



Household Intoxications: Does Non-pharmaceutical Mean Non-dangerous?

Ev İçi Zehirlenmeler: İlaç Değil Demek Tehlikeli Değil Demek mi?

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Abstract

Introduction: Intoxication with non-pharmaceutical substances within household environment is an important group of pediatric injuries seen in pediatric emergency departments. Our objective was to study clinical characteristics and outcomes of these exposures and compare them with pharmaceutical intoxications.

Methods: The study was designed as a retrospective cohort study. All patients between 0 and 18 years old presented to 3rd level teaching hospital pediatric emergency unit between May 1st 2016 and April 30th 2017 with a complaint of acute toxic exposure were included.

Results: Over one-year period, 0.52% of all patients presented to pediatric emergency department were toxic exposures. 44% of them were non-pharmaceutical exposures, most commonly cleaning products (49.5%), followed by carbon monoxide (19.2%) and hydrocarbon products (5.5%). Most common route of exposure was oral route (73.2%) and most of exposures were unintentional (97.9%). Respiratory symptoms were the most common manifestation (4.8%), followed by neurologic and cardiac manifestations (2.4%). 57% of patients were hospitalized, one patient admitted to pediatric intensive care unit (PICU). None of the patients died. When compared with pharmaceutical exposures, patients in non-pharmaceutical group were younger, accidental exposures and non-oral routes of exposure were more in this group. Less patients in household group were admitted to PICU. Cardiac manifestations were seen more in household group.

Conclusion: Household toxic exposures to non-pharmaceutical substances are common in childhood. Although mortality risk of pharmaceutical exposures is higher, household non-pharmaceutical exposures can also result in significant clinical manifestations therefore every effort should be taken to prevent accidental toxic exposures within household environment.

Keywords: Poisoning, intoxication, household, children

Öz

Giriş: Ev içinde ilaç dışı ajanlara maruziyet, çocuk acil polikliniklerinde sık gördüğümüz kaza biçimlerinden biridir. Bu çalışmada bizim amacımız bu tip zehirlenmelerin klinik özelliklerini ve sonuçlarını incelemek ve ilaçla zehirlenmelerle karşılaştırmaktır.

Yöntemler: Çalışma geriye dönük kohort bir çalışma olarak planlanmıştır. Üçüncü basamak bir eğitim araştırma hastanesine 1 Mayıs 2016 ve 30 Nisan 2017 arasında akut zehirlenme ile başvuran 0 ile 18 yaş arası tüm hastalar çalışmaya dahil edilmiştir.

Bulgular: Bir yıllık çalışma sürecinde başvuran tüm hastaların %0,52'si zehirlenme nedeni ile başvurmuştur, bunların %44'si ilaç dışı ajanlarla zehirlenmedir, ilaç dışı ajanlar içerisinde en sık karşılaşılan ajan temizlik ürünleridir (%49,5), bunu karbon monoksit (%19,2) ve hidrokarbonlar (%5,5) takip etmektedir. En sık oral yol ile zehirlenme gerçekleşmiştir (%73,2) ve maruziyetlerin çoğu kaza sonucu olmuştur (%97,9). En sık solunum yolu bulguları ile karşılaşmıştır (%4,8), ikinci sırada kardiyolojik ve nörolojik bulgular görülmüştür (%2,4). Hastaların %57'si yatırılarak izlenmiş, bir hasta çocuk yoğun bakım ünitesine yatırılmıştır. Hastalarda mortalite görülmemiştir. İlaçla zehirlenmelerle karşılaştırıldığında ilaç dışı ajanlara maruziyetlerde çocuklar daha küçük yaşta, kaza ile zehirlenme ve ağızdan alım harici yollarla zehirlenme daha siktir. İlaç dışı zehirlenmelerde çocuk yoğun bakım ünitesine yatma sıklığı daha azdır. Ancak kardiyolojik bulgular ilaç dışı maruziyetlerde daha sık izlenmiştir.

Sonuç: İlaç dışı ajanlara maruziyet evlerde en sık görülen kaza biçimlerinde birisidir. Her ne kadar ilaçla zehirlenmelerde mortalite riski daha yüksek olsa da ilaç dışı ajanlara maruziyetler de morbidite ile sonuçlanabilmektedir. Bu nedenle bu maruziyetlere engel olmak için her türlü önlem alınmalıdır.

Anahtar Kelimeler: Zehirlenme, kaza, ev içi, çocuk

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Introduction

Intoxication with non-pharmaceutical substances within household environment is an important group of pediatric injuries seen in pediatric emergency departments (PED).^{1,2} Most of these patients are observed either in pediatric observation unit in PED or in pediatric wards without complications and safely discharged, but in a small group, serious complications can be seen and admission to intensive care unit can be necessary, resulting in morbidity and rarely in mortality.³

There are two important groups of toxic exposures: Exposures to pharmaceutical substances and non-pharmaceutical household products.² Household products are easy to reach everyday products at home which account for almost half of toxic exposures.^{1,6} Exposure to these substances usually cause clinically insignificant poisonings, however they can rarely result in morbidity and mortality. Therefore, it is important to be aware of clinical characteristics and outcomes of these group of intoxications to guide effective treatment and preventive measures. However, there are few studies in literature that analyze clinical features of household exposures generally and compare them with pharmaceutical exposures.¹

The aim of this study is to define general characteristics and clinical outcomes of household non-pharmaceutical toxic exposures admitting to PED and compare them with pharmaceutical poisonings.

Materials and Methods

The study was designed as a retrospective cohort study. All patients between 0 and 18 years old presented to a tertiary care hospital pediatric emergency unit between May 1st 2016 and April 30th 2017 with a complaint of acute exposure to a toxic substance were included in the study.

Patients with chronic intoxications, food intoxications, intoxications from an unknown material and patients with illicit drug use were excluded from the study. Patients who left the hospital before completion of observation period and patients whose data were incomplete or missing were also excluded. If patients were exposed to different products at the same time, all products were recorded.

Information about patients were gathered from hospital data system. Age and gender of the patient, type of toxic compound, route of toxic exposure (oral, inhalational or cutaneous), reason of exposure (intentional or accidental), presence of cardiovascular, neurologic, respiratory and gastrointestinal findings, treatment at an emergency department (gastrointestinal lavage or active charcoal administration), admission to hospital [either pediatric ward or pediatric intensive care unit (PICU)], length of stay either in emergency unit or pediatric ward and final outcome were

recorded for each patient. Palpitations, syncope, dizziness, chest pain, tachycardia, hypo/hypertension were considered as cardiac manifestations, headache, change in consciousness, convulsions were considered as neurological manifestations, abdominal pain, dysphagia, dyspepsia, vomiting were considered as gastrointestinal manifestations and cough and respiratory distress were considered as respiratory manifestations. Decision for admission to PICU was made with guidance of National Poisoning Center. Decision to discharge was made by consulting physician when half-life of toxic substance has expired and vital signs are stable.

Patients were classified into two groups: Pharmaceutical exposures and non-pharmaceutical household exposures. Two groups were compared according to admission state either to pediatric ward or intensive care unit, length of stay at pediatric emergency unit or pediatric ward, presence of cardiovascular, neurologic, respiratory or gastrointestinal findings and final outcome. Primary objective was to compare clinical outcomes of these groups, admission to pediatric ward or intensive care unit, length of observation period and frequency of clinical manifestations were compared for this purpose. Secondary objective was to compare clinical characteristics of these groups.

Statistical Analysis

SPSS 15.1 program was used for statistical analysis. Kolmogorov-Smirnov test was used for normality. Descriptive statistics were presented with frequencies and percentages for discrete variables and mean and standard deviation when variables were normally distributed or median and interquartile range (IQR) for continuous variables when variables were not normally distributed. Discrete variables of two groups were compared by Pearson chi-square test. Continuous variables were compared by student t-test. $P < 0.05$ was considered statistically significant for all tests.

The study was reviewed and approved by Başkent University Medical Review Board at July 17th 2018 in accordance with Declaration of Helsinki with assigned project number KA 18/218.

Results

A total of 720 patients presented to PED with toxic exposure over one-year period, which accounted for 0.52% of all patients presented to PEM (720/138858). Twenty-four patients left PED before observation period is completed and medical records of twenty-nine patients were missing, so these patients were excluded from the study. Remaining 667 patients were enrolled to study.

Forty four percent (291/667) of all exposures were exposures to non-pharmaceutical substances and remaining 56% were

pharmaceutical exposures. Forty three percent of patients in non-pharmaceutical group were girls and median age of patients in this age group was 3 years old (IQR 2-15 years). Most common route of exposure in non-pharmaceutical group was oral route (73.2%) followed by inhalational route (26.8%). Household cleaning products were the most common agents (49.5%) followed by carbon monoxide (CO) (19.2%), thinner and other hydrocarbon products (5.5%), cosmetic products (5.2%) and ethanol and acetone (4.8%) in non-pharmaceutical group (Figure 1). Eight of 56 CO intoxication patients were saved from same house fire.

Most of exposures in non-pharmaceutical group were unintentional (97.9%). Only four patients were treated with gastric lavage and/or active charcoal (1.3%). Respiratory manifestations were most common (14 patients, 4.8%), especially in hydrocarbon group (4 patients, 26.6% in this group) followed by neurologic manifestations, cardiac and mucosal manifestations (7 patients each, 2.4%), gastrointestinal manifestations were seen only in three patients (1%). Endoscopic evaluation was performed on one patient revealing minor esophageal burns. One hundred sixty-six patients (57%) were hospitalized, one patient was admitted to PICU. None of the patients died. Median time of observation was 24 hours (IQR 24-48 hours).

When pharmaceutical and non-pharmaceutical groups were compared, several factors were found to be statistically significant. More patients in pharmaceutical group were admitted to PICU (10% in pharmaceutical group and 0% in household group, $p=0.000$). There was no statistically significant difference between neurological manifestations between groups, but cardiac manifestations were seen

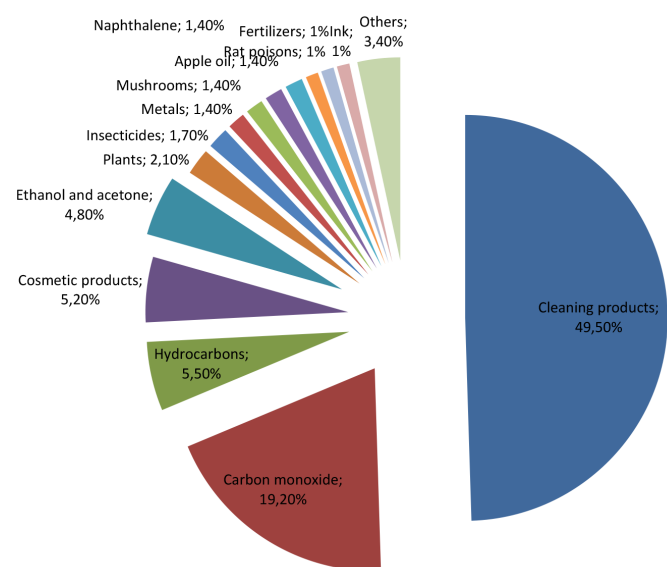


Figure 1. Distribution of non-pharmaceutical household substances that caused poisoning

more frequently in household group (0% in pharmaceutical group and 2% in household group, $p=0.036$). Median age of household group was younger than pharmaceutical group and unintentional poisonings were also more frequent in household group (98% in household group and 64% in pharmaceutical group, $p=0.000$). Oral ingestions were more common in pharmaceutical group and gastrointestinal decontamination was more commonly performed in this group (100% oral ingestion in pharmaceutical group, $p=0.000$). Inhalational and cutaneous routes of exposure were seen significantly more in household group (Table 1).

Discussion

In our study, toxic exposures account for 0.5% of all pediatric emergency department visits and almost half of them (44%) were household non-pharmaceutical exposures similar with other studies in literature.¹⁻⁶ Most common household exposure was exposure to cleaning products that can be corrosive according to pH, ingested amount and concentration. In literature, many studies also showed that cleaning products are the most common substances that cause household intoxications, however some studies reached different results. In a study of Abdollahi et al.⁷, hydrocarbon poisonings were the most common type of household intoxication. Environmental and cultural conditions can affect mechanism of poisoning, in urban environment, hydrocarbon and pesticide intoxications can be fewer and poisonings of cleaning products can be seen more.⁸ Therefore environmental and cultural conditions should be considered when precautions to prevent household poisonings are put in practice.

Cleaning products usually do not cause systemic toxicity, however they can cause significant gastrointestinal mucosal damage according to pH, concentration and amount of substance ingested.^{1,9-11} Ingestion usually occurs accidentally in children less than 10 years, but suicidal ingestions were also reported in literature.⁸⁻¹² In our study median age was 2 years (range 1-17 years), only four patients (2.7%) ingested these products intentionally, all of which are over 15 years old, which is similar with previous studies in literature.⁹

Immediate endoscopic evaluation in first 24-48 hours after ingestion of household product is rarely indicated, it is usually performed when ingested agent is strong alkali or acidic, ingested amount is large or patient is symptomatic or has serious oral burns.^{9,11} In a study of Urganci et al.¹⁰, author concluded that all bleach ingestions should undergo immediate endoscopy even if patient is asymptomatic as severity of symptoms is not correlated with degree of lesions in esophagus or stomach. Some reports suggest endoscopic evaluation of intentional ingestions even if patient is asymptomatic as suicidal ingestions can cause more severe

Table 1. Comparison of clinical characteristics and outcomes of pharmaceutical and non-pharmaceutical household poisonings

	Number of patients in pharmaceutical intoxication group (%)	Number of patients in household intoxication group (%)	p-value
Girls	208 (54%)	141 (48%)	0.114
Accident	244 (64%)	285 (98%)	0.000*
Suicide	130 (34%)	6 (2%)	0.000*
Oral route	381 (100%)	213 (73%)	0.000*
Inhalational route	0 (0%)	78 (27%)	0.000*
Transcutaneous route	0 (0%)	16 (5%)	0.000*
Gastric lavage treatment	162 (43%)	4 (1%)	0.000*
Active charcoal treatment	222 (58%)	3 (1%)	0.000*
Neurological complication	9 (2%)	7 (2%)	0.971
Cardiac complication	2 (0%)	7 (2%)	0.036*
Admission to pediatric ward	205 (54%)	166 (57%)	0.403
Admission to PICU	39 (10%)	1 (0%)	0.000*

PICU: Pediatric intensive care unit

injuries.^{8,9,12} In our series, only one patient needed immediate endoscopic evaluation which revealed minor esophageal burns and discharged safely. Corticosteroids were not given as this treatment is controversial.^{9,10} All patients were referred to gastroenterology department for follow-up.

CO poisonings is the second largest group in household intoxications in our study group. CO intoxications result in tissue hypoxia and it can result in headache, vomiting, dizziness, weakness, seizures, muscle cramps, visual alterations, alterations in consciousness and even coma.^{13,14} CO usually occur due to improperly vented water heaters and stoves in winter months.^{13,14} House fires can also result in CO exposure which can lead to morbidity and mortality.¹⁴ In our study although eight of the patients were saved from an house fire, all cases which were discharged in good health. Main reason for that can be the central location of our hospital as time passing between poisoning and admission to hospital is short so effects of CO can be minimized. Also Salameh et al.¹⁴ showed that patients in clusters have lower risk of intoxication, which could also have been positively affected our patients.

Third most common household exposure in our study was exposure to thinner and other hydrocarbon products. Main risk of hydrocarbon intoxications is inhalational injury to lungs.¹⁵ In our study, four of the patients in this group (26.6%) had respiratory symptoms, they were admitted to pediatric ward and received antibiotic and supportive therapy and discharged uneventfully.

Our study one of the few studies in literature that compares pharmaceutical and non-pharmaceutical toxic exposures and first study conducted in Turkey. Our results showed that more patients were admitted to PICU in pharmaceutical group. These results show that pharmaceutical exposures were expected to

be more detrimental for patients, as in a study of Lacroix et al.¹⁶, majority of intoxication patients admitted to PICU were pharmaceutical intoxication. However, when we considered manifestations, there were no statistical difference between groups for neurological manifestations, furthermore cardiac manifestations were seen more in non-pharmaceutical group. Respiratory and cutaneous manifestations were also seen in this group therefore non-pharmaceutical exposures can also result in significant clinical outcomes even if mortality risk is low. Gastric decontamination methods were performed less in household group not because they are harmless but gastric decontamination can not be performed for the most of the common household intoxications such as cleaning products, hydrocarbons and CO either because they are non-beneficial or they are even harmful.

Many studies showed that in childhood most of toxic exposures are unintentional, with small amounts of toxic substance and they usually happen at home.^{1,2,5,6,8,10} Our results also showed that unintentional exposures are significantly more in non-pharmaceutical group when compared to pharmaceutical group. Unlabelled products used at home can increase the risk of non-pharmaceutical exposures as shown by Urganci et al.¹⁰ Identifying the source of exposure and intervening to remove the source result in significant decreases in poisoning cases therefore household exposures should be studied in detail and right strategies should be developed and parents should be educated according to that to prevent household toxic exposures.¹⁵

Study Limitations

There are several limitations of this study. First, retrospective nature of the study may have resulted in some missed cases. Second, our study was conducted in a central hospital in

one of the main cities, therefore arrival time of patients to a tertiary care center is short, so prognosis of these patients can be better when compared to general population. Third, patients who left before completion of observation period were excluded from the study which may have caused selection bias. Fourth, mortality was not seen in our cohort therefore we could only compare morbidity between groups. Multicenter studies can give us more information about mortality and morbidity risks of household intoxications.

Conclusion

Household toxic exposures are common that usually happen unintentionally at home. Although need for admission to PICU is less for this group of toxic exposures, clinical manifestations can be seen as commonly as pharmaceutical exposures therefore every effort should be taken to prevent them and educate parents for safety.

Ethics

Ethics Committee Approval: The study was reviewed and approved by Başkent University Medical Review Board at July 17th 2018 in accordance with Declaration of Helsinki with assigned project number KA 18/218.

Informed Consent: Retrospective study.

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