Research Center, and the staff at 5 Azar Hospital in Gorgan.

## Funding source

The study was supported by the Golestan University of Medical Sciences.

## Ethical statement

This study was approved by the Research Ethics Committee of Golestan University of Medical Sciences (Code: IR.GOUMS.AC.IR.REC.1397.115).

## Conflict of interest

No conflict of interest in this study.

## Author contributions

Mohammad Shokrzadeh designed the study. Danial Jafari reviewed the article. Reza Hoseinpoor analysed the data. Azam Delaram and Akram Pouyan Sadr collected the data. Elham Masodi reviewed the literatures. Mehmoosh Deylami was involved in the concept and design of the study. Gholamali Lashkarboloki redrafted the article. Yaghoob Shayeste as the corresponding author of this study, participated in all sections of the study and approved this manuscript for publication. Narges Fatemi reviewed the article.

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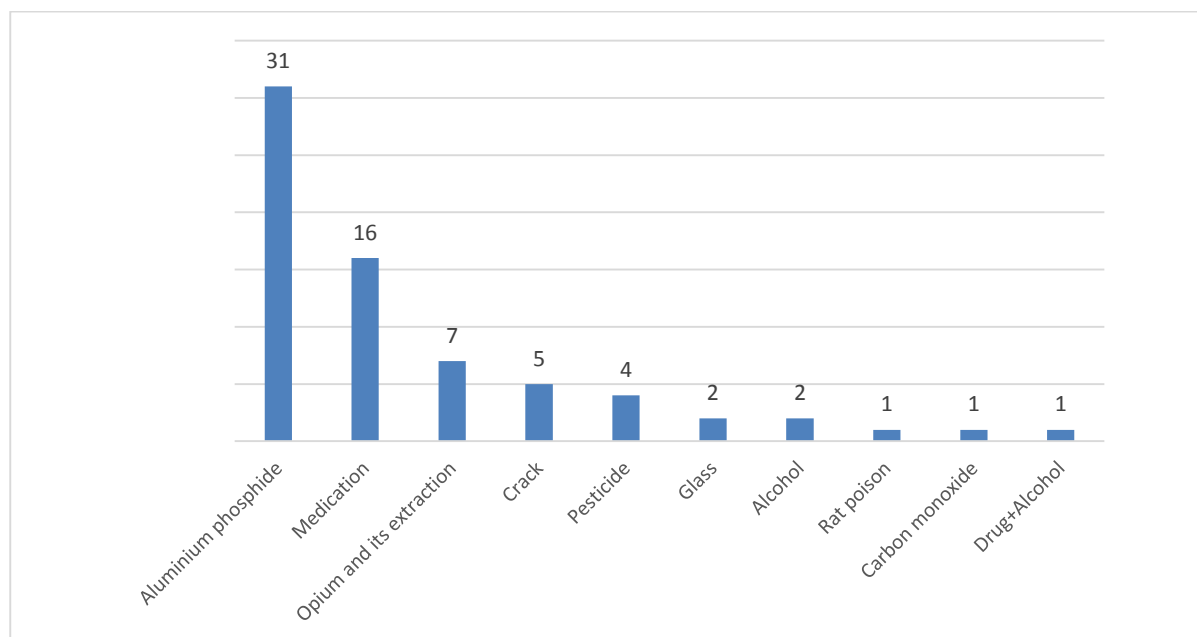
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Figure 1. Frequency of agents that caused the death

**How to Cite:**

Mohammad Shokrzadeh, Danial Jafari, Reza Hoseinpoor, Azam Delara, Akram Pouyan Sadr, Elham Masodi, Mehrnosh Deylami, Gholamali Lashkarboloki, Yaghob Shayesteh, Narges Fatemi. Frequency of Poisoning Leading to Hospitalization in the Intensive Care Unit in Northeastern Iran, 2008-2018. *Journal of Research Development in Nursing & Midwifery*, 2021; 18 (1): 26-29

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