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ORIGINAL ARTICLE
ORİJİNAL ARAŞTIRMA

Evaluation of Pediatric Intoxication Patients Followed-Up in Intensive Care Unit

Yoğun Bakım İhtiyacı Olan Pediatrik Zehirlenme Hastalarının Değerlendirilmesi

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Abstract

Purpose: Our study was planned to reach out intoxication patient's clinical characteristics, treatment modalities and outcomes of those patients followed up in pediatric intensive care unit.

Material and Method: We examined patients admitted to our hospital or transferred from another medical center to our PICU, diagnosed with intoxication from 01 January 2019 to 31 December 2021, retrospectively. We collected patient's demographic data. Glasgow Coma Scale score at admission, medical treatments applied to patients' mechanical ventilation requirement, hemodialysis and plasmapheresis applied was recorded. Outcomes evaluated by survival, days in PICU and days in hospital. We divided study group as adolescent group (>120-month-old) and non-adolescent group (<120-month-old). All collected variables were compared between two groups.

Results: During study period 114 patients included into the study. Most of the patients were in adolescent age group (52.6%). If we examined intoxication causes, in adolescent patient's suicide was major cause of intoxication. In patients below <120-month-old unintentional intoxication was the main reason. Antipsychotics, antidepressants, and analgesics were the most common medication causes of intoxication respectively. Mechanical ventilation applied to 4 patients. 5 patients were hemodialyzed. Plasmapheresis performed to 5 patients. All patients were survived. Median days in PICU was 1 day. Median days in hospital was 3 days.

Conclusion: In our study, 2.8% of all PICU admissions were intoxications. Antipsychotics, antidepressants, and analgesics were the most common medication causes of intoxications. Antidepressants intake were seen in higher rates in adolescent age group. Antidepressant prescription and drug control should be more carefully in adolescent age group.

Keywords: Children, intensive care, intoxication

Öz

Amaç: Çalışmamız, çocuk yoğun bakım ünitesinde izlenen zehirlenme hastalarının klinik özelliklerini, tedavi şekillerini ve sonuçlarını öğrenmek amacıyla planlandı.

Gereç ve Yöntem: 01 Ocak 2019 - 31 Aralık 2021 tarihleri arasında hastanemize başvuran veya başka bir tıp merkezinden ünitemize nakledilen zehirlenme tanısı konulan hastaları geriye dönük olarak incelendi. Hastanın demografik verilerini toplandı. Başvuru anında Glasgow Koma Skalası skoru, hastaların mekanik ventilasyon gereksinimlerine uygulanan medikal tedaviler, uygulanan hemodiyaliz ve plazmaferez uygulamaları kaydedildi. Sonuçlar sağkalım, çocuk yoğun bakım gün sayısı ve hastanedeki gün sayısı ile değerlendirildi. Çalışma grubunu adolesan grup (>120 aylık) ve ergen olmayan grup (<120 aylık) olarak ayırdık. Toplanan tüm değişkenler iki grup arasında karşılaştırıldı.

Bulgular: Çalışma süresince 114 hasta çalışmaya dahil edildi. Hastaların çoğu adolesan yaş grubundaydı (%52,6). Zehirlenme nedenlerini incelersek, ergen hastada zehirlenmenin başlıca nedeni intihardı. 120 ayın altındaki hastalarda kasıtsız zehirlenme ana nedendi. Antipsikotikler, antidepresanlar ve analjezikler, sırasıyla zehirlenmenin en yaygın ilaç nedenleriydi. 4 hastaya mekanik ventilasyon uygulandı. 5 hastaya hemodiyaliz uygulandı. 5 hastaya plazmaferez uygulandı. Tüm hastalar hayatta kaldı. Yoğun bakım yatış gün sayısı medyan gün 1 gündü. Hastanede geçirilen ortalama gün sayısı 3 gündü.

Sonuç: Çalışma döneminde tüm ÇYB başvurularının %2,8'i zehirlenmeydi. Antipsikotikler, antidepresanlar ve analjezikler, zehirlenmelerin en sık ilaçla zehirlenme nedenleriydi. Adolesan yaş grubunda antidepresan alımı daha yüksek oranlarda görüldü. Adolesan yaş grubunda antidepresan reçetesi ve ilaç kontrolü daha dikkatli yapılmalıdır.

Anahtar Kelimeler: Çocuk, yoğun bakım, zehirlenme

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INTRODUCTION

Intoxication is one of the common health problems in childhood. Intoxication causes a large number of emergency service admittance and pediatric intensive care unit hospitalization. (1)

Due to Turkey National Intoxication Counselling Center (NICC) report in 2020 123.366 case had been reported. Nearly half of the intoxication cases (46.96%) were below eighteen years old. There is not any data about intensive care requirement of pediatric and adult patients in Turkey National Intoxication Information Center report. (2)

Intoxication patients mostly handled in emergency services of hospitals. Some of them referred to intensive care units. (3) There is a little information about pediatric intoxication patients handled in pediatric intensive care unit. Although intoxication patients are formed significant number in pediatric intensive care unit, there is no obvious criteria's which children should be hospitalized to pediatric intensive care units. (3) In adult patients referred to intensive care, patients were selected according to intensive care requirement score (IRS). There are not any criteria for intensive care requirement of children admitted to emergency service with intoxication. (4) Childhood mortality from intoxication resulted in rate of 2% developed countries, 5% in underdeveloped countries. (1)

Epidemiology of intoxications differs between countries, social status, age and patients' income status. Even if in a country, there are differences between regions. (3)

According to studies children's intoxications occurred with drugs. Children's below 5-year-old mostly exposing to unintentional drug intake. Adolescent age group exposed to drugs via suicide. (1)

Our study was planned to reach out intoxication patient's clinical characteristics, their treatment modalities and outcomes of those patients followed up in pediatric intensive care unit.

MATERIAL AND METHOD

We examined patients admitted to our hospital or transferred from another medical center to our PICU, diagnosed with intoxication from 01 January 2019 to 31 December 2021, retrospectively. We collected patient's demographic data (age in month, gender, body weight as kilogram, psychiatric comorbidity presence).

Data recorded at admission was referral medical center before PICU admission, time period before pediatric intensive care unit (PICU) admission, reason of toxin exposure (unintentional, suicide and drug mis-use), symptoms of patients (central nervous system symptoms, gastrointestinal tract symptoms, cardiovascular symptoms and respiratory tract symptoms) and treatment before PICU admission. İntoxication cause were recorded as drugs and non-drugs causes. Drugs were grouped as their characteristics.

Glascow Coma Scale score at admission, medical treatments applied to patients (fluid bolus, inotrope/vasopressor, N-Acetyl Cysteine, sodium bicarbonate, atropine, benzodiazepine, anticonvulsant, antivenom, calcium, steroid and intravenous lipid infusion), mechanical ventilation requirement, hemodialysis and plasmapheresis applied was recorded.

Outcomes evaluated by survival, days in PICU and days in hospital.

We divided study group as adolescent group (>120-month-old) and non-adolescent group (<120-month-old). All collected variables were compared between two groups.

Our study was approved by Ankara City Hospital No:2 Clinical Researches Ethics Committee (Date: 24.11. 2021, Decision No: E2-21-1061). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Statistical Analysis

Descriptive analysis of the results was conducted by using the SPSS 17.0 software package for Windows (IBM Company, New York, NY). Categorical data expressed as proportions (%). Median and inter quartile range were used for quantitative data. Differences were evaluated by Chi-Squared test in cases of categorical variables; non parametric test (Mann-Whitney U) for continuous variables. Data was considered statistically significant at p-value <0.05.

RESULTS

During study period 114 patients included into the study. A hundred and fourteen patients were 2.8% of total PICU admissions. Demographic variables and intoxication characteristics were shown in **Table 1**. Median value of patients age was 159-month-old (Inter Quartile Range 48-192). Most of the patients were in adolescent age group (52.6%). Female gender was prominent in not only in total study group, but also in adolescent patients (61.7%). Thirty patients were suffered from psychiatric diseases. Adolescent patients had psychiatric disease presence higher rates than patients below <120-month-old (p=0.013). If we examined intoxication causes, in adolescent patient's suicide was major cause of intoxication. In patients below <120-month-old unintentional intoxication was the main reason. Activated charcoal (50.0%) and gastric lavage (36.6%) was the most applied interventions before pediatric intensive care unit (PICU) admission. Multidrug intake was more common in adolescent age group (40.0%). Most of the patients showed up symptoms (65.4%).

If patient's symptoms evaluated, clinical symptoms were particularly common in adolescent age group (p=0.005). Central nervous system symptoms were more common adolescent age group (p=0.036). Time before PICU admissions median value was 4.5 hour in all of the patients group. Intoxication causes were presented in **Table 2**. Antipsychotics, antidepressants and analgesics were the most common medication causes of intoxication respectively. Antidepressants intake were seen in higher rates in adolescent age group (p=0.003). Alcohol was the most common non-drug reason of intoxication. Most of the intoxications arise from oral intake of agents (88.0%). Transdermal (4.8%) and inhaler (2.8%) routes were less common. Pediatric intensive care follow-up, treatments and outcomes were shown at **Table 3.** Glascow coma scale (GCS) at PICU admission was lower than 15 in 22 (21.1%) patients. Alkalinization, N-Acetyl Cysteine and fluid bolus treatment was most common interventions in PICU. Fluid bolus treatment requirement was more common in adolescent age group (p=0.03).

Mechanical ventilation applied to 4 patients. 5 patients were hemodialyzed. Plasmapheresis performed to 5 patients.

All patients were survived. Median days in PICU was 1 day. Median days in hospital was 3 days.

Table 1. Demographic variables and intoxication characteristics

	Total (n=104)	<120-month-old (n=44)	>120-month-old (n=60)	P value
Female Gender, n (%)	61(53.5)	17(38.6)	44(73.3)	0.0001
Age(month), median (IQR)	159(48-168)	42.5(24-43.5)	188(168-204)	
Psychiatric disease presence, n (%)	30(28.8)	7(15.9)	23(38.3)	0.013
Medical service occupied before PICU admission, n (%)				0.126
Emergency service	16(15.4)	9(20.4)	7(11.7)	
Ward	29(27.9)	8(18.1)	21(35.0)	
Another hospital	59(56.7)	27(61.3)	32(53.3)	
Time before PICU admission (hour), median (IQR)	4.5(3-8)	5.5(3-12)	4(3-7)	0.553
Intoxication cause, n (%)				0.0001
-Unintentional	50(48.1)	40(90.9)	10(16.7)	
-Suicide	48(46.2)	1(2.2)	47(78.3)	
-Drug mis-use	6(5.8)	3(6.8)	3(5.0)	
Multidrug intake, n (%)	28(26.8)	4(9.0)	24(40.0)	0.0001
Symptom, n (%)	68(65.4)	22(50.0)	46(76.7)	0.005
CNS symptoms	55(52.9)	18(40.9)	37(61.3)	0.036
GIS symptoms	36(34.6)	13(29.5)	23(38.3)	0.352
CVS symptoms	8(7.7)	1(2.2)	7(11.7)	0.076
RS symptoms	6(5.8)	3(6.8)	3(5.0)	0.694

CNS: Central nervous system; CVS: Cardiovascular system; IQR: Interquartile range; GIS: Gastrointestinal system; RS: Respiratory system; PICU: Pediatric intensive care unit

Table 2. Intoxication causes

	Total (n=104)	<120 month old (n=44)	>120 month old (n=60)	P value
Drugs, n (%)				
Antipsychotics	23(22.1)	9(20.4)	14(23.3)	0.727
Antidepressant	18(17.3)	2(4.5)	16(26.7)	0.003
Analgesic	18(17.3)	5(11.3)	13(21.7)	0.170
NSAID	11(10.6)	2(4.5)	9(15.0)	0.087
Anticonvulsant	10(9.6)	3(6.8)	7(11.7)	0.407
Cardiac	10(9.6)	3(6.8)	7(11.7)	0.407
Antihistaminic	8(7.7)	2(4.5)	6(10.0)	0.302
Psychostimulants	7(6.7)	2(4.5)	5(8.3)	0.446
Antibiotic	6(5.8)	2(4.5)	4(6.7)	0.647
Oral antidiabetics	4(3.8)	0(0)	4(6.7)	0.081
Hormone	4(3.8)	1(2.2)	3(3.3)	0.751
Other	7(6.7)	4(9.0)	3(3.3)	0.221
Non-drug causes, n (%)				
Alcohol	8(7.7)	1(2.2)	7(11.7)	0.076
İnsect/Scorpion sting	5(4.8)	3(6.8)	2(3.3)	0.412
Raticide	3(2.9)	3(6.8)	0(0)	0.04
Carbon monoxide	3(2.9)	2(4.5)	1(1.6)	0.386
Corrosive matter	2(1.9)	2(4.5)	0(0)	0.095
Weed	1(0.9)	0(0)	0(0)	0.241
Mushroom	1(0.9)	1(2.2)	0(0)	0.241

NSAID: Non-steroid anti-inflammatory drugs

Table 3. PICU follow-up, treatments and outcomes, n (%)

	Total (n=104)	<120 month old (n=44)	>120 month old (n=60)	P value
GCS at PICU admission, median (IQR)	15(15-15)	15(15-15)	15(15-15)	0.850
Treatments applied, n (%)				
Fluid bolus	10(9.6)	1(2.2)	9(15.0)	0.03
Inotrope	3(2.9)	0(0)	3(5.0)	0.132
NAC	12(11.5)	5(11.3)	7(11.3)	0.962
Sodium Bicarbonate	20(19.2)	6(13.6)	14(23.3)	0.215
Atropine	0(0)	0(0)	0(0)	
Benzodiazepine	1(0.9)	0(0)	1(1.7)	0.39
Antiepileptics	2(1.9)	0(0)	2(3.3)	0.221
Calcium	2(1.9)	0(0)	2(3.3)	0.221
IV Lipid	4(3.8)	0(0)	4(6.7)	0.081
Antivenom	3(2.9)	2(4.5)	1(1.7)	0.386
Steroid	1(0.9)	0(0)	0(0)	0.241
Mechanical ventilatory support, n (%)	4(3.8)	1(2.2)	3(5.0)	0.475
Hemodialysis, n (%)	5(4.8)	2(4.5)	3(5.0)	0.915
Plasmapheresis, n (%)	3(2.9)	1(2.2)	2(3.3)	0.750
Mortality, n (%)	0(0)	0(0)	0(0)	
Days in PICU, median (IQR)	1(1-2)	1(1-1)	1(1-2)	0.035
Days in hospital, median (IQR)	3(2-5)	2(2-3)	3(2-5)	0.037

IQR: Interquartile range; IV: Intravenous; GCS: Glasgow Coma Scale; NAC: N-Acetyl Cysteine PICU: Pediatric intensive care unit

DISCUSSION

Intoxications is a common problem in pediatric emergencies and can cause death. (5) In United States in 1950's nearly 900 children died from intoxications. At 1997's with preventive measures nearly fifty children in a-year died from poisoning. (6)

Patients suffered from intoxications who referred to pediatric intensive care units according to clinical condition and disease severity. (7) All patients with poisoning should not be hospitalized into PICU. (4) Patients could also be hospitalized into ward with strict monitorization and clinic follow up. (4) Due to pediatric intensive care's quality and manpower were increasing, mortality was decreasing in recent years. (7) There is no scoring system which providing decision of PICU admission. (8) If any doctor who calls for information about intoxication patients 114 National Intoxication Information Center (NICC), NICC advices mostly intensive care follow-up a large group of patients, according to their instructions. In consequence of this condition patients referred to other hospitals. Nearly 60.0% of our patients were referred from other hospitals for this reason. Scoring systems including patients' clinical condition should be used to prevent unnecessary PICU hospitalizations.

Due to National Intoxication Counseling Center data 46.9% of 187.528 cases were children. (2) 25.1% of intoxication cases were between 0-4 years-old. (2) 18.2% of intoxication cases were between 10-19 years old. (2) Intoxication patients age groups were differing between countries. Studies from Nepal and India showed most of intoxication cases below 5-year-old. (9,10) 6-year study from Italy also report that intoxication events were more common in 1–4-year-old children. (11) Ten-year study from USA briefed that 75.0% of intoxication patients were teenagers. In our study most of the patients were in adolescent age group. Ankara was our countries capital and one of the developed cities of our country. Despite national data, our result may be explained with different economical and educational status apart from other parts of the country.

According to NICC report suicidal intoxications (43.1%) was the leading cause of intoxication in all ages. (2) But in 0-5 age group above ninety percent of patients suffered from unintentional intoxication. (2) There is no data about adolescent patients. Reports from our country showed that 0-5 years children mostly unintentional causes, adolescent intoxications caused by suicides. (7,12,13) 0–3-year-old children exposed to unintentional intoxication's due to beware of danger, high mobility, lack of parenteral education, low socioeconomic status. (12) Adolescent females were more prone to suicidal behavior. (7,11,14) Psychoactive substance usage, alcohol usage of family members, family violence and grown up by single parent also affects suicidal behavior's but we did not questionnaire these factors. (14)

Our study also presented that presence of psychiatric disease increases suicidal behavior. All patients with psychiatric disorders suffered from suicide. Ozdel et all reported that patients who did suicidal attempt admitted to emergency departments had psychiatric disorders at ¾ rate. (15)

Time before PICU admission was different among studies. Emeksiz et al reported that unintentional causes arrived to PICU at first hour of ingestion, suicidal intoxications were in a longer time period. (7) In s study from another center in Ankara showed that time between intoxication and PICU admission was 5.5 hours. (16) There was not any difference between time admission into PICU between our study groups. Our time period may be longer because of transfer of patients from other hospital to our intensive care unit.

Type of pharmaceutical agents were different causes among studies. National Intoxication Concealing Center reported that autoinflammatory drugs were the commonest reason of pharmaceutical agents. Psychiatric and analgesic drugs were coming in order of frequency. (2) Analgesics were the commonest reason in other studies from Turkey and abroad. (4,11,17) In our study group anti psychiatric and antipsychotic drugs were common. Anti-psychiatric drugs were unprescribed and easily accessible drugs in Turkey. These results may be related with this condition. Parenteral and physician control of antipsychotic drugs should be more cautious.

Non-pharmaceutical reasons were changed among studies. Akın et all reported that pesticides were common but larger study conducted by Ozdemir et all reported that corrosives were common. (5,16) In our study non-pharmaceutical reasons was a small group but alcohol was the commonest reason. Alcohol sales were forbidden under eighteen years old but some of our patients could access alcohol. There should be more attention about alcohol sales to children.

There were not more differences at PICU interventions required for patients. A large group of patients hospitalized for intoxication did not need any major interventions. Mos of them only needs close monitorization. (4,7) Only fluid bolus requirement was higher in adolescent age group. Extracorporeal treatments and mechanical ventilation applied in a small group.

Mortality in intoxications changed in literature between 0.4%-8.9%. In a study from Australia reported that 5.8% mortality among intoxication patients. (17) Emeksiz et all reported that 2.1% in our hospital four years ago. (7) We thankfully did not see any mortality. In our center, during study period, pediatric intensive care specialist was working with night shifts. This condition may improve patient care.

Our study had several limitations. Our study was single-centered and retrospective. Our medical team did not run toxicological tests regularly in patients admitted to hospital with intoxication. Due to lack of toxicological screening, some patients may be hospitalized in PICU unnecessarily. Our national patient transfer service did not correctly record patients' data, especially if transfer were done between two hospitals. Also, Glasgow Coma Score of patients at PICU admission was calculated according to doctor records because of GCS did not routinely calculate at PICU admission. We did not have data of patients suffered from intoxication followed-up in ward and emergency service.

CONCLUSION

In our study, 2.8% of all PICU admissions were intoxications. Female gender was prominent in adolescents and patients below 120-month-old. Suicide was common in adolescents, but unintentional intoxications were common in patients below 120-month-old. Most of the patients were symptomatic. Antipsychotics, antidepressants and analgesics were the most common medication causes of intoxications. Antidepressants intake were seen in higher rates in adolescent age group. Antidepressant prescription and drug control should be more carefully in adolescent age group. Alcohol was most common non-drug hospitalization cause in adolescent age group. Information about harmfulness of alcohol should be provided for adolescent age group. Although we did not see any mortality in our study group, intoxications are important patient group in PICU. There should be more education programs about drug safety, drug usage and unintentional and intentional intoxications to increase people's attention. Multicentered-prospective studies should be designed about Turkish children to provide correct status of pediatric intoxication patients.

ETHICAL DECLARATIONS

Ethics Committee Approval: Our study was approved by Ankara City Hospital No:2 Clinical Researches Ethics Committee (Date: 24.11. 2021, Decision No: E2-21-1061).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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