

Accidental Ingestion of Toxic Materials in the Pediatric Population in Dubai: A Retrospective Descriptive Study

Mennatallah Farouk^{1*} and Noura AlSuwaidi²

¹Senior specialist registrar, Pediatric Emergency Department, Dubai Hospital, Dubai Health Authority, Dubai, UAE.

²Year 4 Pediatric Residency program, Medical Education and Research Department, Dubai Health Authority, Dubai, UAE.

***Corresponding Author:** Dr. Mennatallah Farouk, Senior specialist registrar, Pediatric Emergency Department, Dubai Hospital, Dubai Health Authority, Dubai, UAE.

DOI: <https://doi.org/10.58624/SVOAPD.2023.02.023>

Received: December 14, 2022 **Published:** January 02, 2023

Abstract

Introduction: The problem of childhood poisoning in Dubai remains one of the less analysed public health issues.

Aim: This study aimed to describe the epidemiology, pattern, duration and the results of treatment of poisoned patients who were seen in Dubai and Latifa hospitals in Dubai, United Arab Emirates UAE, between the months of September 2017 and September 2019. Additionally, the study examined possible risk factors for childhood poisoning, response to and management of poisoning emergencies.

Methodology: This retrospective descriptive study is a hospital-based study which analysed clinical profiles of children of 13 years and below taken at two health care centres within the 2 years of study for treatment of poisoning complications.

Result: The study found that out of 603 poisoning cases recorded, 579 patients met the inclusion; the majority of the patients were (n=355; 61.3 %) males and (n=224; 38.7%) females. Data written on the data collection form were transferred into excel and later into SPSS. The data were analysed using frequencies and percentages, and a chi-square test was used for categorical variables. The most common toxic substances ingested by children were cosmetic and personal care products (n=130; 22%). The recorded admissions in the course of research period were 104 which accounted for 18 % of the total poisoning cases.

Conclusion: This research concluded that the most common toxin ingested was personal care products and detergents. Poison ingestion was more predominant in males and children below 5 years of age.

Abbreviation: UAE: United Arab Emirates.

Keywords: Poisoning, Accidental ingestion in children, Toxins, Pediatrics.

Introduction

Poisoning is defined as, drinking, or breathing a dangerous substance. (1) Due to the exploratory behaviour of children, accidental and intentional toxin ingestion is a common incident. Unintentional poisoning by household cleaning product is common in children. (2) Due to the development of the infant's gross and fine motor skills, and the robust development of the brain, in addition to their curious behavior they are more liable to toxin ingestions. More than 2.5 million exposures reported by the American Association of Poison Control Centers' National Poison Data System in 2008, 51% occurred in children aged 5 years and younger, 6% in those aged 6–12 years, and 7% in those aged 13–19 years. (3) Only less than 1% of poisoning is reported to be serious. (4)

Toxin ingestion is an important cause of morbidity in the pediatric population, and most of the cases can be preventable by developing certain simple preventive measures.

The anatomy and physiology of the pediatric age group varies according to age, the maturation of the liver and the activation of its enzymes are one of the factors that determines the extent of toxicity, in addition to the drug itself and the route used.

Factors such as gastric pH and emptying time, intestinal transit time, immaturity of secretion and activity of bile and pancreatic fluid among other factors determine the oral bioavailability of pediatric and adult populations. (5) Anatomical, physiological and biochemical characteristics in children also affect the bioavailability of other routes of administration.

Key factors explaining differences in drug distribution and drug effect between the pediatric population and adults are membrane permeability, plasma protein binding and total body water. As far as drug metabolism is concerned, important differences have been found in the pediatric population compared with adults both for phase I and phase II metabolic enzymes. Immaturity of glomerular filtration, renal tubular secretion and tubular reabsorption at birth and their maturation determine the different excretion of drugs in the pediatric population compared to adults and as a result the effects of toxin ingestion in the pediatric population.

Children may be attracted to potentially toxic agents based on colour or appearance of the agent or the container, mistakenly identifying it as a candy or beverage. Children are curious and discover their environment with all their senses, including. (6) Younger children are more willing to taste dangerous substances than older children and perform hand-mouth behaviours nearly 10 times an hour which is very concerning.

The purpose of this study is to describe the epidemiology, pattern, duration and the results of treatment of poisoned patients who were presented to the pediatric emergency departments in Dubai and Latifa Hospitals between September 2017 and September 2019.

Methodology

Study Population and its Setting

This retrospective descriptive research is a hospital-based study which was carried out in Dubai, covering 2 main hospitals, Dubai Hospital and Latifa Women and Children hospital. Childhood poisoning data used in this research were obtained from the individual files recorded and maintained in the authority's registry from the electronic medical records system (EPIC/Salama).

Ethical consideration

Our research complies with the guidelines for human studies, and it was conducted ethically in accordance with the World Medical Association Declaration of Helsinki. Ethical approval from Dubai scientific research ethics committee was obtained prior to starting this research. Approval number: DSREC/RRP/2018/05 Date: 30/07/2018. A general consent was taken from the parents of all participants using a deidentified data for research and publication purposes.

Participants

This research involved all patients, children who visited the emergency units of Dubai and Latifa hospitals with either acute unintentional or intentional poisoning. The patients were recruited to this retrospective descriptive study only after their respective poisoning events were confirmed following the initial evaluation at the hospital's emergency department and subsequently at general pediatric wards. All the poisoning cases involving children of ages between 0-13 years were included in this research. The cases of food poisoning, snake bites, allergic reactions as well as adverse drug reactions which can be examined in the preview of toxicology were excluded from this research. Children with doubtful poisoning where there was no clear aetiology following intensive examination by toxicological professionals within the two facilities were also excluded and those falling out of the frame time and age groups.

Study Design

Data collection in this research was carried out in a retrospective and descriptive manner within the stipulated period of study. The patient's information regarding his or her medical history as far as unintentional ingestion of toxic substances is concerned, physical examination as well as demographic data that included age and sex were acquired using patient's files on the electronic Salama system. The age groups studied in this research were grouped based on their age in which there were 1-12 months, 12 months to 5 years and 6-13 years. The type of poisoning substance was also identified and recorded. The agents leading to the poisoning cases were documented under 7 main categories after which toxicants and toxic effects in each category were given identification codes for easier access. The length of the hospital stays, the medical intervention in the emergency and in the ward as well as the outcome of the unintentional poisoning were also recorded.

Data Collection

The data used in this study were gathered from the patient's parents and/or guardians while some were collected from the files recorded and electronic medical record. The data collection aimed at capturing the patient's demographic information, poisoning associated factors, first actions taken and clinical management of the poisoning situation. Data recorded on the data collection form were transferred into an excel program, and then later into SPSS. The data were analysed descriptively using frequencies and percentages. A chi-square test was used for categorical data with an alpha level of 0.05.

Inclusion Criteria

This study included all males and females with 13 years and below who were diagnosed with toxin ingestion within September 2017 and September 2019. Also, the study considered only those patients that visited the emergency units in the two hospitals: Dubai and Latifa hospitals within the 2 years period.

Exclusion Criteria

The research excluded all intentional cases of poisoning whenever they were mentioned by the patient's parent and/or guardian and in Salama system. Additionally, poisoning cases that fell outside the stipulated study period were not considered for the study and those with no proper documentation on their files were excluded as well.

Study Period

The study period for this research is 2 years beginning in September 2017 and ending in September of 2019.

Results & Discussions

The overall poisoning cases involving children of ages between 0-13 years who attended the emergency units of the two health care institutions in the course of two years covered by this research were 603, however 579 patients met the inclusion and exclusion criteria. Of the 579 patients, 355 were males (61.3%) and 224 were females (38.7%). The mean age of patients were 2.6 years with a 95% confidence interval (2.47-2.82). The age group of patients were divided into 1-12 months, 12 months to 5 years and 6-13 years.

The type of toxin ingested were subdivided into 7 categories (table 1). The most common were cosmetics, personal care products and detergents accounting for 130 cases (22.5%) 83 patients of them were males (63.8%) the rest were females 47 (36.2%) 60 patients (46.2%) of the 130 the amount of medication taken were not known.

Nine cases were reported that parents are not exactly sure what they have ingested or that it was a mixture of medications which accounts for (1.6%).

The number of cases where the amount of toxin taken were known were 364 (62.9%) the rest (37.1%) were not known.

Patients were investigated differently, 258 (44.6%) patients did not require any investigations, 201 (24.7%) required blood investigations only, 59 (10.2) required additional ECG or imaging, 61 (10.5%) required all three bloods, ECG and imaging.

The management in the emergency department were categorized into 4 categories (table2):

The number of patients that needed admission were 104 (18%) of the 579. The inpatient management mostly (98.6%) consisted of observation and supportive management, only 8 patients (1.4%) required additional treatment directing towards the toxin's side effects as an antidote.

Fifteen patients (2.5%) out of the 579 developed complications (Table 3). One of the patients who developed complications had both electrolyte disturbances and disturbed coagulation and another one had both hematemesis and respiratory distress in conjunction. (Table 3)

Table 1: Type of toxins among the studied population.

Toxin type	Number of cases (n) Percentage (%)
Cosmetics, personal care products and detergents	130 (22.5%)
Analgesics, antihistamines and antibiotics	95 (16.4%)
Vitamins	85 (14.7%)
Foreign substances	120 (20.7%)
Anti-hypertensives and oral hypoglycemics	33 (5.7%)
Others	107 (18.5%)
Unknown	9 (1.6%)
Total cases	579 (100%)

Table 2: Type of medical management provided to the studied population.

Management type	Percentage
Activated charcoal	19.8%
IV fluids and other management	4.49%
Supportive/observation	66.4%
Gastric lavage	8.5%
Other	1%

Table 3: Recorded complications in the studied population.

Complication	Percentage
Hematemesis and gastrointestinal disturbances	33.3%
Electrolyte disturbances	33.3%
Psychological disturbances	13.3%
Respiratory distress	13.3%
Disturbed coagulation	6.6%
Extra-pyramidal side effects	6.6%
Tachycardia/bradycardia	16.6%

The average length of stay was 1.3 days for those who were admitted in the hospital. Chi-square test was run to see whether the type of toxin was related to age and that yielded a (P value= 0.994) which is not significant.

There was a significant relationship between the type and the amount of toxin ingested with a p value of <0.05.

There was a significant correlation as well between the type of toxin and the investigations needed for the diagnosis and management with a p value of <0.05.

There was an association between the type of toxin and the need for investigations with a P value of 0.05.

There was a significant relationship between the type of toxin and the in-patient management with a p value of 0.05.

Discussion

This retrospective descriptive research was conducted in two most health care facilities in Dubai, Dubai Hospital and Latifa Women and Children Hospital to which most of the patients within the emirate are referred to. Therefore, the sampled population in this research is a representative of people living within Dubai and UAE at large.

This study aims to determine the incidence of ingestion of toxins in the pediatric population in Dubai and Latifa hospitals, the agents of toxic ingestion, the management, the investigation, the hospital length of stay and the complications that arouse.

This study also aimed to provide scientific evidence for the need for clear guidelines in DHA for toxin ingestions and to establish the need of awareness on ingestion of toxins for the general population.

Age of the studied population

In this study, the mean age was around 2.6 years, with the majority of cases between 1-5 years of age. These results are similar to those found in other parts of the world. For instance, in Australia, the research of Victorian public hospitalization revealed that admissions for unintentional injuries resulting from poisoning in those children with 5 years and below accounted for 16.8% of all emergency admissions mostly in children of between 1 and 2 years of age. (1) Mc Gregor et al, found that children younger than six years accounted for 51 % of the exposures in their study. Of these, 38 % involved children three years of age or younger. (3)

Furthermore, research by Reith et al. and Morrison et al. have confirmed that the young generation of ages between 0-4 years in most cases admitted due to ingestion of toxic substances as they interact with their living environment. (4)

The high rate of poisoning in this particular age bracket can be probably associated with the curiosity nature of children especially in the ages between 2-3 years, and the development of their fine and gross motor skills and their robust brain development, as their central nervous system goes through rapid development by the age of 2-3 years; the development of the five senses in particular oral sensation as well. Moreover, they imitate their parents as part of learning. This partly explains the higher risk for medicinal poisoning at that particular preschool group of children. This high risk is confirmed by the high rate of emergency hospitalization observed in the two hospitals in this study.

Gender of the studied population

The incidence of toxin ingestion was found to be higher in males (n= 355. 61.4%) as compared to females (n=224, 38.7%), this finding is similar to the research by AlNajjar et al. and Ahmed et al who found in their studies that male predominates the incidence of poisoning ingestion below 5 years. (7-8)

However, in a study by Abdel Baseer et. Al, performed on organophosphorus poisoning, it was found that the majority were females, this might be due to the intentional ingestion was higher in females. (9)

Type of toxin ingested

This descriptive study revealed the vast diversity of toxins ingested by children who came to the emergency department of the two hospitals.

The toxins were divided in to seven categories the highest percentage was found to be the cosmetics and personal care products (22.5%), this can be due to their availability and due to the imitative behavior that children exhibit.

In this category, chemicals such as drain cleaners, glue, hair dye, soap detergents, shampoo, and creams were included as the most common toxin in the pediatric population. While other studies found that toxins such as organ phosphorous poisonings was the most common type of poison, (7) this could be due to that the Al Najar's study was performed in Kashmir where horticulture and agricultural activities were common.

In this research, it is concluded that analgesics and other common drugs are the 2nd most common toxic agent ingested in the study population (16.4%), which is similar to research from other parts of the world that have confirmed that analgesics such as acetaminophen, anti-depressants as well as anti-hypertensive medicinal drugs are responsible for high frequencies of poisoning in children. (10-11) This clearly reveals that conventional medicinal drug substances utilized by parents or other family members form a significant portion of potential poisoning in children across the world. (12)

Similarly, Ahmed et al., 2015 confirmed that analgesics are the most common medicinal drugs linked to the poisoning of children in households across the country. (8) The reason behind this observation is due to the fact that non-opioid analgesics drugs are easily accessible by children. In most cases, these substances are stored close to the floor where children can easily reach and ingest leading to their poisoning. Correspondingly, the ease of access to these analgesics substances is also partly explained by the fact they are most frequently prescribed by medical practitioners and as such they are readily available as over-the-counter preparations. (13) This finding is also echoed by Hoy JL, et al who revealed the widespread utilization of over-the-counter medicinal drugs as one of the primary factors responsible for the prevalent occurrences of unintentional poisoning in childhood. (1)

Types of management

In this study, it was reported that the majority of the patients received supportive management 90.69% such as intravenous fluid and/or activated charcoal. Approximately, 20% of patients received activated charcoal which was administered upon arrival at the emergency department. A number of volunteer trials support the efficacy of activated charcoal when it is administered early after ingestion, with absorption decreased by up to 95% or more when activated charcoal is administered within five minutes. (14-15)

Despite the results of these trials, it is important to remember that volunteer scenarios may differ markedly from actual poisonings with respect to the timing of presentation, amount of toxin ingested, and presence of other factors, such as food in the stomach or drugs that alter gastrointestinal transit times.

In this study, 8.5% of patients who were seen in the emergency department were managed with gastric lavage, however, The American Association of Poison Centres (AAPC) and the European Association of Poisons Centres and Clinical Toxicologists (EAPCCT) have released a statement that gastric lavage should not be routinely used in the management of poisoned patients. (16)

In a randomized controlled trial of 808 poisoned patients, symptomatic patients treated with gastric emptying (either ipecac or gastric lavage) had a fourfold increase in intubation rates and a two-fold increase in the rate of ICU admission compared to those receiving activated charcoal. (17) Gastric lavage was associated with a significantly increased risk of aspiration pneumonia. Gastric lavage poses significant risks, which outweigh the benefit and due to the possible complications, its use should be limited if not stopped, and due to this information, the local guidelines should be revised and updated to international guidelines to stop the use of gastric lavage in the two hospitals where the study was made.

Length of hospital stay

The average length of stay was 1.3 days for those who were admitted in the hospital which is similar to other studies which found that the average length of stay was less than 3 days. (1)

Conclusion

In this retrospective descriptive study, we found that cases of unintentional ingestion of toxic substances in children across Dubai are higher among the male children aged 5 and below years. The most common toxic substances ingested by children were cosmetic and personal care products and detergents followed by over-the-counter medications such as acetaminophen. Length of hospital stay was 1.3 day in average. The majority of cases received observation and supportive care; however, gastric lavage was still used.

Study Strengths

- This study is the first study that searched the incidence of poisoning in children in the 2 main children's hospitals in Dubai.
- The quality and consistency of the large sample size and the data obtained from the registries of Dubai and Latifa Women and Children hospitals.

Weaknesses

- The unavailability of some data and unfound medical records for several cases.
- This study is being descriptive with limited knowledge since in most cases the amount of ingested toxic materials as well as the treatment processes for each case could not be determined.
- The lack of documentation in a few of patients' files.

Recommendations

Easy access to poisonous substances has been confirmed to be one of the major risk factors behind the numerous cases of childhood poisoning. The lack of adequate knowledge and education in the caregivers as a preventive measure has also played a critical role in the high rate of childhood poisoning across Dubai. This calls for an increase in the public awareness regarding the safe handling of poisonous substances in the residential settings. The relevant authorities through a mass media and newspapers in Dubai need to offer practical information geared towards tackling, reducing as well as doing away with this risk factor. As well as the establishment of a child poisoning centre with a helpline is necessary to provide accurate and timely information to healthcare professionals and patients.

Spread awareness among healthcare professionals on the management of poisoning in children and the limited indication of gastric lavage.

Conflict of Interest

The authors declare no conflict of interest.

References

1. Hoy JL, Day L, Tibballs J, Ozanne-Smith J. Unintentional poisoning hospitalisations among young children in Victoria. *Inj Prev*. 1999; 5:31–5. doi: 10.1136/ip.5.1.31.
2. Yen CW, Lee EP, Cheng SC, Hsia SH, Huang JL, Lee J. Household cleaning products poisoning in a pediatric emergency center: A 10-year cross-sectional study and literature review. *Pediatrics & Neonatology*. 2021 Nov 1;62(6):638-46.
3. McGregor T, Parkar M, Rao S. Evaluation and management of common childhood poisonings. *Am Fam Physician*. 2009;79(5):397–403.
4. Reith DM, Pitt WR, Hockey R. Childhood poisoning in Queensland: an analysis of presentation and admission rates. *J Paediatr Child Health*. 2001; 37:446–50. doi: 10.1046/j.1440-1754.2001.00666.x.

5. Fernandez E, Perez R, Hernandez A, Tejada P, Arteta M, Ramos JT. Factors and Mechanisms for Pharmacokinetic Differences between Pediatric Population and Adults. *Pharmaceutics*. 2011 Feb 7;3(1):53-72. doi: 10.3390/pharmaceutics3010053. PMID: 24310425; PMCID: PMC3857037.
6. WHO-UNICEF. Children and poisoning: world report on child injury prevention. World Health Organization.2008. [http://www.who.int/violence_injury_prevention/child/injury/world_report/en/, date accessed: March 15, 2014]
7. Najar B. Profile of poisonings in children in south Kashmir, north India. *Current Pediatric Research*. 2022
8. Ahmed, A., AlJamal, A. N., Ibrahim, M. I. M., Salameh, K., AlYafei, K., Zaineh, S. A., & Adheir, F. S. S. (2015). Poisoning emergency visits among children: a 3-year retrospective study in Qatar. *BMC pediatrics*, 15(1), 104. (4)
9. Abdel Baseer KA, Gad EF, Abdel Raheem YF. Clinical profile and outcome of acute organophosphate poisoning in children of Upper Egypt: a cross-sectional study. *BMC pediatrics*. 2021 Dec;21(1):1-8.
10. SIDDIQUI SU, IQBAL M, FARHANA ZAFAR RM, Khan L. Spectrum of Accidental Poisoning in Children Presenting to Dr. Ziauddin Hospital Emergency Department. *Pak Pediatr J*. 2022;46(1):37-41.
11. Manzar, N., Saad, S.M.A., Manzar, B. et al. The study of etiological and demographic characteristics of acute household accidental poisoning in children - a consecutive case series study from Pakistan. *BMC Pediatr* 10, 28 (2010). <https://doi.org/10.1186/1471-2431-10-28>.
12. Murali, R., Bhalla, A., Singh, D., & Singh, S. (2009). Acute pesticide poisoning: 15 years' experience of a large North-West Indian hospital. *Clinical toxicology*, 47(1), 35-38.
13. Gossel, T. A., & Bricker, J. (1994). *Principles Of Clinical Toxicology*, Third Edition. Boca Raton: CRC Press.
14. Neuvonen PJ, Elonen E. Effect of activated charcoal on absorption and elimination of phenobarbitone, carbamazepine and phenylbutazone in man. *Eur J Clin Pharmacol* 1980; 17:51.
15. Lapatto-Reiniluoto O, Kivistö KT, Neuvonen PJ. Activated charcoal alone and followed by whole-bowel irrigation in preventing the absorption of sustained-release drugs. *Clin Pharmacol Ther* 2001; 70:255.
16. Vale JA. Position statement: gastric lavage. American Academy of Clinical Toxicology; European Association of Poisons Centres and Clinical Toxicologists. *J Toxicol Clin Toxicol*. 1997;35(7):711-9. doi: 10.3109/15563659709162568. PMID: 9482426.
17. Parish, R. A., & Brownstein, D. (1986). Emergency department management of children with acute isoniazid poisoning. *Pediatric Emergency Care*,2(2), 88-90. doi:10.1097/00006565-198606000-00006.

Citation: Farouk M, AlSuwaidi N. "Accidental Ingestion of Toxic Materials in the Pediatric Population in Dubai: A Retrospective Descriptive Study". *SVOA Paediatrics* 2023, 2:1, 01-07. <https://doi.org/10.58624/SVOAPD.2023.02.023>

Copyright: © 2023 All rights reserved by Farouk M., et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.