



## Original article

## Paediatric poisoning in Kuwait-Al Adan joint hospital: The need for functional poisoning control centre in Kuwait

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## ABSTRACT

Poisoning is a major global health concern. Every year, unintentional poisoning contributes to 106,683 deaths globally. In Kuwait, paediatric poisoning cases comprise approximately 50% of total poisoning cases. Despite the extensive importance and the long history of poison control centres (PCCs) and the emphasis of the World Health Organization (WHO) to establish a PCC in Kuwait, no functional PCC exists in Kuwait. Here we reported 82 poisoning cases between July and December 2020, revealing a 100% increase in comparison to the official figures published in 2004 and 2005. No fatalities were reported, and all cases were discharged home within 12 h of their visit to the casualty. Children aged 2 to < 4 years comprised the most reported poisoning cases with approximately 45% of the total. The number of male child poisoning cases was approximately two-fold of female children. The most common poisoning agent was silica gel granules (9%) followed by medicines – reported as paracetamol (7%), diclofenac (7%), multivitamin gummies (7%) and vitamin C (5%). Among other causes of poisoning were ingestion of salbutamol nebulizer solution (4%), oral contraceptives and insecticides (4%). These findings reveal the importance of establishing a functional PCC in Kuwait to minimise the unnecessary visits following ingestion of expired orange juice and henna, that may encounter further contraction of infections, especially with the current state of the COVID-19 pandemic. Moreover, a functional PCC would provide comprehensive data and hence further intervention such as shifting the dosage form of salbutamol from nebulizer solution to metered dose inhaler with a spacer, in addition to increasing public awareness towards minimizing such a dramatic increase in casualty visits because of -suspected poisoning.

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## 1. Introduction

Poisoning is a major global health concern. According to the World Health Organization (WHO), unintentional poisoning contributed to 106,683 deaths in 2016 and the loss of 6.3 million years of healthy life (disability-adjusted life years) (World Health Organization, 2014, World Health Organization, 2020). According

to previous official data from the Kuwait Ministry of Health, paediatric poisoning cases comprise approximately 50% of the total poisoning cases in Kuwait. This is attributed mainly to the availability of a wide range of medicines and chemicals, and inappropriate storage of medication, as well as the lack of appropriate supervision whilst in the house (Abahussain and Ball, 2010). Poisoning is considered a main cause of hospital casualty visits. The need for urgent and appropriate diagnosis and treatment reveals the importance of establishing a poison control centre (PCC) that provides specialized healthcare to provide optimum treatment to every poisoning substance and product, in addition to conducting a focus for toxicological research (World Health Organization, 2020). A PCC is a specialized healthcare unit that provides numerous services ranging from functioning as an information centre to providing consultations, while supporting the prevention, diagnosis, and management of poisoning (World Health Organization, 2020). Historically, the first PCC in the world was established in 1953 in Chi-

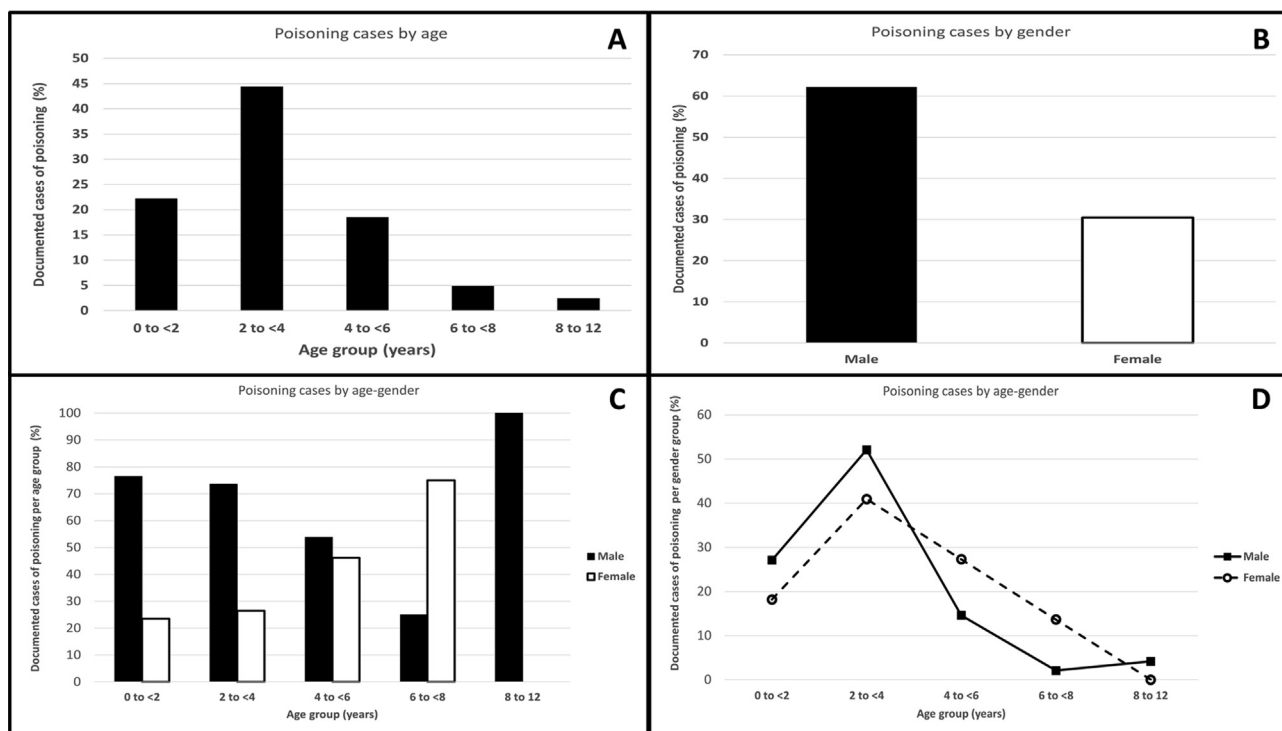
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**Fig. 1.** Demographic characteristics of 82 paediatric poisoning cases in Kuwait-Al Adan Paediatric Joint Hospital from the 1st of July until 31st of December 2020. (A) Poisoning cases and the age factor ranging from 0 to 12 years, presented as percentage of total of 82 cases of poisoning. There were 8 poisoning cases of unspecified age (data not shown) (B) Poisoning cases and the gender factor presented as percentage of total of 82 cases of poisoning. There were 7 cases without specified gender information (data not shown) (C) Poisoning cases and the combined factors of both age and gender, categorised by age group showing significant difference by gender  $P < 0.001$  analysed by Chi-square test. Data presented as percentage of each age group. (D) Poisoning cases and the combined factors of both age and gender categorised by gender showing significant difference by age  $P < 0.001$  analysed by Chi-square test. Data presented as percentage of each gender group.

cago in response to the sharp increase in fatal poisonings in paediatrics in 1950 when statistics revealed that 49% of cases treated by members of the American Academy of Paediatrics were paediatric poisonings. Afterwards, the first PCC in Europe was established in 1960 in the Netherlands. These early centres derived procedures and medicines to treat poison cases from a variety of medical specialities including paediatrics, intensive care, forensic medicine, occupational health, analytical toxicology, pharmacy, and pharmacology. The services were initially provided through telephone calls before evolving rapidly in parallel with information technology to include Internet databases that involve continuous data collection, analysis, and report generation (World Health Organization, 2020). Despite the extensive importance and the long history of PCCs and the call by WHO to establish a PCC in Kuwait (World Health Organization, 2014), there is still no functional PCC in Kuwait. The lack of such an essential healthcare body exacerbates the problem of managing poisoning cases and contributes to further burden on the health system where families visit casualty departments after each incident of real or suspected toxicity (AbeerAl-Mutawa et al., 2015).

This study aims to investigate the most common poisoning causes at Kuwait-Al Adan Paediatric Joint Hospital during the six-month period from July to December 2020 to clarify the importance of establishing a PCC in Kuwait to minimise the unnecessary hospital visits to identify the risk factors associated with poisoning.

## 2. Methods

The study did not require patient consent or approval by an ethics committee, as no intervention was involved, data were anonymised and no patient identifying information was included. Between 1st of July 2020 and 31st of December 2020, data were

retrospectively collected from Kuwait-Al Adan Paediatric Joint Hospital, mainly from two resources: patient medication requests in the pharmacy and the admission logbook in the observation room to identify the age and gender of patients, in addition to poisoning agent and whether the patient was admitted into the hospital or discharged to return home. Thereafter, data were descriptively analysed to compare the poisoning cases in relation to the age and gender of children. Further analyses were conducted to calculate the number of poisoning cases that were attributed to medicines, chemicals, or miscellaneous agents to identify the most common poisoning agents.

To analyse the type of poisoning agent, drugs were segregated in pharmacological classes. Thus, vitamins include multivitamin gummies, vitamin C, vitamin D, zinc, and folic acid; painkillers include paracetamol, diclofenac, mefenamic acid, and etoricoxib; antihypertensives include unspecified antihypertensives, candesartan, and bisoprolol; antihistamines include cetirizine and loratadine; antipsychotics include risperidone and unspecified psychotropic.

Descriptive data analyses were conducted to compare gender and age, while Chi-square test was conducted using SPSS (version 28.0.0.0) to analyse gender differences across age group, and age differences within each gender group. Data were presented as percentage of total of 82 cases. Since some frequencies were lower than 5, the Chi-square test was adjusted using Yate's correction. Statistical analyses were not conducted on cases of unknown age and/or gender.

## 3. Results

From 1st of July until the end 31st of December 2020, 82 poisoning cases were reported in Kuwait-Al Adan Joint Paediatric

**Table 1**  
Demographic characteristics of the poisoning cases in in Kuwait-Al Adan Paediatric Joint Hospital between 1st of July until 31st of December 2020 (N = 82).

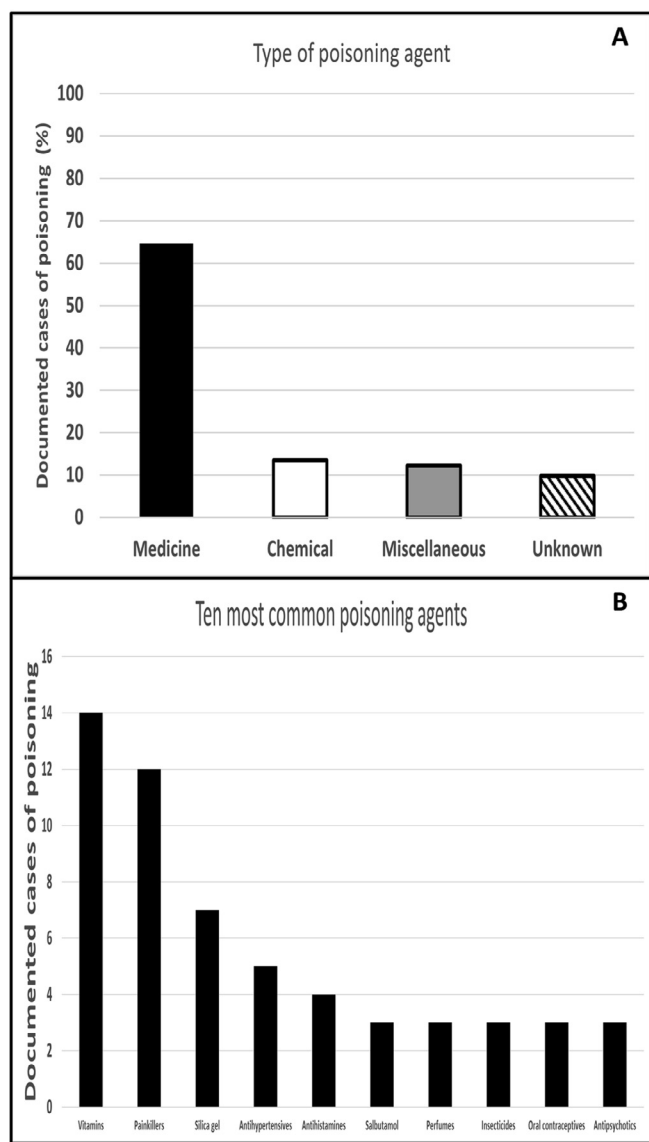
Age group (years)	Male Frequency	Female Frequency	Undocumented gender Frequency
0 to < 2	12	5	1
2 to < 4	25	10	1
4 to < 6	7	5	2
6 to < 8	1	3	0
8 to 12	2	0	0
Undocumented age	4	2	2
Total Frequency (%)	51 (62)	25 (30)	6 (8)

Hospital, with no fatalities reported. Each child was admitted with a record of exposure to one poisoning agent. Among the 82 poisoning cases, approximately 45% of the cases occurred in children aged 2 to < 4 years old (Table 1 and Fig. 1A). Moreover, male children

contributed to approximately 60% of paediatric poisoning cases while females contributed to one third of the cases (Table 1 and Fig. 1B). When combining age and gender factors, there was significant difference by gender across the age groups ( $P < 0.001$ ) (Fig. 1C). Thus, within 0 to < 2 years age group, male paediatrics comprised approximately 76% of the poisoning cases of the total number of cases ( $n = 17$ ). Moreover, male paediatrics composed approximately 73% of the poisoning cases of the total number of cases ( $n = 34$ ) within 2 to < 4 years age group. In 4 to < 6 years age group, male paediatrics cases contributed to approximately 54% of the total poisoning cases ( $n = 13$ ) in this age group. However, female paediatric poisoning cases were 75% of the total poisoning cases ( $n = 4$ ) in the 6 to < 8 years age group. There were only two cases reported in the 8 to 12 years age group, which were in the male paediatric group (Fig. 1C). Furthermore, there was significant difference in the age of poisoning cases, within each gender group ( $P < 0.001$ ) (Fig. 1D). Thus, male paediatrics aged 2 to < 4 years comprised approximately 50% of the total poisoning cases ( $n = 52$ ) in male paediatric poisoning cases, while female children from the same age group contributed to approximately 38% of the total poisoning cases ( $n = 24$ ) in female paediatric poisoning cases (Fig. 1D). There were 8 poisoning cases of unspecified age, and 7 cases without specified gender information. There was no significant relationship between age and gender among the poisoning cases ( $P = 0.17$ ).

Medicines were the most common agents of poisoning cases (65%) compared to chemicals (detergents, Clorox, Kerosene, alcohol, insecticides, and perfumes), and miscellaneous (silica gel, henna, expired orange juice and slime) reported in Kuwait-Al Adan Paediatric Joint Hospital. There were 8 paediatric poisoning cases of unknown poisoning agents, which contribute to approximately 10% of the total paediatric poisoning cases (Fig. 2A). The five most common poisoning agents were vitamins and minerals: multivitamin gummies, vitamin C, Vitamin D, folic acid, and zinc tablets (17%); painkillers: paracetamol, diclofenac, mefenamic acid, and etoricoxib (15%); silica gel granules (9%); antihypertensives: unspecified antihypertensives, candesartan, and bisoprolol (6%); and antihistamines: cetirizine and loratadine (5%) (Fig. 2B).

The five most common causes of poisoning cases were silica gel granules (9%), paracetamol (7%), diclofenac (7%), multivitamin gummies (7%) and vitamin C (5%) (Fig. 3).



**Fig. 2.** Type of poisoning agent and the ten most common causes paediatric poisoning cases in Kuwait-Al Adan Paediatric Joint Hospital reported in paediatric cases between 1st of July and 31st of December 2020. (A) the type of the poisoning agents as medicine, chemical or miscellaneous, presented as percentage of total of 82 cases of poisoning. (B) The ten most common poisoning agents, presented as number of cases.

#### 4. Discussion

In this study, we have shown the cases of poisoning in patients presenting at Kuwait-Al Adan Paediatric Joint Hospital during 6 months of the COVID-19 pandemic. In 2004 and 2005, the annual poisoning cases reported at Al-Adan Hospital were 100 and 128, respectively, while the average poisoning cases in Kuwait were 85 and 78, respectively (Abahussain and Ball, 2010). However, between the 1st of July until the 31st of December 2020, 82 poisoning cases were reported in Kuwait-Al Adan Paediatric Joint Hospital. Such a sharp increase in poisoning cases may be attributed to numerous factors such as full and partial curfews and virtual schooling that resulted in children spending more time in the house where they might encounter an increase in the probability of exposure to in-house medicines, chemicals, or other poisoning agents. As shown in Fig. 1A, approximately 70% of poisoning cases involved children within the age of 0 to < 4 years. Such a finding is similar to what was previously shown in a study reporting child poisoning cases in Romania where 25% of poisoning cases were within the 0–4 years old age group<sup>5</sup>. A similar study based on cases in the Kingdom of Saudi Arabia reported approximately 81% of poisoning cases were within the 2–4 year old age group (Al-Shehri, 2004). Poisoning of very young children is attributed

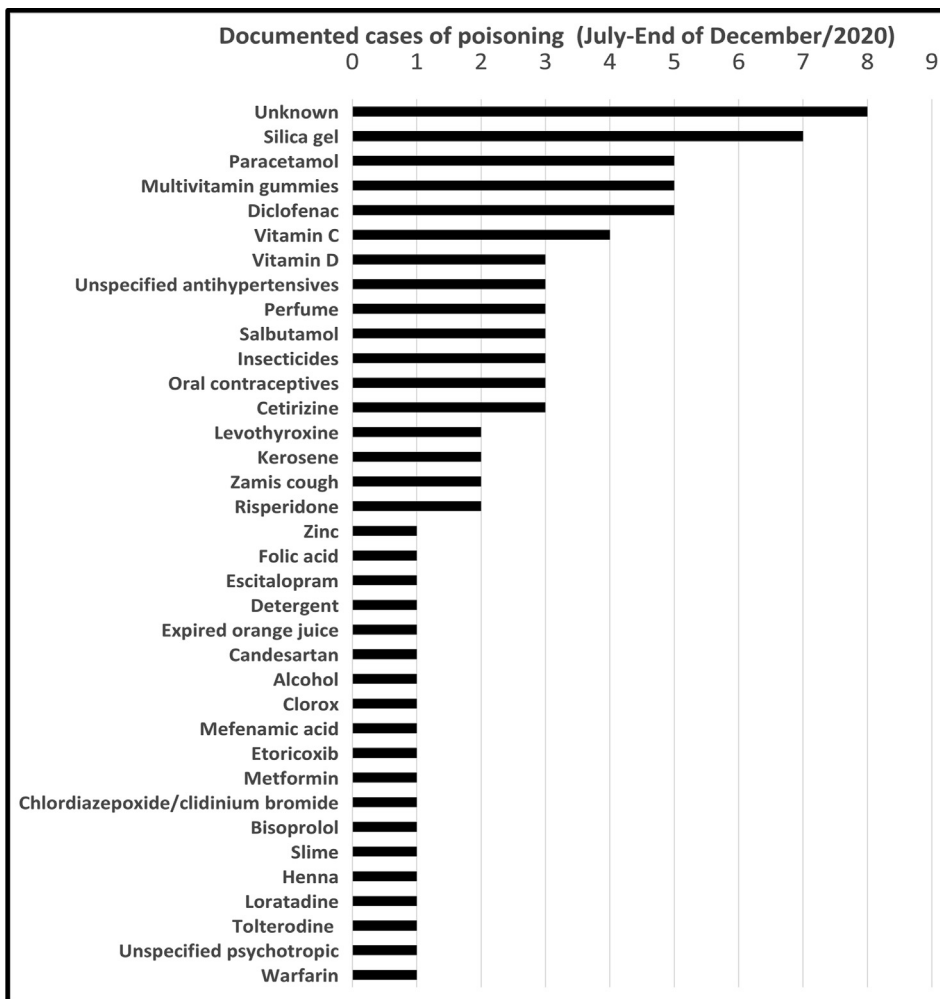


Fig. 3. Poisoning agents in 82 paediatric cases between 1st of July and 31st of December 2020 reported at Kuwait-Al-Adan Paediatric Joint Hospital. Data presented as number of cases.

to numerous factors, including the lack of childproof medication containers (Oprescu et al., 2012). Such a factor may explain the reason for medicines being the most frequently poisoning agents with 80% of the cases as shown in Fig. 2A and 2B. Moreover, limited parental knowledge concerning safe medication storage and child safety are considered additional factors behind such an increase in poisoning cases amongst those of the ages of 0–3 (Oprescu et al., 2012). Furthermore, when increasing the age range to < 6 years, the cases of poisoning increase to approximately 90% (Fig. 1A). Similar increase in cases was reported in the Kingdom of Saudi Arabia (Tobaiqy et al., 2020). Children under the age of 5 are naturally curious and cannot read labels. These two factors are considered as additional reasons for the increased risk of poisoning in this age group (Oprescu et al., 2012). Male children comprise approximately 60% of the poisoning cases (Fig. 1B). Similar increase in poisoning of male children was reported in other studies from the Kingdom of Saudi Arabia where approximately 55–68% of poisoning cases were in male victims (Tobaiqy et al., 2020, Al-Shehri, 2004). Such a gender factor can be linked mainly to the widespread social stereotype that allows male children greater freedom to explore the domestic environment (Aziz and Said, 2012).

The routine admissions policy contributes to straining the healthcare system and overloading healthcare providers, in addition to increasing costs by such a routine policy. In the US, the cost

of treating a paediatric poisoning admission is approximately \$335 (Abahussain and Ball, 2010). When applying such a cost to our study, it yields approximately \$27,470 for healthcare expenditure within the six-month period. Moreover, during such a critical time as the COVID-19 pandemic, a person may encounter unnecessary exposure to the novel coronavirus or other respiratory tract viruses that may lead them to contract COVID-19 or another respiratory viral infection. Therefore, avoiding unnecessary visits and admissions, such as after the ingestion of expired orange juice, and limiting visits and admissions to serious cases may reduce such financial and workload burdens for the healthcare system (Abahussain and Ball, 2010). Limiting admissions to serious cases in addition to reducing the financial and workload burden to the healthcare system can be tackled through establishing a functional PCC (World Health Organization, 2020). Additionally, the importance of having a functional PCC includes collecting poisoning data and identifying risk factors such as these that have been identified in our study for (1) the age group 0 to < 4 years and (2) male children. Such demographic factors can be tackled by merging policy and educational approaches such as repeated public education and awareness campaigns to tackle the exposure of children to toxic substances (Oprescu et al., 2012). Additionally, further strategies may reduce the cases of poisoning, such as shifting the dosage form of salbutamol from an inhalation liquid to a metered dose inhaler with an appropriate spacer, which may reduce the risk of

approximately 4% of poisoning cases that occurred because of ingesting salbutamol as shown in Fig. 2B. Moreover, further medicine security policies can be implemented, such as child-resistant, tampering-proof containers, and proper labelling that can be perceived by children as hazardous containers, especially for those who are under 5 years when children are actively curious but cannot read labels (Oprescu et al., 2012). Additionally, medicines from government healthcare centres are repackaged and dispensed in plastic envelopes, which may contribute to medicine exposures such as antihypertensive medicines shown in Fig. 2B (Abahussain and Ball, 2010). Therefore, appropriate repackaging in child-resistant medicine containers should be implemented to minimise medicine exposure. As shown in Fig. 2B, silica gel ingestion causes approximately 9% of the poisoning cases. Such exposures are attributed to lack of parental care and supervision, as silica gel comes in clothing, bags, and other packaging (Abahussain and Ball, 2010). Therefore, ingestion of silica gel is mainly attributed to a lack of parental care. Moreover, kerosene ingestion was reported in 2 cases (Fig. 3). Kerosene is filled in petrol stations in non-original containers that give no indication of their contents and such random packaging may contribute to chemical exposure (Abahussain and Ball, 2010).

There are some limitations in our study. Firstly, in approximately 10% of the reported cases, the nature of the poison was not identified. Additionally, in approximately 10% of the reported cases, the name/gender, or the age of the patients was not reported. Such an information lack may affect the quality of the collected data.

## 5. Conclusion

In conclusion, inappropriate storage, lack of parental care, curiosity, male gender, and 0–5 years age group are considered as risk factors in paediatric poisoning. A functional PCC would play a vital role in collecting data, conducting research, providing

homecare solutions, and reducing strains on the healthcare system, in addition to conducting public campaigns and parental education courses to minimise the cases of poisoning and unnecessary hospital visits. Therefore, Kuwait must establish a functional PCC to reduce financial and personnel stress on healthcare and minimise the cases of poisoning.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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