

## Research Paper: Changes in Opioid Poisoning Pattern in Children: A Retrospective Study in Rasht, Iran



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## ABSTRACT

**Background:** Poisoning comprises about 7% of accidents in children under 5-year-old and 2% of all pediatric deaths in developing countries. To warn against and prevent future potential poisoning with opioid substances, this comparative study was conducted on pediatric cases referred to the 17th Shahrivar Hospital in Rasht, Iran, in 2006 and 2018.

**Methods:** In this retrospective, cross-sectional study, all hospitalized pediatric cases diagnosed with opioid poisoning in 2006 and 2018 were investigated systematically. The demographic data, such as age, gender, city or village of residence, the poisoning substances involved, and the clinical outcomes were extracted from the medical records and entered on an appropriately-designed form. The data analysis was performed, using SPSS software, version 21.

**Results:** Fifty pediatric cases were examined with a mean age of 44.38±3.8 months old. Among these cases, 14 children had been poisoned, 13 of whom with opium and one with morphine in 2006; while in 2018, 36 children had been poisoned with methadone and only one with opium.

**Conclusion:** Comparing years 2006 with 2018, a considerable increase in pediatric opioid poisoning cases was observed with a tendency toward methadone being the substance involved. The occurrences might be due to unsafe access of unaware children to this drug, especially after the initiation of methadone maintenance treatment for opiate addicts, who were mainly the parents or relatives living in the same household.

**Keywords:** Addiction, Childhood, Methadone, Opiates, Opiates

## Introduction

A poison is defined as any material ingested, inhaled, injected or absorbed, resulting in bodily dysfunction [1]. Poisoning comprises 7% of all pediatric accidents and 2% of death in children under 5-year-old in developed countries. Unfortunately, poisoning with opium constituents a common and dangerous event in Iran [2]. Opioid substances that induce poisoning in-

clude opium, heroin, cocaine, methadone, and codeine. Children, especially those under 6-year-old and elderly are subjected to unintentional poisoning with opiates more often than other age groups [2, 3].

Methadone (Dolophine®) is a synthetic opioid substance with purely agonistic property, long half-life and high analgesic potential. It is an addictive substance; however, if it is consumed under clinical control and supervision, it reduces the need for consuming opioids un-

der unsupervised conditions, such as home or streets [3, 4]. Poisoning with opioids, such as methadone, is very serious and life-threatening in children [3]. The pattern of substance abuse is changing in today's society. Pediatric poisoning with methadone is increasing in recent years. The unsafe storage of methadone syrups in bottles used for commercial beverages or water, or other drugs with similar appearances to water are the main reasons for the rise in pediatric poisoning with methadone [3, 4].

Methadone Maintenance Treatment (MMT) program has been initiated in Iran since 2003 and has gradually grown such that there are more than 1500 centers offering this service in the country [3]. The unsafe storage of this substance at homes has given rise to children accidental access and toxicity in recent years [5]. Therefore, the objective of the current study was to investigate the opioid poisoning trend and the change before and after the initiation of MMT program for addicts in Iran.

## Materials and Methods

In a retrospective cross-sectional study, the records of all hospitalized patients diagnosed with opioid poisoning at the 17th Shahrivar Hospital in Rasht, Iran, were selected. Although the primary aim of this study was to compare opioid poisoning pattern in 2004, shortly after the MMT was launched in Iran with that of 2018. However, since hospital record for the respective patients were not available, the earliest records, i.e., available for 2006, were considered. Fifty pediatric cases were examined with a mean age of  $44.38 \pm 3.8$  months old. The records of all children referred to the hospital with poisoning in 2006 and 2018 were examined and the demographic information, such as gender, age, city or village of residence, type of poisonous substances, treatment outcomes, and the clinical symptoms as recorded in the hospitals were extracted and tabulated in a proper form. Children poisoned with substances other than opioids and suspicious cases were excluded. The analyzed data included the number of cases, percentage, mean and standard deviation by t-test and chi-square, using SPSS software, version 21. A P-value less than 0.05 and CI 95% were considered statistically significant.

## Results

The findings revealed that 14 patients diagnosed with opioid poisoning were hospitalized in 2006, while this number rose to 36 cases in 2018. The mean ages of the patients were  $20.36 \pm 25.83$  and  $52.28 \pm 37.79$  months in 2006 and 2018, respectively. Surprisingly, the youngest poisoned case was a one-day-old neonate. Eight cases

were male (57.1%) and six were female (42.9%) in 2006 while there were 27 males (75%) and 9 females (25%) diagnosed with poisoning in 2018. With respect to place of living, 12 cases (85%) were from cities while two (3.14%) were from villages in 2006. These numbers rose to 26 (72.2%) and 10 (27.8%), respectively, in 2018. Further in 2006, 13 cases were poisoned with opium (92.9%) and one child (7.1%) with morphine. In contrast, 35 children (97.2%) were poisoned with methadone and only one (2.8%) was poisoned with opium in 2018 (Table 1).

In most cases, the children had consumed the poisonous substances accidentally, while playing games around the house. Most cases of methadone poisoning were due to unsafe storage of the syrup bottles, which were consumed mistakenly instead of water or if they were in tablet forms, they were ingested accidentally instead of other drugs or candies. Moreover, in some cases, the poisoned children were forced to ingest opium by the parents, believing it would resolve their diarrhea. In 2006, all of these children recovered their health and were discharged from the hospital. However, one child died in 2018 due to poisoning with methadone.

Based on the data presented in Table 1, statistically significant differences were found regarding the types of opioid substances that were the causes of pediatric poisoning in 2006 versus 2018.

## Discussion

**Methadone poisoning:** Methadone is a synthetic opiate with long-acting effects and has been increasingly responsible for pediatric poisoning cases in recent years [6], often leading to irreversible complications. In many countries, methadone is stored in containers with a conspicuous warning label on them or in child-resistant bottles. However, with the rise in MMT centers operating across Iran since 2003, this drug is not distributed appropriately. Also, it is often stored in bottles used for other beverages or in drinking water bottles in refrigerators, hence the increased risk of pediatric access and poisoning with methadone [7, 8]. The most frequent symptoms of methadone poisoning are drowsiness, miosis, and low consciousness. All of these symptoms are silent and not easily detected as being dangerous by the parents. Therefore, there is usually a long interval between the methadone ingestion by children and the point when the parents may suspect the poisoning symptoms [9]. Fourteen cases of methadone poisoning in 2006 (8 boys and 6 girls), and 36 cases in 2018 (27 boys and 9 girls) indicate that this toxic and risky substance is fairly easily within the reach of children in houses where the parents use this

**Table 1.** Pediatric cases of poisoning with various types of opioid substances in 2006 and 2018

Year	No. (%)			P
	Opium	Methadone	Morphine	
2006	13 (92.9)	0	1 (7.1)	0.0001
2018	1 (2.8)	35 (97.2)	0	

drug. Finally, in most cases, poisoning with methadone has been accidental [5-7].

Farnaghi, et al. [3] conducted a descriptive, cross-sectional study about all children less than 12 years old poisoned with methadone, who were hospitalized at Loghman Hakim Hospital, in Tehran, during the second half of 2009. These patients had been poisoned accidentally, due to their parents' faults. The time lapse between the ingestion of methadone and the onset of symptoms was 1.53 hours, indicating a rather long interval post-poisoning. They reported that more than half of these patients who were referred to other centers before their admission to Loghman Hakim Hospital, had no treatment. Again, this points out to the need for greater emphasis on patients and parents' education in this respect [3]. In our study, the mean time interval between the methadone ingestion and the onset of symptoms was  $2.67 \pm 3$  hours. The early symptom was mainly low consciousness and drowsiness. In some cases, generalized itching, in five cases apnea and in few cases, vomiting was the early symptoms before the children were brought to the hospital. Surprisingly, a one-day old neonate was given opium to calm her from crying at night and in some others, parents used it to treat diarrhea in children. In the remaining cases, opium was ingested by the children accidentally. In many cases of methadone poisoning, it was ingested mistakenly, either by the children because the liquid looked like water or because it was stored in an antitussive or water bottle.

**Poisoning with opioids and other drugs:** In 2006 and 2018, a total of 50 pediatric cases were hospitalized at the 17<sup>th</sup> Shahrvivar Hospital in Rasht, Iran, due to poisoning with opioid substances. Of these cases, 14 of them occurred in 2006 and 36 in 2018. The marked rise in the number of cases indicates that the poisoning rate has increased by more than 2.5 times. This is consistent with those reported by two previous studies [3, 10], both of which conducted at Loghman Hakim Hospital in Tehran. In 2018, the mean age of pediatric poisoning cases was  $53.46 \pm 37.95$  months old. This clearly indicates that the children were at an age when they were able to put things in their mouth or to drink liquids without help from their

parents. In most cases, these children were poisoned with opioid substances accidentally while playing games around their houses. In the case of methadone poisoning, children mistook it for other tablets, candies or water.

**Easy access:** Concerning the types of poisoning substances, 97.3% of the cases happened with methadone and only 2.7% with opium in 2018. Whereas in 2006, opium poisoning occurred in 92.9% and morphine poisoning in 7.1% of cases, with no poisoning happened due to methadone. The children's relatively easy access to methadone is the main reason for the rise in the poisoning after launching the MMT program in Iran. Therefore, proper storage of methadone in child-resistant bottles is of great importance to keep this poisonous substance out of reach of children. Based on the data collected by this study, unfortunately one child has died due to methadone poisoning. Pediatric death has also been reported by other studies [11], highlighting the importance of establishing preventive measures against methadone poisoning in children. The increase in methadone consumption in the society mandates high attention to its hazardous complications by families, physicians, health providers and most importantly, health policy makers.

**Poisoning and household Issues:** Mansouri, et al. [12] evaluated unintentional pediatric poisoning risk factors in Tehran in 2013. Their findings revealed that 58.6% of cases were due to opiates but methadone ranked the highest toxic substance for pediatric poisoning (74.7%) [12]. They concluded that mother's occupation, parents smoking, presence of addicts or mental patients at homes, and storing opioid substances at inappropriate places at homes are responsible for the rise in the unintentional pediatric poisoning cases [12]. However, the current study found no association between the types of opioid substances, gender and place of living. In this study, the mean age of the patients was 53 months which was higher than that in other studies [7]. In these studies, the incidence of poisoning with opium was greater, most likely due to the families' belief that opium was good for treating restlessness, diarrhea or making young babies fall asleep. Thus, in little babies, it was possible that they found pieces of opium around the house, picked it up and put it in their mouth.

An earlier study [5] investigated the causes of acute poisoning in adults between 2006 and 2011. During this study's period, 108265 patients with poisoning symptoms were hospitalized in Loghman Hakim Hospital, Tehran. Although antiepileptics and analgesics accounted for most of the poisonings, a shift has occurred from opium to methadone intoxication. The rate of heroin overdose and other opioids has decreased dramatically, apparently due to the availability and operation of MMT clinics for opiate addicts, where they receive methadone therapy [5]. In our study, at the beginning of MMT Program in 2006, no toxicity with methadone was reported. However, in 2018, 35 methadone poisoning cases were documented, although opium poisoning cases declined from 13 in 2006 to only one in 2018. Based on this finding, opiate addicts increasingly tend to receive methadone from MMT centers instead of buying it illegally on the streets. Albeit, the children of these individuals are more at risk than others, since they may reach methadone largely due to being accessible and/or stored inappropriately at home.

This study initially planned to compare the rate of opiate poisoning in 2003, i.e., before the widespread launching of the MMT program in Iran with that of 2018. However, due to the lack of access to the records of admitted patients into hospitals in 2003, we actually began researching this issue starting with 2006. Moreover, the patients' education level and occupations were not recorded in their hospital charts and consequently were not analyzed in our study. Finally, based on this and other studies conducted since 2006, the frequency of pediatric opioid poisoning has increased in Rasht, Iran. It is, therefore, imperative that the impact of parents' education level, jobs, and the presence of opiate addicts in many households be studied versus the pattern of pediatric poisoning cases across all provinces in Iran.

## Conclusions

In this study, the authors compared the opiate poisoning in 2006 versus 2018, i.e., some 15 years after launching the MMT program in Iran. Unfortunately, the overall rate of poisoning and methadone intoxication have increased significantly, resulting in the death of one patient to date. Specifically, a considerable rise in cases of pediatric poisoning with opioids has occurred in Rasht, Iran, with a progressive increase in methadone poisoning. This has likely occurred due to the unsafe access of children to methadone, especially after the initiation of MMT program for opiate addicts in Iran. This has become the most prevalent cause of poisoning among children with these deadly substances. Therefore, initiating preventive plans

are recommended to restrict children's access to this and other toxic substances, combined with ongoing community-wide monitoring and warning programs to families. To materialize this vital goal, appropriate actions should include but not limited to, updated training and continuing education for physicians involved in MMT program, and for parents and members of the community at large. Most importantly, it is vital to store methadone and other opiate drugs at home in safe and secure packages that are inaccessible to children.

## Ethical Considerations

### Compliance with ethical guidelines

This study was approved by the Ethics Committee of Guilan University of Medical Sciences (Ethics Code: IR.GUMS.REC.1394.336).

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### Author's contributions

All authors equally contributed to preparing this article

### Conflict of interest

The authors declared no conflict of interest.

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