

# Epidemiological and Cost Analysis of Self-Poisoning Cases in Ankara, Turkey

Gulsum Kavalci<sup>1,\*</sup>; Filiz Banu Ethemoglu<sup>1</sup>; Asli Batuman<sup>1</sup>; Dilber Kumral<sup>1</sup>; Cengizhan Emre<sup>1</sup>; Meltem Surgit<sup>1</sup>; Alev Akdikan<sup>1</sup>; Cemil Kavalci<sup>2</sup>

<sup>1</sup>Department of Anesthesiology and Reanimation, Yenimahalle State Hospital, Ankara, Turkey

<sup>2</sup>Department of Medicine Emergency, University of Baskent, Ankara, Turkey

\*Corresponding Author: Gulsum Kavalci, Department of Anesthesiology and Reanimation, Yenimahalle State Hospital, Ankara, Turkey. Tel: +90-3125085026, Fax: +90-3123125346, E-mail: gkavalci@yahoo.com

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**Background:** Poisoning is a global public health problem. Self-poisoning has potentially serious consequences. Follow-up studies have found that 3-10% of self-harm patients eventually succeed.

**Objectives:** This study was designed to investigate the epidemiological, clinical and economical aspects of deliberate self-poisoning patients admitted to Yenimahalle State Hospital Intensive Care Unit.

**Patients and Methods:** The study was carried out retrospectively in Ankara Yenimahalle State Hospital. It included Seventy-one patients over 16 years of age who were admitted to the hospital due to poisoning during 2012. Exposed poisons were classified into one of three categories; pharmaceuticals, pesticides, and alcohols. Cost account was based on the medical invoices at patient discharge. Data were compared using Student's T test and chi-square test. A P value of less than 0.05 was considered significant.

**Results:** The female/male ratio was 2.55. The mean age of the 71 poisoned patients was  $28.92 \pm 11.51$  years. Most of the poisoning agents were pharmaceuticals (68 cases). Among the pharmaceuticals, antidepressants were involved most often, followed by analgesics. There was no statistically significant difference between pharmaceutical agents in terms of hospital cost ( $P > 0.05$ ). The mean length of hospital stay was  $6.4 \pm 4.3$  days. There was a statistically significant difference between the lengths of stay of patients in terms of hospital cost ( $P < 0.05$ ).

**Conclusions:** The patient cost increased as the length of stay increased due to the policy of bundle pricing.

**Keywords:** Poisoning; Cost; Intensive Care Unit

## 1. Background

Poisoning is a global public health problem. Deliberate self-harm (DSH) is a major health problem in developing countries (1, 2). Deliberate self-harm is common among young people, especially in certain subpopulations. It may be associated with depression, suicide attempt and some other psychiatric disorders (2). Deliberate self-poisoning is one of the commonest reasons for general hospital admissions in the UK, and it represents a considerable economic burden (3-5). Self-poisoning has potentially serious consequences; follow-up studies have found that 3- 10% of self-harm patients eventually succeed (4, 5).

## 2. Objectives

This study aimed to investigate the epidemiological, clinical and economic aspects of deliberate self-poisoning patients admitted to Yenimahalle State Hospital Intensive Care Unit (ICU).

## 3. Patients and Methods

This study was cross-sectional and retrospectively car-

ried out at Ankara Yenimahalle State Hospital, Turkey. There were no ethical issues associated with this study. The authors worked according to the Helsinki declaration. We included 71 patients, who were admitted to the hospital's ICU due to self-poisoning during 2012. Deliberate self-poisoning is defined as the deliberate ingestion of substances intended to cause harm. Characteristics such as age and gender of the patients, poisoning agents, outcomes (discharged, referred, admitted, death etc.), and cost were recorded. Inclusion/exclusion criteria are shown in Table 1. Exposed poisons were classified into one of the three categories: pharmaceuticals, pesticides, and alcohols. Pharmaceuticals were subcategorized into antidepressants, analgesics, other psychotropic agents (including antipsychotics, benzodiazepines, lithium, etc.), antiepileptics, antibiotics, antihypertensives, others (including vitamins, antihistamines, antiemetics, antidyspeptic drugs, anti-ulcer drugs, hormones, antidiabetics, skeletal muscle relaxants, warfarin, drugs for the common cold, etc.), and unidentifiable. The number of ingested pharmaceuticals was also recorded. Cost account was based on the medical invoices at patient discharge.

For statistical analysis, patients' data were assessed by the SPSS version 18.0 software. Quantitative variables were expressed as mean  $\pm$  standard deviation. Frequency and percentage distribution were used for the evaluation of data. The chi-squared test was used for comparison of the categorized variables. Distribution of the invoices was evaluated with the Kolmogorov-Smirnov test and normally distributed invoices were compared using Student's T test and ANOVA test. For the determination of factors effective on patient cost, logistic regression analysis was done. A P value of less than 0.05 was accepted as significant.

#### 4. Results

Of the 1291 patients admitted to the critical care unit during this one-year period, 71 (5%) had poisoning. Among these cases, 71.8% were female. The female/male ratio was 2.55. There was no statistically significant difference between the two genders in terms of hospital cost ( $P > 0.05$ ) (Table 2). The mean age of the 71 poisoned patients was  $28.92 \pm 11.51$  years. Most of our patients (42.3%) were under 26 years of age (Table 2). There was no statistically significant difference regarding the hospital cost of different age groups ( $P > 0.05$ ) (Table 2). Mean systolic blood pressure was  $116.96 \pm 14.2$  mmHg, mean diastolic blood pressure was  $76.49 \pm 7.85$  mmHg, and mean heart rate

was  $90.27 \pm 2.56$  bpm. Gastric lavage was performed in 49.3% of patients. Treatment modalities are summarized in Table 2. There was no statistically significant difference between treatment modalities in terms of hospital cost ( $P > 0.05$ ) (Table 3). Furthermore, 67.6% of patients were intoxicated by a single agent, and 14.1% were intoxicated by two agents (Table 4). There was a statistically significant difference between hospital costs according to the number of type of agents ( $P < 0.05$ ) (Table 4).

Most of the poisoning agents were pharmaceuticals (68 cases). The distribution of poisoning agents is shown on the Table 3. There was no statistically significant difference between the poisoning agents in terms of hospital cost ( $P > 0.05$ ) (Table 3). Among the pharmaceuticals, antidepressants were most often involved, followed by analgesics (Table 4). There was no statistically significant difference between pharmaceutical agents in terms of hospital cost ( $P > 0.05$ ) (Table 4). All patients were evaluated, treated, and discharged from the critical care unit (100%). The mean length of hospital stay was  $6.4 \pm 4.3$  days. There was a statistically significant difference between the lengths of stay in terms of hospital cost ( $P < 0.05$ ) (Table 5). No patient died due to poisoning. For the determination of factors effective on patient cost, logistic regression analysis was done. Length of stay, analgesics and antihypertensive poisonings were determined as factors influencing patient costs (Table 6).

**Table 1.** Inclusion/Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Patients over 16 years of age	patients under 16 years of age
Patients who were admitted to the hospital's ICU with deliberate self-poisoning	

**Table 2.** Demographic Features of Patients<sup>a</sup>

Demographic Features	Results	Cost, \$	P Value
<b>Gender</b>			$P > 0.05$
Male	20 (32.3)	$401.57 \pm 326.32$	
Female	51 (71.8)	$329.57 \pm 218.47$	
<b>Age groups</b>			$P > 0.05$
16-25	30 (42.3)	$356.40 \pm 248.54$	
26-35	27 (38)	$268.05 \pm 163.99$	
36-45	7 (9.9)	$509.12 \pm 303.97$	
46-55	5 (7)	$473.43 \pm 490.97$	
56-65	1 (1.4)	498.20	
> 66	1 (1.4)	480.66	

<sup>a</sup> Data are Presented as No. (%) or Mean  $\pm$  SD.

**Table 3.** Poisoning Agents and Treatment Modalities<sup>a</sup>

	Results, N (%)	Cost, \$	P Value
<b>Treatment Modality</b>			P > 0.05
Gastric lavage	35 (49.3)	357.30 ± 272.13	
Active charcoal	38 (53.5)	353.19 ± 264.33	
Antidote	9 (12.7)	413.89 ± 125.18	
<b>Substance</b>			P > 0.05
Pharmaceutical	68 (95.8)	351.265 ± 256.48	
Alcohol	2 (2.8)	232.88 ± 173.49	
Pesticide	1 (1.4)	487.82	

<sup>a</sup> Data are Presented as No. (%) or Mean ± SD.**Table 4.** Pharmaceutical Agents (one or multiple) Involved in Poisoning<sup>a</sup>

	Results	Cost, \$	P Value
<b>Numbers of Agent</b>			P < 0.05
1	48 (67.6)	320.11 ± 198.6	
2	10 (14.1)	557.52 ± 468.50	
3	6 (8.5)	295.65 ± 124.35	
4	7 (9.9)	303.51 ± 93.13	
<b>Pharmaceuticals</b>			P > 0.05
Antidepressant	31 (43.7)	318.59 ± 247.64	
Analgesic	28 (39.4)	365.08 ± 221.05	
Other psychotropic	3 (4.2)	827.06 ± 668.83	
Antiepileptic	2 (2.8)	266.90 ± 24.69	
Antibiotic	6 (8.5)	306.48 ± 201.73	
Antihypertensives	4 (5.6)	558.28 ± 520.65	
Others	16 (22.5)	435.62 ± 298.17	
Unidentifiable	9 (12.7)	270.71 ± 185.41	

<sup>a</sup> Data are Presented as No. (%) or Mean ± SD.**Table 5.** Cost and Length of Stay<sup>a</sup>

Length of Stay	Results	Cost, \$	P Value
1	8 (11.3)	61.41 ± 52.36	< 0.05
2	31 (43.7)	236.72 ± 85.86	
3	24 (33.8)	423.65 ± 128.87	
4	5 (7)	648.70 ± 103.02	
5	2 (2.8)	1150.98 ± 4.88	
7	1 (1.4)	1300	

<sup>a</sup> Data are Presented as No. (%) or Mean ± SD.

**Table 6.** Factors Effective on Patient Cost

Variable	RR (95% CI)	P Value
Length of stay <sup>a</sup>	0.96 (209.1-262.3)	0.000
Analgesic	0.189 (11.4-183.3)	0.027
Antihypertensives	-0.215 (-365.6-103.1)	0.001
Sex	-0.061 (-95.5-26.8)	0.265
Age groups	0.090 (-4.5-46.9)	0.104
Numbers of agent	0.012 (-40.3-46.5)	0.886
Antidepressant	-0.102 (-122.8-19.6)	0.152
Antipsychotropic	0.020 (-149.7-211.1)	0.734
Antiepileptic	0.020 (-139.0-199.4)	0.722
Antibiotic	-0.047 (-180.6-95.9)	0.541
Alcohol	0.002 (-170.1-175.8)	0.974
Pesticide	-0.005 (-231.0-211.4)	0.930
Gastric lavage	0.080 (-41.6-121.9)	0.329
Active charcoal	-0.144 (-157.6-12.1)	0.091
Antidote	-0.092 (-202.2-63.3)	0.299

<sup>a</sup> Logistic regression analysis.

## 5. Discussion

Poisonings are important causes of mortality and morbidity. Suicide is the second most common cause of death among adolescents and young adults (6). In a study of adult poisoning cases carried out in Canada, acute intoxications accounted for 0.7% of admissions (7). Hanssens et al. showed that acute poisoning cases were 0.18% of all hospital admissions (8). Another study on poisonings carried out in England revealed that 1.2% of hospital visits were due to acute poisonings (6). Kapur et al. reported that self-poisoning accounted for 0.31% of hospital admissions (3). Mashreky et al. reported that poisoning cases were 0.073% of hospital admissions (9). Cengiz et al. reported that acute poisoning cases were 0.18% of all hospital admissions (10). According to our results, our patient population had an acute poisoning ratio of 0.05% which is less than that reported from other parts of Turkey (0.004-2.4%) (11-16). Our results were consistent with the literature. In previous reports, the female/male ratio varied between 1.7 and 3 (12-20). The female/male ratio in our patients was 2.55. Interestingly, this ratio has been reported to be lower (approximately 1/1) in various developed countries (7, 21-23). As in other reports, the majority of our patients were young, where 42.3% were under 26 years old; similar to proportions in two international studies and in two studies from Turkey (7, 8, 17, 18). Our results were consistent with the literature. We suggest that economical and social issues, such as unemployment and marriage, more commonly affect this age group. The substances involved in most of the poisonings in our study were pharmaceutical agents (95.8%), which is in agreement with reports from other regions in Tur-

key (12-16). In studies from other countries, pharmaceuticals were also found to be the most common agents involved in acute poisoning (21-24). Cengiz et al. reported that pharmaceutical agents were the cause of 51.2% of intoxications in patients admitted to the intensive care unit (10). Differences between developmental and socio-cultural levels of the regions in which the study was conducted may have affected and changed the study results. Regarding the type of pharmaceutical agents involved in poisonings of Turkey, analgesics were reported to be the most frequently ingested agents in some studies (27.6% in our study) (12-15), whereas antidepressants were most commonly used in the study reported by Baydin et al. (18). Antidepressants were most commonly used in our study (43.7%). Antidepressants are easily available without a prescription in Turkey. Alcohols were the second most common toxic substance in our study (2.8%) (Table 2).

The ratio of alcohol to all other poisoning agents was 3.1-18% in previous studies (1, 22-25). White et al. reported that alcohol poisoning increased in young adults between 1999-2008 (26). Our results were in accordance with the literature. In Islamic communities alcohol consumption is less than western communities, thus poisoning rates might be lower in Turkey. Pesticides were the third most common toxic agent (1.4%). Cengiz et al. reported that pesticide poisoning rate was 10% (10). Khurram and Mahmood reported that pesticide poisoning rate was 21.3% (27). Studies from non-agricultural areas in Turkey reported a much lower percentage of poisonings involving pesticides, ranging between 0.9% and 1.6% (15, 28), while studies from agricultural areas reported a rate of pesticide involvement of 12-26% (18, 29). In such regions, pesticides are often sold in local markets and kept at home (27, 28). We think that the rate of pesticide poisoning in our study was low due to a low ratio of agricultural areas in the studied region. Mortality rate of 0-5.8% has been reported in the literature (8-17, 19). Our mortality rate (0%) was consistent with the literature. Early intervention decreased the mortality rate. The ratio of poisoning by a single agent was reported as 55-74% in previous studies (16, 17, 24), while 67.6% of our patients were intoxicated by a single agent. Our results are similar to the literature. Suicidal attempts are commonly impulsive and patients ingest a single agent that is easily reachable rather than multiple agents. The duration of the intensive care stay ranged between 1.6 and 6.4 days (2, 5, 10, 30) in the literature. The duration of the intensive care stay in our study was  $6.4 \pm 4.3$  days. Increased defensive medicine approaches and malpractice law may have increased the length of stay. Costs of poisoning cases treated at the intensive care unit have been scarcely studied. Serinken et al. reported a hospital cost of \$144.06 for patients admitted for suicide (2). Kapur et al. reported that the cost of intensive care unit ranged between £217 and £432 (3). Shadid et al. reported that the average hospital cost of a poisoning patient was \$255 (31). D'Mello et al. reported that the cost of hospital treatment for patients who over-

dosed on tricyclic antidepressants was four times greater than the cost of treatment for patients who overdosed on selective serotonin reuptake inhibitors (29). Yeo et al. reported that mean cost of a poisoning patient was £425.64 (5). The average cost in our study was \$349. We think that the difference between the costs is a result of varying policies of charging of services. Serinken et al. from Turkey reported a cost of \$144.06 (2) while we determined a cost of \$349. We observed a difference in hospital cost that was associated with the number of ingested agents and length of hospital stay. We feel that our average cost has been increased by the bundle pricing that was put into effect in our country during an intervening period of six years. Poisoning is common in adults in our studied region; the risk being highest in females and younger adults. The patient cost increases as the length of hospital stay increases due to the policy of bundle pricing.

### 5.1. Limitation of the Study

The major limitation of this study was its retrospective nature and small number of patients included in the study due to late establishment of ICU in 2012.

### Authors' Contributions

Gulsum Kavalci: study concept and design. Filiz Banu Ethemoglu and Asli Batuman: acquisition of data. Gulsum Kavalci, Dilber Kumral and Cengizhan Emre: drafting of the manuscript. Meltem Surgit: administrative, technical and material support. Cemil Kavalci: analysis and interpretation of data, and critical revision of the manuscript for important intellectual content.

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