

## ORIGINAL ARTICLE

# Investigation of Lethal Poisonings among Dead Bodies Referred to Regional Office of Iranian Legal Medicine Organization in Shiraz

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## Abstract

**Background:** Death due to acute poisoning is of medical, legal and social significance. This study was designed to investigate lethal poisonings among dead bodies referred to a regional office of Iranian Legal Medicine Organization (ILMO).

**Methods:** This was a retrospective descriptive-analytical study on dead bodies referred to Fars province regional office of ILMO in Shiraz, Iran, during April 2013 to the end of March 2014. For data analysis, only subjects with poisoning as the definitive cause of death were included.

**Results:** During the study period, 2,594 autopsies were conducted in Fars province office of ILMO, among which poisoning was found to be the cause of death in 147 autopsies (5.7%). Eighty-eight cases (59.9%) were men. The majority of subjects aged 20 to 30 years (50.3%). The greatest number of subjects (73.5%) was unmarried persons. Regarding the occupation, most subjects were unemployed (49.7%) followed by housewives (19.7%). Over half of the cases (54.42%) had died within less than 6 hours after the poisoning. The majority of cases were found dead at home (73.5%), while the rest had died in outpatient department or hospital wards. Suicide cases were far more common than unintentional cases (75.5% vs. 24.5%). Suicidal intention was significantly higher in subjects with lower educational status ( $P = 0.033$ ). The most common causes of poisoning were pharmaceutical products (66.7%) followed by aluminum phosphide (10.9%) and other types of pesticides (7.2%).

**Conclusion:** Lethal poisonings is mostly seen in young adults, and those with lower educational level and unemployment. Suicidal intention is the main cause of lethal poisonings.

**Keywords:** Forensic Toxicology; Iran; Mortality; Suicide; Poisoning

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## INTRODUCTION

Rapid development in chemical industry, significant changes in lifestyle and serious socio-economic pressures have led to higher incidence of human poisonings in recent decades (1,2). A number of chemical substances developed to save the agricultural products from rodents and pests so as to protect the human beings from starvation have been in fact proven to be employed for anti-human intents (3,4). The same story can be recited for drugs and pharmaceutical products.

Death due to acute poisoning is of medical, legal and social significance. Even though there are advanced medical treatments and antidotes, death due to poisonings might not be preventable because of different factors. One of these factors is suicidal intention behind poisoning. Patients with suicidal intents are generally found very late after their

attempt and consequently they will receive necessary medical care with a great delay. In addition, after admission to hospital, they might not be conscious to declare the poison they used. Moreover, the majority of patients who are determined to put an end to their lives use highly toxic agents (5,6).

Developing countries are facing with poisoning as a major cause of burden of disease (7). Annually, notable number of deaths occurs as a result of poisonings in Iran (8). Self-poisoning is among the top 4 causes of intentional fatal injuries in Iran affecting 1.2 per 100,000 people each year (8). However, the pattern of deadly poisonings differs region by region according to the toxic agents available and socio-economic factors. Hence, this study was designed to investigate lethal poisonings among dead bodies referred to regional office of Iranian Legal Medicine Organization (ILMO) in Shiraz, southwest Iran.

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## METHODS

This was a retrospective descriptive-analytical study on dead bodies referred to Fars province regional office of ILMO in Shiraz, Iran, during April 2013 to the end of March 2014. For all cases suspected for poisoning, overdose or drug interactions as the cause of death, post-mortem examinations were performed; i.e. after autopsy and complete body examination, appropriate viscera and tissue was preserved by using appropriate preservatives according to the nature of the poison (e.g. blood, urine, bile and liver for drug-related and chemical poisonings and substance abuse) and then the specimens were sent to regional Forensic Laboratory for chemical analysis.

For data analysis, only subjects with poisoning as the definitive cause of death were included. The study was approved by the institutional ethics board. The confidentiality of subjects' personal information was maintained. Toxic agents used and socio-demographic data of subjects were extracted from investigation reports on death scenes, hospital records and necropsy reports. Data were analyzed using SPSS statistical software (IBM Corp., Armonk, NY, USA). Chi squared test was used to analyze the relationship between variables. P values less than 0.05 considered statistically significant.

## RESULTS

### *Sociodemographic features*

During the study period, 2,594 autopsies were conducted in Fars province regional office of ILMO, among which poisoning was found to be the cause of death in 147 autopsies (5.7%). Eighty-eight cases (59.9%) were men. The majority of subjects aged 20 to 30 years (50.3%) (Table 1). The greatest number of subjects (73.5%) was unmarried persons. Incomplete high school was found to be the educational level of the highest number of subjects (58.5%). Regarding the occupation, most subjects were unemployed (49.7%) followed by housewives (19.7%).

### *Circumstances of poisoning*

Over half of the cases (54.42%) had died within less than 6 hours after the poisoning. The majority of cases were found dead at home (73.5%), while the rest had died in outpatient department or hospital wards. Suicide cases were far more common than unintentional cases (75.5% vs. 24.5%). Using chi squared test, level of education was significantly associated with intention of poisoning, i.e. suicidal intention was significantly higher in subjects with lower educational status ( $P = 0.033$ ).

### *Poisoning agents*

Poisoning with pharmaceutical products was found in 98 cases (66.7%), in which acetaminophen + non-steroidal anti-inflammatory drugs were responsible for 31 cases (21.1%), tricyclic antidepressants for 26 cases (17.7%), benzodiazepines for 14 cases (9.5%), barbiturates for 12 cases (8.2%) and other drugs including multi drugs poisoning for the remaining 15 cases (10.2%). Aluminum phosphide (AIP) poisoning accounted for 16 cases (10.9%), poisoning with other types of pesticides (including organophosphates) for 11 cases (7.4%), ethanol intoxication for 9 cases (6.1%) and

**Table 1.** Socio-demographic characteristics of the study subjects and circumstances of poisoning (n = 147)

Variables	N (%)
<b>Age groups (year)</b>	
< 20	18 (12.2)
20-29	75 (51.0)
30-39	29 (19.7)
40-49	14 (9.5)
50-59	7 (4.8)
≥ 60	4 (2.7)
<b>Marital status</b>	
Single	108 (73.5)
Married	39 (26.5)
<b>Level of education</b>	
Primary education	7 (4.8)
Incomplete high school	86 (58.5)
High school diploma	46 (31.3)
Academic education	8 (5.4)
<b>Occupation</b>	
Unemployed	73 (49.7)
Housewife	29 (19.7)
Soldier	10 (6.8)
Student	10 (6.8)
Unreported	10 (6.8)
Farmer	8 (5.4)
Self-employed	4 (2.7)
Prisoner	3 (2.0)
<b>Place of residence</b>	
Rural	92 (62.6)
Urban	55 (37.4)
<b>Time of death</b>	
< 6 hours after poisoning	80 (54.4)
> 6 hours after poisoning	67 (45.6)
<b>Place of death</b>	
Home	108 (73.5)
Outpatient department or hospital ward	39 (26.5)
<b>Intention of poisoning</b>	
Suicide	111 (75.5)
Accidental exposure	21 (14.3)
Drug interaction	8 (5.4)
Overdose	7 (4.8)

cyanide poisoning for 3 cases (2.0%). In acute drug interactions, the most frequent drugs used were barbiturates along with cardiovascular drugs and benzodiazepines.

Suicidal intention was behind the majority of poisonings with pharmaceuticals (79.6%), AIP (75%), non-AIP pesticides (54.5%) and cyanide (100%). Ethanol intoxication

**Table 2.** Causative toxic agents according to gender and intention of poisoning

Parameters	Toxic agent					
	Pharmaceutical products (n = 98)	Aluminum phosphide (n = 16)	Other pesticides (n = 11)	Ethanol (n = 9)	Cyanide (n = 3)	Miscellaneous (n = 10)
<b>Intention behind poisoning</b>						
Suicide	78(79.6)	12 (75.0)	6 (54.5)	2 (22.2)	3 (100)	10 (100)
Accidental exposure	12 (12.2)	4 (25.0)	5 (45.5)	-	-	-
Drug interaction	8 (8.2)	-	-	-	-	-
Overdose	-	-	-	7 (77.8)	-	-
<b>Gender</b>						
Male	53 (54.1)	8 (50.0)	9 (81.8)	8 (88.9)	3 (100)	5 (50.0)
Female	45(45.9)	8 (50.0)	2 (18.2)	1 (11.1)	0 (0.0)	5 (50.0)

was mainly due to unintentional overdose (77.8%). Poisoning with non-AIP pesticides, ethanol and cyanide was more commonly seen in men ( $P < 0.001$ ) (Table 2).

## DISCUSSION

In this study, we found that poisoning was the cause of death in less than 6% of dead bodies referred to Fars province regional office of ILMO. The majority of poisonings was by far due to suicidal attempts. Suicide is an important cause of premature mortality, accounting for over a million deaths each year worldwide (9). Nonetheless, in some epidemiologic studies in which the pattern of poisoning in hospital admissions was evaluated, accidental exposures were more common and the majority of poisoned patients discharged in good health condition (10,11). In other words, a high number of poisoning-related hospital admissions are due to accidental exposure, while the poisoned cases that ultimately came to death are due to suicide. Moreover, if a person is accidentally poisoned, there is a higher chance that low toxic poison is taken and that the poison is ingested in very small amounts, whereas in deliberate self-poisonings (the major theme of our study), because strong intent towards death exists highly toxic agents and higher amount of poisons are ingested (12).

In contrast to different hospital-based studies which showed a female predominance in poisonings (13-16), in the present study men greatly outnumbered women which shows the use of highly toxic agents and greater intent towards death in men (17). To put it in other words, although poisoning might be more common in women in different settings, but the deadly poisonings are far more common in men especially if a suicidal intention is behind it. Generally, women tends to employ poisoning as a tool for parasuicidal behaviors to attract attention (18,19).

In this study, young adults (20 to 29 year-old individuals) accounted for the largest proportion of cases. The similar pattern was observed in a study on deadly poisoning cases referred to Kermanshah regional office of ILMO by Yartire

et al (20) and a study on drug poisoning-related deaths referred to Tehran regional office of ILMO by Akhgari et al (21). In the present study, unmarried subjects greatly outnumbered married ones, a finding which replicates an earlier study by Najjari and Afshar in Tehran, Iran (22), but contrasts with a study by Varma and Kalele in Bhavnagar, India (23). In one aspect, it can be said that lack of emotional support from family for single people may predispose susceptible ones to commit suicide. On the other side, familial disharmony may also be a risk for suicidal behavior.

In this study, we found lower educational level and unemployment as great risks for lethal poisonings. The same story has been reported in several other studies (22,24,25). The socio-economic pressure as a result of unemployment can be a risk for suicide (6,25). In addition, lower educational level which associates with lower chance of finding a job is itself a predisposing factor for lethal poisonings both in case of less educated people who ingest wrong dosage of a medicine, and those who commit self-poisoning parasuicidally but are not aware of consequences of a lethal poison (25,26). Public educational programs about the lethal poisons and risk factors for poisoning might be an effective measure to diminish the rate of this health threat.

In the present study, analgesics and neurologic medicines were responsible for highest proportion of poisonings. In the next rank, different types of pesticides were the killer poisons. These data follows the epidemiologic pattern of poisoning in different parts of Iran (15,16,27). This pattern is a combination of poisoning pattern in high income western countries where drug poisoning is the main cause of poisoning (10,12,19), and developing Asian countries where pesticide agents are easily available and commonly used for self-poisoning (3,4). Statistics show that 90% of fatal poisonings occurs in developing countries, especially, amongst the agricultural workforces. Developing countries such as India,

Bangladesh and Sri Lanka have reported alarming rates of poisoning and deaths due to pesticides (3,4,28). In recent decades, AIP has emerged as the most common pesticide used for suicide because it is cheap, easily available, highly toxic with no antidote (29).

All in all, it seems that no adequate global response has been made toward the problem of deliberate self-poisoning with drugs and chemicals. These findings suggest that there is a need for stronger health policy towards drug and chemical control across the globe in general, and in our country in particular.

### LIMITATIONS

Although the research reached to valuable findings, there were some unavoidable limitations. First of all, due to the retrospective nature of the study, the researchers were not able to collect all of the patient's history and sociodemographic features from the documents and records. Second, the data of deadly cases due to opioid overdose are not presented and analyzed in this study, because of absence of relevant subjects' files.

### CONCLUSION

Lethal poisonings is mostly seen in young adults, and those with lower educational level and unemployment. Suicidal intention is the main cause of lethal poisonings.

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