

The Files of Patients Who Were Diagnosed with Drug Intoxication, Research Laboratory Analysis

Ali Sarıdaş¹, Basar Cander², Murat Duyan³

¹ University of Health Sciences, Prof Dr Cemil Tascioglu City Hospital, Department of Emergency Medicine, Istanbul, Turkey

² Sağlık Bilimleri Üniversitesi Kanuni Sultan Süleyman Eğitim ve Araştırma Hastanesi, Acil Tıp Kliniği, İstanbul

³ Antalya Education and Research Hospital, Department of Emergency Medicine, Antalya, Turkey.

Abstract

Objective: In this study, we aimed to evaluate the relationship between laboratory electrolyte disturbances and drugs taken in poisoning cases who applied to the Emergency Department and took drugs for suicidal purposes.

Materials and Methods: This study is a retrospective study. Patients aged 18 years and older who were diagnosed with drug poisoning in the Adult Emergency Clinic of Okmeydanı Training and Research Hospital Emergency Medicine Clinic were included in the study. Data analysis was done in SPSS 15.0 program. The significance level was taken as $p < 0.05$.

Results: 162 patients were included in the study. The mean age of the patients was 27 (range 18-61) years. Thirty-four (20.99%) of the patients were male. Considering the frequency of the drugs taken, 34 (21.1%) of the patients had NSAIDs (most common), 33 (20.5%) had paracetamol and/or its compounds, 29 (17.7%) had SSRI, had TCA, 149 (55.3%) had other drugs. It was observed that the serum Na values of the patients who took and did not take high-dose NSAIDs changed statistically ($p = 0.000$). The laboratory test results of the patients who took and did not take these drugs were compared, and no statistically significant difference was found ($p > 0.05$).

Conclusion: According to our suicidal study findings, the amount of drugs taken by our patients is not correlated with their blood levels. Although more than half of our patients have taken toxic doses of the drugs, most of the poisonings are mild and our results can not be generalized to severe poisoning cases.

Key words: Electrolyte, paracetamol, selective serotonin reuptake inhibitors, nonsteroidal anti-inflammatory drugs, tricyclic antidepressants

Introduction

Cases of poisoning as a result of drug intake are common medical emergencies. Poisoning; is the event that an organic or inorganic substance adversely affects the functioning of any system in the organism, partially or completely. In case of high intake, every drug or substance has the possibility of turning into poison. Although poisoning usually occurs after oral intake, it can also occur in many ways such as inhalation, insufflation, skin and mucous membranes, or injection.

The first application center of the patients with drug intoxication is usually the emergency department. Nature and amount of the substance taken, time interval between intake of the drug and admission to the hospital, are of great importance in terms of the first intervention and treatment in the hospital.

High-dose drug intake remains the most common cause of poisoning all over the world. Among the substances taken for suicidal purposes, analgesics, antibiotics, antidepressants, antiepileptics, antihistamines are the most common. In the United States (USA), approximately 2-5 million high-

dose drug intake patients are observed in a year¹. Patients may not know that tricyclic antidepressants (TCA), which they take regularly and recommended by their doctors, can be lethal in high doses, or that antihistamines can be less lethal.

Studies examining toxic dose drug exposures and laboratory electrolytes together are rare. In this study, we aim to evaluate the types of laboratory electrolyte disorders and its relationship between the drugs taken in cases of poisoning who applied to the Emergency Service and took drugs for suicidal purposes.

Methods and Materials

This study is a retrospective study. patients diagnosed with drug intoxication in the Adult Emergency Clinic of Okmeydanı Training and Research Hospital Emergency Medicine Clinic were included in the study. Those with missing data and patients under the age of 18 were excluded from the study.

Corresponding Author: Murat Duyan **e-mail:** drmuratduyan@gmail.com

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Orcid: <https://orcid.org/0000-0002-6420-3259>

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Ali Sarıdaş **e-mail:** dralisaridas@hotmail.com

Basar Cander **e-mail:** basarcander@yahoo.com

Murat Duyan **e-mail:** drmuratduyan@gmail.com

After obtaining the approval of the Okmeydanı Training and Research Hospital Senate Ethics Committee with protocol number 281 and dated March 03, 2015, the ethics committee of Okmeydanı Training and Research Hospital, Emergency Medicine Clinic Adult Emergency Service between January 1, 2014, and January 1, 2015, who took suicidal drugs aged 18 years or older. Hospital file records were examined in order to evaluate the cases. Information was obtained about the arrival time, medications, toxic overdose, pregnancy, and hospitalization status of the patients. Hemoglobin, glucose, Na⁺, K⁺, Ca, Urea, Cr, AST, ALT, alkaline phosphatase (ALP), gamma-glutamyl transferase (GGT), total bilirubin (T.Bil), International Normalized Ratio (INR) laboratory values of the patients were evaluated. Partial thromboplastin time (aPTT), cardiac enzymes (CE) Troponin T (Trop T), pH, bicarbonate (HCO₃) values in AKG were examined. The reference ranges of the laboratory parameters are given in Table 1.

Table 1: Reference range of laboratory values

	Reference Range	Unit
Na ⁺	136-145	mmol/dL
K ⁺	3.5-5.1	mmol/dL
BUN	15-43	mg/dL
Cr	0.57-1.11	mg/dL
AST	<34	U/L
ALT	<55	U/L
GGT	<36	U/L
T. Bil.	0.2-1.2	mg/dL
ALP	<150	U/L
Trop-T	<0.014	ng/mL
Calcium	8.4-10.2	mg/dl
Hb	11.5-15.5	g/dL
PH	7.35-7.45	
HCO ₃	22-26	mmol/L
aPTT	21-37	sn
INR	0.8-1.2	INR

BUN: Blood urea nitrogen, Cr: Creatinine ALT: Alanine aminotransferase, AST: Aspartate aminotransferase, GGT: gamma-glutamyl transferase, T.Bil: Total Bilirubin, ALP: Alkaline phosphatase, Hb: hemoglobin, aPTT: activated partial prothrombin time, INR: international normalized ratio,

Statistical

Statistical analyzes were performed in IBM SPSS for Windows Version 16.0 package program. Numerical variables were summarized as mean ± standard deviation, median [minimum – maximum] values. Categorical variables were shown as numbers and percentages. The difference between the groups in terms of categorical variables was investigated using the chi-square test and Fisher’s exact test. The Significance level was taken as p<0.05.

Results

162 patients were included in the study. The mean age of the patients was 27 (range 18-61) years. Thirty-four (20.99%) of the patients were male and 128 (79.01%) were female. Age distribution of the patients according to their sex is stated in Figure 1.

While 125 (77.1%) of the patients were taking medication above the maximum recommended daily dose, 25 (15.4%) were taking medication at or below the daily recommended dose, drug types and dose amounts were not known in 12 (7.5%) patients.

Considering the frequency of the drugs taken, it was estimated that 34 (21.1%) of the patients had NSAIDs (most common), 33 (20.5%) had paracetamol and/or its compounds, 29 (17.7%) had SSRI, 25 (15.5%) had TCA, 149 (55.3%) had other drugs (Table 2).

When the Na⁺ values of the patients who took high-dose and non-high-dose NSAIDs were compared, it was found that the Na⁺ value changed statistically (p=0.000). When the Na⁺, K⁺, Urea, Cr, AST, ALT, T.Bil, GGT, ALP, INR, aPTT,

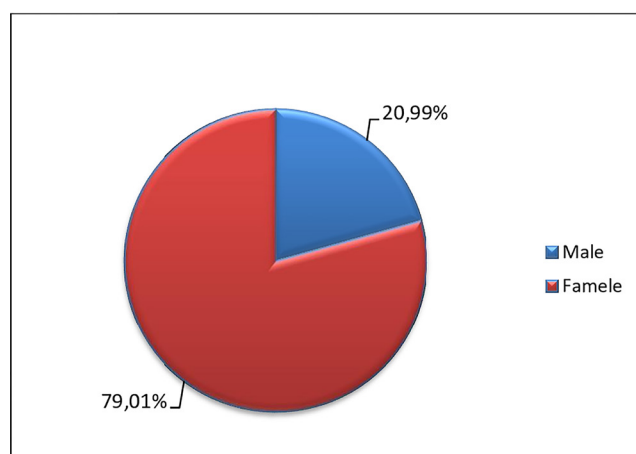


Figure 1: Sex percentages of patients

Table 2: Frequency of the drugs taken

Drugs	n	Percentile of the drugs	Percentile of the cases
Paracetamol	33	12,2%	20,5%
NSAID	34	12,6%	21,1%
SSRI	29	10,6%	17,7%
TCA	25	9,3%	15,5%
Other	149	55,3%	99,8%
Total	270	100,0%	167,7%

n: number of the patients
NSAID: Non-steroidal anti-inflammatory drugs
SSRI: Selective serotonin reuptake inhibitors
TCA: Tricyclic antidepressant

pH, HCO₃ values of the other parameters measured were compared, no statistically significant difference was found (p>0.05). (Table 3)

Na⁺, K⁺, Urea, Cr, AST, ALT, T.bil, GGT, ALP, aPTT, INR values of the patients who received high-dose paracetamol and non-high-dose paracetamol were compared, no statistically significant difference was found (p>0.05). In addition, no significant relationship was found in the CEs examined. (Table 4)

Na⁺, K⁺, Urea, Cr, AST, ALT, T.Bil, GGT, ALP, aPTT, INR, pH, HCO₃ values of the patients receiving high-dose SSRI and non-high-dose SSRI were compared, no statistically significant difference was found (p>0.05). In addition, no significant relationship was found in the CEs examined (p>0.05). (Table 5)

Table 3: Laboratory values of the patients taking NSAIDs

Laboratory values seen in patients taking high-dose NSAIDs					Laboratory values seen in patients taking normal or low-dose NSAIDs					
	Low	Normal	High	Total(n)		Low	Normal	Hig	Total (n)	p
Na ⁺	3	22	0	25	Na ⁺	0	9	0	9	0,000
K ⁺	3	22	0	25	K ⁺	0	9	0	9	0,383
BUN	0	25	0	25	BUN	0	9	0	9	-
Cr	0	24	1	25	Cr	0	9	0	9	1,000
AST	0	24	1	25	AST	0	9	0	9	1,000
ALT	0	24	1	25	ALT	0	9	0	9	1,000
GGT	0	24	1	25	GGT	0	9	0	9	1,000
T.Bil.	0	24	1	25	T.Bil.	0	8	1	9	0,506
ALP	0	0	0	25	ALP	0	9	0	9	-
aPTT	0	25	0	25	aPTT	0	0	0	0	-
INR	0	25	0	25	INR	0	0	0	0	-
PH	1	18	1	20	PH	0	7	0	7	0,500
HCO ₃	8	12	0	20	HCO ₃	0	7	0	7	0,780

BUN: Blood urea nitrogen, Cr: Creatinine ALT: Alanine aminotransferase, AST: Aspartate aminotransferase, GGT: gamma-glutamyl transferase, T.Bil: Total Bilirubin, ALP: Alkaline phosphatase, Hb: hemoglobin, aPTT: activated partial prothrombin time, INR: international normalized ratio

Table 4: Laboratory values of the patients taking Paracetamol

Laboratory values seen in patients taking high-dose paracetamol					Laboratory values seen in patients taking normal or low-dose paracetamol					
	Low	Normal	High	Total (n)		Low	Normal	High	Total (n)	p
Na ⁺	3	21	0	24	Na ⁺	0	9	0	9	0,326
K ⁺	6	18	0	24	K ⁺	1	8	0	9	0,156
BUN	0	24	0	24	BUN	0	9	0	9	-
Cr	0	24	0	24	Cr	0	9	0	9	-
AST	0	24	1	25	AST	0	7	1	8	0,558
ALT	0	24	1	25	ALT	0	8	0	8	1,000
GGT	0	24	1	25	GGT	0	8	0	8	1,000
T.Bil.	0	24	1	25	T.Bil.	0	8	0	8	1,000
ALP	0	24	1	25	ALP	0	8	0	8	-
aPTT	0	9	0	9	aPTT	0	3	0	3	-
INR	0	9	0	9	INR	0	3	0	3	-
Trop-T	0	10	0	10	Trop-T	0	2	0	2	-

BUN: Blood urea nitrogen, Cr: Creatinine ALT: Alanine aminotransferase, AST: Aspartate aminotransferase, GGT: gamma-glutamyl transferase, T.Bil: Total Bilirubin, ALP: Alkaline phosphatase, Hb: hemoglobin, aPTT: activated partial prothrombin time, INR: international normalized ratio

Na⁺, K, Urea, Cr, AST, ALT, T.Bil, GGT, ALP, aPTT, INR, pH, HCO₃ values of patients receiving high-dose TcA and non-high-dose TSA were compared, no statistically significant difference was found (p>0.05). In addition, no significant relationship was found in the CEs examined (p>0.05). (Table 6)

Discussion

We obtained two results in this study, in which we evaluated the laboratory analyzes of the patients who applied to the

emergency department for suicidal drug intoxication. First result was that although most of the patients had taken toxic doses of drugs, there was a weak correlation between the amount taken by the patients and their blood drug levels. Second result was that Na levels decreased in the patients taking NSAID. In our point of view, this may indicate that NSAID drugs cause effects at the cellular level.

According to the studies investigated in the literature, average age of high-dose drug poisoning was between 21-31 years^{1,2,3}. In this study, the median age was 27 (18-61) years. The median age for women was 27 (18-57), while the median age for men was 29 (18-61). In a study examining 2,229 patients who applied to the emergency department with poi-

Table 5: Laboratory values of the patients taking SSRI

Laboratory values seen in patients taking high-dose SSRI				Laboratory values seen in patients taking normal or low-dose SSRI						
	Low	Normal	High	Total (n)		Low	Normal	High	Total (n)	p
Na ⁺	4	18	0	22	Na ⁺	1	6	0	7	1,000
K ⁺	2	20	0	22	K ⁺	0	6	1	7	0,081
BUN	0	22	0	22	BUN	0	7	0	7	-
Cr	0	22	0	22	Cr	0	7	0	7	-
AST	0	20	2	22	AST	0	6	1	7	0,536
ALT	0	21	1	22	ALT	0	7	0	7	1,000
GGT	0	20	2	22	GGT	0	7	0	7	1,000
T.Bil.	0	22	0	22	T.Bil.	0	6	1	7	0,170
ALP	0	22	0	22	ALP	0	7	0	7	-
aPTT	0	11	0	11	aPTT	0	0	0	0	-
INR	0	11	0	11	INR	0	0	0	0	-
PH	1	17	0	18	PH	0	2	0	2	1,000
HCO ₃	5	12	1	18	HCO ₃	0	2	0	2	0,219

BUN: Blood urea nitrogen, Cr: Creatinine ALT: Alanine aminotransferase, AST: Aspartate aminotransferase, GGT: gamma-glutamyl transferase, T.Bil: Total Bilirubin, ALP: Alkaline phosphatase, Hb: hemoglobin, aPTT: activated partial prothrombin time, INR: international normalized ratio

Table 6: Laboratory values of the patients taking TCA

Laboratory values seen in patients taking high-dose TCA				Laboratory values seen in patients taking normal or low-dose TCA						
	Low	Normal	High	Total		Low	Normal	High	Total	p
Na ⁺	3	17	1	21	Na ⁺	1	5	0	6	0,8660
K ⁺	3	16	1	20	K ⁺	0	6	0	6	0,3340
BUN	0	21	0	21	BUN	0	6	0	6	-
Cr	0	20	1	21	Cr	0	6	0	6	1,0000
AST	0	20	1	21	AST	0	6	0	6	1,0000
ALT	0	20	1	21	ALT	0	6	0	6	1,0000
GGT	0	20	1	21	GGT	0	6	0	6	1,0000
T.Bil.	0	21	0	21	T.Bil.	0	5	1	6	0,1250
ALP	0	21	0	21	ALP	0	6	0	6	-
aPTT	0	12	0	12	aPTT	0	1	0	1	-
INR	0	12	0	12	INR	0	1	0	1	-
Trop-T	0	13	0	13	Trop-T	0	2	0	2	-
PH	2	17	0	19	PH	0	3	1	4	0,0930
HCO ₃	5	13	1	19	HCO ₃	0	3	1	4	0,0210

BUN: Blood urea nitrogen, Cr: Creatinine ALT: Alanine aminotransferase, AST: Aspartate aminotransferase, GGT: gamma-glutamyl transferase, T.Bil: Total Bilirubin, ALP: Alkaline phosphatase, Hb: hemoglobin, aPTT: activated partial prothrombin time, INR: international normalized ratio, trop-T: troponin T

soning, the mean age of male patients was 29.3 ± 13.2 years, while the mean age of females was 23.8 ± 9.6 years⁴. In another study by Satar et al., the mean age for women was 24.5 ± 10.1 years⁵, while it was 29.5 ± 13.2 years for men. Our study was conducted in the adult emergency department and patients over the age of 18 were accepted. In this respect, our age data were found to be compatible with studies that included adult patients, while supporting the view that high-dose drug intoxication is a health problem that particularly concerns the young age group. The reason is that young adults are more prone to suicidal poisoning due to unemployment, difficulty in adapting to difficult living conditions and emotional traumas. In the studies, the rate of women in toxic dose drug intake was generally higher than men, and the ratio of women to men was 3 times higher.^{6,7,8} Similarly, in our study, the female-to-male ratio was found to be 3.8/1 (128/34 patients).

Studies showing the rate of high-dose drug intake in suicidal drug intake are few. In a study by Makk et al 498 (79.3%) of 628 patients were taking high-dose drugs, while 130 patients (20.7%) were taking non-high-dose drugs⁹. Similarly, in our study, 124 patients (77%) had high-dose drug intake, 25 patients (15%) were found to be taking non-high-dose drugs, and 13 (8%) patients were taking unknown-dose drugs. Considering these two studies, patients taking unknown doses of the medication will be considered as they received high doses of medication, and the treatment approach will be arranged accordingly. The types of drugs taken for suicidal purposes are the main indicator on the patient's clinic.

The types of drugs that cause poisoning vary in research. While sedatives and antiepileptics were the most common in the study of Anthony et al.⁷, NSAIDs were found most frequently in the studies conducted by Özköse et al. Paracetamol was found to be the most poisoning drug in many studies.¹⁰⁻¹¹ In the study of Akkaş et al.¹² with 1,098 patients who applied to Hacettepe Adult Emergency Service between 1998 and 2002 with poisoning, it was reported that the highest number of poisoning cases was in the antidepressant group with a rate of 32%. In our study, drugs taken for suicidal purposes were at the top of our list with NSAIDs (21%), followed by paracetamol (20%), SSRI (17%) and TSAs (15%). As a result, it was considered that patients did not prefer any drug while taking drugs for suicidal purposes and took it randomly. NSAIDs, which have a wide range of use, have anti-inflammatory, analgesic and antiaggregant properties as well as many side effects. Various electrolyte disturbances have been detected in cases taking NSAIDs for suicidal purposes. In a study conducted by Wharam et al.¹³ on triathlete athletes, a significant relationship was found between NSAIDs and hyponatremia. In a case reported by Roche et al.¹⁴ hyponatremia was detected due to NSAID intake. However, in a study conducted by Page et al.¹⁵ on 123 athletes, no significant difference in Na⁺ level

change was found between those taking NSAIDs and the patients who don't take NSAIDs.

In our study, hyponatremia was found in 3 of 25 patients who took high-dose NSAIDs for suicidal purposes, and it was considered significant. In the few studies examining the relationship between potassium and NSAIDs; significant correlation was found between NSAIDs and elevated K levels. In our study, however, no significant K level change was detected in patients taking NSAIDs. When the previous studies and presentations were examined, it was determined that the patients who developed hyperkalemia were generally over the age of 50, had comorbidities, and were taking additional medication. The fact that the majority of the patients in our study were young may explain this different situation.

Results

According to our suicidal study findings, the amount of drugs taken by our patients is not correlated with their blood levels. Although more than half of our patients have taken toxic doses of the drugs, most of the poisonings are mild and our results can not be generalized to severe poisoning cases. When the serum Na⁺ values of the patients who took and did not take high-dose NSAIDs were compared, it was found that the Na⁺ value changed statistically ($p=0.000$).

References

1. Jayakrishnan B, Al Asmi A, Al Qassabi A, Nandhagopal R, Mohammed I. Acute drug overdose: clinical profile, etiologic spectrum and determinants of duration of intensive medical treatment. *Oman Med J.* 2012;27(6):501-504. doi:10.5001/omj.2012.120
2. Akkose S, Bulut M, Armagan E, Cebicci H, Fedakar R. Acute poisoning in adults in the years 1996-2001 treated in the Uludag University Hospital, Marmara Region, Turkey. *Clin Toxicol (Phila).* 2005;43(2):105-109.
3. Özköse Z, Ayoglu F. Etiological and demographic characteristics of acute adult poisoning in Ankara, Turkey. *Hum Exp Toxicol.* 1999;18(10):614-618. doi:10.1191/096032799678839446
4. Seydaoglu G, Satar S, Alparslan N. Frequency and mortality risk factors of acute adult poisoning in Adana, Turkey, 1997-2002. *Mt Sinai J Med.* 2005;72(6):393-401.
5. Satar S, Seydaoglu G, Akpınar A, et al. Trends in acute adult poisoning in a ten-year period in Turkey: factors affecting the hazardous outcome. *Bratisl Lek Listy.* 2009;110(7):404-411.
6. Sağlam Z, Ataoglu E, Yenigün M, et al., Causes of acute poisoning in adults: a retrospective study, in a hospital in Istanbul, Turkey. *Journal of Public Health,* 2012. 20(1): p. 59-63.
7. Anthony L, Kulkarni C. Patterns of poisoning and drug overdose and their outcome among in-patients admitted to the emergency medicine department of a tertiary

- care hospital. *Indian J Crit Care Med.* 2012;16(3):130-135. doi:10.4103/0972-5229.102070
8. Özayar, E.D. Semih; Güleç, Handan; Şahin, et all. Retrospective Analysis of Intoxication Cases in the ICU. *Turkish Journal of Medical & Surgical Intensive Care Medicine*, 2011(3): p. 59. doi:10.5152/dcbybd.2011.13
 9. Mak KK, Ho CS, Zhang MW, et all. Characteristics of overdose and non-overdose suicide attempts in a multi-ethnic Asian society. *Asian Journal of Psychiatry.* 2013 Oct;6(5):373-379. DOI: 10.1016/j.ajp.2013.03.011.
 10. Williams-Johnson J, Williams E, Gossell-Williams M, Sewell CA, Abel WD, Whitehorne-Smith PA. Suicide attempt by self-poisoning: characteristics of suicide attempters seen at the Emergency Room at the University Hospital of the West Indies. *West Indian Med J.* 2012;61(5):526-531. doi:10.7727/wimj.2012.209.
 11. Shah R, Uren Z, Baker A, Majeed A. Trends in suicide from drug overdose in the elderly in England and Wales, 1993-1999. *Int J Geriatr Psychiatry.* 2002;17(5):416-421. doi:10.1002/gps.625
 12. Akkas M, Coskun F, Ulu N, Sivri B. An epidemiological evaluation of 1098 acute poisoning cases from Turkey. *Vet Hum Toxicol.* 2004;46(4):213-215.
 13. Wharam PC, Speedy DB, Noakes TD, Thompson JM, Reid SA, Holtzhausen LM. NSAID use increases the risk of developing hyponatremia during an Ironman triathlon [published correction appears in *Med Sci Sports Exerc.* 2006 Jul;38(7):1364]. *Med Sci Sports Exerc.* 2006;38(4):618-622. doi:10.1249/01.mss.0000210209.40694.09
 14. Roche C, Ragot C, Moalic JL, Simon F, Oliver M. Ibuprofen can induce syndrome of inappropriate diuresis in healthy young patients. *Case Rep Med.* 2013;2013:167267. doi:10.1155/2013/167267.
 15. Page AJ, Reid SA, Speedy DB, Mulligan GP, Thompson J. Exercise-associated hyponatremia, renal function, and nonsteroidal antiinflammatory drug use in an ultraendurance mountain run. *Clin J Sport Med.* 2007;17(1):43-48. doi:10.1097/JSM.0b013e31802b5be9