

Research Article

The Results of Urine Toxicology Tests in Children With Drug Abuse Poisoning in Loghman Hakim Hospital in 2021



Fariba Farnaghi¹, Zahra Pournasiri², Saeideh Alinejad^{3*}, Hamid Owliaey⁴

1. Department of Pediatrics, School of Medicine, Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

2. Pediatric Nephrology Research Center, Research Institute for Children's Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

3. Department of Pediatrics, School of Medicine, Toxicological Research Center, Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

4. Yazd Branch, Islamic Azad University, Yazd, Iran.



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Corresponding Author:

Saeideh Alinejad
Address: Department
of Pediatrics, School of
Medicine, Toxicological
Research Center,
Loghman Hakim
Hospital, Shahid Beheshti
University of Medical
Sciences, Tehran, Iran.
E-mail: s.alinejad68@yahoo.com

ABSTRACT

Background and Aim: Correct and rapid diagnosis and timely treatment of acute poisoning are of great importance, mainly in legally crucial drugs of abuse poisoning. Urine drug toxicology (UDT) is an available, rapid, and cheap diagnostic tool. This study aims to evaluate the results of this study in children with acute poisoning.

Methods: In this prospective descriptive cross-sectional study conducted on the urine toxicology results of children admitted to Loghman-Hakim Hospital due to poisoning with opioids and cannabis in 2021, UDT was performed for all patients. Demographic data, type, method and time of poisoning, time of urine sample collection, urine pH and specific gravity (SG), and urine toxicology results were collected and statically analyzed using SPSS version 26.

Results: A total of 137 children were evaluated. The mean age was 4.11 ± 3.45 years, and 49.6% were boys. UDTs were positive in 106 of 137 patients (77.4%). The most common poisoning was methadone (61.32%) followed by opium (19.71%). No significant statistical difference was observed between the time of taking the urine sample as well as the type, pH, and specific gravity (SG) ($P > 0.05$). Of the 84 methadone-poisoned patients, 74 (88%) tested positive for UDT. The positive results for opium, cannabis, and buprenorphine were 77.77%, 33.33%, and 50%, respectively.

Conclusion: In our study, methadone was the most common poisoning, with urine toxicology showing a positive result in 88% of cases.

Keywords: Urine toxicology test, Methadone, Opium



Introduction

More than 1 million cases of acute poisoning are reported to the toxic exposure surveillance system of the [American Association of Poison Control Centers](#) (each year, making it a common cause of morbidity and mortality among children [1, 2]. Additionally, toxicity accounts for 2% of all child deaths in affluent countries, 7% of all incidents involving children under the age of five, and more than 5% of fatalities in developing countries [3, 4]. Furthermore, the pattern of child toxicity is constantly changing, and new, undiscovered, and lethal substances emerge every day [5]. Drug abuse, such as opioids, is fatal in children. Methadone liquid syrup is a light amber hue, and most parents keep it in mineral water and other edible bottles in the refrigerator, making it available to children [6].

Urine toxicology is crucial in various fields, including healthcare, forensic science, occupational safety, and pediatric medicine. Urine analysis of toxic substances provides valuable insights into an individual's exposure to drugs, chemicals, and environmental pollutants, which is especially crucial in children [7]. In pediatric medicine, urine toxicology plays a vital role in assessing drug exposure in infants and children, monitoring medication compliance, and detecting illicit drug use. It helps healthcare professionals identify potential drug toxicity or adverse effects in pediatric patients, guiding appropriate treatment and interventions [8]. Moreover, urine toxicology in children is essential for evaluating suspected cases of child abuse or neglect because it can provide evidence of exposure to harmful substances. By employing urine toxicology, healthcare providers can ensure the well-being and safety of children, detect early signs of substance abuse, and provide appropriate interventions and support [9]. Thus, urine toxicology serves as a rapid, cheap, and powerful tool for substance detection, aiding in identifying and monitoring toxic exposures, facilitating medical diagnosis, and appropriate treatment of poisoning [10]. Along with utilizing child-resistant packaging, earlier exposure detection, correct diagnosis, and better treatment can reduce the fatality rate of acute pediatric poisonings [11]. Given the importance of urine drug toxicology (UDT), as well as the paucity of research on this subject in Iran, we decided to analyze the outcomes of urine toxicology in drug poisoning in children in this study.

Materials and Methods

Study design and population

We designed a descriptive cross-sectional prospective study to evaluate all children admitted to [Loghman Hakim Hospital](#) in 2021 with an exact history and symptoms compatible with drug abuse poisoning.

Participation in the project required a history of drug poisoning and clinical symptoms consistent with poisoning. The exclusion criteria included the absence of a urine sample for toxicological examination and the patient's or his parents' refusal to participate in the study.

Measurements

The patients were enrolled in the study after providing consent. All patients also underwent a urine toxicology test for urine pH and specific gravity (SG). The patient's information was gathered, including age, sex, time of drug use, time of urine sample collection, type of drug used, and method of drug use. The file also contains the results of urine toxicology. To perform the test, at least 10 cc of urine is required, and the test method is a fast immunoassay in the [Loghman Hakim Hospital](#) laboratory. The test results are qualitatively reported.

Statistics

The data are described as Mean±SD, frequency and percentage. An analysis of variance test was used to check the relationship between the toxicology results and quantitative variables, such as age and urine pH and the chi-square test and Fisher's exact test were used to check the relationship between the results and qualitative variables, such as sex. SPSS software, version 26.0 was used for all the analyses. Statistical significance was defined as a $P < 0.05$.

Results

After reviewing the inclusion and exclusion criteria, 137 patients were enrolled in the study, including 69 boys (50.4%) and 68 girls (49.6%). The Mean±SD of the study participants age was 4.11 ± 3.45 years.

Figure 1 shows the most common types of poisoning in the study patients. Methadone was the most common type of poisoning in 61.3 % of cases (31.4% syrup, 29.9% tablet), followed by opium, and buprenorphine (B2) and cannabinoids (Marijuana, Hashish) were the next (10.2% and 8.7%, respectively).

Table 1. The time interval and root of poisoning categorized by types of drug poisoning among all study participants

| Variables | | Drug Type, No. (%) | | | | | P |
|---|-----------|--------------------|----------------|----------|-----------|---------------|-------|
| | | Methadone Syrup | Methadone Pill | Opium | Marijuana | Buprenorphine | |
| Time interval after consumption (hours) | 1-3 | 21(48.8) | 16(39.0) | 14(51.9) | 6(50.0) | 10(71.4) | 0.359 |
| | 4-6 | 13(30.2) | 11(26.8) | 10(37.0) | 5(41.7) | 2(14.3) | |
| | 7-10 | 7(16.3) | 9(22.0) | 3(11.1) | 1(8.3) | 2(14.3) | |
| | > 10 | 2(4.7) | 5(12.2) | 0(0.0) | 0(0.0) | 0(0.0) | |
| Root of poisoning | Ingestion | 43(100.0) | 41(100.0) | 25(92.6) | 12(100.0) | 14(100.0) | 0.082 |
| | Smoking | 0(0.0) | 0(0.0) | 2(7.4) | 0(0.0) | 0(0.0) | |

Table 1 presents the time since drug consumption as well as the type of narcotic drug used. Most children (48.9%) were referred within one to three hours of drug use.

Table 1 presents the time between drug poisoning and the type of drug used. Most children (48.9%) were referred within 1-3 hours post ingestion.

Table 2 presents the relationship between the type of narcotic drug used and the time of urine sampling. Most of our patients, 49(35.8%), were admitted within the first five hours after ingestion.

Table 3 presents the relationship between urine SG and pH and the type of poisoning. No statistically significant difference was observed between urine SG and pH and the types of drugs used in the data analysis.

Of the 137 individuals, 106(77.4%) showed positive urine toxicological results. In 88% of cases, urine toxicology successfully detected methadone toxicity. The diagnosis accuracies for buprenorphine, marijuana, and opium were 70.77%, 33.33% and 50%, respectively.

Table 4 presents more details of the correlation between urine toxicology results and associated drug poisoning and urinary factors. Except for the relationship between the type of drug used and the positive or negative UDT test results, the differences observed in the field of other parameters were not significant.

Discussion

In summary, the mean age of the children in this study was 4.11 ± 3.45 years, and 50.4% were male. Within three hours of drug use, 48.9% of the children were taken to the center. Methadone, opium, and buprenorphine accounted for 61.32%, 19.71%, and 10.22% of patients' poisoning, respectively. Children who used methadone and opium had low SG levels, but those who used marijuana and buprenorphine had high SG levels; however, this difference was not statistically significant. Urine toxicology properly diagnosed methadone toxicity in 74 (88%), of 84 patients with methadone poisoning. Opium, marijuana, and buprenorphine (B2) had diagnostic accuracy of 77.77%, 33.33%, and 50%, respectively. It

Table 2. Sampling time after consumption of drugs based on types of drugs

| Sampling Time After Poisoning (h) | No. (%) | Drug Type, No. (%) | | | | | P |
|-----------------------------------|----------|--------------------|----------------|----------|-----------|---------------|-------|
| | | Methadone Syrup | Methadone Pill | Opium | Marijuana | Buprenorphine | |
| 0-5 | 49(35.8) | 13(30.2) | 17(41.5) | 10(37.0) | 5(41.7) | 4(28.6) | 0.987 |
| 5-10 | 45(32.8) | 14(32.6) | 13(31.7) | 11(40.7) | 3(25.0) | 4(28.6) | |
| 10-15 | 24(17.5) | 9(20.9) | 6(14.6) | 3(11.1) | 2(16.7) | 4(28.6) | |
| 15-20 | 14(10.2) | 5(11.6) | 4(9.8) | 2(7.4) | 1(8.3) | 2(14.3) | |
| 20 | 5(3.6) | 2(4.7) | 1(2.4) | 1(3.7) | 1(8.3) | 0(0.0) | |

Table 3. The values of urine specific gravity and pH categorized by different types of consumed drugs

| Variables | | No. (%) | | | | | | P |
|------------------|--------|-----------|-----------------|----------------|----------|-----------|---------------|-------|
| | | Drug Type | | | | | | |
| | | Total | Methadone Syrup | Methadone Pill | Opium | Marijuana | Buprenorphine | |
| Specific gravity | Low | 27(19.7) | 5(11.6) | 13(31.7) | 7(25.9) | 0(0.0) | 2(14.3) | 0.093 |
| | Normal | 90(65.7) | 34(79.1) | 23(56.1) | 15(55.6) | 10(83.3) | 8(57.1) | |
| | High | 20(14.6) | 4(9.3) | 5(12.2) | 5(18.5) | 2(16.7) | 4(28.6) | |
| pH | 5-5.9 | 67(48.9) | 20(46.5) | 17(41.5) | 15(55.6) | 7(58.3) | 8(57.1) | 0.633 |
| | 6-6.9 | 43(31.4) | 12(27.9) | 15(36.6) | 10(37.0) | 2(16.7) | 4(28.6) | |
| | 7-7.9 | 18(13.1) | 6(14.0) | 6(14.6) | 1(3.7) | 3(25.0) | 2(14.3) | |
| | 8 | 9(6.6) | 5(11.6) | 3(7.3) | 1(3.7) | 0(0.0) | 0(0.0) | |

should be emphasized that four infants were poisoned by tramadol, and due to their small number, these four were categorized as having opium poisoning because tramadol is an opioid derivative.

Drug use in children is often unintentional, resulting in complications and death. Anderson et al. discovered that between 2001 and 2013, 28 children aged 4 years and younger were accidentally poisoned by a pharmaceutical product in England and Wales, with methadone being the causative drug in 16 cases (57%) [12]. Between 2002 and 2012, 201 children aged 4 years and younger were admitted to pediatric intensive care with medication poisoning in the United Kingdom. The causative agent was identified in 115 patients, with benzodiazepines (115/22, 19%) and methadone (20/115, 17%) being the most common [13]. Methadone was determined to be

the most common lethal poisoning drug and one of the leading reasons for hospitalization in a pediatric intensive care unit in England. The most common drug poisoning in children in the current study was methadone, which is similar to the study by Anderson et al. [12]. Of course, the amount of consumption in the current study was much higher than that in the study by Anderson et al. [12], which could be due to the difference in the methods used to conduct the two studies, as the current study was performed on children referred to the emergency room, whereas the study by Anderson et al. [12] was performed on children hospitalized in the pediatric ICU. Furthermore, Mehrpour et al. indicated that the most common causes of poisoning were opioids and insecticides. The mortality rate of poisoned patients in intensive care units is relatively high and the death rate due to opioid poisoning is a serious issue and the region's leading cause of

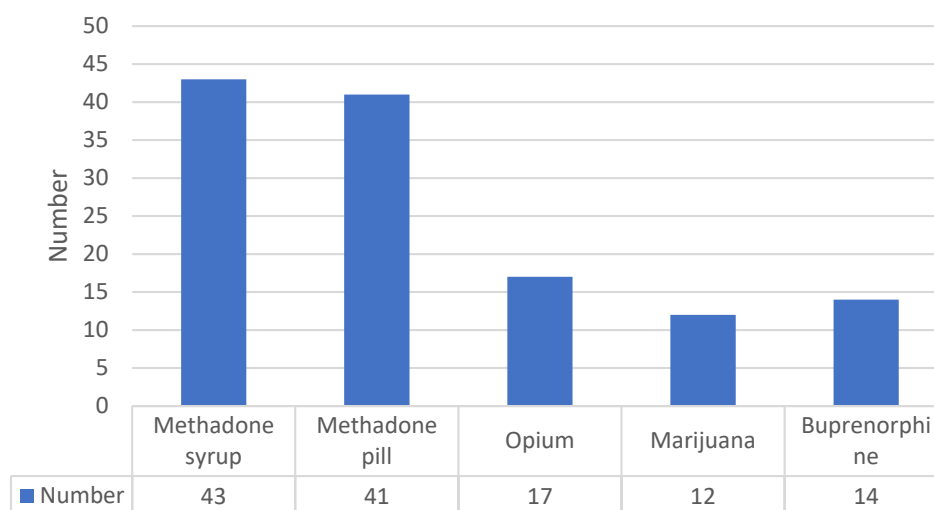
**Figure 1.** Type of drug poisoning in studied cases

Table 4. The relationship between study parameters and the results of urine toxicology test

| Parameters | UDT Results, No. (%) | | P | |
|-------------------------------------|----------------------|-----------|-----------|--------|
| | Negative | Positive | | |
| Drug poisoning type | Methadone syrup | 5(16.1) | 38(35.8) | <0.001 |
| | Methadone pill | 5(16.1) | 36(34.0) | |
| | Opium | 6(19.4) | 21(19.8) | |
| | Marijuana | 8(25.8) | 4(3.8) | |
| | Buprenorphine | 7(22.6) | 7(6.6) | |
| Time interval after consumption (h) | 1-3 | 14(45.2) | 53(50.0) | 0.821 |
| | 4-6 | 11(35.5) | 30(28.3) | |
| | 7-10 | 4(12.9) | 18(17.0) | |
| | > 10 | 2(6.5) | 5(4.7) | |
| Root of toxicity | Ingestion | 31(100.0) | 104(98.1) | >0.999 |
| | Smoking | 0(0.0) | 2(1.9) | |
| Sampling time after consumption (h) | 0-5 | 7(22.6) | 42(39.6) | 0.137 |
| | 6-10 | 9(29.0) | 36(34.0) | |
| | 11-15 | 8(25.8) | 16(15.1) | |
| | 15-20 | 6(19.4) | 8(7.5) | |
| | >20 | 1(3.2) | 4(3.8) | |
| Specific gravity | Low | 10(32.3) | 17(16.0) | 0.135 |
| | Normal | 17(54.8) | 73(68.9) | |
| | High | 4(12.9) | 16(15.1) | |
| PH | 5-5.9 | 13(41.9) | 54(50.9) | 0.829 |
| | 6-6.9 | 11(35.5) | 32(30.2) | |
| | 7-7.9 | 5(16.1) | 13(12.3) | |
| | 8 | 2(6.5) | 7(6.6) | |

UDT: Urine drug toxicology.

death from poisoning [14]. Despite ours, the study population included adults. However, both studies found that opioid poisoning is common, and measures to reduce this type of poisoning are needed.

According to a study by Kashani et al. the most common cause of consumption (97.8%) was accidental drug poisoning in children, and syrup was the most commonly used form of medicine in 146 patients (81.6%) [15]. In the current study, methadone syrup was also utilized in

31.39% of the patients; however, narcotic medicine was administered orally in 98.5% of the cases. Based on the results of the current study and the study by Kashani et al. [15], it can be deduced that children frequently absorb oral medicines by accident, and providing education to parents, in general, can be a good approach to prevent this from happening.

Terhani et al. explored the epidemiological causes of pediatric acute poisoning and discovered that the average

age of poisoned children was 4.903.27 years. A substantial relationship was observed between the child's age and type of poisoning. Patients aged 5 years and younger had the highest incidence (69.6%) [16]. The most common sex was male (58.6%); nevertheless, no significant relationship was found between the child's sex and type of poisoning. Medication poisoning was the most common type of poisoning in children (60.6%) and was primarily caused by methadone. The overall mortality rate in this trial was 1.2%. The average age of the children in the current study was 4.11 years, and 50.4% were boys, almost identical to the results of Tehrani et al. [16]. In our study, it was also discovered that methadone poisoning was the most common cause of children's poisoning, and the two studies are identical in this regard.

Conclusion

This study showed that methadone poisoning was the most common, followed by opium poisoning. This study highlights the importance of urine toxicology tests as a cheap and rapid diagnostic tool for drug poisoning in children, although the positive result is not 100%. In future studies, repeated and delayed testing will be recommended.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of [Shahid Beheshti University of Medical Sciences](#) (Code: IR.SBMU.MSP.REC.1400.133).

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Authors' contributions

All authors contributed equally to the conception and design of the study, data collection and analysis, interpretation of the results, and manuscript drafting. Each author approved the submission of the final version of the manuscript.

Conflict of interest

The authors declared no conflict of interest.

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