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A Retrospective Analysis of Intoxicated Patients Admitted to the Intensive Care Unit: A Single-Institution Assessment in the Post-Pandemic Period

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Abstract

Background: The aim of this study was to evaluate the clinical and epidemiological characteristics of patients with acute intoxication admitted to the Intensive Care Unit (ICU). **Material and Methods:** An observational retrospective study was conducted on intoxicated patients who admitted to ICU between January 2022 and January 2024. Data were collected from the patients medical records. The demographic characteristics, causes of intoxications, clinical parameters, the mean stay in the ICU, treatment modalities and prognosis were recorded. **Results:** A total of 2875 critically ill patients were admitted during the study period, and 109 (3.79%) of them were acute intoxications. Their mean of ages was 38.09 ± 12.29. The female-to-male ratio was 1.37/1. Drugs were found to be the primary cause (62.39%) of intoxications, and analgesics, antidepressants, and antibiotics were the most frequent agents. Suicidal attempts were present in 66 patients, most of them were female (62.13%) and between 17 - 24 years (40.91%). The other common causes of intoxications were carbon monoxide (CO) (22.02%), methyl/ethyl alcohol (8.26%) and mushroom (5.50%). The mean stay in the ICU was 2.69 ± 0.89 days. Mechanical ventilation was applied to 10 of our patients. Renal replacement therapy was required in 6 patients. Despite all treatments, 6 of our patients died, and we found the mortality rate to be 5.50%. **Conclusion:** Intoxications were more frequent in young female patients and drugs were the most common cause with suicidal intent. Unfortunately, CO poisoning continues to be a very important problem in our city. These findings provided significant information about the characteristics of intoxications in Karabuk.

Keywords

Intoxication, Intensive Care Unit, Suicidal, Mortality

1. Introduction

Acute intoxication is an important socio-economic health problem in our country as well as all over the world. The causes and incidence of poisoning may differ from country to country and even between cities of the same country [1] [2]. In studies from Turkey, common sources of intoxications have been reported as drugs, carbon monoxide (CO), plants, chemical compounds, methyl alcohol, etc [1] [2] [3] [4]. We had revealed similar results in our previous study [5].

In our country, the majority of acute intoxication cases presenting to the emergency department (ED) are admitted to the intensive care unit (ICU). The National Poison Center of Turkey recommends that these patients be followed under ICU. ED physicians also prefer to refer these patients to the ICU, because these patients are generally young and can be closely monitored and treated for possible complications. Intoxicated cases constitute a significant portion of patients admitted to ICU [4] [5] [6] [7] [8].

It is very important to use the limited number of ICU beds effectively, especially in rural hospitals like ours. We retrospectively evaluated intoxicated patients admitted to ICU over a period of two years in terms of demographics characteristics, intoxication causes, prognosis and complications. We aimed to obtain a specific data for Karabuk.

2. Material and Methods

2.1. Patients

After approval of the ethics committee (no: 2024/1666), this single-center, retrospective study was conducted in the ICU's at the Karabuk University Hospital in Karabuk, Turkey. All intoxicated patients who admitted to the ICU's of the Karabuk Training and Research Hospital, between Jan 2022 to Jan 2024, were evaluated. The data were obtained by examining the patients' hospital records. Patients whose stay was less than 24 hours, those who were younger than 17 years old, and pregnant women were excluded from the study. Additionally, patients who were followed up and treated in the ED were not included.

The study was carried out in accordance with the Declaration of Helsinki. In the ICU, intoxicated patients were managed according to the standard ICU protocols and The National Poison Center of Turkey recommends.

2.2. Data

Patients' age, gender, causes of intoxications, reason of administring the substance (accident, suicide), clinical symptoms, the mean stay in the ICU, applied treatment modalities, mechanical ventilation (MV), renal replacement therapy (RRT), hyperbaric oxygen therapy (HBA) requirements and discharge status were recorded.

The ICU's were a 22 bed medical closed unit, and was staffed by anesthesiologyst on a 24 hours per days, 7 days a week basis.

2.3. Statistical Analyses

Statistical analyses were carried out using SPSS for Windows. Measurable variables were presented as mean (X) ± standard deviation (SD) and qualitative variables were presented with numbers and percentages.

3. Results

During the study period, a total of 2875 patients were acceptted to the ICU. There were 126 intoxicated patients admitted from the ED to the ICU. A total of 17 patients were excluded due to: 10 patients that stayed ≤ 24 hours, 4 patients who were younger than 17 years old and 3 patients with missing data. Thus, 109 (3.79%) patients were evaluated. The mean ages of female and male patients were 36.71 ± 12.29 years and 39.97 ± 15.21 years, respectively. 63 of them were female (57.80%). The mean stay in the ICU was 2.69 ± 0.89 days.

The most common causes of intoxication are drugs (62.39%, n: 68), CO (22.02%, n: 24), methyl/ethyl alchocol (8.26%, n: 9) and mushroom (5.50%, n: 6) and others (1.83%, n: 2). The intoxication causes in terms of gender were summarized in Table 1.

Of the 68 patients intoxicated with drugs, 44 were female and 24 were male patients. The mean age of them was 29.42 ± 10.08 years. Thirty-four patients had taken multiple drug, 27 patients had taken one drug and in the remaining 7 patients had taken the drug could not be determined. The most frequently involved drugs were analgesics (40%, n: 26), antidepressants (26.15%, n: 17), and antibiotics (18.46%, n: 12). All of the patients had taken the drug with suicidal intent except two patients. The mean stay in the ICU was 2.25 ± 0.98 days.

Suicidal attempt was present in 66 (60.55%) patients. Forty-one of them were female (62.13%) and the rest of the patients were (37.87%) male. The mean age of the suicide attempted patients were 27.24 ± 9.25 and 32.52 ± 12.35 in female and in male, respectively. The majority of those patients were between the age range of 17 - 34 years. These data were summarized in Table 2.

The mean age of the 24 patients who intoxicated with CO was 55.95 ± 12.49 years, and most of patients presented during the winter months. The most common sources of CO were coal stoves (91.67%, n: 22) and water heaters (8.33%, n: 2). The most common complaints were weakness and myalgia in 15 patients (62.50%), confusion and syncope in 12 patient (50%), headache in 8 patients (33.33%), and chest pain in 5 patients (20.83%). The mean carboxyhemoglobin (COHb) level was 32.97 ± 10.25%. Troponin I values were found to be high in 10 of the patients. Hyperbaric oxygen therapy was applied to 8 patients, 12 patients were treated with O_2 (via non rebreathing facial mask). Four patients were intubated and applied to MV due to loss of consciousness and respiratory failure. Three of the intubated patients died and one patient was transferred to another hospital. The mean stay in the ICU was 3.04 ± 0.94 days.

Eight patients intoxicated with methyl alcohol, and one patient intoxicated with ethyl alcohol. The mean age of them was 43.00 ± 6.45. One of the patients

Table 1. Causes of Intoxication in terms of gender.

Agent	Female (n)	Male (n)	Total (n)	Percentage (%)
Drug	44	24	68	62.39
CO*	14	10	24	22.02
Alcohol	1	8	9	8.26
Mushroom	4	2	6	5.50
Other	0	2	2	1.83
Total	63	46	109	100

*CO: Carbon monoxide.

Table 2. Suicide attempts by age groups and gender.

Age (years)	Female (n)	Male (n)	Total (n)	Percentage (%)
17 - 24	19	8	27	40.91
25 - 34	16	6	22	33.33
35 - 44	2	8	10	15.15
45<	4	3	7	10.61
Total	41	25	66	100

was woman. Six patients had serious respiratory failure and severe metabolic acidosis. They were intubated and applied to MV. The mean duration of MV was 3.16 ± 0.24 days. RRT was performed in 6 patients. The mean stay in the ICU was 5.22 ± 0.18 days. Despite all supportive treatments, 3 of the patients died. The others were transferred to service.

Six patients (5.50%) intoxicated with mushroom. The mean age was 49.00 ± 8.04 years. The most common complaints were were weakness, nausea-vomiting and abdominal pain. The mean stay in the ICU was 2.16 ± 0.45 days.

One of the patients had a snake bite and the other one had used Atropa Belladonna herb. Both patients were discharged with full recovery.

Mechanical ventilation was applied to 10 of our patients (6 methyl alcohol,4 CO patients). RRT was required in 6 patients with methyl alcohol intoxication. Despite all supportive treatments, 6 patients died, and we found the mortality rate to be 5.50% (3 methyl alcohol, 3 CO patients). Outcomes of the patients with regard to causes of intoxications were shown in **Table 3**.

4. Discussion

Acute intoxications are a growing problem all over the world. As a result, these cases constitute a significant proportion of ICU admissions. This rate varies between 4% and 20% for ICUs in Turkey [9] [10] [11] [12] [13]. In our previous study, we reported this rate as 7.61% [5], and in our current study we found it to be 3.79%.

The most common causes of intoxication can be affected by many different

Table 3. Outcomes of the patients with regard to causes of intoxications.

	Drug (n)	CO (n)	Alcohol (n)	Mushroom (n)	Other (n)	Total (n)	Percentage (%)
Refused the treatment	16	0	0	0	0	16	14.68
Transferred to other hospitals	0	1	0	0	0	1	0.92
Transferred to service	10	8	5	0	2	25	22.94
Discharged with recovery	42	12	1	6	0	61	55.96
Loss of life	0	3	3	0	0	6	5.50

factors such as the sociocultural level of the society, education level and economic status.

Medical drugs has been reported as the most common cause of intoxication, both in studies conducted in different countries of the world and in our country. It was previously reported that the antidepressants, antibiotics, analgesics, benzodiazepines are the most frequently used drugs, in different proportions [7] [8] [9] [13] [14] [15] [16] [17]. As is shown in this study, drugs are often the major cause of intoxication (62.39%). The drugs that the most commonly used in intoxication cases were similar with those from other studies.

It has been mentioned that the greatest portion of acute intoxications, reported as 78.3% to 97.3%, were the cases of patients using the mentioned substances in purpose of committing suicide, especially in drug intoxications [14]-[22].

In Turkey, the incidence of suicidal intoxications has been reported in numerous studies as 39.8% - 82.2% [3] [12] [17] [18] [19]. Cengiz *et al.* reported that 80.2% of intoxicated patients were suicide attempts [3]. Most suicide attempts were carried out by females (51 cases, 59.3%). Ozkose reported that 78.9% of their intoxicated cases were suicide attempts [17]. Our study showed that in 60.55% of intoxication cases, suicidal intent was found which is in line with the literature. Almost all of the studies previously done on the topic indicated that there is a preponderance of females among the intoxication cases.

Acute CO intoxication is still seen in the developing countries in not insignificant numbers with potentially life threatening complications. Ozkose reported that CO poisoning was 6.9% of all intoxications [17]. This rate was 19.25% of total intoxications in report of Yagan *et al.* [23]. In our previous study, it was found that CO intoxications consisted 24.70% of all total intoxications [5]. Our current study included 24 patients who have been hospitalised with CO intoxication (22.01%). Out of all, 8 patients received hyperbaric oxygen therapy, 4 patients needed mechanical ventilation support. One patient was transferred to another hospital and the others were treated with normobaric oxygen theraphy in accordance with the guidelines. We note with regret that 3 of our patients passed away in ICU.

Number of cases of methyl alcohol intoxication has been increasing in our country. Prices of drinks containing ethyl alcohol has been increasing due to the

taxation and socioeconomic reasons caused population to increasingly consume smuggled or otherwise illegaly brewed alcoholic drinks. In our study, we had 8 patients with alcohol intoxication. Seven of them were due to methyl alcohol. 5 patients needed MV and RRT treatement. Despite showing all the necessary effort and care, we regret to inform that 3 of the patients passed away.

It was reported in Guven *et al*. that rate of mushroom intoxication was 9% and such patients made 6.99% of total intoxication in study of Yagan *et al*. [4] [23]. Our previous studys showed that mushroom intoxications made 19.28% of all intoxications in our population [5]. Such difference was linked to the richness of regional mushroom types and it's place in regional cuisine. We found that such patients only made 5.76% in our current study. All of the patients discharged upon healing without any complication. We attribute this decrease in the ratio of mushroom toxication to the previous campaigns made by local health authorities about food safety regarding mushrooms.

In different studies, intoxication mortality rates range between 0.2% and 23.5% [7] [14] [16] [24]. Kose *et al*. showed that 29.4% of the patients needed mechanical ventilation support and the mortality rater in their findings was 23.5% [25]. In our study, 10 of our patients required MV, 6 patients who were also cases of methyl alcohol intoxication required the RRT and 6 of our patient required inothrop infusion. Twenty-two patients were transferred to services, and 59 patients were discharged upon recovery, 16 patients refused the treatment and left the ICU, while 6 patients regrettably passed away. We found that mortality rate as 5.76%. The mean stay in ICU was reported as 1 - 8 days for intoxicated patients in previous studies [2] [3] [4] [5] [6]. For our patients this was 2.67 ± 0.89 days.

The most important limitations of our study are its single-center and retrospective nature. Patients who were followed up and treated in the ED were not included.

5. Conclusion

In our study, the data showed that intoxications were more commonly seen in younger female patients and drugs were the most common cause. Majority of all intoxications cases were suicidal attempts. Although, these findings are mostly consistent with the literature in many aspects, CO intoxications still are more commonly seen in our province than in other parts of Turkey. When compared with our previous research, unfortunately, we saw that methyl alcohol intoxication has increased at remarkable rates in our region as well as in our country. It is planned to organize training activities in our region to inform the public and raise awareness, especially about co and methyl alcohol poisoning. Our study determines that even in the same region, causes of intoxication cases might change drastically in time. In our opinion, regular studies to recognise and determine such changes would be beneficial, as it would help in decision making process to use available ICU beds more effectively.

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Authors' Contributions

The first author named is lead and corresponding author. All other authors are listed in alphabetical order. Conceptualization: AY and BNT, Methodology: AY and BNT, Validation: İÖ, Investigation: AY and BNT, Writing—Original Draft: AY, Visualization: İÖ, Writing—review and editing: BNT and AY

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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