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Assessment of unintentional childhood injuries and associated factors in the pediatric clinics of a tertiary care hospital in Riyadh, Saudi Arabia

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Abstract:

BACKGROUND: Although unintentional childhood injuries are a major cause of morbidity, there is a dearth of literature on the issue in Saudi Arabia. The aim of this study was to assess the prevalence of unintentional childhood injuries in Saudi children, safety of their home environment, and the parents' attitude toward home safety measures.

MATERIALS AND METHODS: A cross-sectional survey was conducted in a consecutive sample of parents accompanying children aged ≤ 12 years to the pediatric outpatient clinics of a tertiary care hospital in Riyadh, Saudi Arabia. A validated self-administered questionnaire was used for data collection. Data was analysed using SPSS; Chi-square test and t-test were used to identify variables associated with injury in the preceding 12 months. Logistic regression analysis performed to identify the significant variables associated with injury after controlling for other variables.

RESULTS: A total of 283 participants were enrolled. The prevalence of unintentional childhood injuries was 24.7% in the past 12 months. The majority of these injuries occurred at home (74.3%). Accidental falls were the most reported (62.9%) cause of injury followed by burns (22.9%). Being a male child, attending a nursery or kindergarten, and having parents who kept hazardous objects within the reach of children were found to be significantly associated with higher odds of injury.

CONCLUSION: The prevalence of unintentional childhood injuries was high in the study population. Significant gaps were found between parents' reported knowledge and practice. Focused educational programs to improve home safety will be valuable in reducing this burden.

Keywords:

Accidents, child, prevalence, Saudi Arabia, wounds and injuries

Introduction

Injuries of children are a public health problem worldwide. A subset of injuries comprises unintentional injuries or accidents for which there is no evidence of predetermined intent. According to the World Health Organization (WHO), loss of life as a result of injuries to children under the age of 15 which in 2011 reached 630,000, and has been the common cause of death during

the 1st year of life in many countries.^[1-4] Deaths are only the extreme consequences of the larger problem of unintentional injuries, while major and minor disabilities represent a vast majority of subsequent effects. In 2016, in Saudi Arabia, 52,173 disability-adjusted life years were lost as a result of unintentional childhood injuries.^[5,6] Injuries to children can have long-term health, educational, social, and occupational consequences in later life, such as physical disability,^[7-9] psychological morbidity,^[10,11] cognitive or social impairment,^[12] and lower educational achievement.^[12,13]

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Table 1: Sociodemographic characteristics of the children and their association with unintentional childhood injuries (n=283)

	Total (n=283) N (%)	Prevalence of injury N (%)	P-value
Age category (years)			
≤3	121 (42.8)	30 (24.8)	0.184
4-5	65 (23.0)	21 (32.3)	
>5	97 (34.3)	19 (19.6)	
Sex			
Female	132 (46.6)	21 (15.9)	0.001
Male	151 (53.4)	49 (32.5)	
Informant relationship			
Father	43 (15.2)	10 (23.3)	-
Mother	240 (84.8)	60 (25.0)	
Attending school/day care			
None	169 (59.7)	41 (24.3)	0.007
Nursery or kindergarten	30 (10.6)	14 (46.7)	
School	84 (29.7)	15 (17.9)	
Total number of siblings			
None	27 (9.6)	10 (37.0)	0.127
Only one	64 (22.7)	19 (29.7)	
More than one	191 (67.7)	41 (21.5)	
Caregiver other than parents			
None	174 (61.5)	40 (23.0)	0.244
Grandparent	33 (11.7)	5 (15.2)	
Nanny	28 (9.9)	10 (35.7)	
Older sibling	31 (11.0)	11 (35.5)	
Multiple persons	12 (4.2)	2 (16.7)	
Others	5 (1.8)	2 (40.0)	

Columns total will not add up to the total *n* in case of missing information

Many risk factors for unintentional childhood injuries have been identified. Factors such as parents' socioeconomic status, sociodemographic characteristics, age, education, and immigration status have been linked to an increased risk of unintentional childhood injuries and their severity and accidents at home.^[14-17] A large number of such injuries occur in the home environment where children spend most of their time.^[18-20] Drowning, falls, burns, poisoning, suffocation, and transportation-related injuries are some of the most common fatal and nonfatal causes of unintentional childhood injuries.^[21]

Children play a very important role in Saudi society. Children aged ≤15 years comprise more than a quarter of the population in Saudi Arabia,^[22-24] but parents and caregivers have very little awareness of home safety measures for children. In 2005, the WHO and UNICEF issued a directive for a greatly expanded global effort to prevent child injury.^[25] This was followed in 2006 by the WHO's 10-year plan of action on child injury.^[26] Therefore, the aim of this study was to assess the prevalence of unintentional childhood injuries to Saudi children, their home environment safety, and their parents' attitudes toward home safety measures.

Materials and Methods

This was a cross-sectional survey of a consecutive sample of parents accompanying children aged ≤12 years to the pediatric outpatient clinics of a tertiary care hospital in Riyadh, Saudi Arabia. Because data could not be collected from children, the parents were the informants. Parents are the most reliable source of information on their children's health compared to other caregivers. Thus, only children accompanied by parents were included in the study. In addition, information was taken for one child only per household in order to avoid problems of clustering and inflation of variance. In our case, the numerator was the number of children who had injuries and the denominator was the total number of children for whom information was provided by the parents. Unintentional injuries or accidents are those injuries for which there is no evidence of predetermined intent. A minimum sample size of 283 was based on an expected proportion of 20.9% (the prevalence of unintentional childhood home injuries as reported by Aloufi^[27] in Makkah Al Mokarramah), a precision of 5%, an alpha error of 5%, and a nonresponse rate of 10%. A self-administered questionnaire was used to collect the data, which comprised six sections eliciting information about the attending child, sociodemographic details of the parents, details of unintentional injuries,

Table 2: Characteristics of the children's parents and their association with unintentional childhood injuries (n=283)

	Total (n=283) N (%)	Prevalence of injury N (%)	P-value
Marital status of parents			
Currently married	260 (93.9)	66 (25.4)	0.576
Currently not married (divorced, separated, and widowed)	17 (6.1)	3 (17.6)	
Mother's age, Mean±SD	33.3±6.6	32.8±7.0	0.446
Father's age, Mean±SD	40.1±9.5	38.8±8.3	0.210
Mother's education			
High school or less	162 (57.9)	30 (18.5)	0.008
College educated	118 (42.1)	38 (32.2)	
Father's education			
High school or less	144 (54.5)	32 (22.2)	0.265
College educated	120 (45.5)	35 (29.2)	
Mother's employment			
Employed	59 (21.1)	16 (27.1)	0.580
Student, unemployed, or retired	220 (78.9)	52 (23.6)	
Father's employment			
Employed	222 (84.7)	58 (26.1)	0.411
Student, unemployed, or retired	40 (15.3)	8 (20.0)	
Total family income (monthly SAR)			
<7000	155 (57.0)	35 (22.6)	0.289
≥7000	117 (43.0)	33 (28.2)	
Type of house			
Apartment	154 (55.0)	38 (24.7)	0.989
Individual house	126 (45.0)	31 (24.6)	
Type of family			
Joint	64 (23.3)	15 (23.4)	0.728
Nuclear	211 (76.7)	54 (25.6)	

Columns total will not add up to total the *n* in case of missing information. SD=Standard deviation, SAR=Saudi Arabian Riyal

adherence to injury prevention measures, attitude toward home safety, and home hazards checklist [See Appendix]. Because it was difficult to determine the difference between intentional and unintentional injuries, for the purposes of this study, we considered an injury to be unintentional if there was no evidence of predetermined intention from the caregiver. This was done by subtle questioning of the primary caregiver. The English version, validated by a three-member expert panel to ensure face validity of the questions, was then translated into Arabic and translated back by two different bilingual persons to ensure that there were no ambiguities. Data were collected from October to December 2018 and on an average of 5–10 completed forms per data collection day. The exclusion criteria for the study were parents who had completed the survey during any previous visits, children not accompanied by parents, children with special needs, and non-Saudis. Participants were approached about taking part in the study in the outpatient department waiting areas, vital sign rooms, and reception areas of the hospital. Ethical approval was obtained from the Institutional Review Board vide letter No. H-01-R-053 dated 26/07/2018, and informed written consent was taken from the parents.

The data collected in paper form were entered in Epicollect 5 (Imperial College, London, United Kingdom) to ensure

quality and analyzed using Statistical Package for Social Sciences (SPSS) for Windows, version 26.0. (IBM Corp., Armonk, NY, USA). The prevalence of unintentional childhood injury was measured in two forms – lifetime and the past 12 months. Bivariate analysis using the Chi-square test and Student's *t*-test was performed to identify significant variables associated with injury in the preceding 12 months. A backward step-wise binary logistic regression was carried out to determine factors that were significantly and independently associated with the above-mentioned outcome, and model-fit measures were presented. *P* < 0.05 was considered statistically significant.

Results

At the end of the study, a total of 283 responses were collected from eligible participants. Mothers provided the information in 84.8% of the cases. Nearly three-fifths (59.7%) of the children were in nurseries or schools, and a large majority (61.5%) had caregivers rather than their parents. Slightly more than half of the families lived in apartments (55%) and not in houses, and most (67.7%) children had more than one sibling [Tables 1 and 2].

Bivariate analysis was performed to assess the factors associated with injuries in the previous 12 months, and three factors were found significant. Boys reported statistically significantly more injuries than girls (32.5% vs. 15.9%, $P < 0.001$). Children who were in nursery schools or kindergartens had more injuries than those who were at home or attending regular school (46.7% vs. 24.3% vs. 17.9%, $P = 0.007$). Unexpectedly, children of college-educated mothers experienced more injuries than the children of less educated mothers (32.2% vs. 18.5%, $P = 0.008$) [Tables 1 and 2].

The prevalence of lifetime injuries was 32.5% and that of the previous 12 months was 24.7%. More details of the injuries sustained by the child in the past 12 months were collected. Accidental falls were the most reported (62.9%) cause of the most recent injuries

Table 3: Prevalence and characteristics of unintentional childhood injuries (n=283)

	N (%)
Experienced injury during lifetime	
No	191 (67.5)
Yes	92 (32.5)
Experienced injury during the past 12 months	
No	213 (75.3)
Yes	70 (24.7)
Total number of injuries sustained in the past 12 months	
One	51 (72.9)
More than one	19 (27.1)
Last injury: Cause of injury	
Suffocation	1 (1.4)
Sharp cut	3 (4.3)
Poisoning	1 (1.4)
Others	3 (4.3)
Motor vehicle accident	2 (2.9)
Fall	44 (62.9)
Burns	16 (22.9)
Last injury: Place of injury	
Outside home	18 (25.7)
Inside home	52 (74.3)
Last injury: disability due to injury	
Temporary	21 (30.0)
Permanent	1 (1.4)
None	48 (68.6)
Last injury: Treatment given for injury	
None	16 (22.9)
Home remedy	21 (30.0)
Treated as outpatient	28 (40.0)
Admitted in hospital	5 (7.1)
Last injury: Time taken to return to normal activity after injury	
Immediately	36 (51.4)
1-7 days	19 (27.1)
>7 days	15 (21.4)

For lifetime and past 12 months' injury prevalence, the n is 283, for injury-related variables pertaining to the past 12 months, the n is 70. Columns total will not add up to the total n in case of missing information

followed by burns (22.9%), and the remaining causes (suffocation, cuts with sharps, poisoning, motor vehicle accident, and others) constituted 14.3% of injuries. Nearly three-quarters (74.3%) of these injuries occurred at home. Two-thirds of the injured children were treated as outpatients in emergency rooms and outpatient clinics, whereas 30% were managed at home and more than half (51.4%) of the children returned to regular activities immediately [Table 3].

Approximately three-quarters (76.2%) of the parents claimed to have sufficient knowledge of suitable precautions to take to reduce the risk of childhood injuries at home, and most (90%) claimed to have taken sufficient precautions to reduce the risk of injuries at home. The most common sources of information on the prevention of childhood injuries were the media (Internet, television, or newspapers; 30.1%), followed by friends, family, and doctors' visits (15.6%); other sources (safety books and first aid course) comprised 7.8%, and 32.6% said that they had no such information. A series of questions were asked to assess the parents' adherence to injury prevention measures at home, and the majority of parents (>90%) reported that they never left their child at home, while one-fifth (32.6%) reported that they allowed their children (5 months to 5 years of age) to play with small objects such as nuts or beads. Furthermore, 81% of the parents reported that they placed their children (6 months to 2 years of age) in infant walkers, and a quarter reported that they drank or carried hot liquids when the children were nearby [Table 4]. A checklist was used to assess the home environment for safety. Cookers, hazardous products, and plastic products were kept out of the reach of children in 84.7%, 94.3%, and 91.7% of homes, respectively. Approximately 44.4% of the parents stated that they had electrical outlet safety covers. Surprisingly, 17% of sharp objects were kept within the reach of children. Approximately half of the mothers reported that they shared a bed with children aged 0–3 years [Table 4].

Backward step-wise multiple logistic regression was used to determine factors independently associated with injuries in the previous 12 months, and factors with $P < 0.2$ in bivariate analysis were included in step 1. Boys had 2.59 times higher odds of injury than girls did (adjusted odds ratio [aOR] = 2.59%–95% confidence interval; 1.39–4.80; $P = 0.003$), children who were in nurseries or kindergartens had higher odds of injury than those who were still at home (aOR = 3.10; 1.33–7.24; $P = 0.009$), and children whose parents reported that they did not keep hazardous products out of the children's reach had higher odds of injury (aOR = 4.25; 1.35–13.36; $P = 0.01$). The model was statistically significant overall ($P < 0.001$) with a Nagelkerke R^2 of 0.149 and a classification accuracy of 79% [Table 5].

Table 4: Parents' safety practices, attitude, and home hazards and their association with unintentional childhood injuries (n=283)

	Total N (%)	Prevalence of injury N (%)	P-value
Safety practices			
Leaves a child alone at home (applicable to all children)			
Yes/sometimes	25 (8.9)	4 (16.0)	0.276
No	255 (91.1)	66 (25.9)	
Let child play with small objects (applicable to child aged 5 months-5 years)			
Yes/sometimes	56 (32.6)	19 (33.9)	0.393
No	116 (67.4)	32 (27.6)	
Places the child in infant walker (applicable for child aged 6 months-2 years)			
Yes/sometimes	51 (81.0)	15 (29.4)	0.131
No	12 (19.0)	1 (8.3)	
Drinks or carries hot liquids while holding the baby (applicable to child aged 0 months-3 years)			
Yes/sometimes	31 (26.5)	9 (29.0)	0.523
No	86 (73.5)	20 (23.3)	
Home hazards checklist			
The stove is kept out of the reach of children (applicable to all children)			
Yes/sometimes	238 (84.7)	57 (23.9)	0.579
No	43 (15.3)	12 (27.9)	
Cutlery and sharp instruments are within reach of children (applicable to all children)			
Yes/sometimes	48 (17.1)	16 (33.3)	0.105
No	233 (82.9)	52 (22.3)	
Hazardous products are out of the reach of the child and in locked cabinets (applicable to all children)			
Yes/sometimes	266 (94.3)	62 (23.3)	0.065
No	16 (5.7)	7 (43.8)	
Leaves the baby alone in or near a bath, pail of water, or toilet, even for a brief moment (applicable to child aged 0 months-5 years)			
Yes/sometimes	43 (23.5)	15 (34.9)	0.203
No	140 (76.5)	35 (25.0)	
Checks the temperature of the water in bath before putting the child in (applicable to all children)			
Yes/sometimes	255 (94.1)	61 (23.9)	0.294
No	16 (5.9)	2 (12.5)	
The infant shares the same bed with the mother (applicable to child aged 0 months-3 years)			
Yes/sometimes	56 (49.6)	13 (23.2)	0.867
No	57 (50.4)	14 (24.6)	
Uses electrical outlet safety covers (applicable to all children)			
Yes/sometimes	123 (44.4)	27 (22.0)	0.513
No	154 (55.6)	39 (25.3)	
Keeps plastic wrappers, plastic bags, and balloons away from children (applicable to all children)			
Yes/sometimes	253 (91.7)	61 (24.1)	0.799
No	23 (8.3)	5 (21.7)	
Attitude toward home safety and injury prevention and source of information			
I have sufficient knowledge about suitable precautions to reduce the risk of childhood injuries at home			
Agree	214 (76.2)	57 (26.6)	0.232
Neither agree nor disagree	23 (8.2)	4 (17.4)	
Disagree	44 (15.7)	7 (15.9)	
I have taken sufficient precautions, to reduce the risk of childhood injuries at home			
Agree	252 (89.7)	65 (25.8)	0.110
Neither agree nor disagree	11 (3.9)	0 (0.0)	
Disagree	18 (6.4)	3 (16.7)	

Contd...

Table 4: Contd...

	Total N (%)	Prevalence of injury N (%)	P-value
Source of information on the prevention of childhood injuries			
I did not receive such information	92 (32.6)	24 (26.1)	0.948
During doctor visits	6 (2.1)	2 (33.3)	
Friends or family members	38 (13.5)	8 (21.1)	
Media (Internet, television, and newspapers)	85 (30.1)	19 (22.4)	
Other sources	22 (7.8)	5 (22.7)	
Multiple sources	39 (13.8)	11 (28.2)	

Columns total will not add up to the total *n* in case of missing information. SD=Standard deviation, SAR=Saudi Arabian Riyal

Table 5: Logistic regression analysis final model for factors associated with unintentional childhood injuries in the past 12 months

	N	β	OR	95% CI		P-value
				Lower	Upper	
Sex						
Female	130		1			
Male	146	0.95	2.59	1.39	4.80	0.003
Attending school/day care						
None	164		1			
Nursery or kindergarten	30	1.13	3.10	1.33	7.24	0.009
School	82	-0.52	0.59	0.28	1.22	0.15
Take sufficient precautions to decrease the risk of childhood injuries at home						
Agree	247		1			
Neutral/disagree	29	-1.12	0.32	0.09	1.16	0.08
Hazardous products are out of the reach of the child and in locked cabinets						
Yes/sometimes	260		1			
No	16	1.44	4.25	1.35	13.36	0.01
Constant		-1.76	0.17			<0.001

Variables entered in the model: total number of siblings, attending school/day care, age category, mother's education, sex, take sufficient precautions to decrease the risk of childhood injuries at home, cutlery and sharp instruments are within the reach of children, hazardous products are out of the reach of the child and in locked cabinets. OR=Odds ratio, CI=Confidence interval

Discussion

This study found that the prevalence of unintentional childhood injuries in children aged 12 years or younger who attended the pediatric clinics in Saudi Arabia was 24.7% in the previous 12 months. Falls were the most reported (62.9%) cause of injury followed by burns (22.9%). Such falls could hinder the children's ability to balance properly and might lead to the inability to be independently mobile and with a lack of hazard avoidance skills. Being a male child increases the risk of injury owing to their psychological and behavioral differences from female children. In addition, attending nursery or kindergarten and having parents who failed to keep hazardous objects out of children's reach were found to be significantly associated with higher odds of injury.

A few studies, by Aloufi,^[27] Gad *et al.*,^[28] Mutairi *et al.*,^[29] and Jan *et al.*^[30] on unintentional injuries in children, have been carried out in Saudi Arabia. A 2013 study by Aloufi in Makkah Al Mukarramah^[27] reported that the prevalence of home injuries was 20.9% in children aged younger than 12 years attending Al-Rusifa PHC. The most

commonly reported injuries were falls (64.4%) followed by wounds from sharps (20%), burns (8.9%), and simple electric shocks (6.7%). Boys reported more injury than girls, but this difference was not statistically significant.^[27] In a 2008 study conducted in Riyadh, the prevalence of unintentional injuries in children and adolescents selected from thirty primary health-care centers was 22.2%, and the common causes were falls (40.4%), road traffic accidents (15%), and food poisoning (8.8%). They also found that males reported significantly more injuries than females (26% vs. 18%, $P < 0.001$).^[28] Our study reported a prevalence of 24.7%, which was comparable to that reported by Aloufi^[27] (20.9%) and Mutairi *et al.*^[29] (22.2%) in Saudi Arabia. Because our study was conducted in a tertiary care hospital, which represents a selective population, our prevalence was slightly higher than that of these two studies.

In comparison to Saudi Arabia, the prevalence and types of injuries were slightly different in other Gulf countries. The most reported cause of injury was falls followed by injuries from blunt instruments and burns, and 62.3% of these injuries occurred at home; there was no gender difference.^[31] In the United Arab Emirates,

a study conducted at a major trauma facility center on 485 injured children aged between 0 and 19 years, found that nontraffic injuries comprised 60% of all injuries; the most common of which were falls followed by burns, animal-related injuries, and other unintentional (falling objects, sharp objects, and unknown causes). Similar to previous studies, the majority of injuries occurred at home.^[32] A study conducted in Oman reported that injuries commonly occurred in homes and playgrounds and the most common were falls. Besides, injuries were four times more common in males than in females.^[33]

An Indian study in 2018 reported that the prevalence of unintentional childhood injuries was 16.6%, but that the majority of injuries occurred on roads rather than at home.^[34] Similar studies conducted in Syria,^[35] Egypt,^[36] India,^[37] Pakistan,^[38] and Japan^[39] reported the prevalence of unintentional childhood injury ranging from 4.5% to 23.2%. Males had more injuries than females, the home was the most common place of injury, and falls were the most common cause of injury. In Egypt, however, the most common cause was burns followed by falls. Some studies, especially those from Ethiopia (62%) and Italy (63.3%), reported a much higher prevalence.^[40,41]

In addition to the deaths, tens of millions of children required hospital care for nonfatal injuries. This not only affects the children themselves but also their caregivers, physically and psychologically.^[26] In Eastern Mediterranean Region (EMR), unintentional injuries are one of the major causes of death and disability in children. In 2004, approximately 12% of all worldwide deaths due to unintentional injuries in individuals <20 years old occurred in the EMR with 113,327 deaths, which is approximately 19% higher than the global rate (45.5 vs. 38.8/100,000).^[42]

In comparison, a study by Gad *et al.* found that the majority of the children completely recovered, while 6.7% had a deformity and 1.5% died.^[28] In a Syrian study, the majority of injured children (90.8%) recovered completely and 10% were left with a residual effect.^[35] Similar results were reported in a study from Qatar.^[31] In a study from Pakistan, the percentage of children with a disability was reported to be more than 3%, and more girls suffered from disabilities than boys.^[38] A study by Kamal in Egypt reported a 6.6% disability in children who had had a fall.^[36] A WHO report stated that in children aged 0–17 years, the following events occurred for every fatal fall: approximately 690 children missed school or could not work; 24 children were hospitalized for 1–9 days; 13 children were hospitalized for >10 days; and four children suffered a permanent disability. Furthermore, nonfatal falls were the most common cause of emergency room visits and were a leading cause of long-term disability.^[18] A study in urban Delhi reported

that home remedies were used as the first option in more than half of the injuries, and a child had to take injury-related sick leave for an average of 7 days.^[37] In a Japanese study, 43.8% of injured children were managed at home, a majority had disabilities, and >1% suffered permanent disability.^[39] A multicountry study of injuries also reported similar findings on the prevalence of disabilities and treatment following injuries; 24% of children were admitted to hospitals, whereas 49% were treated in emergency rooms.^[43]

The current study showed that 32.5% of the children had experienced at least one injury during their lifetime, despite nearly three-quarters of parents claiming to have sufficient knowledge about precautions and approximately 90% claiming to have taken sufficient precautions to reduce the risk of the injuries of a child at home. These findings indicate that the injury prevention strategies used at home were grossly inadequate and therefore could not protect these children from repeated unintentional injuries regardless of parents' knowledge and attitude. These injuries occur if parents take incorrect precautions or overestimate their ability to take adequate precautions. The media (Internet, television, or newspapers) were the main sources of information on the prevention of childhood injuries, followed by friends and family. This may be because parents find safety instructions from the media to be more convincing and convenient. Books on safety, first aid courses, and physicians were the least common sources. This may indicate that most physicians do not regularly provide advice on injury prevention in our country. A study by Mutairi *et al.* reported that caregivers were aware of the mortality and morbidity related to childhood injury, and that they had adequate knowledge about home-related injuries, but had inadequate knowledge of safety measures.^[29] Results similar to the current study were reported by İnce *et al.* on the sources of information: media (36.0%), first aid courses (30.0%), friends and family members (29.7%), and doctors' visits (4.3%).^[44] Similarly, in an Italian study, approximately 70% of the parents were aware of safety measures for the prevention of childhood injuries, but physicians were the most common source of information, followed by television/newspapers, the Internet, and relatives.^[41] In Tehran, more than half of the mothers of preschool children reported inappropriate attitudes toward the implementation of preventive measures though most had good knowledge of these measures.^[45] A qualitative study conducted on 12 Palestinian mothers reported the following: most of the mothers had a positive attitude toward working to prevent home injuries, a majority of them thought that the injuries were preventable, and acknowledged their role in injury prevention.^[46]

Previous studies have reported on a number of factors associated with home safety and childhood injuries. A study by Mayes *et al.* found that socioeconomic and sociodemographic variables (family income and parent age) were associated with childhood injuries.^[47] Similarly, de Sousa Petersburgo *et al.* reported that monthly family income was a significant factor.^[48] Sato *et al.* revealed that unintentional injuries among preschool children were higher in those whose fathers had high-school certificates and in families with multiple siblings, but these findings were not statistically significant.^[39] In the study by Aloufi, mothers' age was significantly associated with injuries.^[27] An Australian study showed an inverse relationship between home risk and childhood injury, but after adjustments were made for demographic and socioeconomic factors, the relationship between home risk and injury was no longer significant.^[49] Similarly, Parmeswaran *et al.* also showed that sociodemographic factors (type, age, occupation of caregiver, type of family, birth order, child's age, and education level) were not significantly associated with childhood injury.^[37] In the current study, surprisingly, children of college-educated mothers had had more injuries than children of less educated mothers (32.2% vs. 18.5%, $P = 0.008$), but this relationship disappeared in the adjusted analysis. The current study did not find a significant association between the sociodemographic characteristics of parents and the majority of the home safety variables. However, it was found that children in nurseries or kindergartens were significantly more vulnerable to injuries (aOR = 3.1). This finding could be attributed to the nursery and kindergarten age group who like to explore and lack awareness of danger or hazards in comparison to older children. In addition, male children (aOR = 2.6) and children in environments characterized by a careless storage of hazardous materials (aOR = 4.3) were at significant risk of injuries. Different levels of risk have been reported by previous studies. For example, socioeconomic factors were not significant in logistic regression in the Sato *et al.*'s study.^[39] In contrast to our findings, Shi *et al.* showed that children whose mothers had primary school education or lower had an increased risk of injury (OR = 2.4), but this study was performed only among those with burn injury.^[50] In a study by Tiruneh *et al.*, logistic regression found that children aged 5 years or younger and male children had higher odds of injury. Other factors, including the age of caregiver, type of family, father's employment, level of child activity, child's level of awareness of danger, and education level, were also statistically significant.^[40] A study by Adam *et al.* on children aged 0–18 years reported that as children grew older, the odds of their sustaining an injury increased (aOR = 3.9 in 1–2 year olds to aOR = 6.3 in children 3 years or older compared with infants), and children who had paid caregivers (hourly work) had

threefold increased odds of injury than those with unpaid or voluntary caregivers. In our study, we found that only 76.2% of the parents had sufficient knowledge on suitable precautions, which is low. This lack of awareness of the association between adequate household safety and childhood unintentional injuries could be attributed to the prevalence ranging as high as ~25%. This can be seen from the logistic regression that parents who did not follow a particular type of safety measure were more likely to have injured children. This can be corrected by increasing the awareness of the parents and the institution of corrective measures to improve home safety in the population.

A few limitations, including certain methodological limitations, must be borne in mind in the interpretation of the results of this study. Because the study population included only a single tertiary care hospital setting, the results cannot be generalized to cover all children in the Kingdom. However, it could be representative of all children visiting similar settings. Although extreme care was taken to include only unintentional injuries, there could be a very small proportion of a mix of intentional and unintentional injuries. It was further assumed that parents would not disclose voluntarily any information that could indicate that an injury was intentional.

Conclusion

A quarter of the children had suffered at least one unintentional injury in the previous 12 months. More than half did not seek proper medical care. Although most parents reported that they had enough knowledge and took sufficient precautions to reduce childhood home injuries, there was much room for improvement of home safety. At the end of the study, the questions on the questionnaire were used to advise the parents on the safety measures to be taken at home. An awareness campaign, contingent on funding and subject to institutional permission, is being planned to educate parents.

An urgent preventive program is required to keep the home environment safer for children. An awareness campaign and a national program should be conducted to increase the awareness of simple inexpensive home safety measures. All injured children, especially those with multiple injuries, should be properly evaluated by medical professionals and social workers. Parents of children with injuries or those with injury-related disabilities can be provided paid vacations to take care of the child and help them recover promptly. Family physicians and pediatricians should be properly trained to counsel parents on home safety and identify children at risk of further injuries during their hospital visits. In summary, injury prevention programs should consist of multidimensional strategies including children's safety

program, home visits, child and parent awareness, involvement of schools, legislation, and environmental modification.

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Conflicts of interest

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