

# Frequency and Mortality Risk Factors of Acute Adult Poisoning in Adana, Turkey, 1997–2002

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## Abstract

**Objective:** The purpose of this study was to evaluate the data on acute adult poisoning over a six-year period at a university emergency department in Turkey and identify the risk factors of mortality.

**Material and Methods:** In this survey, data were collected from 2,229 adult patients admitted to the Emergency Department (ED) of Cukurova Medical Faculty, Adana, from January 1, 1997 to December 31, 2002.

**Results:** Of all emergency admissions during the six years, 1.6% were poisoned. Of the total poisoning cases, 725 (32.5%) were males and 1,504 were females. Mean age was 29.3±13.2 for males and 23.8±9.6 for females ( $p=0.001$ ). A majority of the cases (76.4%) were attempted suicides. The attempted suicide ratio is higher for women (gender ratio: 2.4/1) and youths. Drugs were the most frequent cause of poisoning (59.0%) and pesticides were the second (26.4%). Psychoactive drugs were the most common agent (33.5%) among drugs, with their rate increasing each year. Eighty-seven patients died (3.9%): alcohol (methanol) was the most frequent cause of death (20.6%), followed by mushrooms (11.5%), carbon monoxide (10.3%) and pesticides (8.3%). More men than women died by poisoning (OR: 1.8 CI: 1.1–3.1). Gender, age, season, clinical status, initial emergency care and type of substance were significant risk factors for mortality.

**Conclusion:** Poisoning by psychoactive drugs was increasing each year of the study, but many drugs are not a serious risk factor for mortality. However, organic phosphorus is a serious risk factor for poisoning and mortality in this area. Providing satisfactory public and emergency staff assistance and education on the subject may reduce the mortality rate.

**Key Words:** Adult, mortality, poisoning, risk factors.

## Introduction

IN DEVELOPED COUNTRIES, the annual incidence of both unintentional and deliberate human poisoning varies from 0.2–9.3 poison exposures per 1,000 population, and continues to increase annually worldwide (1). Acute adult poisoning usually results from attempted suicide and tends to be associated with low morbidity and mortality. Trends in poisoning have been changing in recent years, and the methods and substances used for self-poisoning have changed considerably over time (2–10). In many countries, especially in Western Europe and North America over the last two decades, the most common agents taken by adults have been drugs (4–20). In developing countries, unintentional and deliberate pesticide poisoning is probably the commonest cause of adult deaths (21). In an extrapolation from very limited data, the World Health Organization (WHO) estimates that 3 million pesticide-poisoning cases occur worldwide

each year, with 220,000 deaths, most of which are intentional (22).

In Turkey's Cukurova region, one with large agricultural fields of about 675,000 hectares, usage of pesticides is very common. Adana, with its population of about 1,900,000, is the main city of this region. The major landholders of the region employ seasonal labor. Every year thousands of families from neighboring areas come to Adana in the spring and summer as migrant farm workers. Most of them are illiterate and are unfamiliar with the usage warnings written on containers, bottles, etc.

No satisfactory data on demographic characteristics of poison victims and substances ingested were provided by reports of the Turkish Health Ministry (THM). In general, however, the prevalence of poisoning in Turkey is estimated as 0.04% in 1995 (23). The average annual rate of suicide in Turkey from 1974–1998 was 2.2 /100,000, and a total of 28,408 suicide deaths were reported in that period (24). An emergency call center was established in 1997, called the "112 Emergency Service" (ES). Emergency statistics are collected by this unit and reported annually by THM. According to these reports, in 2002, 4.2% of all patients recorded by the ES were poisoned. Although this statistic represents only the cases administrated by ES, it is a sign that poisoning has become as im-

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portant a problem for medical emergency centers in Turkey as it is in developed countries. However, a statistic such as this does not provide the type of substance, cause of poisoning and outcome of poisoning, parameters needed for making comparisons with other countries.

Determination of the demographic and etiology in poisoning cases, and risk factors of mortality has major importance for the treatment and management policy of this health problem. The aim of this study was to evaluate the data on acute adult poisoning and determine the risk factors of mortality for a six-year period in our emergency department.

### Material and Methods

This study was conducted at the Emergency Department (ED) of Cukurova Medical Faculty in Adana, from January 1, 1997 to December 31, 2002. The adult emergency department of the university sees over 25,000 patients annually. The toxicology laboratory is not activated yet, so analytical confirmation of cases could not be performed.

It was a retrospective study, using data based on patient files for the period January 1997 to December 2002. Specifically, the data was based on a special form routinely completed for all poison cases by ED staff. Since the Ministry of Health has determined that it is necessary to report all poisoning cases, standard forms and files of these cases are completed by staff as accurately as possible. All patients are followed up by the staff until patients have no remaining risk (i.e., are cured). During the period studied, only 18 patients were discharged within one hour without follow-up because they did not show any serious physical signs or symptoms in their medical examinations. Another 18 were referred to intensive care (IC), and information was obtained for only 5 of them (who were cured). Thirteen cases referred to IC with no information about their outcome were excluded from the data when analyses were performed for risk of death. The rest of the patients were followed until they died or were totally cured. Data on self-poisonings recorded by the ED staff were classified according to the International Classification of Diseases (ICD-10) categories relevant at the time: suicides, unintentional poisonings and undetermined intent. Poisonings of undetermined intent were not included in this study; thus the classification includes two titles.

The data form includes information about age, sex, date of poisoning, time and method of arrival, type and amount of medical intervention (i.e., gastric lavage, IV support, antidotes) given in other

health centers or in the ambulance before referral (initial emergency care or resuscitation), substance, cause of poisoning, level of consciousness, severity of poisoning, length of hospitalization, and outcome. This information is collected by interviewing the patient and relatives. In particular, causes of poisoning and amount of toxins are asked about in detail.

During the six-year study period, 2,488 patients over 14 years old were admitted to the ED because of acute poisoning. Pediatric cases and animal envenomations were not included in this study. One hundred and fifty-seven patients were excluded because of incomplete key data elements (gender, age, drug name and cause of poisoning); thus 2,229 patient were analyzed. There were no statistically significant differences according to gender, age and mortality ratio between the dropout patients and the study group. Since there were no significant differences between years, data were analyzed in total.

The toxins were classified into 7 groups: drugs, inhaled gases (mostly carbon monoxide), mushrooms, caustics, pesticides, alcohol/methanol (48 of 60 cases were methanol poisoning, 12 were alcohol) and unknown. For multivariate analyses, the toxin groups were gathered into 3 groups: drugs, agrochemicals (pesticides, rodenticides, and caustics) and others (carbon monoxide, mushroom, alcohol/methanol and unknown). The drugs were also categorized, as follows: analgesics, psychoactive drugs, anti-epileptics, cardiovascular drugs, multidrugs and others (antibiotics, antihistamines, anti-emetics, vitamins and hormones). A majority of the multidrug group was a combination of analgesic and psychoactive drug, followed by analgesic and other(s).

The patients were classified by the poisoning severity score developed by the International Programme on Chemical Safety, the Commission of the European Union, and the European Association of Poison Centers and Clinical Toxicologists (IPCS; EU; EAPCCT) into four groups: none, minor, moderate and severe. For statistical analyses "none" and "minor" groups were grouped together as "mild"; "moderate" and "severe" groups were grouped together as "severe" clinical status.

Statistical analyses were performed using the statistical package SPSS v 10.0. Continuous variables such as age, duration of hospital stay, and duration of time between poisoning and hospital arrival were analyzed by using student's t test or one-way analysis of variance (ANOVA) between groups. The categorical data between groups were analyzed by using the Chi square test; Odds Ratio and confidence interval (CI) were calculated by

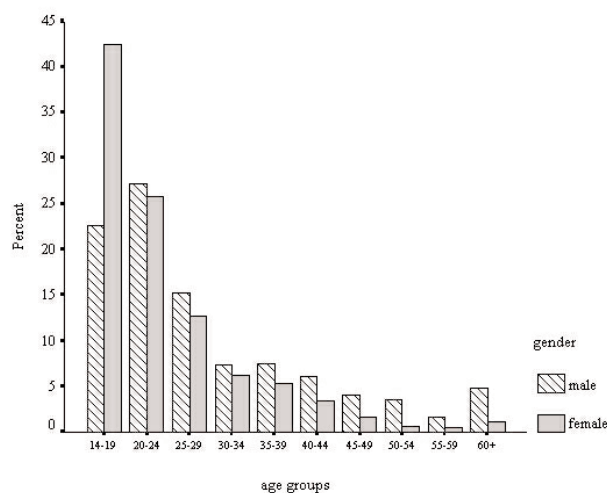
univariate analyses and multiple logistic regression analysis. Results were presented as mean  $\pm$  SD and percent (%). A p value of less than 0.05 was considered significant.

## Results

According to Ministry of Health (MH) statistics, trauma is the leading cause of admission to the emergency department in Turkey and poisoning ranked seventh. While the percent of causes of poisoning is decreasing in Turkey, it has been increasing in Adana over the last two years. This increase is also true for our emergency department (Table 1).

The distribution of age and gender is shown in the Figure. Of the total 2,229 patients, 62.2% were less than 25 years of age (range: 15–96). The mean age of the 725 males (32.5%) was  $29.3 \pm 13.2$  and the mean age of the 1,504 females (67.5%) was  $23.8 \pm 9.6$  ( $p=0.001$ ). The patients' leading occupations were students, unemployed housewives, farmers, general service and unemployed.

Of the total, 1,614 patients (72.4%) were transferred from other health centers and only 13.3% of them arrived within 2 hours of poisoning. Also, 1,517 patients (68.1%) had not received any medical treatment, 549 had had lavage, 107 had re-



**Figure.** Distribution of age groups by gender in total poisoning cases (n=2,229).

ceived antidotes and 55 had received charcoal, 506 (22.7%) were unconscious and 18 (0.8%) were dead when they arrived at the ED. Eighteen patients were discharged following initial emergency care and 2,193 were hospitalized. The mean duration of hospitalization was  $2.9 \pm 2.1$  days. Thirty six patients (1.6%) were not followed, 19 (0.9%) were followed up for less than 12 hours, 287 (12.9%)

**TABLE 1**

*The Percent of Diagnoses\* of Diseases in Emergency Call Service According to Ministry of Health (MH) Statistics in Turkey and Adana by Years (1998–2002\*)*

	Year				
	1998	1999	2000	2001	2002
<b>Total number of cases</b>	<b>98,716</b>	<b>137,224</b>	<b>211,944</b>	<b>268,594</b>	<b>350,056</b>
<b>Pre-diagnosis of Diseases (Turkey)</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>%</b>
Trauma	26.0	25.1	24.4	24.7	24.9
Cardio-vascular	20.6	21.0	20.8	21.6	21.2
Neurological	10.6	11.1	11.4	11.4	11.4
Respiratory	7.9	9.0	7.9	7.2	7.6
Psychiatric	6.0	6.1	7.1	8.3	8.1
Gastro-intestinal	5.0	4.7	5.0	4.6	4.6
Poisoning	5.0	4.7	4.6	4.3	4.2
Endocrine	2.4	2.6	2.8	2.9	2.9
Gynecological	2.0	2.3	2.3	2.2	1.9
Urinary	2.0	1.9	2.2	1.9	2.1
Infections	1.7	1.6	1.7	1.8	1.6
Neonatal	0.6	0.6	0.6	0.8	0.8
Other	10.2	9.3	9.2	8.3	8.7
<b>Percent of Poisonings in Adana</b>					
Data of MH	-	-	1.8	3.0	3.8
Data of present study	1.3	1.4	1.5	1.5	2.1

\*The diagnosis of the MH emergency call service is based on paramedic staff's comments (physicians and nurses together) and not yet confirmed by a medical center or laboratory data. Data from 1997 is not available in MH.

were followed for 12–24 hours, 919 (41.2%) were followed for 24–48 hours and 968 (43.4%) were followed for more than 48 hours. Eighteen patients (0.9%) were referred to an intensive care unit, 69.6% were treated by IV supplements, 6.5% had lavage, 20.0% were given antidotes and 3.0% were given charcoal. Treatment of OPPs (organophosphate poisonings) includes decontamination and antidotal medication (2PAM [2 pralidoxime]) was used in all cases and atropine injections were used until bronchoalveolar secretion stopped). Three quarters of the patients needed psychiatric care, but only 8.2% were counseled by the Department of Psychiatry in ED. Sixty-nine hospitalized patients died, a total of 87 poisoning deaths, resulting in an overall mortality of 3.9%.

A seasonal difference was observed for rate of admission and poison substance. The number of patients increased in May (n=246, 11.0%) and June (n=226, 10.1%) and decreased in January (n=120, 5.4%) and February (n=136, 6.1%). The most common substance was pesticides in May and June and carbon monoxide in January and February.

Drugs were the most frequent cause of poisoning (59.0%) and organic phosphorus was second (26.5%). Carbamates and bipyridiliums were the most frequent organophosphates agents. Common clinical findings with these products were nausea, vomiting, abdominal pain, dizziness and headache.

Suicidal poisoning made up the majority of cases (76.2%); 13.4% of the patients were poisoned unintentionally and 10.4% were exposures (exposure and unintentional poisoning were grouped as unintentional). There were significant differences between the suicidal and unintentional poisoning groups by sex, age groups, season, clinical status and substance (Table 2). Of the 590 pesticide poisonings 47.6% were attempted suicides and 52.4% were unintentional cases.

The percent of mortality and severity for various types of toxins is shown in Table 3. Alcohol/methanol (20.6%) was the most frequent cause of death and severity. Mean length of hospitalization was longest for pesticide poisoning (4.2 days). The time lapse for arrival at the hospital for patients poisoned by mushroom was the longest (mean 9.9 hours).

**TABLE 2**  
*Characteristics of All Patients by the Cause of Poisoning in Adana, 1997–2002*

	Risk Factor	Suicide n (%)	Cause of Poisoning		p value
			Unintentional n (%)	Total n (%)	
<b>Gender</b>	Male	494 (29.0)	231 (43.9)	725 (32.5)	0.001
	Female	1209 (71.0)	295 (56.1)	1504 (67.5)	
<b>Age groups</b>	14–19	635 (37.3)	166 (31.6)	801 (35.9)	0.001
	20–24	468 (27.5)	118 (22.4)	586 (26.3)	
	25–29	233 (13.7)	69 (13.1)	302 (13.5)	
	30+	367 (21.6)	173 (32.9)	540 (24.2)	
	1997–1998	602 (35.3)	198 (37.6)	800 (35.9)	
<b>Year</b>	1999–2000	512 (30.1)	152 (28.9)	664 (29.8)	0.6
	2001–2002	589 (34.6)	176 (33.5)	765 (34.3)	
<b>Season</b>	Winter	325 (19.1)	105 (20.0)	430 (19.3)	0.001
	Spring	467 (27.4)	187 (35.6)	654 (29.3)	
	Summer	501 (29.4)	126 (24.0)	627 (28.1)	
	Autumn	410 (24.1)	108 (20.4)	518 (23.2)	
<b>Time of arrival</b>	1–2 hour (early)	232 (13.6)	63 (12.0)	295 (13.2)	0.3
	3+ hour (late)	1471 (86.4)	463 (88.0)	1934 (86.8)	
<b>Initial emergency care</b>	Yes	570 (33.5)	140 (26.6)	710 (31.9)	0.003
	No	1133 (66.5)	386 (73.4)	1519 (68.1)	
<b>Clinical status</b>	Mild	1266 (74.3)	457 (86.9)	1723 (77.3)	0.001
	Severe	437 (25.7)	69 (13.1)	506 (22.7)	
<b>Substance (toxins)</b>	Drugs	1298 (76.2)	17 (3.2)	1315 (59.0)	0.001
	Caustics	12 (0.7)	63 (12.0)	75 (3.4)	
	Pesticides	281 (16.5)	309 (58.7)	590 (26.5)	
	Carbon monoxide	1 (0.1)	39 (7.4)	40 (1.8)	
	Mushroom	-	26 (4.9)	26 (1.2)	
	Alcohol/methanol	-	68 (12.9)	68 (3.1)	
	Unknown	111 (6.5)	4 (0.8)	115 (5.2)	
	1997–1998	1640 (96.3)	502 (95.4)	2142 (96.1)	
<b>Prognosis</b>	Cured/transferred	1640 (96.3)	502 (95.4)	2142 (96.1)	0.3
	Dead	63 (3.7)	24 (4.6)	87 (3.9)	

TABLE 3

Percent of Mortality and Severity of Poisoning, Time of Arrival and Hospitalization of Patients According to Substance (Toxin) (n=2,229)

Substance (Toxin)	% of Mortality	% of Severity	Mean Days of Hospitalization	Mean Hour of Arrival
Drug	1.5	22.1	2.4	6.1
Carbon monoxide	10.3	12.5	3.0	4.8
Mushroom	11.5	10.5	4.1	9.9
Caustics	1.4	4.0	2.8	7.4
Pesticides	11.9	45.6	3.7	5.6
Alcohol/methanol	20.6	22.1	2.6	5.9
Unknown	3.5	29.6	2.8	6.9
Total	3.9	22.7	2.9	6.1

TABLE 4

Trends in Poisoning-Related Drug Categories by Year in Adana, 1997–2002, with Percent of Mortality (n=1,315)

Drug Categories	Year			Total n (%)	Mortality n (%)
	1997–1998 n (%)	1999–2000 n (%)	2001–2002 n (%)		
Multidrug	160 (36.1)	129 (33.1)	137 (28.4)	426 (32.4)	7 (1.6)
Psychoactive	119 (26.9)	129 (33.1)	192 (39.8)	440 (33.5)	4 (0.9)
Analgesics	77 (17.4)	57 (14.6)	67 (13.9)	201 (15.3)	5 (2.5)
Anti-epileptics	35 (7.9)	33 (8.5)	38 (7.9)	106 (8.1)	1 (0.9)
Cardiovascular	16 (3.6)	23 (5.9)	28 (5.8)	67 (5.1)	1 (1.5)
Other	36 (8.1)	19 (4.9)	20 (4.1)	75 (5.7)	2 (2.7)
<b>Total</b>	<b>443(33.7)</b>	<b>390 (29.6)</b>	<b>482 (36.7)</b>	<b>1315</b>	<b>20 (1.5)</b>

Psychoactive drugs (33.5%) were the most common cause of poisoning, and the patterns of categories of drug poisoning have been changing over the years (Table 4).

The categories of psychoactive drugs were: tricyclic antidepressants (64.2%), benzodiazepines (16.9%), and psychotic and psychosomatic regulators (20.9%). Of the total 201 analgesics, 48.2% were non-steroidal anti-inflammatory agents (NSAIDs), 28.3% paracetamols, 11.2% salicylates and 12.3% other analgesics (metamizole, muscle relaxants, etc.). Of the total 426 multidrug poisonings, a majority involved a combination of anti-psychotic plus analgesic (36.3%), followed by analgesic plus other(s) (24.1%).

Of the 87 patients who died, 18 (20.6%) were dead on arrival at the ED. To begin with, the risk factors of mortality, such as gender, age, year, season, clinical status, cause of poisoning, initial emergency care, time lapse for arrival, type of administration and type of substance, were evaluated by univariate analyses (Chi square test). The risk of mortality increased for patients who were older, male, unconscious, and transferred without medical intervention, and for patients who arrived after 2 hours ( $p<0.05$ ). It decreased each succeeding year

( $p<0.001$ ) but increased in winter ( $p<0.001$ ). Cause of poisoning was apparently not a factor ( $p=0.3$ ).

As a second step, the Odds Ratio and CI of risk factors for mortality were calculated by multivariate logistic regression analyses (Table 5).

## Discussion

During the six-year study period (1997–2002), 2,388 poisonings accounted for 1.6% of the total admissions to the emergency department. The percentage of poisonings among the total number of emergency admissions was found to be 0.7% (25), 0.7% (26), 0.84% (27) and 5% (28) in studies held in Turkey. According to the Ministry of Health emergency statistics, the percentage of poisoned patients in Adana were 1.8, 3.0 and 3.8 respectively in 2000, 2001 and 2002. Considering the fact that our data does not include child and animal envenomations, the percentage of poisonings has to be higher than 1.6, which suggests that about half of the poisoning cases of Adana had been admitted to our ED. According to the annual report of the year 2000, 63 poison centers in the US reported that most exposures occurred at the patient's own residence, and that most patients

TABLE 5

Number of Deaths Related to Poisoning in Adana, 1997–2002, using Multivariate Risk Factors of Mortality for All Death, Odds Ratio (OR) and (95% CI) (n=2,216)\*

Risk Factor	Prognosis		OR(CI)	p	
	Cured n	Dead n (%)			
Gender	Female	1,456	39 (2.6)		
	Male	673	48 (6.7)	1.8 (1.1–3.1)	0.02
Age groups	14–19	775	23 (2.9)	Ref.	
	20–24	566	15 (2.6)	1.0 (0.5–2.1)	0.9
	25–29	294	7 (2.3)	0.7 (0.3–2.0)	0.6
	30+	494	42 (7.8)	2.9 (1.5–5.5)	0.001
	Year	1997–1998	738	49 (6.2)	Ref.
	1999–2000	650	14 (2.1)	0.22 (0.1–0.4)	0.001
	2001–2002	741	24 (3.1)	0.58 (0.3–0.9)	0.001
Season	Winter	404	22 (5.2)	Ref.	
	Spring	634	17 (2.6)	0.3 (0.1–0.7)	0.006
	Summer	602	23 (3.7)	0.4 (0.2–0.9)	0.04
	Autumn	489	25 (4.9)	0.6 (0.3–1.2)	0.2
Cause	Suicide	1,640	63 (3.8)		
	Unintentional	502	24 (5.8)	1.5 (0.8–2.9)	0.1
Clinical status	Mild	1,695	20 (1.2)		
	Severe	434	67 (13.4)	14.3 (8.0–25.5)	0.001
Time of arrival	Early (1–2 hour)	287	5 (1.7)		
	Late (>2 hour)	1,842	82 (4.3)	1.3 (0.5–3.6)	0.5
Initial emergency care	Yes	691	18 (2.5)		
	No	1,438	49 (4.6)	2.2 (1.2–4.1)	0.008
Substance toxin)	Drugs	1,288	20 (1.5)	Ref.	
	Organic Phosphorus	548	41 (7.0)	5.2 (2.8–9.8)	0.001
	Other	293	26 (8.2)	7.1 (3.4–14.9)	0.001
<b>Total (n=2216)</b>		<b>2,129 (96.1)</b>	<b>87 (3.9)</b>		

OR=Odds Ratio, CI=Confidence Interval, p value of risk factors for mortality calculated by multivariate logistic regression analyses. \*n=2,216, 13 cases referred to Intensive Care were excluded.

(75%) were managed on-site with assistance from a poison information center and did not require an emergency department visit (2). Taking into consideration the poisoning patients who are very often treated by traditional antidotal home remedies at their own residence, the number of poisonings according to hospital presentation data represent only the “tip of the iceberg” in this region also.

Mortality from poisoning was found to be 0% (26), 0.8% (27) 2.5% (29), and 2.8% (25) in various studies performed in Turkey. The mortality rate was found to be 2.9% in Greece (20), 1.4% in Hong Kong (30), 1.6% and 0.08% in Spain (31, 32), 0.5% in New Zealand (33), 0.03 in Belgium (19), 6.9% in Hungary (17), and 0.5% in 1987–1988 and 0.1% in 1992–1993, in the U.K. (7). To describe the trends in poisoning deaths in the U.S., health professionals in 11 states analyzed vital statistics data for 1990–2001. During this period, the death rate from poisoning in the U.S. increased 56%, from 5.0 per 100,000 in 1990 to 7.8 per 100,000 in 2001 (3). In another report it was shown that the accidental poisoning mortality rate has been increasing. In the U.S. in the 21-year pe-

riod 1981–2001, mortality rates due to accidental poisoning more than doubled, from 2.0 per 100,000 in 1981 to 4.9 per 100,000 in 2001 (34). An overall mortality rate of 3.9% in our study is higher than in these studies. Our university hospital is the largest reference hospital in this region, and almost all neighborhood city hospitals and local hospitals refer their serious emergency cases to our hospital. However, the sizable percentage of patients transferred from other hospitals (72.4%) with serious clinical status (22.7%) and without initial emergency care (68.1%) end up with a high mortality rate.

As a result of the high rate of severely poisoned patients, our data concerning duration of hospitalization (2.9±1.8 day) is not in accordance with previous reports in some other countries (35, 36). However, the rate of referral to the intensive care unit is low (0.8%). According to a year 2000 annual report of 63 poison centers in the U.S. (total of 2,168,248 cases), 3% of patients required critical care (2). Decreasing mortality rate by years shows that university ED staff has learned to handle these cases.

Although the death rate for poisoning was higher for men than for women, and higher for older individuals than for younger ones, the prevalence of suicidal poisoning is higher for the young and for females, as mentioned in many other studies (3, 10–12, 15, 16, 18). In Utah, the death rates per 100,000 were higher for men than women during 1991–1998 and 1999–2003 (men: 1.86 and 4.90; women: 1.08 and 3.90), but the percentage increase in rates from 1991–1998 to 1999–2003 was greater for women than for men (261% vs. 163%) (37). More men than women die by suicide (gender ratio is 2.1 for this study); more women than men report a history of attempted suicide (gender ratio 2.4) (15, 16, 18, 27, 28). In 2001, the WHO reported that one million people commit suicide every year (38). Attempted suicides occur primarily among women, while completed suicides occur primarily among men (8, 13, 16, 39). It has been shown that women use significantly less violent methods than do men (39–41). The rates of attempted and completed suicides per 100,000 inhabitants over 15 years of age were found to be 31.9 and 9.9 for males and 85.6 and 5.6 for females, respectively, in a survey done in Turkey in 2002 (41). In another study, in the 4-year period 1998–2001, in a catchment area of Turkey, the mean annual suicide rate was found to be increasing (42). “This upward trend may be related to the intense economic difficulties, increasing unemployment, and rapid social change experienced in Turkey in recent years” (42).

Different trends in suicidal or unintentional poisoning rates were reported in some studies. The overall suicide rate has been falling since the 1960s in the UK (6, 16); however, the rate has been increasing in recent years for one notable group (young males, aged 15–24) (6, 7, 13, 16, 43). A linear increase was observed in unintentional poisoning mortality rates in certain Texas counties, and males were found to be at higher risk of death from accidental poisoning than were females (8). In this present study, no significant increase in suicidal or unintentional poisoning rate was found. However, a clear seasonal variation was seen in poisoning cases that may be due to agricultural poisoning (occurring in spring and summer) and psychotic disorders. It was reported that people who have psychotic disorders usually attempt suicide in the summer (44).

In Western Europe, North America and Turkey, drugs have been the most common agents taken by adults both for intoxication and for suicide (2, 4, 7, 13, 15–19, 20, 31–35, 45) but the trend in categories of drugs has been changing. There are variations from country to country, in

Europe. In Finland, alcohol, cardiovascular drugs and psychotropic drugs are the most common causes of poisoning (35). Analgesic poisoning occurred more commonly than previously during 1976–1997 in UK (6, 16, 43). A similar pattern of change has been noted in Norway and in central Europe (45). In Turkey previous reports demonstrated that analgesics and NSAIDs are the most common causes of poisoning from drugs (25, 26). On September 16, 1998 the UK introduced legislation limiting the amount of paracetamol, salicylates and their compounds, which may have influenced both the number and severity of paracetamol overdoses in the U.K. (46). Before the 1990s, most drug overdose suicides involved barbiturates. However, since barbiturates became controlled drugs after the 1990s, their availability as a method of committing suicide significantly decreased (16). Thus, overdose with other psychotropic agents is now more frequent (3, 7, 12–14, 47). However, Backman et al. suggested that the increased number of sales of antidepressants has not caused an increased use of antidepressants in self-poisonings (15). Antidepressant overdoses, especially of selective serotonin reuptake inhibitors (SSRIs), were found to have increased substantially in many countries. In this study, drugs were the most common cause of poisoning. The increased incidence of poisoning by psychoactive drugs over the years might be due to the increased prescription of antidepressants. ED staff and primary medical care staff have an important role in recommending psychiatric care for people suffering from mental problems such as depression or for those who have attempted suicide or thought of doing so.

The demographics, sources and outcomes of methanol poisoning, which has a very high risk of mortality (20.6%), have not been described for Turkey. In a study of the recorded 30,485 calls concerning poisoning for Izmir from 1993 to 2002, 996 (3.3%) were found to be alcohol poisonings and 113 (0.37%) were methanol poisonings. Sixteen patients had died (48). Methanol used for producing cheap “eu de colognes” in Turkey is the principal reason for severe poisoning and deaths. In addition, in our region methanol is included in a traditional alcohol drink, which is produced cheaply and illegally, resulting in increasing mortality in recent years. Poverty is an important factor in mushroom and gas poisoning. The use of natural mushrooms instead of cultured mushrooms for meals as well as primitive, traditional coal stoves and flash heaters for heating frequently results in accidental poisoning.

Pesticides are the most common method of self-poisoning in many rural regions (25). Agro-

chemicals account for nearly 60% of all poisonings in Sri Lanka (mortality; 9.8%) (21), 46% in India (11), 35.8% in China (47), 31.4% in Zimbabwe (49), and 7.7% in Greece (20). The proportion of OPPs was found to be 15.1% (28) and 7.6% (25) in the ED of two universities located in agricultural cities in Turkey. In England and Wales, such agents account for less than 1% of hospital admissions due to poisoning (50). This is also the case in large industrialized cities in Turkey (0.9%) (26). Pesticides were responsible for only 1.1% of deaths from poisoning occurring in England and Wales between 1945 and 1989 (50). There were 338,170 poison exposures reported to poison centers in the United States over the 6-year period (1985–1990). Life-threatening manifestations or long-term sequelae occurred in 782 agricultural and horticultural chemical poisoning cases, and 97 deaths were reported (51). The death rate related to the agricultural poisoning has been found to be 0.4% (48) and 4.7% (28) in Turkey.

The frequency of pesticide poisoning (26.5%) and mortality (11.9%) was high in this study. Workers in agriculture, who are relatively poor and uneducated, migrate from southeastern of Turkey to Adana seasonally and live in tents that generally do not have a clean water supply. Pesticide application without adequate protection, illiteracy, economical problems, difficult life conditions and various psychological stresses seem to correlate with high rates of pesticide poisoning, both suicidal and unintentional. The high proportion of OPP poisoning patients transferred to the university hospital without antidotal treatment led us to consider that ED staff working in state hospitals may not be aware of the clinical manifestations and the antidotal treatment for this type of poisoning.

### Limitation of the Study

Information about the outcome of 18 patients who were referred to IC was obtained only for 5 patients (cured). These were all fairly serious cases and may increase the death rate. These cases were excluded from the data when analyses were performed for risk of death. Since the toxicology laboratory has not been activated yet, analytical confirmation of cases was not possible; so the presumed diagnosis relied only on history, physical signs and symptoms. Although the history and physical examination are important, they may be unreliable or incomplete. Taking these factors into consideration, the family members, friends and the patient were questioned in detail, and the patients were followed up for at least 24 hours in the ob-

servation room as a departmental procedure. This procedure may have been a factor prolonging the duration of hospitalization.

### Conclusion

Death was directly related to product toxicity and the severity of the poisoning. The study implicates pesticide poisoning as a serious risk factor for mortality in our region. There was also a clear relationship between fatal outcome and a delay between ingestion and medical support. Product toxicity, severity of the poisoning and a delay in medical support may be considered major predictors of a negative prognosis of the poisoning. We also conclude that evaluating the etiological and demographic characteristics of the patients and current toxicological trends has importance for the prognosis of these patients in emergency centers. Finally, it is clear that greater interdisciplinary collaboration is needed on this issue. Education of the public and also emergency department staff about appropriate initial emergency care and the crucial importance of transferring patients rapidly would reduce the mortality rate.

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