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The risk factors and parent perceptions regarding childhood poisoning; A descriptive cross-sectional study

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Abstract

Background: Poisoning represents a major health problem among children. It is among the top leading causes of death and disability among children. Despite the critical role of parents in implementation of any preventive measures of poisoning, data assessing the awareness of parents about childhood poisoning are very limited. is good solution for bed occupancy in hospitals.

Objective: To determine the prevalence and risk factors of childhood poisoning among families attending Alwazarat family medicine center in Riyadh, Saudi Arabia. Additionally, to determine awareness of the parents about the causes and risk factors of childhood poisoning.

Methods: Observational cross-sectional design has been conducted between October and December 2020 among parents attending Alwazarat healthcare center. The target was fathers and mothers with at least one child under 6 years. The data were collected using a self-completed questionnaire. It included data on socio-demographic characteristics of parents, information about the child who had poisoning, information about the child poisoning incident, and parents' opinions about the causes and risk factors of child poisoning in general.

Results: A total 236 parents were included in this analysis. The mean age was 36.0 ± 8.1 years and 69.1% of the parents were fathers. Approximately 92.3% of the parents were married and only 7.7% were divorced or separated. A total 10 (4.2%) parents reported having one of their children had poisoning. Approximately 70% of the children who had poisoning required care at emergency department and 10% required hospitalization. None of the incidents was fatal. The poisoning incidents were caused by medications (40%), pesticide/insecticides (40%), and house-cleaning product (20%). Potential causes of poisoning included lack of child supervision in 50% of the incidents and lack of child-resistant cover of the storage container in 20%. The mean awareness score among parents was 69.6%. The highly acknowledged causes and risk factors of childhood poisoning included unsafe storage of household chemicals (97.4%), unsafe storage of medicines (96.2%), presence of poisons in the neighborhood/home garden (95.8%), and inadequate space in the house (90.7%). The least acknowledged causes and risk factors of childhood poisoning included lack of social support from community (29.8%), poor education of mother (30.6%), lack of family support (30.6%), poor behavior of mother (31.6%), and single-parent living status (33.9%). In multivariate logistic regression analysis, living in houses with larger number of rooms and smaller number of family members were significantly associated with higher awareness level.

Conclusions: The prevalence of childhood poisoning was 4.2% among families seeking primary care services in Riyadh, Saudi Arabia. The finding indicate inadequate knowledge level of parents about childhood poisoning. There is urgent need for increasing public awareness on home safety measures to reduce the risk of childhood poisoning.

Keywords: risk factors, childhood poisoning, cross-sectional study

Introduction

The global decline in childhood mortality as a direct impact of the control of infectious diseases increased the relative importance of noncommunicable diseases and injuries, as contributors for global disease burden ^[1]. Unintentional injuries in children include traffic accidents, drowning, poisonings, burns, and falls ^[2]. Poisoning is defined as exposure of an individual to a substance that can cause symptoms and signs of organ dysfunction leading to injury or death ^[3]. Poisons are present in different forms such as liquid, powder, or solid state and therefore can be ingested, inhaled, or absorbed. Virtually all known chemicals have the potential to cause poisoning in case of large amount is taken ^[4]. Th factors that can probably determine the severity of poisoning and its consequences include the type of poison, the

dose, the formulation, the route of exposure, the age of the child, the presence of other poisons, the state of nutrition of the child, the presence of other diseases or injuries, and the interval between ingestion and effective treatment [5].

Due the curiosity nature of children, most the cases of childhood poisoning are acute and accidentally happen in home [6]. Several risk factors can contribute to unintentional childhood poisoning including social, behavioral, environmental, and developmental risk factors [7]. Acute childhood poisoning is important because it may cause negative consequences on body functions and may lead to disability or death [8]. Childhood poisoning is among the top leading causes of death and disability among children [2]. Childhood poisoning frequently needs treatment at the emergency department or even the intensive-care unit [4]. Fortunately, most of poisonings in children can be significantly and effectively prevented by appropriate preventive and educational measures [7, 9]. As the role of parents specially mothers in the prevention of childhood poisoning is critical [10], this report assessed the burden of the problem, its risk factors, and the parents' awareness of the causes and risk factors childhood poisoning.

Materials and Methods

Research question

- What is the prevalence of childhood poisoning among the families attending Alwazarat family medicine center in PSMCC in Riyadh?
- What are the risk factors associated with childhood poisoning among the families attending Alwazarat family medicine center who have a child with previous poisoning?
- What is level of awareness about the causes and risk factors of childhood poisoning among parents attending Alwazarat family medicine center?

Design

The study used observational cross-sectional design that has been conducted between October and December 2020.

Setting

The study was conducted at Alwazarat Family Medicine Center located in Prince Sultan Military Medical City, Riyadh, Saudi Arabia. It is a big family medicine center accredited by the Joint Commission International (JCI). It consists of thirty two general clinics, pharmacy, laboratory, treatment room and radiology room. Alwazarat Family Medicine Center is serving about 1000 visits daily. Alwazarat Family Medicine Center is staffed by senior family physicians that are board certified; board certified clinical pharmacist, dietician, diabetic educator, and health educator.

Subjects

The study target was parents attending Alwazarat family medicine clinics between October and December 2020 who have at least one child under 6 years. There were no exclusions based on gender, nationality, or type of care received.

Inclusions Criteria

Fathers or mothers with children (at least one child under 6 years)

Exclusions Criteria

Married males and females without children

Married males and females with older children (≥ 6 years)

Age below 20 and above 60 years

Sample size estimation

It has been shown that the prevalence of accidental poisoning in children under 6 years ranged between 1% and 7%, with an average of 3.8% [8]. So assuming a frequency of 4% with two-sided confidence limits of 2.5%, 236 parents would be required, using 80% power level and 95% two-sided significance level. Additionally, the awareness of parents about the different causes of childhood poisoning ranged between 14% to 89% [37, 38]. So assuming an awareness of 50% with two-sided confidence limits of 7.5%, 171 parents would be required, using 80% power level and 95% two-sided significance level. Therefore, the sample size of this study was estimated at 236 to examine both prevalence and awareness. The equation used was

$$N = \frac{Z_{\alpha/2}^2 * P * (1-p) * D}{E^2}$$

$Z_{\alpha/2}$: is normal deviate at a level of significance=1.96

P: is the hypothesized % frequency, which was set at 4% (frequency) and 50% (awareness)

E: is the desired precision (half desired CI width), which was set at 2.5% (frequency) and 7.5% (awareness)

D the design effect, which is usually set to 1 in cross-sectional studies

Sampling technique

Non-random convenient sampling technique was used to select our sample from the study population. The researcher distributed the study questionnaire to the parents in the clinic waiting area. A female assistant helped in distributing the questionnaire at the female section. The parents were asked to sign a consent form (Appendix-I) before starting the study questionnaire.

Data collection and data collection tool

The data were collected using a structured study questionnaire. This included data on socio-demographic characteristics of parents, information about the child who had poisoning, information about the child poisoning incident, and parents' opinions about the causes and risk factors of child poisoning in general. The questionnaire was self-completed by the parents. Help in filling the questionnaire was offers for illiterate parents. Variables included were shown below and a copy of the questionnaire was shown in Appendix-II

Results

A total 236 parents were included in this analysis. The socio-demographic characteristics of the examined parents are shown in Table 1. The mean age was 36.0 ± 8.1 years and approximately 46.4% of the parents were in the 30-39 years age group, 24.7% were below 30 years and 28.9% were 40 years or above. The majority (69.1%) of the parents were fathers. The vast majority (97.5%) of the parents had Saudi nationality. Approximately 92.3% of the parents were married and only 7.7% were divorced or separated. The majority of the parents had family monthly income $\geq 15,000$

Saudi Riyals. The majority (62.3%) of the fathers had more than high school education; 54.7% had college education and 7.6% had post-graduate education. Less than half (46.2%) of the mothers had more than high school education; 44.1% had college education and 2.1% had post-graduate education. The vast majority (98.7%) of the fathers were working while only 38.6% of the mother were working. The majority (67.5%) of the parents were living in rent house or apartment. The average number of family members was 3.6 ± 1.5 persons with the majority (60.2%) of the families had two or three family members. The average number of rooms was 8.3 ± 3.0 rooms with the majority (68.2%) of the families had between 6 and 10 rooms. Both parents were living with the child in 92.8% of families and approximately 7.2% of the families had marital problems.

As shown in Figure 1, 10 (4.2%) parents out of the 236 parents included in the study reported having one of their children had poisoning. Table 2 shows the socio-demographic and other characteristics of the children who had poisoning. The age of the children ranged between one and five years, with a mean age of 2.8 ± 1.3 years. Out of the ten children who had poisoning, seven (70%) were males. The order of the children among their brothers and sisters ranged between first and third, with a mean order of 1.9 ± 0.6 . Out of the ten children who had poisoning, only one child was attending daycare or any type of schooling/education. None of the ten children who had poisoning had delayed physical or mental development, problems with speech/hearing or vision, personality or behavioral abnormalities, previous self-injury, or another poisoning.

Table 3 shows the information about the child poisoning incident. The poisoning agent was a medication in four (40.0%) incidents, a pesticide/insecticide in four (40.0%) incidents, and a house cleaning product in two (20.0%) incidents. The poisoning agent was in the form of power in five (50.0%) incidents, liquid in four (40.0%) incidents, and solid in one (10.0%) incident. In all incidents, the poisoning agent was stored in the original container of the poison and the container was potentially accessible by the child (less than 150 cm from ground). In eight incidents (80%), the storage container of the poison has a child-resistant cover. The place of poisoning agent was kitchen in five (50.0%) incidents, living room/bedroom in three (30.0%) incidents, and yard/garden in one (10.0%) incident. The child supervision at the time of poisoning was lacking in five (50.0%) incidents. The poison was taken through the digestive system in six (60%) incidents and the respiratory system in four (40.0%) incidents. Management of the poisoning at the emergency department was required in seven (70.0%) incidents and hospitalization was required in one (10.0%) incident. In all incidents, no residual disability/death happened and complete cure was achieved.

Table 4 shows the parents' opinions about the causes and risk factors of childhood poisoning. Approximately half the causes and risk factors were acknowledged (agree and strongly agree) by 80% or more of the parents. The highly

acknowledged causes and risk factors of childhood poisoning included unsafe storage of household chemicals (97.4%), unsafe storage of medicines (96.2%), presence of poisons in the neighborhood/home garden (95.8%), inadequate space in the house (90.7%), father/mother is alcohol drinker or drug dependent (86.4%), and psychological problems in one of the parents (86.4%). The least acknowledged causes and risk factors of childhood poisoning included lack of social support from community (29.8%), poor education of mother (30.6%), lack of family support (30.6%), poor behavior of mother (31.6%), and single-parent living status (33.9%).

As shown in Figure 2, the mean awareness score of the causes and risk factors of childhood poisoning as perceived by the parents was 69.6%. The awareness score was not different by the status of having previous poisoning in one of the parent children. It was 71.7% in parents with previous child poisoning and 69.5% in parents without previous child poisoning ($p=0.449$). The median awareness score was 70%. The awareness score was divided into high and low awareness groups based on having awareness score \geq median ($\geq 70\%$) or $<$ median ($<70\%$), respectively.

Table 5 shows the differences in socio-demographic characteristics of the parents by the levels of awareness score of the causes of childhood poisoning. Out of all socio-demographic characteristics of the parents, only two variables were significantly associated or tended to be significantly associated with the awareness level. Parents living in houses with larger number of rooms had higher awareness level; 8.8 ± 3.2 rooms in those with awareness score \geq median compared with 7.8 ± 2.5 rooms in those with awareness score $<$ median ($p=0.010$). Parents living in houses with smaller number of family members had higher awareness level; 3.4 ± 1.3 family members in those with awareness score \geq median compared with 3.7 ± 1.7 family members in those with awareness score $<$ median. The difference, however, did not reach statistical significance ($p=0.092$).

Table 6 shows the multivariate logistic regression analysis of potential predictors of high parent awareness of the causes and risk factors of child poisoning. After adjusting for all variables included in univariate analysis with p -value < 0.20 (as shown in Table 5 including age, type of residence, number of rooms, and number of family members), awareness level was significantly associated with number of rooms and number of family members. For example, living in houses with larger number of rooms was significantly associated with higher awareness level; odds ratio (OR) 1.12, 95% confidence interval (CI) 1.01-1.24, $p=0.028$. On the other hand, living in houses with higher number of family members was significantly associated with lower awareness level; OR=0.74, 95% CI 0.59-0.93, $p=0.009$. Finally, having owned residence was associated with higher awareness level; OR=1.93, 95% CI 0.97-3.86. The association, however, did not reach statistical significance ($p=0.061$).

Table 1: Socio-demographic characteristics of the study parents

Characteristics	Number*	Percentage
Age (years)		
Mean ± SD	36.0±8.1	
20-29	58	24.70%
30-39	109	46.4%
≥40	68	28.9%
Gender		
Male	163	69.1%
Female	73	30.9%
Nationality		
Saudi Arabia	230	97.5%
Non-Saudi	6	2.5%
Marital status		
Married	217	92.3%
Divorced/separated	18	7.7%
Monthly family income (Saudi Riyals)		
<10,000	15	6.4%
10,000-14,999	77	32.6%
≥15,000	144	61.0%
Father education		
High School or lower	89	37.7%
College	129	54.7%
Post-graduate	18	7.6%
Mother education		
High School or lower	127	53.8%
College	104	44.1%
Post-graduate	5	2.1%
Father working status		
Employed	233	98.7%
Unemployed including retirees	3	1.3%
Mother working status		
Employed	91	38.6%
Unemployed including housewives and retirees	119	50.4%
Students	26	11.0%
Type of residence		
Owner	76	32.5%
Rent	158	67.5%
Number of family members		
2-3	142	60.2%
4-5	74	31.4%
>5	20	8.5%
Number of rooms		
Mean ± SD	8.3±3.0	
≤5	32	13.6%
6-10	161	68.2%
>10	43	18.2%
Living status		
Both parents are living with the child	218	92.8%
Only one parent is living with the child	17	7.2%
Marital problems		
No	218	92.8%
Yes	17	7.2%

* Unless mentioned otherwise. SD, standard deviation

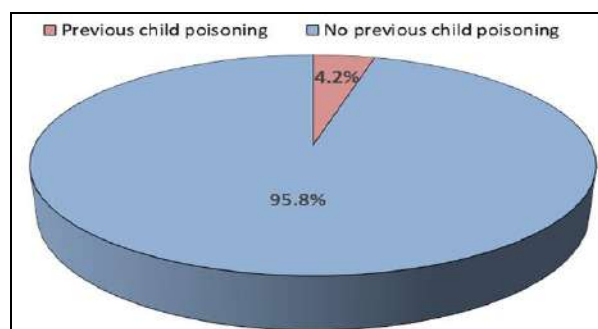


Fig 1: Prevalence of ever having poisoning in one of own children

Table 2: Socio-demographic and other characteristics of the children who had poisoning

Characteristics	Number*	Percentage*
Age (years)	2.8±1.3	
Gender		
Male	7	70.0%
Female	3	30.0%
Order among brothers and sisters	1.9±0.6	
Child attend daycare or any type of schooling/education		
No	9	90.0%
Yes	1	10.0%
Childhood problems		
Delayed physical development	0	0.0%
Delayed mental development	0	0.0%
Problems with speech/hearing	0	0.0%
Problems with vision	0	0.0%
Personality abnormalities	0	0.0%
Behavioral abnormalities	0	0.0%
Previous self-injury	0	0.0%
Another poisoning	0	0.0%

* Unless mentioned otherwise. SD, standard deviation

Table 3: Information about the child poisoning incident

Characteristics	Number	Percentage
Type of poisoning agent		
Medication	4	40.0%
Pesticides/insecticides	4	40.0%
House cleaning products	2	20.0%
Physical forms of the poisoning		
Powder	5	50.0%
Liquid	4	40.0%
Solid	1	10.0%
Type of storage container of the poison		
Original poison container	10	100.0%
A different container like (water bottle, Pepsi bottle, etc.)	0	0.0%
Child-resistant cover of storage container of the poison		
No	2	20.0%
Yes	8	80.0%
Place of storage container of the poison		
Potentially accessible by the child (less than 150 cm from ground)	10	100.0%
Potentially not accessible by the child (greater than or equal to 150 cm from the ground)	0	0.0%
Place of poisoning		
Kitchen	5	50.0%
Living room/bedroom	3	30.0%
Yard/garden	1	10.0%
Other places	1	10.0%
Child supervision at the time of poisoning		
Absent	5	50.0%
Present- Parental	4	40.0%
Present- Maid	1	10.0%
Way of poisoning		
Digestive	6	60.0%
Respiratory	4	40.0%
Management of poisoning		
Required hospitalization	1	10.0%
ER management	7	70.0%
Home management	1	10.0%
No treatment	1	10.0%
Outcome of poisoning		
Complete cure	10	100.0%
Residual disability/death	0	0.0%

Table 4: Parents’ opinions about the causes and risk factors of childhood poisoning

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Unsafe storage of medicines	5 (2.1%)	2 (0.8%)	2 (0.8%)	147 (62.3%)	80 (33.9%)
Unsafe storage of household chemicals	4 (1.7%)	2 (0.9%)	0 (0.0%)	146 (62.1%)	83 (35.3%)
Inadequate space in the house	3 (1.3%)	13 (5.5%)	6 (2.5%)	137 (58.1%)	77 (32.6%)
Presence of poisons in the neighborhood/home garden	3 (1.3%)	5 (2.1%)	2 (0.8%)	150 (63.6%)	76 (32.2%)
Psychological problems in one of the parents	2 (0.9%)	23 (9.8%)	7 (3.0%)	148 (63.0%)	55 (23.4%)
Father/mother is alcohol drinker or drug dependent	7 (3.0%)	16 (6.8%)	9 (3.8%)	159 (67.4%)	45 (19.1%)
Economic problems in the family	1 (0.4%)	67 (28.5%)	17 (7.2%)	136 (57.9%)	14 (6.0%)
Mother working during the daytime	3 (1.3%)	132 (55.9%)	10 (4.2%)	84 (35.6%)	7 (3.0%)
Poor education of mother	4 (1.7%)	148 (63.0%)	11 (4.7%)	68 (28.9%)	4 (1.7%)
Poor behavior of mother	4 (1.7%)	145 (62.0%)	11 (4.7%)	69 (29.5%)	5 (2.1%)
Inability of mother to cope with family responsibilities	8 (3.4%)	121 (51.7%)	21 (9.0%)	80 (34.2%)	4 (1.7%)
Inadequate supervision of the child	6 (2.6%)	73 (31.2%)	34 (14.5%)	111 (47.4%)	10 (4.3%)
Marital problems among parents	6 (2.6%)	83 (35.3%)	47 (20.0%)	92 (39.1%)	7 (3.0%)
Single-parent living status	6 (2.5%)	96 (40.7%)	54 (22.9%)	74 (31.4%)	6 (2.5%)
Lack of family support	5 (2.1%)	101 (43.0%)	57 (24.3%)	67 (28.5%)	5 (2.1%)
Lack of social support from community	5 (2.1%)	106 (45.1%)	54 (23.0%)	68 (28.9%)	2 (0.9%)
Developmental problems in the child	6 (2.5%)	16 (6.8%)	25 (10.6%)	140 (59.3%)	49 (20.8%)
Personality abnormalities in the child	4 (1.7%)	16 (6.8%)	23 (9.7%)	141 (59.7%)	52 (22.0%)
Behavioral abnormalities in the child	4 (1.7%)	17 (7.2%)	25 (10.6%)	136 (57.6%)	54 (22.9%)
Lack of schooling/education to the child	4 (1.7%)	28 (11.9%)	18 (7.6%)	132 (55.9%)	54 (22.9%)

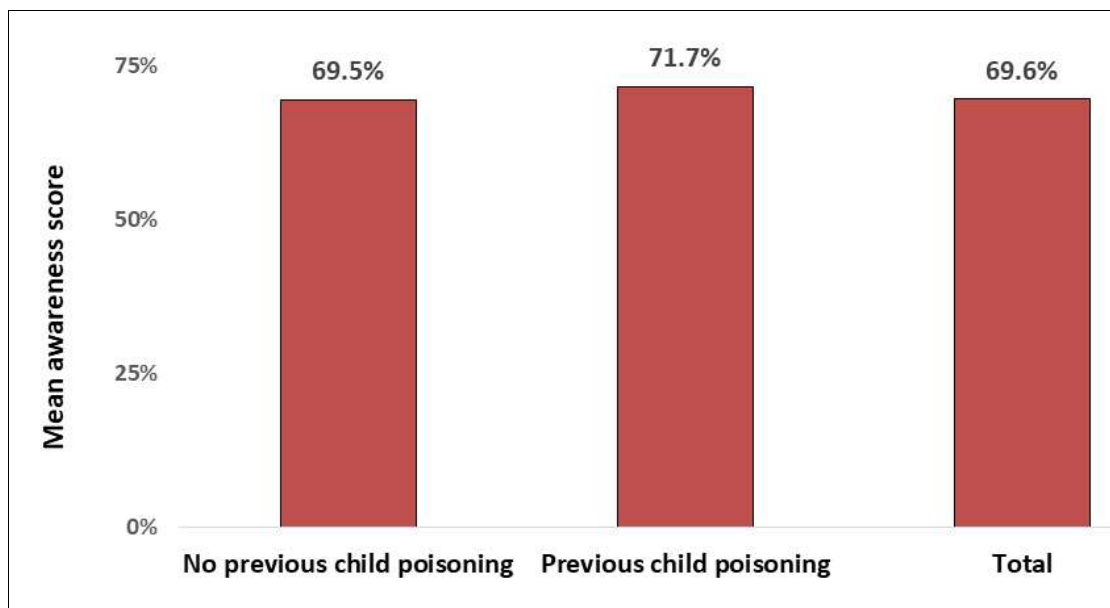


Fig 2: Average parent awareness score of the causes and risk factors of childhood poisoning by the status of having previous poisoning in one of his/her children

Table 5: Socio-demographic characteristics of the study parents by the levels of awareness score of the causes of childhood poisoning*

	Awareness score		P-value	Test
	High (≥ median)	Low (< median)		
Age (years)				
Mean ± SD	36.8±8.1	35.1±8.0	0.119	t-test
20-29	25 (43.1%)	33 (56.9%)	0.151	Chi-square
30-39	59 (54.1%)	50 (45.9%)		
≥40	41 (60.3%)	27 (39.7%)		
Gender				
Male	85 (52.1%)	78 (47.9%)	0.706	Chi-square
Female	40 (54.8%)	33 (45.2%)		
Nationality				
Saudi Arabia	122 (53.0%)	108 (47.0%)	>0.99	Fisher
Non-Saudi	3 (50.0%)	3 (50.0%)		
Marital status				
Married	114 (52.5%)	103 (47.5%)	0.805	Chi-square
Divorced/separated	10 (55.6%)	8 (44.4%)		
Monthly family income (Saudi Riyals)				
<10,000	6 (40.0%)	9 (60.0%)	0.361	Chi-square
10,000-14,999	38 (49.4%)	39 (50.6%)		

≥15,000	81 (56.3%)	63 (43.8%)		
Father education				
High School or lower	51 (57.3%)	38 (42.7%)	0.362	Chi-square
College	63 (48.8%)	66 (51.2%)		
Post-graduate	11 (61.1%)	7 (38.9%)		
Mother education				
High School or lower	68 (53.5%)	59 (46.5%)	0.965	Fisher
College	54 (51.9%)	50 (48.1%)		
Post-graduate	3 (60.0%)	2 (40.0%)		
Father working status				
Employed	123 (52.8%)	110 (47.2%)	>0.99	Fisher
Unemployed including retirees	2 (66.7%)	1 (33.3%)		
Mother working status				
Employed	48 (52.7%)	43 (47.3%)	0.995	Chi-square
Unemployed including housewives and retirees	63 (52.9%)	56 (47.1%)		
Students	14 (53.8%)	12 (46.2%)		
Type of residence				
Owner	46 (60.5%)	30 (39.5%)	0.109	Chi-square
Rent	78 (49.4%)	80 (50.6%)		
Number of rooms				
Mean ± SD	8.8±3.2	7.8±2.5	0.010	t-test
≤5	15 (46.9%)	17 (53.1%)	0.103	Chi-square
6-10	81 (50.3%)	80 (49.7%)		
>10	29 (67.4%)	14 (32.6%)		
Number of family members				
Mean ± SD	3.4±1.3	3.7±1.7	0.092	t-test
2-3	82 (57.7%)	60 (42.3%)	0.178	Chi-square
4-5	33 (44.6%)	41 (55.4%)		
>5	10 (50.0%)	10 (50.0%)		
Living status				
Both parents are living with the child	114 (52.3%)	104 (47.7%)	0.603	Chi-square
Only one parent is living with the child	10 (58.8%)	7 (41.2%)		
Marital problems				
No	115 (52.8%)	103 (47.2%)	0.988	Chi-square
Yes	9 (52.9%)	8 (47.1%)		

* Number and percentage unless mentioned otherwise. SD, standard deviation.

Table 6: Multivariate* logistic regression analysis of potential predictors of high parent awareness of the causes of child poisoning

	Odds ratio (OR)	95% confidence interval of OR		P-value
		Lower	Upper	
Type of residence (owner versus rent)	1.93	0.97	3.86	0.061
Number of rooms	1.12	1.01	1.24	0.028
Number of family members	0.74	0.59	0.93	0.009

* Multivariate logistic regression was done using backward elimination of all variables included in univariate analysis (Table 5), with p-value <0.2. This included age, type of residence, number of rooms, and number of family member

Discussion

The current study examined the prevalence and risk of childhood poisoning among families attending primary care services as well as the parents' awareness about the causes and the risk factors of childhood poisoning. The prevalence of childhood poisoning in the current study was estimated at 4.2%. Comparing current prevalence is difficult as there is no available national data about the prevalence of childhood poisoning in Saudi Arabia. All the studies that examined the epidemiology of childhood poisoning in Saudi Arabia were descriptive isolated studies that only included cases that are reported through passive surveillance to Saudi MOH or the cases seen at the emergency department [12-14]. For example, Moazzam and colleagues reported annual incidence rates of childhood poisoning in Qassim Region between 1999 and 2003 [12]. The rates ranged between 4.9 and 10.7 per 100 thousand population, which probably indicate a significant underestimation of the problem. For example, the poisoning incidents included were those reported to local preventive medicine department of the MOH in Qassim. However,

mild cases may not go to hospitals and not all cases seen in hospitals are reported to local MOH office. Nevertheless, the current prevalence rate was very similar to the rates reported in the United States. For example, the prevalence of poisoning incidents in the United States was estimated by the AAPCC between 1% and 7% with an average of 3.8% in children under 5 years [8].

None of the 10 children with childhood poisoning detected in the current study were fatal. Similarly, Izuora and colleagues could not find any deaths among 168 cases of childhood poisoning seen during seven years in Hafr Al Batin in Saudi Arabia [43]. On the other hand, the mortality associated with childhood poisoning have been estimated between 1.1% and 3.1% in local studies that reviewed larger number of poisoning incidents in Saudi Arabia [12, 14, 19]. The lack of mortality in the current study is probably caused by the small number of poisoning incidents detected. Additionally, the objective of the study was prevalence of poisoning rather than mortality from poisoning.

Approximately 70% of the children with childhood poisoning in the current study required care at emergency department and 10% required hospitalization. These rates were generally higher than reported before in Saudi Arabia [22] and internationally [21]. For example, only 12% of the poisoning cases presented to a large tertiary care hospital in Riyadh required emergency care while 20% required hospitalization [22]. Additionally, 26% of poisoning incidents happened in the United States required emergency care while 7% required hospitalization [21]. The higher emergency care in the current study may indicate moderate severity of the poisoning incidents that do not require hospitalization and may explain the lack of mortality shown above.

The childhood poisoning in the current study was caused by medications in 40% of the incidents, pesticide/insecticides in 40% of the incidents, and house-cleaning product in 20% of the incidents. The finding was generally consistent with previous data in Saudi Arabia and internationally. Similarly, a local study done in Riyadh found that the most common type of poisons among children presented to the emergency department were medications, pesticides, and household cleaning substances [13]. Additionally, a recent study in Jeddah found that the most frequent causes of poisoning among children presented to the emergency department were medications, specially analgesics and antipyretics [15]. Another recent study in Jeddah found that the most frequent causes of poisoning among children aged less than 5 years were detergents, followed by both disinfectants and antiseptics, insecticides, and pesticides [14]. Internationally, the causes of childhood poisoning varied widely between counties. Medications and household cleaning substances are the most frequent contributors of childhood poisoning in developed countries [8]. On the other hand, pesticides are a significant contributor for childhood poisoning in developing countries where agricultural activities are common [24, 25].

The poison agent in the current study was taken through the digestive system in 60% of the incidents. Consistent with this finding, a study in emergency units in different areas of Saudi Arabia showed that the most frequent symptoms were gastrointestinal, in the form of severe vomiting and diarrhea [19]. On the other hand, a study in an emergency unit in Jeddah showed that gastrointestinal symptoms were the second most common symptoms after neurological symptoms [18].

Potential causes of poisoning in the current study included lack of child supervision in 50% of the incidents and lack of child-resistant cover of the storage container in 20%. Similarly, a hospital based case-control study in Sri Lanka found that the strongest risk factor of childhood poisoning was inadequate supervision [27]. Additionally, safe packaging of harmful substances ensuring child-resistant closures is one of the main suggested strategies to reduce the risk of childhood poisoning [41]. It has been shown that child-resistant packaging and closures can reduce the rate of poisoning-related hospitalizations by 50% [42].

The mean awareness score of the causes and risk factors of childhood poisoning as perceived by the parents in the current study was 69.6%. Despite the fact that knowledge of parents about the causative factors and preventive measures of poisoning are the basis of any preventive measures [9, 10], there is complete lack of studies assessing the awareness of parents about childhood poisoning in Saudi Arabia and the

data internationally are very limited. This makes comparing the current findings very challenging, specially with lack of standard knowledge questionnaire internationally. Nevertheless, the current finding reconfirm the inadequate knowledge level of parents about childhood poisoning. In the few studies that assessed the awareness of parents about childhood poisoning, the awareness was very variable and ranged between 14% to 89% [37, 38]. For example, a study among mothers in Turkey found that the knowledge score was on average 43.3%, indicating inadequate knowledge of the mother about childhood poisoning [37]. On the other hand, the knowledge of parents about food poisoning was generally higher than their knowledge about chemical poisoning. For example, a study done among parents in Palestine reported 80% knowledge, 73% positive attitude, and 90% good hygienic practices related to food poisoning [40].

Multivariate analysis in the current study showed that high awareness level was associated with living in houses with larger number of rooms and lower number of family members. Consistent with these findings, a study among mothers in Turkey found that the knowledge score was positively associated with higher income and negatively associated with the number of children [37]. Additionally, a study among parents in Palestine showed that higher knowledge and/or positive attitude towards food poisoning was positively associated with higher income and negatively associated with living in camping residence, which is characterized by crowding and less number of rooms [40]. This study had several strengths and few limitations. It is considered the first local study to comprehensively examine parents' awareness about the causes and the risk factors of childhood poisoning. Additionally, the awareness tool included 20 different causes and risk factors of childhood poisoning reported in the literature. Moreover, the study used multivariate analysis to identify potential predictors of high parent awareness of the causes and risk factors of child poisoning. Nevertheless, we acknowledge few limitations. For example, as the study used a cross-sectional design, causal association cannot be determined and recall bias cannot be excluded. Being a single center experience with convenient sampling may limit the generalizability of the findings. However, we believe that these limitations have minor impact on the study finding (if any) and largely unavoidable in primary care setting.

Conclusions

The finding of the current study estimated prevalence of childhood poisoning at 4.2% among families seeking primary care services in Riyadh, Saudi Arabia. Approximately 70% of the children who had poisoning required care at emergency department and 10% required hospitalization. None of the incidents was fatal. The poisoning was caused by medications in 40% of the incidents, pesticide/insecticides in 40% of the incidents, and house-cleaning product in 20% of the incidents. Potential causes of poisoning included lack of child supervision in 50% of the incidents and lack of child-resistant cover of the storage container in 20%. The mean awareness score of the causes and risk factors of childhood poisoning among the parents was 69.6%. The recognition of different cause and risk factors of childhood poisoning ranged between 29.8% and 97.4%. The finding indicate inadequate knowledge level of parents about childhood poisoning. In multivariate logistic regression analysis, living in houses with larger

number of rooms and smaller number of family members were significantly associated with higher awareness level. There is urgent need for increasing public awareness on home safety measures to reduce the risk of childhood poisoning.

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