



Home Accidents among Children: A Retrospective Study at a Tertiary Care Center in Oman

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ABSTRACT

Objectives: We sought to identify the prevalence, commonest causes, and severity of home accident injuries and their effects on children who present to the emergency department (ED) of a university-tertiary hospital in Oman. **Methods:** We conducted a retrospective study among children aged ≤ 18 years old who presented with home accidents to the ED between January and June 2017. A checklist for data collection was designed to include demographic data, causes and effects of home accidents, and treatment outcomes. The data was retrieved from the hospital electronic patient records. **Results:** A total of 1333 children presented to the ED over six months as a result of unintentional home accidents, giving a prevalence of 7.7% from all children who visited the ED. There was a significant male to female ratio of 1.7:1. The most prevalent causes for home accidents were 'falls' in 716 (53.7%) children, followed by 'struck by/against-animate/inanimate mechanical force' in 201 (15.1%) children. 'Poisoning' was the third major cause in 117 (8.8%) children. Severity scale showed that around 36.0% of children suffered from severe injuries and 5.4% were admitted to the hospital. **Conclusions:** Despite this study being a single-center study in Oman, it indicates a high prevalence and severity of unintentional home accidents among children. The study findings suggest the need for implementing strategies to raise public awareness of child safety at home and to improve the preparedness of healthcare providers in ED to deal with such accidents.

Globally, home accidents are a leading cause of preventable disabilities and death among children and young people.¹ There are many definitions of accidents found in the literature. The World Health Organization define an accident as an event "that occurs unwillingly and causes physical and mental damage by sudden external force".² The focus of this study is on unintentional home accidents, which we define as "any event occurring inside the home or in the immediate vicinity of the home that resulted in injury",³ which was not done deliberately but happened by accident.⁴ In this paper, the terms 'home accidents' and 'unintentional home accidents' will be used interchangeably.

The Center for Disease Control Statistics in the US reported that every hour a child dies from injury and each year there are more than 50 000 children hospitalized due to accident-related injury.⁵ Furthermore, the Safety Report Card Summary for 18 countries in the European Union reported that

each year over 10 000 children and adolescents less than 20 years old die as a result of unintentional accidents.⁶ That is almost one child dying every hour of every day.⁶ In addition, studies conducted in Oman, the UAE, Saudi Arabia, Greece, and the UK, found that home accidental injuries are also high among children aged less than five years old.^{3,7-13}

Many times, children survive accidents with physical or mental damage that curtails their activities in the long-term. The most commonly reported accidental injuries include head injury, open wounds, and poisoning. Even when the effects are not long-lasting, treating the injuries caused by accidents involve a huge financial outlay for health care organizations as well as for families.¹⁴

Even though there are studies addressing unintentional home accidents with children in Oman, there is no study to date focusing on the prevalence of home accidents in children in different age groups as well as the severity and outcome of the

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Table 1: Canadian Triage and Acuity Scale (CTAS) guideline.

CTAS level	Acuity/Severity	Color	Time
1	Resuscitation	Blue	Patients need to be seen by a physician immediately 98% of the time
2	Emergent	Red	Patients need to be seen by a physician within 15 minutes 95% of the time
3	Urgent	Yellow	Patients need to be seen by a physician within 30 minutes 90% of the time
4	Less urgent (semi-urgent)	Green	Patients need to be seen by a physician within 60 minutes 85% of the time
5	Non-urgent	White	Patients need to be seen by a physician within 120 minutes 80% of the time

injuries. Therefore, this study aimed to identify the prevalence of children presented to the emergency department (ED) of a university-tertiary hospital in Oman due to unintentional home accidents over six months. The study presents the most common causes of home accidents among children in different age groups as well as the severity and outcome of injuries.

METHODS

The study was conducted at Sultan Qaboos University Hospital (SQUH), which is a university-tertiary hospital located in a well-populated area (> 361 000 people) in Muscat, Oman. Furthermore, SQUH is a governmental hospital that provides health care services to the public regardless of their place of residence. The ED at SQUH receives all emergencies including children with injuries related to unintentional home accidents. Based on the extent and cause of the injury, children are either managed in the ED and discharged home or admitted to the hospital for further management or transferred to another specialized hospital.

We conducted a descriptive, retrospective study from January to June 2017. The Medical Research and Ethics Committee of the College of Medicine and Health Sciences at SQU approved the study. For the purpose of this study, a child was defined as “a human being below the age of 18 years old” according to child protection law in Oman.¹⁵ Therefore, this study included all children aged ≤ 18 years presented at SQUH ED due to unintentional home accidents. Children with motor vehicle accidents and children with home accidental injuries suspected to be related to domestic violence were excluded as they are not considered unintentional injuries. Furthermore, children with chronic medical conditions were also excluded.

A data collection checklist was developed by the research team based on the literature review using

Access Microsoft Office. The checklist included questions regarding the demographic data, date of ED visit, and cause of the accident. Medical information was retrieved from the hospital electronic patient record by two ED registered nurses. Home accidents were divided based on ICD 10 types (International Statistical Classification of Diseases and Related Health Problems, 2015).

Since this study was mainly conducted in the ED, the severities of the injuries were classified according to Canadian Triage and Acuity Scale guideline,¹⁶ which is followed by the ED in SQUH [Table 1].

The checklist also included a section about the nature of unintentional home accidents related injuries and the treatment outcome. Furthermore, children admitted to the inpatient wards due to home accident-related injuries were followed-up and the research team recorded the length of hospitalization and treatment outcomes.

We used SPSS (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) to analyze the data (frequency and correlation). Epi Info (version 3) was used to test any correlations between two variables using the *p*-value. A *p*-value < 0.050 was considered the cut-off point value for significance. The associations between the study variables such as age and gender with the prevalence of accidents were done using the chi-square test.

RESULTS

A total of 1333 children visited the ED due to unintentional home accidents. This accounts for 7.7% of the total number of visits made by children to the ED. In general, there was a significant difference in home accidents visits made by male ($n = 832$; 62.4%) compared to female ($n = 501$; 37.6%) children, with a male to female ratio of 1.7:1 ($p = 0.006$) [Table 2].

Table 2: Prevalence of unintentional home accidents among children over six months.

Variables	n	Percentage, (%)
Unintentional home accidents (January-June 2017)		
Children ≤ 18 years who visited the ED	17 336	100
Children visited ED with unintentional home accidents	1411	8.1
Children with unintentional home accidents included in the study	1333	7.7
Children with unintentional home accidents excluded from the study	78	5.5
Sex		
Male	832	62.4
Females	501	37.6
Male to female ratio	1.7:1	<i>p</i> = 0.006
Distribution of unintentional home accidents per month (January-June 2017)		
January	280	21.0
February	187	14.0
March	225	16.9
April	197	14.8
May	200	15.0
June	244	18.3

ED: emergency department.

We found ‘falls’ to be the most common cause of unintentional home accidents occurring in 716 (53.7%) children, followed by ‘struck by/against-animate/inanimate mechanical force’ in 201 (15.1%) children [Table 3]. Falls were the leading cause of unintentional home accidents among children for all age groups (*p* < 0.001). Toddlers (1–3 years old) most frequently presented to the ED due to home accident injuries with 370 (27.8%) followed by preschoolers (3–6 years old) with 331 (24.8%) children. Teenagers and infants least frequently

presented to the ED due to home accidents with 249 (18.7) and 119 (8.9%) visits, respectively.

This study found no significant difference in the trend of the number of children presenting to the ED due to unintentional home accidents in the six-month study period. Yet, there was a slight increase in home accident-related injuries ED visits with 280 (21.0%) during January compared to other months [Table 2].

Falls were highly significant among boys in all age groups (*p* < 0.001) with the exception of infants

Table 3: Causes of unintentional home accidents according to age group.

Cause of unintentional home accident	Age groups, years					Total n (%)
	≤ 1 n (%)	1–3 n (%)	3–6 n (%)	6–12 n (%)	12–18 n (%)	
Fall*	82 (11.5)**	190 (26.5)	186 (26.0)	140 (19.6)	118 (16.5)	716 (53.7)
Struck by/against-animate/ inanimate mechanical force	9 (4.5)	43 (21.4)	54 (26.9)	53 (26.4)	42 (20.9)	201 (15.1)
Poisoning	8 (6.8)	55 (47.0)	19 (16.2)	15 (12.8)	20 (17.1)	117 (8.8)
Foreign body in orifice/ ingestion	9 (8.2)	40 (36.4)	46 (41.8)	11 (10.0)	4 (3.6)	110 (8.3)
Sharps injury	2 (2.0)	26 (26.3)	21 (21.2)	28 (28.3)	22 (22.2)	99 (7.4)
Other causes ^b	1 (2.0)	0 (0.0)	1 (2.0)	8 (16.0)	40 (80.0)	50 (3.8)
Fire/flame	8 (22.2)	15 (41.7)	4 (11.1)	7 (19.4)	2 (5.6)	36 (2.7)
Drowning	0 (0.0)	1 (25.0)	0 (0.0)	2 (50.0)	1 (25.0)	4 (0.3)
Total	119 (8.9)	370 (27.8)	331 (24.8)	264 (19.8)	249 (18.7)	1333(100)

**No statistical significance in fall between girls and boys in the infant age group (≤ 1 year), *p* = 0.860.

^bIncluded chemical liquid splash on the face and sport/football injury.

*Falls were highly significant common among boys more than girls in all age groups, *p* < 0.001.

Table 4: Nature of unintentional home accidents related injuries and age groups.

Nature of injury	Age groups, years					Total, n (%)
	≤ 1 n (%)	1-3 n (%)	3-6 n (%)	6-12 n (%)	12-18 n (%)	
Superficial injury	13 (3.7)	99 (28.1)	115 (32.7)	78 (22.2)	47 (13.4)	352 (26.4)
Contusion/hematoma/swelling	24 (9.6)	59 (23.5)	46 (18.3)	59 (23.5)	63(25.1)	251 (18.8)
Pain only	6 (3.6)	26 (15.5)	32 (19.0)	45 (26.8)	59 (35.1)	168 (12.6)
None	25 (17.1)	49 (33.6)	46 (31.5)	13 (8.9)	13 (8.9)	146 (11.0)
Head injury	23 (19.7)	37 (31.6)	29 (24.8)	19 (16.2)	9 (7.7)	117 (8.8)
Other injuries*	10 (11.0)	37 (40.7)	23 (25.3)	16 (17.6)	5 (5.5)	91 (6.8)
Fracture	2 (2.7)	8 (10.7)	17 (22.7)	19 (25.3)	29 (38.7)	75 (5.6)
Poisoning	6 (8.2)	33 (45.2)	13 (17.8)	8 (11.0)	13 (17.8)	73 (5.5)
Burn	8 (22.9)	15 (42.9)	4 (11.4)	6 (17.1)	2 (5.7)	35 (2.6)
Strain/sprain	0 (0.0)	1 (6.7)	5 (33.3)	0 (0.0)	9 (60.0)	15 (1.1)
Suffocation/choking	2 (20.0)	6 (60.0)	1 (10.0)	1 (10.0)	0 (0.0)	10 (0.8)
Total children in age groups	119 (8.9)	370 (27.8)	331 (24.8)	264 (19.8)	249 (18.7)	1333 (100)

*Other injuries included abscess, tooth loss, bleeding, amputation, and muscle dissection.

(≤ 1 year old). Infant girls were more prone to falls than infant boys, but this finding was not statistically significant ($p = 0.860$).

The nature of home accidents related injuries were severe for some children including head injury (117 children; 8.8%), burn (35 children; 2.6%), fracture (75 children; 5.6%), poisoning (73 children; 5.5%), and suffocation/choking (10 children; 0.8%) [Table 4]. Furthermore, there was an ‘other’ injuries category to define severity with 91 (6.8%) children. These injuries include abscess, tooth loss, amputation, bleeding, and muscle dissection.

In terms of home accidents severities, 480 (36.0%) children had severe injuries and 692 (51.9%) children had semi-urgent (green category) injuries [Table 5]. One child required resuscitation but died as a result of falling from a height.

Children were managed differently [Table 5]. Some were treated in the ED and discharged, while others had to be admitted to the hospital or transferred to other hospitals. One child died, seven (0.5%) children refused the plan of treatment and went leave against medical advice (LAMA), and 44 (3.3%) left the ED before being seen by a physician. Nineteen (1.4%) children were referred to other tertiary hospitals when the modality of treatment was not available at SQUH, and 72 (5.4%) children were admitted to the hospital in the pediatric wards for further management.

The causes for admission to the hospital pediatric inpatient wards were mainly due to falls

(23 children; 34.3%), foreign body in orifice/ingestion (14 children; 20.9%), and poisoning (13 children; 19.4%). The main reasons for admission due to unintentional home accident-related injuries were fracture (13 children; 19.4%), poisoning (13 children; 19.4%), superficial injuries (nine children; 13.4%), suffocation/choking (eight children;

Table 5: The severity of home accidental injuries and management plan outcomes in the ED from January-June 2017.

Variables	n	%
The severity of home accidental injuries according to CTAS guideline		
Resuscitation (blue)	1	0.1
Emergency (red)	134	10.1
Urgent (yellow)	480	36.0
Less urgent/semi urgent (green)	692	51.9
Non-urgent (white)	26	2.0
Management outcomes plan in ED		
Discharge from ED	1080	81.0
Referred to other health institution	110	8.3
Referred to other tertiary hospital	19	1.4
Left before seen by Doctor	44	3.3
LAMA	7	0.5
Died	1	0.1
Admitted to ward	72	5.4

ED: emergency department, CTAS: Canadian Triage and Acuity Scale; LAMA: leave against medical advice.

Table 6: Causes of unintentional home accident among admitted children in inpatient wards.

Variables	n	%
Causes of admission		
Falls	23	34.3
Foreign body in orifice/ingestion	14	20.9
Poisoning	13	19.4
Animate/inanimate mechanical force	9	13.4
Sharps injury	5	7.5
Burn	1	1.5
Drowning	1	1.5
Other causes*	1	1.5
Nature of injury		
Fracture	13	19.4
Poisoning	13	19.4
Superficial injury	9	13.4
Suffocation/choking	8	11.9
Head injury	8	11.9
None	8	11.9
Contusions/hematoma/swelling	3	4.5
Other injuries**	3	4.5
Burn	1	1.5
Pain only	1	1.5
Length of hospitalization, days		
1	7	10.4
2	30	44.8
3–4	20	29.9
5–11	10	14.9
Admission treatment outcomes (discharge)		
Home	63	94.0
LAMA	2	3.0
Transferred to another hospital	2	3.0

LAMA: leave against medical advice.

*Sport/football injury.

**Bleeding, abscess, muscle dissection, and amputation.

11.9%), and head injury (eight children; 11.9%) [Table 6]. The length of stay varied according to the severity of the injury, ranging between one to 11 days with a mean of 2.9 days and a median of 2.0 days.

DISCUSSION

From the literature, it is apparent that unintentional home accidents among children are a major health problem. This study indicated that 1333 children (77 per 1000 children) visited the ED due to home accident injuries over six months. This is higher than the prevalence reported in previous studies

and the reports of childhood injury surveillance in Oman (2014–2015), rural areas in Egypt (2012), and São Paulo in Brazil (2017).^{10,17,18} This high prevalence might be related to the study setting, which is a university-tertiary hospital located in a very populated area in the capital city. Furthermore, the hospital ED is the only public ED in the area. This might have resulted in more children visiting the ED compared with another study from Oman, which was conducted in a local health center.⁹ In addition, the prevalence of childhood home accidents related injury reported in surveillance in Oman 2014–2015 was a general figure where data from all health organizations in the country were reported collectively, which might have diluted the results.¹⁰

Our study findings showed that the common causes of home accidents among children are ‘falls’, ‘struck by/against-animate/inanimate mechanical force’ and ‘poisoning’, which is consistent with the childhood injury surveillance report in Oman 2014–2015.¹⁰ Furthermore, in other Arab countries like the UAE, Saudi Arabia, and Egypt, similar types of home accident-related injuries were reported, but with a different trend in terms of prevalence.^{11,12,17} These differences can be attributed to sociocultural differences and study settings. On the other hand, a study conducted in a rural area in Egypt showed that cut wounds were the highest accidents among the studied children.¹⁹ Furthermore, in a study conducted in the Arab Bedouin population in South Israel, burns were the most prevalent injuries.²⁰ Although these studies were carried out in the Middle East where it can be assumed that there are similarities in terms of culture and facilities, the differences in results might indicate diversities rather than similarities in terms of culture and practices related to child-care, home environment, and the available child-care services. On the other hand, causes of home accidents are similar in reported statistics from countries like the US and UK. Yet, the prevalence of these causes among children is different from that reported here.^{8,21,22} These differences might again indicate the differences in home environment settings and culture.

Falls were the commonest cause of unintentional home accidents requiring medical care and the most common non-fatal injury requiring hospitalization among infants. These findings are consistent with the literature reported from Oman, UAE, UK,

USA, and Australia.^{9,10,23-25} The reduced incidents of falls in infants might be due to the limited physical abilities of this age group.

In general, the findings of this study indicated that toddlers and preschoolers have an increased prevalence of home accidents compared to other age groups. This is consistent with other studies' findings.^{7-10,12} The prevalence of home accidents increases during the first two years of life, reaching a peak at three to four years of age. This could be because children at this age are exploring the world.²⁶ Additionally, children at this age are spending most of their time at home compared to school-age children. Furthermore, toddlers and preschoolers are fragile as per their physical development. In fact, children's rapid increase in motor activities is not usually accompanied by a corresponding increase in cognitive abilities. This might place children of this age group at higher risk as they are not able to recognize dangers.^{21,26}

Furthermore, this study indicated that the prevalence of poisoning was very high among toddlers. It is apparent that the risk of poisoning home accidents increased with age as the prevalence increased with children aged ≤ 1 year and then increased further with children in the toddler age group. Yet, the prevalence of poisoning reduced as children got older. On the other hand, unintentional home accidents related to struck by/against-animate/inanimate mechanical force increased with age from birth to 12 years of age. However, after 12 years of age, it started to decrease. Home accidents related to foreign bodies in orifice/ingestion were highest among toddlers and preschoolers. In general, the findings of this study indicated a correlation between age and home accidents as the prevalence of home accidents decreases with increasing age, which might be due to the development of children's cognitive abilities with age.

Males had more home accidents. This was also reported in other studies.^{3,7-12} It has been reported that boys might be more prone to accidents as they are more physically active and adventurous compared to girls.^{8,19,20} In addition, there are also some other factors found to affect children in their home environment, including the physical environment in the house, the knowledge and behavior of the parents and other caregivers, overcrowding, and the availability of safety equipment in the home.^{20,27} Despite their importance, this study was unable to investigate

the effect of these factors on unintentional home accidents due to its retrospective nature.

The findings of this study showed no significant difference in the prevalence of home accidents over the first six months of the year in 2017. Yet, there was a noted increase in home accidents in January. This can be because during January school children had a mid-term school holiday and may have spent most of their time at home. A report published by a secondary hospital in Oman located in a main city indicated that in 2007 and 2008 the number of unintentional home injuries increased during school summer holiday (July to September).²⁷ Warmer months, from April to September, were reported to have an increased number of home accidents in the US.²⁸ This indicates that home related accidents might increase during the months that children spend more time at home.

Unintentional home accidents have contributed from mild to severe injuries and a lot of deaths during hospital admission and long-term harm.¹³ Four children were admitted to the pediatric intensive care unit immediately as a result of suffocation/choking from foreign body ingestion and drowning, while one child was transferred directly to a burn unit in another specialized hospital. The same has been reported by the Public Health in England (2014) as choking and drowning were the highest serious unintentional home accidents, while burns require long-term hospitalization and cause serious disabilities but rarely death.⁸ On the other hand, poisoning was found to cause the shortest hospital stay with a maximum of three days. This has also been reported earlier in the UK.^{8,28}

The findings of this study on the increased number of injuries related to home accidents among children might indicate low social attention to preventive safety measures in the home environment.¹⁴ Furthermore, this might indicate a lack of an effective plan for preventing home accidents to reduce the severity of injuries. Managing and treating unintentional home accident-related injuries is costly to health care organizations.

This study could not find any significant correlation between unintentional home accidents and specific time periods as it was only conducted for six months. This study was conducted in one hospital for six months and, therefore, the findings might not be generalized to the whole population and further studies are required. Due to the retrospective nature

of the study, it was difficult to account for different factors that might have affected the prevalence of unintentional home accidents (e.g., parents' education, economic level, and home environment).

Background knowledge for ED nurses on home accidents among children may help them in predicting the common types of injuries, the severity of the injuries, and subsequently be prepared to provide the required care. The findings of this study can be utilized in developing strategies to deal with home accident-related injuries to reduce their impact on children and families' lives. Furthermore, the study findings provide valuable information for policymakers that can be utilized to implement strategies to improve home environment safety.

CONCLUSION

Home accidents are an important cause of morbidity and mortality in children worldwide. Furthermore, home accidents are expansive for health care. This study has shown that there is a high hospital prevalence of unintentional home accidents with 77 in 1000 children presenting to the ED during a six-month period. The most common type of unintentional home accidents in children was fall with toddlers being the highest vulnerable age group. The results of this study urges children's advocates like, educational groups, government organizations, policymakers, guardians, and parents to develop mechanisms and implement measures that are made mandatory to reduce and prevent home accidents among children. Furthermore, this study adds vital information to the scientific body of knowledge that can be utilized to improve patient care from triaging by anticipating the risk of an unintentional home accident-related injury.

Disclosure

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