

A Ten-Year Clinico-Epidemiology Profile of Poisoned Patients in a Tertiary Care Emergency Department in the Black Sea Region of Türkiye

Karadeniz Bölgesi'ndeki Bir Üçüncü Basamak Acil Serviste Zehirlenme Vakalarının On Yıllık Klinik-Epidemiyolojik Profili

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ABSTRACT

Aim: This study aimed to analyze the demographic, etiological, and clinical characteristics of acute poisoning cases, along with 10-year trends, in patients presenting to a tertiary emergency department in the Eastern Black Sea Region of Türkiye.

Material and Methods: This retrospective, cross-sectional study included 1811 patients aged over 17 years who were diagnosed with intoxications between 2007 and 2016. Data were collected from the emergency department database. Key variables included demographics, intoxication agents, clinical presentations, and outcomes. Decontamination and elimination techniques, as well as trends in substance use and presentation times, were evaluated.

Results: Of 505,525 emergency department visits, 0.4% (n=1811) were due to intoxications, predominantly involving females (63.1%) and individuals aged 17–24 years (50.0%). Suicide attempts accounted for 60.7% of cases, with 44.6% of these patients having a psychiatric history. The most common agents were analgesics (24.4%) and antidepressants (24.3%), with paracetamol and amitriptyline being the most frequently implicated drugs. Decontamination was applied to 57.3% of patients, and antidote therapy to 13.4%. Over the decade, a shift from amitriptyline to paracetamol poisonings was observed. Mortality was low, at 0.2%, and 90.8% of patients fully recovered.

Conclusion: This study highlights significant changes in poisoning agents over a decade, with increasing paracetamol use and decreasing amitriptyline-related cases. These findings underscore the importance of region-specific epidemiological studies to guide preventive and clinical strategies, reduce intoxication-related morbidity and mortality, and improve public health policies.

Keywords: Acute poisoning, drug overdose, retrospective study, toxicology.

ÖZ

Amaç: Bu çalışma, Türkiye'nin Doğu Karadeniz Bölgesi'nde yer alan bir üçüncü basamak acil servisine başvuran akut zehirlenme vakalarının demografik, etiyolojik ve klinik özelliklerini ve 10 yıllık eğilimlerini analiz etmeyi amaçlamıştır.

Gereç ve Yöntemler: Bu retrospektif, kesitsel çalışmada, 2007-2016 yılları arasında zehirlenme tanısı alan 17 yaş üstü 1811 hasta incelenmiştir. Veriler acil servis veri tabanından toplanmıştır. Demografik veriler, zehirlenme etkenleri, klinik bulgular ve sonuçlar gibi temel değişkenler değerlendirilmiştir. Dekontaminasyon ve eliminasyon teknikleri ile madde kullanımı ve başvuru zamanlarındaki eğilimler incelenmiştir.

Bulgular: 505.525 acil servis başvurusunun %0,4'ü (n=1811) zehirlenmeler nedeniyle olmuş ve vakaların çoğunluğu kadınlar (%63,1) ve 17-24 yaş grubundaki kişilerden (%50,0) oluşmuştur. Vaka sayısının %60,7'si intihar girişimleri ile ilişkili bulunmuş, bu hastaların %44,6'sının psikiyatrik hastalık öyküsü olduğu tespit edilmiştir. En yaygın zehirlenme etkenleri analjezikler (%24,4) ve antidepressanlar (%24,3) olup, parasetamol ve amitriptilin en sık sorumlu tutulan ilaçlar olmuştur. Hastaların %57,3'üne dekontaminasyon uygulanmış, %13,4'üne antidot tedavisi verilmiştir. On yıllık süreçte amitriptilin zehirlenmelerinin azaldığı, parasetamol zehirlenmelerinin ise arttığı görülmüştür. Mortalite oranı %0,2 ile düşük bulunmuş ve hastaların %90,8'i tamamen iyileşmiştir.

Sonuç: Bu çalışma, on yıllık süreçte zehirlenme etkenlerindeki önemli değişikliklere dikkat çekmektedir; parasetamol kullanımındaki artış ve amitriptilin zehirlenmelerindeki azalma bunlara örnek olarak verilebilir. Bulgular, bölgeye özgü epidemiyolojik çalışmaların, koruyucu ve klinik stratejiler geliştirilmesindeki önemini vurgulamaktadır. Bu tür çalışmalar, zehirlenme ile ilişkili morbidite ve mortaliteyi azaltmaya ve halk sağlığı politikalarını iyileştirmeye katkı sağlayabilir.

Anahtar Kelimeler: Akut zehirlenme, ilaç doz aşımı, retrospektif çalışma, toksikoloji.

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Introduction

Increasing intoxication-related mortality and morbidity have become an important problem. Analysis of retrospective large-scale data is required for establishing diagnostic, therapeutic and admission algorithms. The importance of epidemiological data illuminating prognostic characteristics of presenting patients and showing annual presentation rates and variations, and changes in substances involved, and assisting with the taking of protective legal and clinical measures is increasing all the time. The nature of these data changes over the years, from country to country and from region to region. The repetition of these data analyses at specific intervals will therefore contribute to the reinforcement of preventive measures and procedures in clinical practice and to a reduction in unnecessary health spending by reducing intoxication-related mortality and morbidity (1, 2).

The purpose of this study was to analyze data for patients presenting due to intoxication to a tertiary emergency department receiving a mean of 75,000 patient presentations a year and also serving as a toxicology center in the Black Sea region of Türkiye, and to identify changes occurring on a year-on-year basis.

Material and Methods

Study Design

This research was designed as a retrospective, cross-sectional, descriptive, single-center study. Following approval from the local ethics committee (No. 2016/48), all patients receiving intoxication-related International Statistical Classification of Diseases and Related Health Problems (ICD-10) codes between January 2007 and December 2016 were identified from the study center's computer software system, and patient records retrieved from the archives were examined retrospectively.

Study Setting and Population

The study center was the Karadeniz Technical University Medical Faculty Hospital Emergency Department. Demographic, clinical and laboratory data were recorded onto a data form through a retrospective examination of the records of patients presenting during the study period and constituting the study population. These data included age, sex, type and time of presentation, the intoxication agent, means of exposure, symptoms and findings, treatment administered, follow-up times and locations in the hospital, and clinical outcomes. Patients aged under 17, with missing data or with incorrect ICD-10 codes were excluded.

Statistical Analysis

Statistical analysis was performed on SPSS 23.0 (IBM SPSS, Armonk, NY) software. Normality of data distribution was analyzed using the Kolmogorov Smirnov test. Student's *t* test was used in the statistical analysis of normally distributed data, the chi-square test for frequency analysis of non-normally distributed non-parametric data, and the Mann Whitney U test for ordinal data. *p*<0.05 was regarded as statistically significant.

Results

Two thousand five hundred forty-six patients aged over 17 receiving intoxication-related ICD-10 diagnoses from among 505,525 patients presenting to the Karadeniz Technical

Parameter	n (%)
Sex	
Female	1143 (63.1)
Male	668 (36.9)
Age	
17-24	905 (50.0)
25-34	407 (22.5)
35-43	221 (12.2)
44-54	152 (8.4)
55-64	57 (3.1)
>65	69 (3.8)
Education level	
Illiterate	168 (9.2)
Primary school	62 (3.4)
Middle school	115 (6.3)
High school	155 (8.5)
University	258 (14.2)
Unknown	1053 (58.1)
Place of residence	
Provincial center	971 (53.6)
District center	422 (23.3)
Village	240 (13.3)
Unknown	178 (9.8)
Marital status	
Married	184 (10.1)
Single	411 (22.6)
Divorced	12 (0.6)
Widowed	21 (1.2)
Unknown	1183 (65.3)
Type of presentation	
On foot	810 (44.7)
Via the 112 emergency system	185 (10.2)
Referral from another institution	805 (44.4)
Unknown	11 (0.6)
History of psychiatric disease	
Yes	565 (31.1)
No	443 (24.4)
Unknown	803 (44.3)

Table 1. Patients' demographic characteristics

University Farabi Hospital between 1 January 2007, and 31 December 2016, were included in the study. Following a detailed examination of the patient records, 735 patients were excluded due to deficient data, and the data for 1811 patients were finally subjected to analysis.

Intoxication-related presentations represented 0.35% (n=1811) of all emergency presentations. Women represented 63.1% (n=1143) of the patients, and 50% of the patients (n=905) were in the 17-25 age group. The patients' demographic characteristics are presented in Table 1.

Attempted suicides represented 60.7% (n=1101) of presentations. Known psychiatric disease was present in 31.1% (n=565) of patients, and in 44.6% (n=492) of the 1101 patients consuming drugs for purposes of suicide. A

statistically significant relation was determined between the type of intoxication and history of psychiatric disease ($p<0.05$).

Examination of the agents resulting in intoxication showed that analgesic drugs were the most common at 24.4%, followed by antidepressants at 24.3% and sedative-hypnotic-antipsychotics at 18.8%. Paracetamol exposure was the most common form of intoxication among analgesic drugs and also among all preparations (n=224, 12.3%). The most common prepareate among antidepressants was amitriptyline (n=120, 6%). In terms of target organ systems, ingestion most commonly involved nervous system drugs at 49.0% (n=896) (Figure 1).

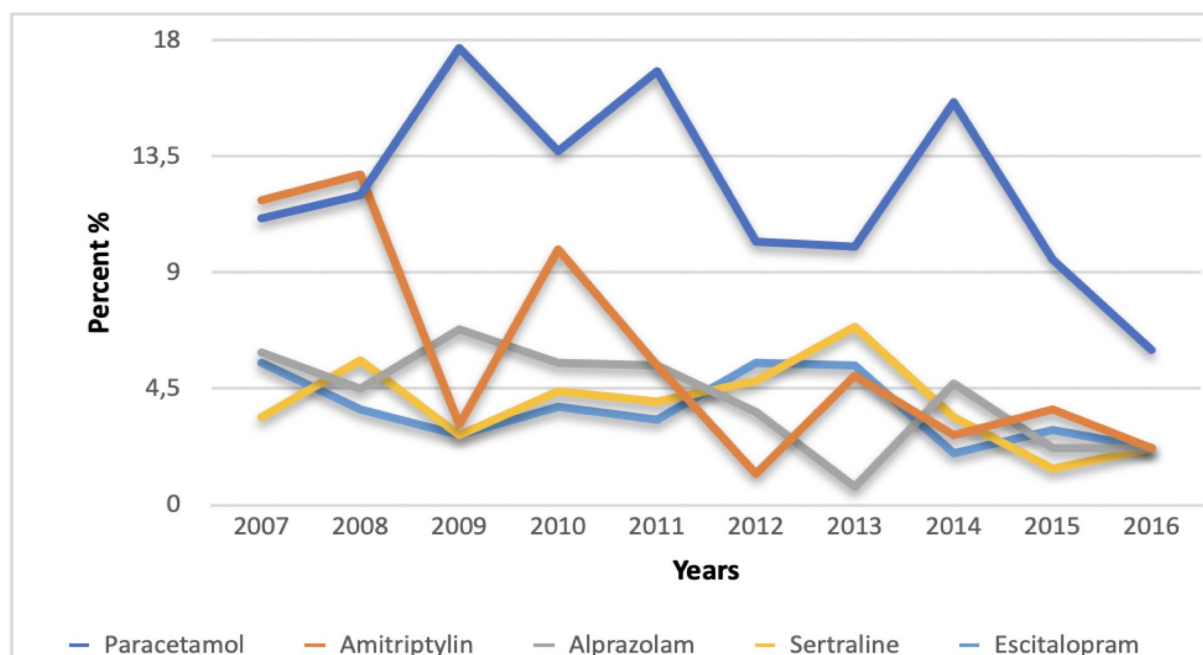


Figure 1: Distributions of the five most common agents by years

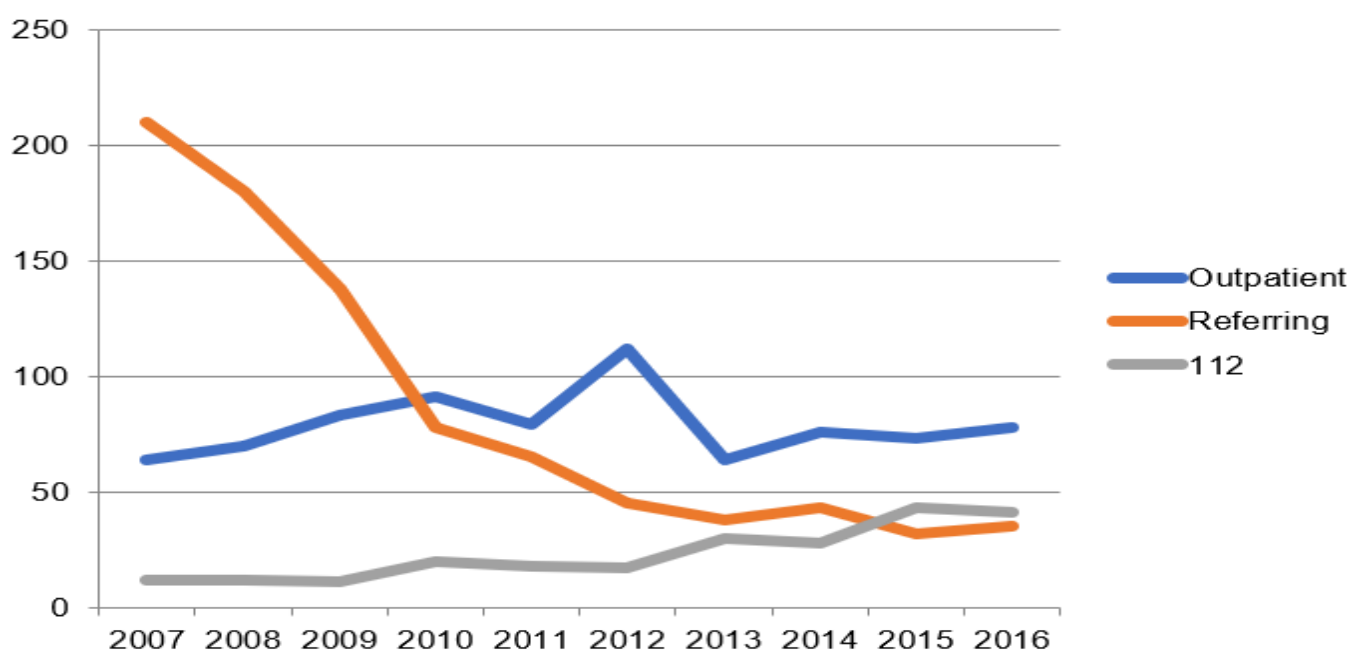


Figure 2: Types of presentation by years

Drug groups and substances	n (%)	Drug groups and substances	n (%)
Analgesic	443 (24.4)	Antidepressant	441 (24.3)
Paracetamol	224	SSRI	228
Non-steroidal anti-inflammatory drug	203	Sertraline	72
Diclofenac	49	Escitalopram	70
Naproxen	32	Paroxetine	57
Ibuprofen	27	TCA	154
Sedative-hypnotic-antipsychotic	342 (18.8)	Amitriptyline	120
Benzodiazepine	155	Opipramol	16
Alprazolam	82	Clomipramine	11
Medazepam	34	SNRI	19
Clonazepam	24	Venlafaxine	16
Atypical antipsychotic	115	Duloxetine	3
Quetiapine	41	Others	59
Risperidone	33	Antihistaminic	127 (7)
Olanzapine	28	Cardiovascular drugs	123 (6.8)
Typical antipsychotic	34	Beta blocker	25
Trifluoperazine	23	Diuretic	21
Haloperidol	3	Dihydropyridine calcium channel blocker	18
Chlorpromazine	3	Non-dihydropyridine calcium channel blocker	8
Opioid	7	Other	51
Other	31	Pesticides	40 (2.2)
Street drugs	53 (2.9)	Insecticide	19
Cocaine-Amphetamine	14	Rodenticide	21
Cannabinoid	39	Chill medications	180 (9.9)
Alcohol	120 (6.6)	Animal bites/Stings	102 (5.6)
Cleaning products	38 (2)	Scorpion	50
Vitamins	21 (1.2)	Snake	37
Antimicrobials	137 (7.5)	Bee	12
Anticonvulsants	113 (6.2)	Other	3
Carbamazepine	67	Plant intoxications	5 (0.2)
Valproic Acid	63	Gas intoxication	201 (11.0)
Phenytoin	9	Carbon monoxide	197
Hydrocarbons	6 (0.3)	Other	4
Gastrointestinal Drugs	128 (7.0)	Other Drugs	247 (13.6)
Mushroom	10 (0.5)	Unknown	39 (2.2)

Table 2. Distributions by drug groups and common agents

SNRI: Serotonin-norepinephrine reuptake inhibitor, SSRI: Selective serotonin reuptake inhibitor, TCA: Tricyclic antidepressants

All intoxication agents are shown in Table 2. In terms of procedures applied in the emergency department, decontamination methods were applied to 75.3% of patients (n=1038) and at least one elimination method to 17.2%. Antidote therapy was applied to 14.3% of patients (n=243).

We determined that the number of annual presentations to the emergency department due to intoxication decreased in a time-dependent manner (Figure 2). Presentations were most common in May and least common in September. Examination of presentations by month and sex revealed a significant difference between men and women ($p < 0.05$). Analysis of presentation numbers and types by years revealed that the number of outpatient presentations increased between 2007 and 2012 and then decreased continuously between 2012 and 2016 (Figure 2).

The number of patients brought to the emergency department from the scene of the incident by the 112-emergency ambulance system increased continuously from 2007 to 2016. Referrals from other health institutions decreased significantly between 2007 and 2016 (Figure 2). Analysis of times of drug ingestion and presentation to hospital among patients diagnosed with intoxication revealed a significant increase between 18:00 and 02:00 (Figure 3).

Decontamination methods were applied to 1038 (57.3%) patients. Gastric lavage was performed on 1026 (56.6%) patients, single-dose activated charcoal was administered to 977 (53.9%), whole bowel irrigation was used in two cases, and combined gastric lavage and activated charcoal was employed in 964 (53.2%) patients. Three hundred twelve (17.2%) patients received one elimination method.

Repetitive doses of activated charcoal were administered to 217 (11.9%) patients, hemodialysis to 22 (1.2%), forced diuresis to 89 (4.9%), and urine alkalinization to 5 (0.2%) (Table 3). Antidote therapy was applied to 243 patients. In addition, 83.9% (n=1702) of patients were treated in the

emergency department, 1.2% (n=23) on the ward, and 4.5% (n=82) in intensive care. Healing was achieved in 90.8% (n=1645) of patients, while 0.2% (n=3) died, and outcome data were unavailable for 8.7%.

Treatment applied	n (%)
Decontamination	1038 (57.3)
Gastric lavage	1026 (56.6)
Single-dose activated charcoal	977 (53.9)
Gastric lavage + activated charcoal	964 (53.2)
Whole bowel irrigation	2 (0.1)
Elimination	312 (17.2)
Repetitive-dose activated charcoal	217 (11.9)
Hemodialysis	22 (1.2)
Forced diuresis	89 (4.9)
Urine alkalinization	5 (0.2)
Antidote therapy	243 (13.4)
Parameter	n (%)
Follow-up in the emergency department	1702 (83.9)
Follow-up on the ward	23 (1.2)
Follow-up in intensive care	82 (4.5)
Healed	1645 (90.8)
Died	3 (0.2)
Not known	163 (8.7)

Table 3. Decontamination and elimination techniques applied

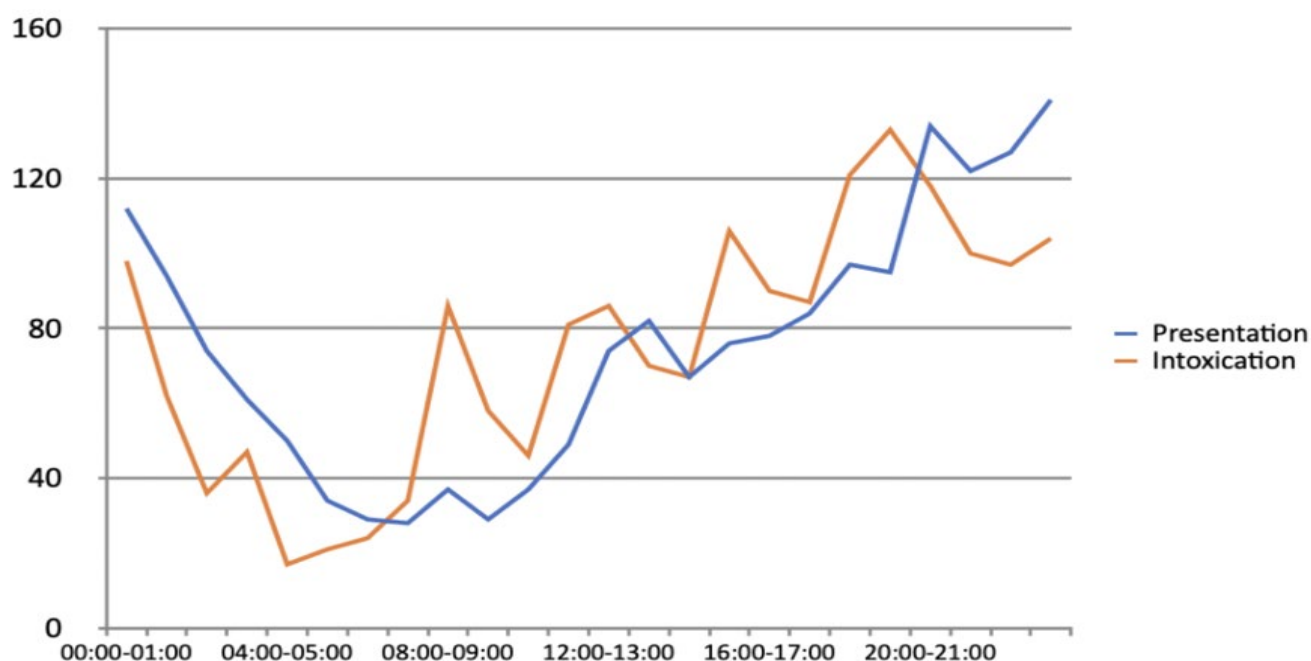


Figure 3: Types of presentation by years

Discussion

Comparison of the epidemiological findings from this study with various data in the previous literature revealed a number of discrepancies in addition to similarities. Women constituted 63.1% of cases and men (36.9%), with a female to male ratio of 1,71. The mean age of the patients was 30.6 years. Presentations were most common, at 50.0%, in the 17-25 age group, followed by the 26-34 age group. We determined that 60.7% of intoxications resulted from attempted suicide. Single drug intoxication was the most common type among our drug intoxication cases (67.7%), followed by multi-drug intoxication at 32.1%. Analgesics were the most common agents of intoxication, followed by antidepressants in second place. The number of intoxications involving paracetamol increases over time, while that of intoxications involving amitriptyline decreased. Three patients died in the departments to which they were transferred.

Our first study finding was that cases of intoxication represented 0.4% of emergency department presentations, a figure compatible with the previous literature. Several previous studies have investigated the proportion of intoxications among all patients presenting to the emergency departments. Studies from Türkiye have reported figures of 0.3-1.4%, compared to 1.4-1.7% in Japan and the USA (3-6).

The sex ratio in emergency department presentations resulting from intoxication varies from region to region, and one of the most important underlying factors is socioeconomic level. Presentation rates in studies from developing countries, and particularly in regions close to agricultural areas, are higher among men. One of our demographic findings was the higher ratio of intoxication-related hospital presentations among women. Examination of other studies in the literature shows that the male/female ratio is increasing, but that it is still higher in women than in men (7, 8). This may be due to increasing freedom among women and their beginning to enjoy economic freedom by entering the jobs market. However, unemployment is still a severe social problem, and women in Türkiye having low economic self-sufficiency together with economic difficulties and problems coping with the resulting emotional stress may lead to higher intoxication-related presentation rates compared to men (9, 10).

A gradual change in intoxication agents is inevitable due to developing and changing technology, medicolegal measures adopted, and the increase in new synthetic substances. Another finding from our study with the change in agents observed over the years. Amitriptyline was the most common intoxication agent in 2007 and 2008, but began being increasingly replaced by the analgesic paracetamol in subsequent years. The rate of intoxications with drugs affecting the nervous system, together with that of non-pharmacological agents, increased over time, while that of intoxications involving other agents remained similar over time. In a study from Europe conducted in 2001-2002, Fiaolva et al. reported that 20% of patients used at least one inappropriate drug, and that the most commonly prescribed of these were the psychotropic agents amitriptyline and doxazosin (11). Rhee et al. reported similar findings in their

study from 2002-2012 (12). The prescription of more potentially harmful tricyclic antidepressants such as amitriptyline has decreased with the discovery and spread of SSRI and SNRIs (12). The initially high level of amitriptyline-related intoxications in this study may be associated with the inappropriate prescription observed in Europe during those same years. The development of new-generation antidepressants has reduced the numbers of such prescriptions. The incidence of amitriptyline-related intoxications has decreased, but it remains one of the drugs with the highest mortality levels (15).

Although paracetamol is the most common agent in some regions of Türkiye, others vary. While intoxications related to pesticides and food poisonings predominate in some regions, alcohol and corrosive materials occupy second place in others (8, 18-20). International studies show that analgesics, ethanol and other sedatives are among the most common causes of intoxications in Western countries, while organophosphates and hydrocarbons are particularly dominant in South Asia and African countries (21-26).

Young people aged 17-24 represented the majority of presentations in our study. Several other studies have reported similar findings (30-32). There may be several reasons why young patients constitute the majority of intoxication cases. These may include greater accidental exposure due to more active lifestyles, and their different responses to emotional stress.

The rate of drug consumption for purposes of suicide in our study was 60.7%, a figure compatible with studies from Türkiye but not in agreement with international studies. The rates of attempted suicides in studies from Türkiye range between 53.7% and 97.0% (27, 33). In a study from Norway in 2015, Vallersness et al. reported that drug-related attempted suicides constituted 9% of intoxication-associated presentations to the emergency department, and that the majority consisted of cases of substance abuse (34). In their study from Saudi Arabia performed in 2008-2012, Bakhaidar et al. reported that drug consumption for purposes of suicide accounted for 26.4% of intoxication cases presenting to the emergency department (7). In its 2017 report, the World Health Organization stated that intoxication for purposes of suicide represented 16% of all cases in developed countries (35).

In terms of history of psychiatric disease before presentation, Akkaş et al. reported such a history in 10% of patients (27). In our study, we determined a history of psychiatric disease in 31,1% of patients presenting to the emergency department due to intoxication. Analysis revealed a significant relation between type of intoxication and history of psychiatric disease. Patients with a history of psychiatric disease have a greater likelihood of drug ingestion for suicidal purposes and emergency department presentation (26, 36). This may be attributed to these patients having easier access to psychotropic drugs and a greater disposition to drug consumption for purposes of suicide due to depressive characteristics in the face of stressor conditions.

In terms of presentations by years, the numbers of presentations due to intoxication decreased in a time-dependent manner. In addition, analysis revealed a

significant decrease in the numbers of patients referred from other institutions. This decrease in presentation numbers and also numbers of referred patients may be due to an increase in numbers of specialist physicians and trained personnel in public hospitals, and to unnecessary referrals being prevented through improvements to health system infrastructure. Moreover, the updating of the relevant official communique on 16.10.2009 is thought to have led to a decrease in referral numbers by making these more difficult (37).

Several factors are associated with mortality and morbidity in intoxications, including the nature of the toxin consumed, the dose ingested, time of ingestion, and time elapsing until presentation to a health institution (38). Studies from Türkiye have reported intoxication-related mortality rates between 0% and 3.9% (20, 28). In international studies, the figures range between 0% and 28.5% (39, 40). Examination of studies with high mortality rates reveals that these have been conducted among populations living in areas with low socioeconomic levels, and that organophosphate intoxications predominate. The mortality rate in our study was 0.2%, relatively lower than the national average. This may be due to our center being well-equipped in terms of emergency care services and intensive care, and to presenting patients being exposed to low-degree toxin exposure.

Limitations

There are a number of limitations to this study. The first is its retrospective nature. Second, we were unable to retrieve all the data in the patient records. Another limitation is that due to the single-center nature of our study, the epidemiological data obtained reflect only the Eastern Black Sea region, and not the country as a whole.

Conclusion

Although significant time-dependent changes were not observed in demographic data this descriptive research, we nevertheless concluded that the agents involved changed significantly over time. These findings should therefore be taken into account when taking precautions aimed at reducing intoxication-related mortality and morbidity, and the characteristics of each country's own intoxication population should be clarified by means of multi-center studies.

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Authors' Contribution: **AS:** Designing the study, interpretation of data, overall supervision. **AG:** Designing the study, interpretation of data, overall supervision, performing critical revision. **MC:** Writing the manuscript, managing the

submission process, interpretation of data, performing critical revision. **Mİ:** Data collection, data analysis, performing critical revision. **ÖĞÇ:** Statistical analysis, interpretation of data, performing critical revision. All authors read and approved the final version of the manuscript.

Ethical Approval: Ethical approval was obtained from the local ethical committee (Approval No: 2016/48).

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