

Children drug poisoning in Jeddah: Prevalence, pattern and mother's practice

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Abstract

Introduction: Accidental children poisoning is a potential source of morbidity and mortality. There is a paucity of data about its burden in Saudi Arabia.

Objectives: To assess the prevalence and patterns of acute poisoning in children and the response of mothers/caregivers to its incidence in Jeddah, Saudi Arabia.

Materials and Methods: A cross-sectional study was conducted including the mothers who attended the primary healthcare centers (PHCs) during the period from Sep to Oct 2017. Seven PHCs were randomly selected followed by selecting a proportional sample of mothers from each center. Data collection was performed through an interview with the participants via a structured questionnaire.

Results: In a total of 354 mothers (69.8% with at least a high school education), 82 mothers (23.2%) reported a history of poisoning. The affected children aged 2-5 years with a slight male propensity (53.7%). Therapeutic drugs accounted for 87.8% of cases (mainly antipyretics, cough syrups and decongestants). Telephone consultation and immediate referral to the nearest PHC were the most common responses (86.1% and 70.8%, respectively). Family members were the most frequent source of information (69%) while 76.4% of the mothers had no contact with the drug poisoning center. Poisoning episodes increased significantly when the mother was less educated ($P=0.017$), non-working ($P=0.026$), had another child aged <1 year ($P=0.029$), or transferred to a new home ($P=0.033$).

Conclusion: Accidental children poisoning represents a significant burden. Effective communication with the local drug poisoning center should be established. There is an urgent need to conduct aggressive campaigns to reduce poisoning rates.

Keywords: Poisoning, Children, Saudi Arabia, Morbidity, Drug-related side effects and adverse reactions.

Introduction

Despite the implementation of several strategies to reduce accidental drug poisoning, toxic exposure implies a considerable burden on the community and healthcare resources. Poisoning is referred to as an exposure to a substance that can cause unfavorable consequences and signs of organ dysfunction leading to injury or mortality. Drug poisoning was the leading cause of injury-related deaths in the United States, accounting for up to 44,000 death in 2015,¹ while non-fatal episodes comprised approximately 22%-54% of hospital admissions in Saudi Arabia.²⁻⁴ According to the most recent Annual Report of the American Association of Poison Control Centers' National Poison Data System (NPDS),⁵ drugs were associated with poisoning episodes in 57% of total poisoning cases in 2017.

In children, acute poisoning is even more prominent. Pediatric drug poisoning is mostly accidental due to their decreased ability to control themselves than older individuals and their reduced perception of harmful substances and hazardous materials. Therefore, they are particularly vulnerable to accidental poisoning. The extensive availability of medications, household chemicals, and pesticides has a major impact on increasing the rates of accidental poisoning in children. However, there is a strong evidence showing that fatal childhood poisoning incidents have decreased dramatically since the early 1970s following the introduction of the children resistant containers (CRC) to the markets although the frequency of such episodes remains an important public health concern.⁶ This decreasing trend may be also attributable to establishing poison control centers in the developed countries, early recognition of exposure, and

the significant improvements that occurred in poisoning management.⁷ Data from National Center for Injury Prevention and Control, Centers for Disease Control and Prevention showed that about 41,000 non-fatal unintentional drug poisoning emergency visits were reported in the United States in 2017 among children aged less than 4 years, representing 2.3% of all injuries in this age group.⁸ Considering Saudi Arabia, a cross-sectional study of patients attending the emergency department in King Khalid National Guard hospital revealed that children under 12 years represented 44.2% of total visits, of which drug poisoning was reported in the majority of them (92.2%).⁹

In other countries, there are comparable estimates of children drug poisoning, with remarkable elevations in low- and middle-income countries.¹⁰ Lack of parental awareness, inadequate public knowledge, and the absence of poison control centers may all contribute to increased poisoning-related morbidity and mortality. Awareness of family members, including the mother, regarding the potential risk factors is an important element to prevent acute poisoning. Moreover, although acute poisoning is manageable and rarely leads to death, the burden has a significant impact on the physical and mental health of the families. The emotional consequences and familial anxiety are remarkable and should be considered.¹¹

From another perspective, medical treatment of childhood poisoning is costly. In 2013, the total expenditure of unintentional poisoning in the United States was estimated at US\$3.79 billion with a total of US\$50,255 spent per case.¹² In Saudi Arabia, a recent cost analysis indicated that drug poisoning costs US\$1.94 billion, accounting for 1.6% of total

drug-related problems.¹³ As such, the burden is not only limited to the patients and their families, but also includes healthcare services.

In general, children drug poisoning is affected by the prevalent economic, occupational, social and cultural attitudes as well as the availability of particular poisons. This highlights the need of conducting epidemiologic studies in a given country or region to get an insight into the different aspects of the problem and tailor targeted interventions accordingly.¹⁴ Nonetheless, several countries may encounter some difficulties in estimating the magnitude of children drug poisoning due to insufficient reliable data. On the local level, although the population of Jeddah is well-characterized in several healthcare aspects, little is known about the morbidity and mortality of drug poisoning in children per unit population. The purpose of this study was to estimate the prevalence and recognize the patterns of pediatric drug poisoning in Jeddah. In addition, we sought to evaluate to mother's practice regarding poisoning.

Materials and Methods

This was a cross-sectional study involving the mothers attending primary healthcare centers (PHCs) in Jeddah, Saudi Arabia during the period from Sep to Oct 2017. Jeddah is the second largest city in the country and it contains 42 PHCs supervised by seven sectors as well as one Drug and Poisoning Information Center (DPIC) located in the southern part of the city. The study protocol was approved by the joint program of family and community medicine and a permission was obtained from the PHCs to conduct the study. Each participant provided a verbal consent and the obtained data were kept confidential.

Sample size was calculated by the EPI info software,¹⁵ revealing a total of 322 participants. The study employed a multistage stratified sampling technique. The first stage included a random selection of seven centers from each of the seven sectors (Almarwah, Alsalama, Sharg Alkhat, Moshreefah, Almahjaar, Alsulimaniah, Guoiza). In the second stage, all mothers attending the PHCs during the study period were included (a proportional sample was taken from each center according to number of population at the catchment area).

Data collection was performed by a semi-structured questionnaire that is prepared by the researcher and validated by 3 experts. Prior to starting the investigation, a pilot study was conducted at a different PHC (not included in the study), where the questionnaire was submitted to a sample of 32 mothers and some changes were made in the data collection tool accordingly. The following data were collected: 1) Socio-demographic data of the mother and the affected child; 2) details about the poisoning episode (if any); 3) the mother's practice or response during the poisoning episode; 4) safety measures taken at home to prevent such events; 5) family stressors that can increase the risk of encountering the event. A sample of the used questionnaire is provided in **Error! Reference source not found.** Data were collected during the working hours through an interview with each

mother. Mothers' data were compared with those obtained from the DPIC to optimize the reliability of the collected data.

Statistical analysis was performed using the Statistical Package for Social Sciences version 16.0 for Windows (SPSS Inc., Chicago, IL, USA). The dependent variable was the incident acute poisoning due to either a drug or a chemical. Results were presented as frequency (percentage). A Chi-square test was used to analyze the association and/or the difference between two categorical variables. Statistical significance was considered at $P < 0.05$.

Results

Demographic Characteristics

The personal characteristics of the participants are summarized in Table 1. In a total of 354 mothers, the majority were Saudis (72.9%), married (91.2%), and not working (80.5%). About two-thirds of them (69.8%) received at least a high school education. More than half of the mothers (56.8%) had three or less children.

Prevalence and Characteristics of Children Poisoning

Among the participants, 82 mothers reported a history of poisoning, giving a prevalence of 23.2%. Drug poisoning accounted for 87.8% of the total incident cases and occurred for the first time in 81 children (98.8%). Approximately one-third of children with poisoning aged 3 years (35.4%) or 4 years (32.9%). Slightly more than half of children affected by poisoning were boys (53.7%, Table 2).

Circumstance of Poisoning Episodes and the Response to them

Among the affected children, antipyretics were the main cause of poisoning (25%) followed by cough syrups and decongestants (18.1%), and oral contraceptive pills (11.1%, Fig. 1). Regarding the forms of drugs, slightly more than half of the ingested drugs were in the form of tablets (55.6%) or syrups (43.1%, Fig. 2).

Table 3 shows the circumstances of poisoning episodes as well as the response of the supervisor to the event. Among the reported poisoning events, most cases occurred in the living room or the bedroom (37.5% for each) and in the evening (47.2%). Mothers represented the main supervisors during poisoning episodes (61.1%) as they were either working in the kitchen (31.9%) or caring for another child (23.6%). Following the onset of poisoning, telephone consultation, immediate referral to the nearest health care facility and induction of vomiting were the most common behaviors (86.1%, 70.8% and 68.1% respectively). Family members constituted the most frequent source of information (69%). DPIC had no role in providing information for any of the participants while most of them had no contact with the center after the episode (76.4%). Importantly, although 62.5% of the participants have mentioned that their behavior was appropriate, the majority of them (93.1%) reported that they need additional information regarding childhood poisoning and how to deal appropriately with it (Table 3).

Preventive Safety Procedures

More than half of participated mothers claimed that they stored drugs in the fridge (55.9%) while in 17.5% of them; the drugs were stored in unlocked cabinets. Only 47 mothers

(13.3%) have used children resistant containers. None of the participated mothers had a stomach purging syrup (EPICA) at their homes (Table 4).

Factors Associated with Poisoning

The results showed that more poisoning episodes were reported when the mother was less educated (26.1% versus 13.4%, respectively, $P=0.017$), non-working (25.6% versus

13.0%, $P=0.026$), had another child aged <1 year (36.0% versus 21.1%, $P=0.029$), or transferred to a new home (25.2% versus 11.3%, $P=0.033$) when compared to their counterparts. Additionally, acute poisoning occurred more frequently when the poison was placed close to the bed (50%) rather than placed on a high shelf or in a locked cabinet (16.7% for both, $P=0.031$, Table 5).

Table 1: Demographic characteristics of the participants

Personal characteristics	Frequency (n=354)	%
Age in years		
<30	159	44.9
30-40	134	37.9
>40	61	17.2
Nationality		
Saudi	258	72.9
Non-Saudi	96	27.1
Marital status		
Married	323	91.2
Divorced	21	5.9
Widowed	10	2.8
Educational level		
Illiterate or read & write	16	4.5
Elementary-Intermediate	91	25.7
High school	165	46.6
University or above	82	23.2
Working status		
Working	69	19.5
Not working	285	80.5
Work duration in hours*		
6	29	42.0
8	40	58.0
Income (SR/month)		
<5000	156	44.1
5000-10000	160	45.2
>10000	38	10.7
Number of children		
One	42	11.9
Two	70	19.8
Three	89	25.1
Four	74	20.9
More than four	79	22.3

* For those working (hours /day)

Table 2: Characteristics of children with accidental poisoning

Parameter	Frequency (n=82)	%
Type of poisoning		
Drug	72	87.8
Chemical	10	12.2
Frequency of poisoning		
First time	81	98.8
Recurrent	1	1.2
Distribution of poisoning by age (year)		
2	10	12.2
3	29	35.4

4	27	32.9
5	16	19.5
Distribution of poisoning by gender		
Boy	44	53.7
Girl	38	46.3

Table 3: Circumstances and the supervisor's response to children drug poisoning

Details	No. n=72	%
Circumstances of poisoning		
Place		
Living room	27	37.5
Bed room	27	37.5
Kitchen	17	23.6
Bathroom	1	1.4
Timing		
Morning(1:00-12:00am)	21	29.2
Evening(1:00-6:00pm)	34	47.2
Night(7:00-12:00pm)	17	23.6
Drug owner		
Parent	34	47.2
Child	13	18.1
Brothers/sisters	16	22.2
Grandfather/mother	7	9.7
Others	2	2.8
Child's supervisor		
Mother	44	61.1
Father	3	4.2
Maid	11	15.3
Grand mother	2	2.8
Brother/sister	7	9.7
Others	5	6.9
Supervisor's activity during poisoning		
Kitchen works	23	31.9
Caring for another child	17	23.6
Sleeping	7	9.7
Watching TV	5	6.9
Others	20	27.8
Supervisor's response to poisoning		
Mode of behavior		
- Telephone consultation	62	86.1
-Immediate referral to health facility	51	70.8
-Inducing vomiting	49	68.1
-Reading drug pamphlet	21	29.2
-Astonishment and crying	20	27.8
-Milk intake	11	15.3
-Lemon juice intake	2	2.8
Source of information		
-Family members	49	69.0
-Media (TV, internet, magazines)	8	11.3
-Friends	7	9.9
-Physician	7	9.9
-Drug poisoning center	0	0.0
Duration between the accident and referral to nearest health facility.		
-<one hour	33	45.8
- one –two hours	25	34.7

->two hours	14	19.5
Is there any contact with drug poisoning center?		
-Yes	17	23.6
-No	55	76.4
Do you think that this behavior was appropriate?		
-Yes	45	62.5
-No	27	37.5
Do you need additional information?		
-Yes	67	93.1
-No	5	6.9

Table 4: Drug poisoning preventive safety procedures

Détails	No. n=354	%
Place for drug storage		
-Fridge	198	55.9
-Close to the bed	22	6.2
-On high shelf	48	13.6
-Unlocked cabinet	62	17.5
-Locked cabinet	24	6.8
Using of children resistant container		
-Yes	47	13.3
-No	307	86.7
Do you have IPECAC* at home?		
-Yes	0	0.0
-No	354	100.0
Do you warn your children regarding playing with drugs?		
-Yes	349	98.6
-No	5	1.4

*IPECAC: a stomach purging syrup used as front-line treatment for orally ingested toxins

Table 5: Factors associated with the poisoning episodes

Parameter		Children Poisoning				X ²	P value
		Yes		No			
		No.	%	No.	%		
Mothers` personal characteristics							
Age	<30 years (159)	32	20.1	127	79.9	3.01	0.222
	30-40 years (134)	31	23.1	103	76.9		
	>40 years (61)	19	31.1	42	68.9		
Nationality	Saudi (258)	56	21.7	202	78.3	1.14	0.322
	Non-Saudi (96)	26	27.1	70	72.9		
Marital status	Married (323)	72	22.3	251	77.7	2.08	0.354
	Divorced (21)	6	28.6	15	71.4		
	Widowed (10)	4	40	6	60		
Educational level	< university (272)	71	26.1	201	73.9	5.7	0.017*
	≥ university (82)	11	13.4	71	86.6		
Working status	Working (69)	9	13	60	87	4.93	0.026*
	Not working (285)	73	25.6	212	74.4		
Working duration/day	6 hours (29)	4	13.8	25	86.2	0.03	0.575
	8 hours (40)	5	12.5	35	87.5		
Income (SR/month)	< 5000 (156)	42	26.9	114	73.1	3.53	0.172
	5000-10000 (160)	35	21.9	125	78.1		
	>10000 (38)	5	13.2	33	86.8		

Number of children	One (42)		14.3	36	85.7	2.94	0.567
	Two (70)	18	25.7	52	74.3		
	Three (89)	24	27	65	73		
	Four (74)	16	21.6	58	78.4		
	>Four (79)	18	22.8	61	77.2		
Family factors							
Maternal pregnancy or recent delivery	Yes (71)	18	25.4	53	74.6	0.24	0.638
	No (283)	64	22.6	219	77.4		
Another child <one year	Yes (50)	18	36	32	64	5.39	0.029*
	No (304)	64	21.1	240	78.9		
Maternal depression	Yes (13)	3	23.1	10	76.9	0.01	0.647
	No (341)	79	23.2	262	76.8		
Family history of chronic diseases	Yes (91)	25	27.5	66	72.5	1.28	0.313
	No (263)	57	21.7	206	78.3		
Elderly person at home	Yes (73)	21	28.8	52	71.2	1.62	0.215
	No (281)	61	21.7	220	78.3		
New home	Yes (53)	6	11.3	47	88.7	4.91	0.033*
	No (301)	76	25.2	225	74.8		
Maternal practice							
Place for drug storage	Fridge (198)	45	22.7	153	77.3	10.64	0.031*
	Close to the bed (22)	11	50	11	50		
	On high shelf (48)	8	16.7	40	83.3		
	Unlocked cabinet (62)	14	22.6	48	77.4		
	Locked cabinet (24)	4	16.7	20	83.3		
Child warning	Yes (349)	81	23.2	268	76.8	0.03	0.672
	No (5)	1	20	4	80		
Using children resistant containers	Yes (13)	3	23.1	10	76.9	0.01	0.647
	No (341)	79	23.2	262	76.8		

* Statistically significant at P < 0.05

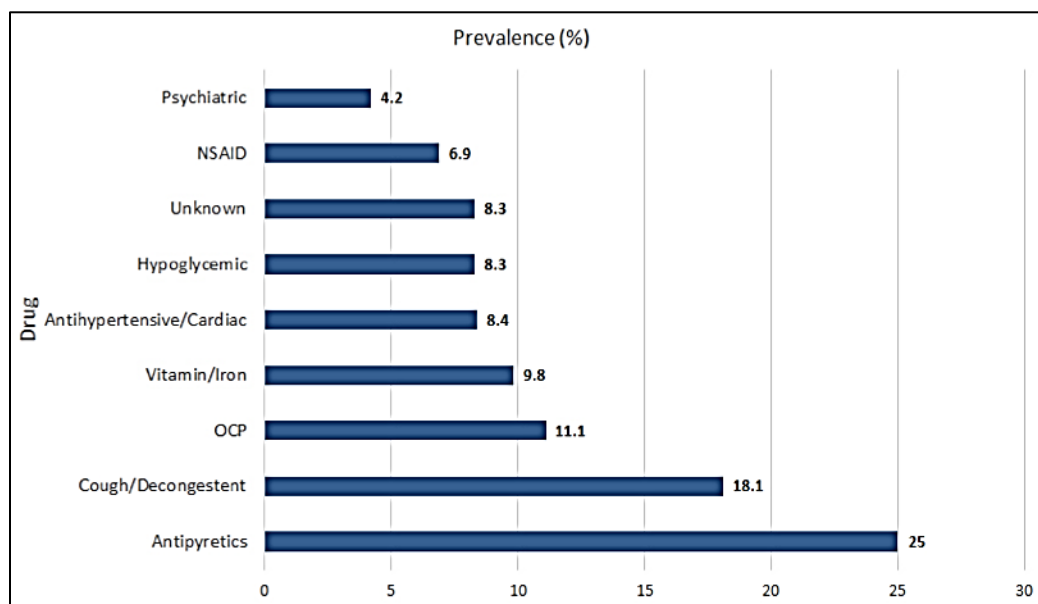


Fig. 1: The prevalence of drugs reported by mothers of children with drug poisoning

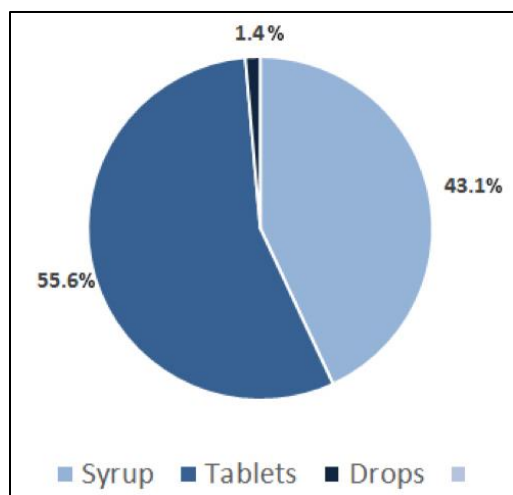


Fig. 2: The percentages of forms of drugs reported by mothers of children with drug poisoning

Discussion

Accidental children poisoning due to chemicals and drugs has been originally reported as the most common cause of unintentional injuries in children aged ≤ 5 years.¹⁶ It is therefore imperative to reveal the epidemiological patterns of such burden on the national level. In the present study, approximately one-quarter of the attending mothers to the governmental PHCs located in Jeddah reported poisoning events in their children.

Our study reported a slight male propensity in the incidence of children poisoning and all of them aged ≤ 5 years. Similarly, males represented 68% of the affected children in a retrospective study conducted in Aseer Central Hospital,¹⁷ 59.3% in Riyadh,¹⁸ and poisoning frequency was relatively higher in males in most of other Saudi reports.^{19,20} Likewise, the involvement of children under five-years-old was typically reported with other national and worldwide findings. Actually, this was not surprising given the curious and explorative behavior in this age category and, in some instances, hyperactivity may render the child vulnerable to throw almost every substance into the mouth. This might also reflect the accidental nature of poisoning among all reported cases in children in our study and other studies.^{21,22}

Drugs were the most common cause of acute poisoning in the present study followed by chemicals in 87.8% and 12.2%, of children, respectively. Similar patterns were observed in the literature among the pediatric populations, with pharmaceutical drugs accounting for 70% of poisoning cases in children aged under 2 years of age²³ while, in patients aged <12 years, drugs were the main poison in 84.4% of patients in Al Majmaah region,²⁰ 72% in Abha,¹⁷ and 63% in Riyadh.¹⁸ Several medications are readily abundant in the Saudi houses as they can be bought over-the-counter while patients tend to change their treating physicians regularly for the same illness episode. Therefore, a wide variety of medications are implicated. Additionally, other factors could contribute to increased chances of accidental poisoning, such as drug prescription in a monthly basis (that lead to the

availability of drugs in high quantities) and in medication dispensing envelopes rather than child-resistant containers.

Antipyretics were the main medications which caused acute poisoning to children in our study. This was consistent with the findings of Alanazi et al.¹⁸ who found that antipyretics and analgesics were prevalent poisons. Paracetamol is a popular antipyretic that can be used for children. However, toxic doses in this age category have been associated with acute hepatic liver.^{24, 25} The unlimited access to paracetamol and other antipyretics as over-the-counter drugs should be reconsidered.

Several poisoning-associated factors were revealed in the current study, including having a low level of education, having another child aged <1 year, the proximity of medications to the bed, and the transfer to a new home. The level of knowledge about poisoning is definitely linked to the level of mother's education.²⁶ This could be explained by the fact that approximately 73% of poisoning cases were reported in children with illiterate mothers.²⁷ In addition, much of the child's life is spent at home up with mother/caregiver until the age of seven and it is therefore important for them to understand all possible protective precautions for their child's safety.²⁸ Low educational levels and poor knowledge usually lead to negligence and ignorance about poisoning, uninformed use of drugs, and leaving the drugs within reach of children.²⁶ As for the role of maternal employment, in agreement with our report, Siddiqui et al.²⁹ found that 81% of mothers of children who experienced corrosive poisoning were non-working. Furthermore, the impact of working hours on children exposure to accidental injuries has been demonstrated elsewhere in the literature.³⁰

It is worthy to note that there was a remarkable decrease in using poison centers (PCs) in our study and this was associated with an increasing need to fill the gap of knowledge about children acute poisoning. Similar to those of the United States, possible contributors to such pattern of PC utilization are the decline of birth rates in Saudi Arabia³¹ and the increasing use of text rather than voice communication.⁵ The latter observation is of particular importance, especially with the increasing reliance on internet resources for gaining information.³² As such, PCs are required to adjust their communication preferences to the recent approach to meet the public's need. Failure to attain these changes will ultimately lead to a retro-shift, with more individual seeking medical management at healthcare facilities rather than receiving far simple management at a PC. Furthermore, the patient may experience more complicated morbidities and even mortality because of incorrect internet information obtained by the parents regarding the most suitable way to deal with their children.

The present study has some limitations. First, we could not investigate the patterns of poisoning in a prospective manner due to scarcity of data. Second, mothers attending the PHCs may not represent all registered mothers in the center. Third, since we analyzed the data of interviewed mothers, we could not obtain a comprehensive figure about the true prevalence of poisoning in Jeddah. Finally, as with other questionnaire-based studies, recall bias is a well-established

limitation. However, our study provides an initial step towards conducting other future investigations to assess the efficacy of interventions to prevent children accidental poisoning.

Conclusion

Accidental children poisoning in Jeddah was mainly associated with the therapeutic agents with an estimated prevalence of 23.3%. Maternal education and knowledge had a major role in increasing the rates of children poisoning. The impact of the drug poisoning center in Jeddah was not apparent to raise awareness and increase mother's knowledge. The study provides a strong evidence to support the need for aggressive campaigns to reduce poisoning rates. Developing the communication methods implied by drug poisoning centers is warranted, particularly in accordance with the increasing use of the internet and mobile applications as sources of healthcare information.

Conflict of Interest: None.

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