



Retrospective analysis of poisoning cases in the pediatric intensive care unit

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Abstract

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Aim: According to the World Health Organization (WHO) data, poisonings are still a significant reason for mortality and morbidity in the childhood group. The rapid technological developments and the change in socio-cultural structures have caused an increase in chemical substances in homes, and the easy access of children to these chemicals has increased the possibility of poisoning. We aimed to make a retrospective analysis of patients with a diagnosis of poisoning hospitalized in the pediatric intensive care unit (PICU).

Materials and Methods: The current clinical study is a retrospective, observational, single-center study and contains children adopted to the tertiary PICU of the 16-bed Batman Training and Research Hospital between March 2021 and March 2022 with a diagnosis of acute poisoning.

Results: Forty patients were female (56.3%), and 31 patients were male (43.7%). All patients were admitted to the intensive care unit for advanced and supportive treatment. Supportive treatment was sufficient for 42 patients (59.2%). As advanced treatment; N-acetylcysteine infusion was given to 14 patients (19.7), oxygen to 3 patients (4.2%), inotropic support to 2 patients (2.8%), mechanical ventilatory support to 1 patient (1.4%), and antidote to 1 patient (1.4%). No mortality was observed, but some patients progressed morbidly and needed a mechanical ventilator and inotropic agent support.

Conclusion: No mortality was observed, but some patients progressed morbidly and needed mechanical ventilatory support and inotropic agents. For this reason, the physician who first encounters the patient in the emergency department should evaluate each patient and the poison separately.



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Introduction

Intoxication is one of the frequent causes of admission to emergency departments which increases patient care costs [1]. According to the World Health Organization (WHO) data, poisoning is still a substantial reason of mortality and morbidity in the pediatric age group [2]. Although the incidence of poisoning is common in children younger than six years of age, it can observe at any age [3]. Poisons are taken into the body in different ways, they can cause structural and functional disorders in tissues and organs depending on many factors such as the method of use, absorption rate, the dose taken, and age of the patient [4]. The rapid technological developments and the change in socio-cultural structures have caused an increase in chemical substances in homes, and the easy access of children to these chemicals has increased the possibility of poisoning

[5]. While poisoning due to household cleaning products is the most common cause of poisoning in children aged 3-5 years, poisoning with drugs for suicide is the most common cause of poisoning in school-age children [6]. Pediatric poisonings lead to minor symptoms or are generally asymptomatic, but sometimes severely toxic and require immediate medical intervention to prevent the risk of morbidity and mortality [7]. Emergency staff should know poisoning management and approach proactively common causes of pediatric poisoning based on current information. The etiology and demography of pediatric poisonings can change over time, and their differences even in the same region make diagnosis and treatment difficult [8]. Determination of the epidemiological data of childhood poisoning is very important for the prevention of poisoning cases and this data contributes to the advancement of health policies and management plans for intoxication. In this research, pediatric patients hospitalized in the pediatric intensive care unit (PICU) due to acute poisoning were investigated.

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This study aims to evaluate the demographic characteristics and treatment methods of poisoning cases.

Materials and Methods

The current clinical study is a retrospective, observational, single-center study and contains children admitted to the PICU of the 16-bed Batman Training and Research Hospital between March 2021 and March 2022 with a diagnosis of acute poisoning. This research was approved by Batman Educational and Training Hospital Ethics Committee. The ethics committee approval number is 316. The data of all patients were kept confidential. Children from 1 month to 18 years of age were registered. The diagnosis of intoxication was based on the history taken from the patient or their relatives. Toxic exposure was defined as unintentional or intentional ingestion of pharmaceutical or non-pharmaceutical substances at a dose that elicited a toxic response. Patients with foreign body aspiration (such as coins, marbles, and nuts) were excluded from the study. Age and gender of patients, time from poisoning to arrival at the emergency department, signs and symptoms of poisoning on admission, Glasgow Coma Scale (GCS), Pediatric risk of mortality III scores (PRISM III), substances responsible for poisoning, the way of intoxication (accidental or suicide), supportive and/or specific treatments applied in the emergency department or PICU, length of PICU stay, and the outcomes were documented. The hospital medical reports were utilized to acquire data of patients. The minimum sample size was determined as 50 by using the G power program by taking impact size 0,40 (based on a similar study result [9] $\alpha=0,05$ and power $(1-\beta)=0.80$ at a confidence level of 95% [10]).

Statistical analysis

Statistical Package for Social Sciences, version 22 (IBM, Armonk, NY, USA) was used for analyzing variables. Descriptive statistics were performed for non-parametric quantitative variables by the median and interquartile range (IQR), and parametric quantitative variables by mean \pm standard deviation, while they were done by frequency and percentage for categorical variables.

Results

A total of 619 children were admitted to the PICU between March 2021 and March 2022. 71 patients were hospitalized in the PICU with the diagnosis of poisoning (Table 1). Forty patients were female (56.3%), and 31 patients were male (43.7%). The median age was 72 months (min:4, max:215) and the median weight was 22kg (min:5, max:66). In terms of age group, patients were classified as under 5 years old (34 patients, 47.9%), over 10 years old (34 patients, 47.9%), and 5-10 years old (3 patients, 4.2%).

When the patients were evaluated according to the season of admission, it was found that patients were admitted mostly in the spring (38.1%) season, then in the summer (21.1%), winter (21.1%), and at least in the autumn (19.7%).

The most frequent admission time was found between 18:00- 23:59 (40.8%) and at least between 06:00 and 11:59

Table 1. General information about poisonings and demographic characteristics of patients.

	n	%
Gender		
Male	31	43.7
Female	40	56.3
Age		
≤5 years	34	47.9
5-10 years	3	4.2
≥10 years	34	
Season		
Spring	27	38
Summer	15	21.1
Autumn	14	19.7
Winter	15	21.1
Time		
00:00-05:59 a.m.	14	19.7
06:00-11:59 a.m.	5	7
12:00-17:59 p.m.	23	32.4
18:00-23:59 p.m.	29	40.8
Location of poisoning		
Home	68	95.8
Outside the home	3	4.2
Poisoning agent		
Pharmaceutical	58	81.7
Non-pharmaceutical	13	18.3
Owner of the drug		
Own	24	41.4
Family member	34	58.6
Pharmaceutical agent		
Analgesic/antipyretic/anti-inflammatory	17	23.9
Sedative/antipsychotic/CNS	10	14.1
CVS medicals	9	12.7
GIS medicals	3	4.2
Antiepileptic	5	7
Colchicine	2	2.8
Anticholinergic	1	1.4
Antibiotic	1	1.4
Advanced intervention in the PICU		
Supportive treatment	42	59.2
NAC inf	14	19.7
Oxygen	3	4.2
Inotropic agent	2	2.8
Alkalinization of urine	2	2.8
Mechanical ventilatory	1	1.4
Antidot	1	1.4
Antiepileptic	1	1.4

PICU: Pediatric Intensive Care Unit, NAC: N-Acetylcysteine, CVS: Cardiovascular System, GIS: Gastrointestinal System, CNS: Central Nervous System.

(7%) in terms of time intervals. When the time between ingestion of the poisoning agent and admission to the hospital was evaluated, the median time was 3 hours (min:0-max:48 hours), 22 patients (31%) in the first hour, 12 patients (16.9%) between 1-2 hours, 29 patients (41.9%) between 2-12 hours, 8 patients (11.2%) after 12 hours were admitted. 13 patients (18.3%) were admitted from other cities, and 58 patients (81.7%) were admitted from Batman. All patients were hospitalized in the intensive care unit for supportive treatment and follow-up. Forty-seven patients did not need any medical treatment at the first admission. Gastric lavage and activated charcoal were applied to 14 patients (19.7%), and activated charcoal was employed on 10 patients (14%) before PICU admission. Pharmaceutical poisoning was detected in 58 patients, while 13 patients had non-pharmaceutical poisoning. Fifty-one patients (71.8%) had a single poisoning agent, while 20 patients (28.2%) had multiple poisoning agents. When we investigated the frequency of pharmaceutical agents, 17 patients (23.9%) were most frequently poisoned with Analgesic/Antipyretic/Anti-inflammatory agents. This group was followed by Sedative/Hypnotic/Antipsychotic/CNS (Central nervous system) drugs in 10 patients (14.1%), Cardiovascular system drugs in 9 patients (12.7%), and antiepileptic drugs in 5 patients (7%).

While 24 (41.4%) of those were poisoned with their own medicine, 34 (58.6%) were poisoned by the drugs of other people living in the same house. Sixty-eight patients (95.8%) were exposed to the poisoning agent at home and 3 patients (4.2%) were exposed outside the home. All patients presented with acute poisoning suffering. Thirty-eight patients (53.5%) were accidentally, and 33 patients (46.5%) were poisoned for suicidal purposes. Twenty-five (62.5%) of the patients were female and it was statistically significant ($p=0.002$). While it was the first suicide attempt in 87.9% (29 patients) of intentional ingestions, it was the second suicide attempt in 12.1% (4 patients). All of the suicide cases were over the age of 10.

Thirty-eight patients (53.5%) had no complaint about intoxication at the time of admission. Thirty-three patients (46.5%) had symptoms at admission. The most common complaints were nausea (37.4%) and vomiting (23.5%).

Sixty-three patients had no chronic disease, but 8 patients (11.3%) had known diseases. The most common chronic disease was neuro-psychiatric disorders. Depression was diagnosed in 3 patients, epilepsy in 2 patients, and psychosis in 1 patient.

While only supportive treatment was applied to 42 patients (59.2%), N-acetylcysteine infusion was administered to 14 patients (19.7%), oxygen was administered to 3 patients (4.2%), 2 (2.8%) patients needed inotropic support (Calcium Channel Blockers ingestion), and 1 (1.4%) case required mechanical ventilatory support and antidote used for only 1 patient (table 1). The mean PRISM III score of the patients was 0.59 (min:0, max:8), and the mean PDR (predictive death rate) was 0.64 (min:0.30, max:3.90). GCS mean was 14, min:5, max:15. There was no mortality observed.

Discussion

This study determines the demographic and descriptive characteristics of PICU-specific poisoning cases. In the current study, the number of patients admitted to the PICU, their clinical and medical history and the specific treatments administered were presented. There were more patients in the under 5 and over 10 years old groups. All patients presented with acute poisoning. Pharmaceutical poisonings were more common than non-pharmaceuticals. All of the patients who were admitted for suicide were in the group above 10 years old, and the number of girls was significantly higher than that of boys. Patients often did not need first medical intervention, but gastric lavage and activated charcoal were the most common performed treatment options. The most commonly agent was the analgesic/anti-inflammatory drug in the pharmaceutical group. NAC infusion was used most frequently as a further intervention. In research, it was shown that poisoning rates in patients hospitalized in the intensive care unit are between 8% and 9.7% [5]. In our study, the intoxication ratio was more common than previous data of poisoning at 11.4%. In this present study, the number of female patients was higher than male patients, especially in the group over the age of 10, which is the group with all suicide cases. Similar results were shown in another research, the rate of female patients was greater in the group over 10 years of age [11]. When we examined the patient according to age groups, the majority of patients were under the age of 5 and over the age of 10. However, all of the suicide cases were over the age of 10, which was higher than in previous studies (47.9%) (12). This indicates a high incidence of intentional ingestions as well as unintentional ingestions. Patients (40.8%) were generally admitted to the hospital between 06.00 p.m.-12.00 a.m. The present findings were similar to those of Lee et al., however, in Ram et al. study, the most common admission time was 12:00 p.m.-06:00 p.m. [8, 12]. This difference was not related to the mortality and morbidity of the patients. A larger number of cases were reported during spring with 27 patients (38%). In a study evaluating the frequency of seasonal hospitalizations, Rum et al. showed that admissions under the age of 5 were more frequent in the summer season, while older children admissions were more common in the rainy season (8). In total, 47 patients did not need medical intervention at the emergency department, and 24 patients received medical intervention. Gastric lavage and activated charcoal were performed together in 14 of these patients, while the other 10 patients used only activated charcoal. The most common medical intervention in the literature was the use of activated charcoal [13]. This difference can be explained by the early admission of approximately 47.9% of the patients to the emergency department. In general, studies have shown that the ratios of pharmaceutical agents and non-pharmaceutical agents used for suicide are close to each other. While the rate of non-pharmaceutical agent usage was shown as 41.4% in the study of Lee et al., it was presented as 47.9% in the study of Lin et al. [12, 14]. Unlike the literature, it has been shown that pharmaceutical agents (81.7%) are more frequently preferred for suicidal purposes in our study. When evaluated according to

the content of the drug group, analgesic/antipyretic/anti-inflammatory group drugs (23.9%) were used most frequently, while CNS drugs (sedative, hypnotic, antiepileptic) (14.1%) were preferred second most commonly. The frequency of CNS drugs has increased in recent years, followed by the analgesic group [14]. In contrast to previous studies, analgesic group drug intake was found the most frequently in our study. Considering the frequency of intentional and unintentional drug intake, it was observed that 53.5% of the patients had non-intentional ingestion. In a South Indian study, similar to our study, the ratio of intentional ingestion was lower than that of unintentional ingestion [8]. All of the intentional ingestion was in the group over 10 years old and 62.5% of them were female patients, and this difference was statistically significant. Similar to the present study, Lin et al. in which poisoning cases admitted to the emergency department were examined; there was a significant relationship between intentional ingestion and female patients [14]. In the PICU, most patients needed non-specific supportive treatment. Except for gastric lavage and activated charcoal; NAC infusion was applied to 14 patients, 3 patients required oxygen support, 2 patients need inotropic agents, and 1 patient was supported by mechanical ventilatory due to respiratory failure. The reason for frequent administration of NAC infusion may be caused by a large number of analgesic groups and the inability to measure paracetamol level. In another study where drug levels could be measured, it was observed that antidote treatment was most frequently used after gastric lavage and activated charcoal administration [11]. While mortality rates between 1% and 7.4% were reported in various publications, no mortality was found in our study. It is thought that the low mortality is because there are mostly fewer lethal poisoning cases and that drug ingestion is mostly unintentional poisoning.

Limitations

Our study limitations are; a retrospective study, a limited number of patients, and our patient had a mild clinical course.

Conclusion

Poisonings were mostly determined under the age of 5 and above the age of 10. All of the poisonings over the age of 10 were for suicidal purposes. Most of the intentional ingestion patients were girls. No mortality was observed, but some patients progressed morbidly and needed mechanical ventilatory support and inotropic agents. For this reason, the physician who first encounters the patient in the emergency department should evaluate each patient and the poison separately.

Exclusion criteria

Patients whose medical records could not be reached and who were diagnosed with poisoning as a result of animal bites and carbon monoxide poisoning were excluded from the study.

Ethical approval

This research was approved by Batman Educational and Training Hospital Ethics Committee (Approval number: 316).

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