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EVALUATION OF ACUTE DRUG INTOXICATIONS AND DRUG USE IN THE INTENSIVE CARE UNIT: A RETROSPECTIVE, SINGLE-CENTER ANALYSIS

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Abstract

Aim: Drug intoxications and drug uses are public health problems and an important reason for patient admission to emergency departments and intensive care units (ICU). This study aims to evaluate the demographic and clinical data of acute drug intoxications and drug use.

Methods: Patients followed up in the ICU for acute drug intoxications and drug use between January 2014 and January 2020 were evaluated retrospectively.

Results: A total of 194 patients were included in the study, including 168 drug intoxication and 26 drug use. While 59.5% of drug intoxications were female, the mean age was 27.8±8.3 years, 92.3% of drug use was male, and the mean age was 26.5±3.8 years. While the mean duration of stay in the ICU was 2.3±1.2 days for drug intoxications, it was 2.8±1.9 days for drug use. The highest rate of drug intoxication was between the ages of 17-30, and 98.8% of them were suicidal. Most of the intoxications (61.9%) occurred with multiple drugs, most commonly with analgesics (40.4%) and antidepressants (34.5%). The mortality rate of drug intoxication was 0.6%, and the mortality rate of drug users was 11.5%. While male gender and mechanical ventilation (Mv) requirement were significantly higher in drug use, Glasgow coma scale (GCS) scores at discharge and hospitalization were significantly lower ($p<0.001$).

Conclusions: Although mortality and clinical manifestations are more severe in drug use than drug intoxication, we think effective policies should be implemented by considering both cases as significant public health problems.

Keywords: *Drug use, intensive care unit, intoxication, suicide*

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Introduction

Intoxication is the occurrence of undesirable effects on any function of the organism after exposure to a substance. Drug intoxications and drug uses are public health problems and an important reason for patient admission to emergency departments and intensive care units (ICU). Drugs, substance abuse, and toxic substances of domestic, agricultural, and industrial origin are the most common causes of intoxication. It has been reported that approximately 2.5 million emergency service applications were made in the USA in 2012 due to intoxication and drug use, and 105 people lost their lives every day[1].

Acute intoxications may occur due to accidental intake, most of which are taken for suicidal purposes. Life-threatening situations are encountered due to intoxication factors, hospital admission, and comorbid diseases, and patients may need ICUs. It has been reported that intoxications constitute 0.4-1.7% of the patients admitted to emergency services in Turkey[2]. It has been reported that 2-14% of the patients followed up in the ICU are due to drug intoxications[3].

This study aims to analyze the demographic data of acute drug intoxications and drug use followed in the ICU of a tertiary center for seven years, length of stay in the ICU, mechanical ventilation (Mv) and renal replacement therapy (RRT) requirements, and mortality rates.

Materials and Methods

The Clinical Research Ethics Committee approved this retrospective cross-sectional study of the Kanuni Sultan Suleyman Training and Research Hospital (date:26.10.2022, number:214). The work was started following the principles of the Declaration of Helsinki. All patients followed up for acute drug intoxication and drug use during the seven years between January 2014 and January 2020 in the University of Kanuni Sultan Suleyman Training and Research Hospital ICU were included in the study. While the patient was followed in 4 beds in the establishment of our hospital's ICU, it reached a capacity of 50 beds over time. Ethyl and methyl alcohol abuse, trauma caused by alcohol or drugs, isolated agricultural and industrial substance intoxications, and intoxications caused by addictive drugs were excluded from the study. In this retrospective cross-sectional study, the sample size was not determined, and all patients with acute drug intoxication and drug use in the seven years were included. Demographic data of the patients, agents responsible for drug intoxications, types of intoxication (accidental and suicidal), psychiatric disease history of the cases, Glasgow coma scale (GCS), duration of stay in ICU, RRT, and Mv requirements, length of stay in Mv, discharge status and place of discharge, and 28-day mortality were evaluated.

Statistical Analysis

SPSS 29.0 (SPSS Inc., Chicago, USA) program was used to analyze the data. Descriptive data were expressed as the number of patients, percentage, mean, standard deviation, and distribution range. The conformity of the variables to the normal distribution was evaluated analytically (Shapiro-Wilks test) and visually (histogram), and the Mann-Whitney U test was used to analyze the quantitative variables that were not normally distributed between the two groups. The Chi-square and Fisher's exact tests were used to evaluate qualitative data. The statistical significance limit was accepted as $p<0.05$.

Results

In the seven years between January 2014 and January 2020, 168 drug intoxication and 26 drug use patients who were followed up and treated in the ICU were included in the study. While 59.5% (n=100) of drug intoxications were female, 92.3% (n=24) of drug abuse cases were male. The mean age and distribution range of drug intoxications was 27.8±8.3 (17-67) years, while the mean age and distri-

bution range of drug users was 26.5±3.8 (18-33) years. While the mean duration of stay in the ICU was 2.3±1.2 days for drug intoxications, it was 2.8±1.9 days for drug use. The mean GCS scores at the time of admission to the ICU was 13.1±3.1 in drug intoxications and 6.8±4.1 in drug use. During the ICU follow-ups, 10.7% (n=18) of drug intoxications received Mv for an average of 1.7±9.4 days and 61.5% (n=16) of drug users for an average of 2.2±1.9 days. While 99.4% (n=167) of drug intoxications were discharged, one patient (0.6%) who had taken multiple drugs and cyanide died. While 88.5% (n=23) of drug users were discharged to inpatient services, centers established for addiction treatment, or to their homes, three patients (11.5%) died. When drug intoxications and drug use were compared, male gender and Mv requirements were significantly higher in drug use. At the same time, GCS scores at discharge and hospitalization were found to be significantly lower (p<0.001) (Table 1).

Table 1. Demographic data and some clinical features of drug intoxications and drug users

Variable	Drug Intoxication (n=168)	Drug Uses (n=26)	p
Age (years)	27.8±8.3 (17-67)	26.5±3.8 (18-33)	0.954
Gender, n (%)			
· Female	100 (59.5)	2 (7.7)	<0.001
· Male	68 (40.5)	24 (92.3)	
GCS score	13.1±3.1 (3-15)	6.8±4.1 (3-15)	<0.001
Duration of ICU (days)	2.2±1.2 (1-7)	2.9±1.9 (1-7)	0.140
Mv, n (%)	18 (10.7)	16 (61.5)	<0.001
Duration of Mv (days)	1.7±0.9 (1-4)	2.2±1.9 (1-7)	0.905
RRT, n (%)	4 (2.4)	2 (7.7)	
Vasopressor, n (%)	1 (0.6)	5(19.2)	
Discharge, n (%)	167 (99.4)	23 (88.5)	<0.001
Place of discharge, n (%)			
· Inpatient service	105 (62.9)	14 (60.9)	0.858
· To home	58 (34.7)	8 (34.8)	
Treatment rejection	4 (2.4)	1 (4.3)	
Mortality (28-day), n (%)	1 (0.6)	3 (11.5)	

Data are given as mean±standard deviation (minimum-maximum), number of patients (n), and percentage. ***GCS:*** *Glascow koma scale,* ***ICU****: Intensive care unit,* ***Mv:*** *Mechanical ventilation,* ***RRT:*** *Renal replacement therapy*

Table 2. Age ranges and some clinical features of drug intoxications

	n	%
Patient age (years)		
· 17-30	97	57.7
· 31-45	61	36.3
· >45	10	6
Number of drugs		
· Single	64	38.1
· Multiple	104	61.9
Psychiatric diagnosis		
· Yes	59	35.1
· No	109	64.9
Drug and rat poison		
· Yes	8	4.7
· No	160	95.3
Drug and pesticide		
· Yes	6	3.5
· No	162	96.5
Drug and alcohol		
· Yes	6	3.5
· No	162	96.5
Drug and cleaning products		
· Yes	5	2.9
· No	163	97.1
Drug and industrial products*		
· Yes	4	2.3
· No	164	97.7

**Cyanide (n:3), chemical cleaning product (n:1)*

When drug intoxications were analyzed according to age groups, most cases (57.7%) were patients between the ages of 17-30. Multiple drug intakes were detected in most of the intoxications (61.9%). The psychiatric disease was present in 35.1% (n=59) of the patients. In one of the drug intoxications, there was a previous history of suicidal drug intoxication. In 4.7% (n=8) of drug intoxications, rat poison was taken together with the drug, while in 3.5% (n=6) pesticides, 2.9% (n=5) cleaning products, and 2.3% (n=4) cyanide was detected (Table 2).

Intoxications occurred most frequently with analgesics (40.4%), antidepressants (34.5%), and cardiovascular system drugs (20.8%) (Table 3). It was determined that 98.8% (n=166) of the intoxication cases occurred to suicide. It was observed that the patients with psychiatric disease (35.1%) frequently used their drugs. In contrast, the patients without chronic drug use were found to use the medications of their family members for intoxication. It was determined that 1.2% (n=2) of the cases used the drugs they bought without a prescription from the pharmacy for suicidal purposes.

Although there is no clear definition of the substances used in drug use, 61.6% (n=16) of the patients were found to have used cannabis and heroin. Synthetic cannabinoid (Bonsai) use was detected in 38.4% (n=10) patients. While two of the patients using bonsai were admitted to the ICU after suffering cardiopulmonary arrest in the emergency service, spontaneous brain edema was detected in another patient, and these three patients died. Bonsai uses were all identified in 2014.

Table 3. Distribution of the agents responsible from intoxication

Drug type	n	%*
Analgesics	68	40.4
Paracetamol	32	19
NSAİDs	32	19
Other	4	2.4
Antidepressants	58	34.5
· SSRI	37	22
· TCA	14	8.3
· Atypical	7	4.1
Cardiovascular Drugs	35	20.8
Antihypertensives	17	10.1
Beta-blockers	10	5.9
Antiaggregant	8	4.7
Antipsychotics	25	14.8
Antibiotics	20	11.9
Gastrointestinal system drugs	12	7.1
Antiepileptics	12	7.1
Anti-flu	12	7.1
Antihistamines	8	4.7
Anxiolytics	6	4.7
Oral Antidiabetics	6	4.7
Other**	18	10.7

**It is more than 100% because 61.9% (n:104) of the cases have multiple drug intakes.*

*** Antihyperlipidemic (n:6), colchicine (n:4), bronchodilators (n:4), levothyroxine (n:2), oral contraceptives (n:2).*

Discussion

Cases of acute intoxication are increasing due to changing lifestyles, stressful life, and technological developments, making it easier to reach many chemical and pharmacological agents. The fact that intoxication cases are common, partially preventable, respond well to treatment with emergency intervention, and in some cases require intensive care support, require extensive investigation. The frequency of intoxication may vary according to geographical regions, age, gender, educational status, and seasons in the same country[4]. Acute intoxication may be suicidal or accidental with drugs and non-drug substances. It has been reported that in most acute intoxications, such as 78.3% to 97.3%, patients aim to commit suicide, especially in drug intoxications[4-8]. In our study, suicidal intent was found in 98.8% of drug intoxication cases, in line with the literature.

Similar to different countries, studies from Turkey have also reported that intoxications are more common in young women[2,4-9]. Kaydu et al.[4] reported that 78% of drug in-

toxications were women, and the mean age was 26.2 years. Zöhre et al.[6] found that 71% of drug intoxications were women, and the mean age was 27.4 years. Another study emphasized that 70.4% of the patients were female, and 63.5% were between 18-30[10]. Kosovalı et al.[11] reported that intoxication is more common in young women, and the reasons for this may include domestic violence, social pressure on women, and socioeconomic problems. In our study, 59.5% of drug intoxications were women, 57.7% were in the 17-30 age range, and the mean age was 27.8 years. The proportionally fewer women in our study may be related to the internal dynamics of our hospital. We think that intoxication cases with stable clinical status may have been referred to external center ICUs due to the high number of trauma and non-traumatic emergency operations in our hospital's region and the need for an ICU for these patients.

Geographical region, socio-cultural and economic conditions of societies affect the etiological causes and the frequency of intoxication. As in the rest of the world, medical drugs have been reported as the most common cause of intoxication in studies from Turkey[2,4-12]. However, in a survey from Qatar, chemicals were shown as the most common intoxication agent in patients who applied to the emergency department[13]. Drug intoxication can occur with a single drug group or multiple drug groups or drugs and chemical substances. Kaydu et al.[4] in 48.2% of patients, and Doğan et al.[10] reported that 53.5% had multiple drug intake. Our study determined that 61.9% of the patients had taken more than one drug with rat poison and household and industrial chemicals. Reflections from the USA and Europe have reported that analgesics and benzodiazepines are the most common causes of intoxication[14-16]. Kaydu et al.[4] reported that analgesics (36.8%) were used most frequently in drug intoxications, followed by antidepressants. Yeşiller et al.[17] reported that intoxication with analgesics developed most frequently (54.4%) after antidepressants. In our study, intoxication with analgesics (40.4%) and antidepressants (34.5%) were the most common, consistent with the literature. Kosovalı et al.[11] reported that selective serotonin reuptake inhibitors (SSRI) and tricyclic antidepressants (TCA) are the most common antidepressant drugs that cause intoxication. In our study, SSRIs and TCAs were found to be the most common antidepressants in drug intoxication. We think that the fact that analgesics and antidepressants are the most common intoxication agents in studies from Turkey may be due to the widespread use and over-the-counter sale of these drugs. In addition, it is known that the drugs used in intoxication cases for psychiatric diseases are also used for this purpose. Our study found that those with a history of psychiatric illness frequently used their drugs for intoxication.

It is known that pre-existing psychiatric problems are an essential factor in suicidal intoxication attempts. Dogan et al.[10] in 23% of the patients, Yeşiller et al.[17] in 34.1% of patients, and Urfalıoğlu et al.[18] emphasized that 51% of the patients had a history of psychiatric illness. In our study, 35.1% of intoxication cases had a history of psychiatric illness, which was consistent with the literature. Patients followed up in our ICU due to intoxication are consulted by psychiatrists before they are discharged. The opinions of psychiatrists are essential in this regard, and it is decided to remove the patients from their homes or psychiatry services in line with their views. Yeşiller et al.[17] reported that 68.2% of the patients were discharged to wards, 22.7% to their homes, and 9.1% left the ICU voluntarily. In our study, 62.9% of the cases were discharged to psychiatry or internal diseases services, and 34.7% to their homes. 2.4% of the patients refused the treatment and left the ICU.

The average length of stay in the ICU for drug intoxication cases by Yeşiller et al.[17] was 2.5 days, Duran et al.[19] 2 days, and Özdemir et al.[20] reported 4.6 days. In another study, it was reported that the average length of stay was 1.5 days, advanced life support and mechanical ventilation support were applied to 1% of the cases, and 0.2% of the patients died[21]. In studies, intoxication mortal-

ity rates vary between 0.2% and 23.5% [4,11,17,20]. Kose et al.[21] reported that the mean GCS score of drug intoxication was 13.1. They reported that 29.4% of the patients required Mv, and 23.5% of them required RRT, and they found a mortality rate of 23.5%. The high mortality rate may be attributed to low intoxication cases (n=17) and severe clinical conditions such as corrosive substance intake, methyl alcohol intoxication, and cyanide intake. RRT in drug intoxications are used for treatment by accelerating drug elimination or correcting kidney dysfunction in organ failure. It has been stated that while it increases patients' chance of survival when used to improve drug elimination, RRT applied in subsequent renal dysfunction may not positively affect the prognosis[21]. In our study, while the mean GCS score of drug intoxication was 13.1, Mv was required in 10.7% of the cases, and RRT was needed in 2.4%. One patient who had cyanide intake with drug intake died, and the mortality rate was 0.6%.

After using cannabis, heroin, and synthetic cannabinoids (Bonsai), patients apply to emergency services with various complaints. The clinical features of the cases differ depending on the active ingredient and amount of the product they use. Bonsai are cheap, easy-to-access substances that are widely abused all over the world. Since 2004, its use has increased rapidly, mainly since it is sold on the internet, and it became legal in many countries in the first years. The treatment of these cases is symptomatic, and there is no specific treatment. In a study including 316 synthetic cannabinoid intoxications from Austria, it was reported that 77% of the cases were male, and the median age was 27 (23-34). Decreased motor coordination was found in 38% of the patients, tachycardia, and arrhythmia in 33%, and confusion in 18% (22). Altınışık et al.[23] reported 12 Bonsai intoxications in the ICU between 2014 and 2015. It was emphasized that 83% of the patients had cardiovascular system findings such as tachycardia and hypotension, 33% were confused, and one patient received mechanical ventilation support. In our study, 92.3% of 26 patients with drug intoxication were male, and the mean age was 26.5 (18-33) years. Mv support was applied to 61.5% of the patients; 7.7% required RRT, and 19.2% required vasopressor. Bonsai use was detected in 38.4% (n=10) of drug intoxications, and cardiopulmonary resuscitation was performed in the emergency department since two bonsai patients had a cardiac arrest. Between the dates of our study in our ICU, patients who fell from height after drug use (suicide attempt?), traffic accidents, and drug intoxications along with drugs were identified. However, these cases were not included in our study.

The main limitations of the study are that the study was single-center and retrospective, the doses of drugs taken, and the drugs could not be determined clearly.

Conclusion

In conclusion, although the follow-up of acute drug intoxications affecting the young-adult population is short and mortality rates are low in the ICU, care should be taken regarding morbidity and mortality in case of overdose and ingestion of additional chemicals. While multiple drug intake is observed in most intoxications, analgesics, and antidepressants that patients can quickly obtain stand out. It should be kept in mind that taking industrial chemicals such as cyanide and drugs may complicate the ICU treatment process, and the mortality rates of patients may increase. We think that comprehensive psychiatric examination is essential because approximately one-third of these patients have a history of psychiatric illness. However, we believe mortality and clinical manifestations are more severe in drug use than in drug intoxication. Adequate controls and policies should be applied in both cases, considering it a significant public health problem.

Conflict of interest
The authors declare that they have no conflict of interest.

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Ethical approval
The Clinical Research Ethics Committee approved this retrospective cross-sectional study of the Kanuni Sultan Suleyman Training and Research Hospital (date:26.10.2022, number:214).

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