

## ORIGINAL ARTICLE

# FACTORS ASSOCIATED WITH FALL INJURY AT HOME AMONG CHILDREN UNDER 5 YEARS OLD IN YEMEN

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## ABSTRACT

Falls are the most common injury causing death or long term disability particularly among children. This study aimed to identify the risk factors of the unintentional injuries due to falls in children aged less than five years in Yemen. This cross sectional study enrolled a total of 439 children under five years old from the emergency department of 6 hospitals in Sana'a city. Multistage sampling was used to select six hospitals from public and private sectors in Sana'a city. Face to face interviews were conducted by using a structured questionnaire. Simple logistic regression and multiple logistic regression were used in the analysis. The prevalence of falls among children under five years old was 21.2%. In the multivariate analysis, factors associated with falls among children were young mother (<sup>a</sup>OR= 0.9, 95% CI 0.81-0.91), working of mother (<sup>a</sup>OR= 4.5 95% CI 2.40-7.65), frequent family social gatherings (<sup>a</sup>OR= 2.7, 95% CI 1.54-4.61), number of children at home (<sup>a</sup>OR= 2.6, 95% CI 1.43-4.64), chewing khat by father (<sup>a</sup>OR= 2.4, 95% CI 1.38-4.10), presence of staircase in the house (<sup>a</sup>OR= 2.1, 95% CI 1.24-3.70), number of rooms at home (<sup>a</sup>OR= 2.2, 95% CI 1.17-3.99) and disabled children (<sup>a</sup>OR= 3.3, 95% CI 1.20-9.27). In the study, socio-economic and cultural factors such as family gathering and chewing khat were associated with home fall injury among children under 5 years old in Yemen. Health promotion program should take place to reduce the occurrence of fall injury.

**Key words:** Child health, falls, family, home, injury, Yemeni children.

## INTRODUCTION

Unintentional injuries have been recognized as one of the leading causes of death and disability<sup>1</sup>. Globally, over 700,000 children die every year due to injuries, especially in the developing countries<sup>2</sup>. Unintentional fall injuries are the most common injuries among children<sup>3</sup>. In the developing countries, falls are accounting for 25.0-52.0% of all treated injuries among children<sup>4</sup>. The estimated rate of fall injury was 60.0 per 1,000 population among all age groups whereas the incidence among children under 5 years due to fall was 40.6 per 100,000 population<sup>5</sup>. For instant, in 4 countries comprise Ethiopia, Peru, India and Vietnam, the most frequent type of injury was serious falls (5.6-12.3%) among children under 18 years old and almost half of the injuries (49.0%) occurred in children under 5 years old<sup>6,7</sup>. Among children, deaths due to fall injuries are rare (0.3/100,000/year in the age group 0-5 years); however, the

rates of hospitalization was higher (200/100,000/year) while the visits to the emergency department was the highest (5000/100,000/year)<sup>5,8</sup>. This injury was estimated to be more than £17 million and resulting in more than 20,000 hospital admissions each year<sup>9,10</sup>. In USA, it was reported that for every childhood death caused by injury, there are approximately 18 hospitalizations, 233 visit to the emergency department<sup>11</sup>.

Most of the injuries occurred in children under 5 years old at home were caused by falls, burns and scalds which assumed to be preventable when the particular hazards are removed<sup>12,13</sup>. Falls were associated with child characteristics, such as curiosity and to their love to explore the surrounding environment. Other associated factors were the heights of swings and slippery surfaces, such as polished floors<sup>4</sup>. Young age (0-6 years), male sex and low socioeconomic

status were also associated with fall injuries<sup>14</sup>.

In Yemen, most families are lower income entities. A 2003 report indicated that 42.0% of the Yemeni population lived below the poverty line. This group lacked not only money, but also basic life necessities including food, water, education, healthcare and shelter because of the above mentioned situation the probability of high rate of fall injury among children in this society is possible<sup>15</sup>. It was reported by the Ministry of Interior in 2009 that injury due to falling were the most frequent to be occurred among children. Fall injury comprised 31.0% of injuries among children<sup>16</sup>.

Although fall injury is a major health burden, the risk factors for such injuries have not been investigated in a systematic, comprehensive manner in Yemen. Therefore, this study aimed to determine the prevalence and risk factors of unintentional injuries due to falls in children aged less than 5 years in Yemen.

## **MATERIALS & METHODS**

### **Study Design and Population**

A cross sectional study was conducted as a part of bigger study in Sana'a city-Yemen from April to August 2012. Six hospitals from Sana'a city were selected randomly then a convenient sample of participants from each hospital was included in this study. Study population were children under five years old who had seek treatment in the emergency department in each hospital. A total of 439 children were included in the analysis.

### **Study Instruments**

A self-developed questionnaire was used to determine the associated factors with fall injury. Content validity was conducted to ensure the relevant and unique factors of Yemeni population are included in this questionnaire. In addition, the questionnaire was piloted

among 60 subjects (10 from each hospital). Face to face interview was conducted by the researcher and one assistant from each hospital. The questionnaire was distributed to the parents of all eligible respondents who met the inclusion criteria in the selected hospitals. Parents were approached in the emergency department by using direct interview after taken an oral consent from them. The questionnaire included questions on socio-demographic, home factors, family factors and social habits and traditions. The dependent variable was fall injury of children under five years old. Children were considered to have 'unintentional fall injury' at home according to their parents report.

### **Statistical Analysis**

Descriptive statistics was conducted to obtain the frequencies, percentages and means. Simple logistic regression was performed in the bivariate analysis to determine the association between the independent variables and full injury at home using the unadjusted OR. Multiple logistic regression was used to identify the most important factors associated with fall injury at home using the adjusted OR. SPSS software version 20 was used to perform the analysis. The results were considered statistically significant at the  $p < 0.05$ .

### **Ethical Consideration**

This research was conducted on a voluntary basis where all respondents were given briefings on the conduct of the study. Oral consent was obtained from the respondents. Permission to conduct this study was taken from the Health and population office in Sana'a-Yemen. Approval was obtained from the research and ethical committee of UKMMC - Malaysia.

## **RESULTS**

The prevalence of falls among children under 5 years old was 93/439 (21.2%). Table 1 shows that the mean  $\pm$  s.d age of

children was 3.1 years  $\pm$  0.9. The mean age ( $\pm$  SD) of parents was 33.4 ( $\pm$ 5.8) years and 27.7( $\pm$ 5.6) years for fathers and mothers respectively. Most of the children were boys (58.5%), belong to married parents (85.9%), 49.7% of

fathers and 49.4% of mothers had secondary education, 79.0% of fathers and of 27.6% of mothers were working. The majority had a family income of  $\leq$  55,000 YR.

**Table 1: Descriptive statistics of the socio-economic factors and full injury at home (n=439)**

Variables	Total n= 439 N (%)
<b>Child age</b>	3.1 $\pm$ 0.9*
<b>Father age</b>	33.4 $\pm$ 5.8*
<b>Mother age</b>	27.7 $\pm$ 5.6*
<b>Child gender</b>	
Girl	182 (41.5)
Boy	257 (58.5)
<b>Marital status</b>	
Married	377 (85.9)
Unmarried (divorced or widowed)	62 (14.1)
<b>Education of father</b>	
Postgraduate	138 (31.4)
Secondary	218 (49.7)
Primary	59 (13.4)
Illiterate	24 (5.5)
<b>Education of mother</b>	
Postgraduate	49 (11.2)
Secondary	217 (49.4)
Primary	108 (24.6)
Illiterate	65 (14.8)
<b>Working of father</b>	
No	92 (21.0)
Yes	347 (79.0)
<b>Working of mother</b>	
No	318 (72.4)
Yes	121 (27.6)
<b>Family income /month(YR)</b>	
> 55,000	207 (47.2)
$\leq$ 55,000	232 (52.8)

\* Mean  $\pm$  SD for continuous variables, YR: Yemeni Rial

In Table 2, the majority of children lived in their own house (63.8%), lived in house without yard (69.2%), their houses had three rooms or less (63.3%), had no staircases at their houses (52.4%), there was three children or less in the

household (63.1%), had old siblings (51.5%), were not disabled (94.8%), had small family (67.0%), lived in a nuclear family (74.9) and with low social family gatherings (53.1%). Parents did not chew khat (50.3%, 73.3%) for fathers and mothers respectively.

**Table 2: Descriptive analysis of house, family, social habits factors and fall injury at home (n=439)**

Variables	Total n= 439 N (%)
<b>Ownership of the</b>	
Owner	280 (63.8)
Tenant	159 (36.2)
<b>Presence of yard at home</b>	
No	304 (69.2)
Yes	135 (30.8)
<b>House size</b>	
> 3 rooms	161 (36.7)
≤ 3 rooms	278 (63.3)
<b>Presence of staircase</b>	
No	230 (52.4)
Yes	209 (47.6)
<b>Number of children</b>	
≤ 3 children	277 (63.1)
> 3 children	162 (36.9)
<b>Having old siblings</b>	
No	213 (48.5)
Yes	226 (51.5)
<b>Disability of the child</b>	
No	416 (94.8)
Yes	23 (5.2)
<b>Family size</b>	
≥ 6 members	145 (33.0)
< 6 members	294 (67.0)
<b>Family type</b>	
Nuclear family	329 (74.9)
Alternative family	75 (17.1)
Extended family	35 (8.0)
<b>Chewing khat by father</b>	
No	221 (50.3)
Yes	218 (49.7)
<b>Chewing khat by mother</b>	
No	322 (73.3)
Yes	117 (26.7)
<b>Family social gatherings/week</b>	
≤ 3 times	233 (53.1)
> 3 times	206 (46.9)

Simple logistic regression was performed in the bivariate analysis and was demonstrated by OR (95% CI) and p value. Presence of staircases at home ( $p= 0.042$ ), the presence of more than 3 siblings ( $p= 0.020$ ), fathers or caregivers chew khat ( $p< 0.001$ ), frequent social family gatherings ( $p= 0.002$ ) presence of

home yard ( $p= 0.016$ ) were associated with fall injury. Other socio-demographic factors showed a significant association with fall injury were: were father's age ( $p= 0.003$ ), mother's age ( $p< 0.001$ ), working of fathers ( $p= 0.034$ ) and working of mothers ( $p< 0.001$ ) as shown in Tables 3 and 4.

**Table 3: The association between socio-economic factors and fall injury at home in simple logistic regression (n=439)**

Variables	Fall injury 93 (21.2%)	Not fall injury 346 (78.8%)	Crude OR (95% CI)	P value
<b>Child age</b>	3.2±1.0*	3.0±0.9*	1.2 (0.91-1.46)	0.236
<b>Father age</b>	31.7±6.5*	33.8±5.6*	0.9 (0.90-0.98)	<b>0.003</b>
<b>Mother age</b>	25.2±5.6*	28.4±5.5*	0.9 (0.85-0.94)	<b>&lt; 0.001</b>
<b>Child gender</b>				
Girl	33 (18.1)	149 (81.9)	1	
Boy	60 (23.3)	197 (76.7)	1.4 (0.85-2.21)	0.189
<b>Marital status</b>				
Married	79 (21.0)	298 (79.0)	1	
Unmarried	14 (22.6)	48 (77.4)	1.1 (0.58-2.10)	0.772
<b>Education of father</b>				
Postgraduate	30 (21.7)	108 (78.3)	1	
Secondary	51 (23.4)	167 (76.6)	1.1 (0.66-1.83)	0.717
Primary	7 (11.9)	52 (88.1)	0.5 (0.20-1.18)	0.109
Illiterate	5 (20.8)	19 (79.2)	0.9 (0.33-2.75)	0.921
<b>Education of mother</b>				
Postgraduate	12 (24.5)	37 (75.5)	1	
Secondary	44 (20.3)	173 (79.7)	0.8 (0.38-1.63)	0.514
Primary	26 (24.1)	82 (75.9)	0.9 (0.45-2.15)	0.955
Illiterate	11 (16.9)	54 (83.1)	0.6 (0.25-1.57)	0.321
<b>Working of father</b>				
No	12 (13.0)	80 (87.0)	1	
Yes	81 (23.3)	266 (76.7)	2.0 (1.05-3.91)	<b>0.034</b>
<b>Working of mother</b>				
No	51 (16.0)	267(84.0)	1	
Yes	42 (34.7)	79 (65.3)	2.8 (1.72-4.49)	<b>&lt; 0.001</b>
<b>Family income /month(YR)</b>				
> 55,000	43 (20.8)	164 (79.2)	1	
≤ 55,000	50 (21.6)	182 (78.4)	0.9 (0.60-1.51)	0.842

\* Mean ± SD for continuous variables, YR: Yemeni Rial

**Table 4: The association between house, family & social habits factors and fall injury at home in simple logistic regression (n=439)**

Variables	Fall injury 93 (21.2%)	Not fall injury 346 (78.8%)	Crude OR (95% CI)	P value
<b>House type</b>				
Owner	57 (20.4)	223 (79.6)	1	
Tenant	36 (22.6)	123 (77.4)	1.2 (0.71-1.84)	0.574
<b>Presence of yard at home</b>				
No	74 (24.3)	230 (75.7)	1	
Yes	19 (14.1)	116 (85.9)	0.5 (0.29-0.88)	<b>0.016</b>
<b>House size</b>				
> 3 rooms	31 (19.3)	130 (80.7)	1	
≤ 3 rooms	62 (22.3)	216 (77.7)	1.2 (0.74-1.95)	0.452
<b>Presence of staircase</b>				
No	40 (17.4)	190 (82.6)	1	
Yes	53 (25.4)	156 (74.6)	1.6 (1.02-2.56)	<b>0.042</b>
<b>Number of children</b>				
≤ 3	49 (17.7)	228 (82.3)	1	
> 3	44 (27.2)	118 (72.8)	1.7 (1.10-2.76)	<b>0.020</b>
<b>Having old siblings</b>				
No	38 (17.8)	175 (82.2)	1	
Yes	55 (24.3)	171 (75.7)	1.5 (0.93-2.36)	0.097
<b>Child disability</b>				
No	85 (20.4)	331 (79.6)	1	
Yes	8 (34.8)	15 (65.2)	2.1 (0.85-5.05)	0.108
<b>Family size</b>				
≥ 6 members	30 (20.7)	115 (79.3)	1	
< 6 members	63 (21.4)	231 (78.6)	0.9 (0.59-1.56)	0.859
<b>Family type</b>				
Nuclear family	74 (22.5)	255 (77.5)	1	
Alternative family	10 (13.3)	65 (86.7)	0.5 (0.26-1.08)	0.082
Extended family	9 (25.7)	26 (74.3)	1.2 (0.54-2.67)	0.666
<b>Chewing khat by father</b>				
No	32 (14.5)	189 (85.5)	1	
Yes	61 (28.0)	157 (72.0)	2.3 (1.42-3.70)	<b>0.001</b>
<b>Chewing khat by mother</b>				
No	64 (19.9)	258 (80.1)	1	
Yes	29 (24.8)	88 (75.2)	1.3 (0.81-2.19)	0.267
<b>Family social gatherings/week</b>				
≤3 times	36 (15.5)	197 (84.5)	1	
>3 times	57 (27.7)	149 (72.3)	2.1 (1.31-3.34)	<b>0.002</b>

In multivariate analysis, Table 5 revealed that 8 factors were associated with fall injury in this study by using multiple logistic regression. These included young mother (<sup>a</sup>OR= 0.9, 95% CI 0.81-0.91, *p*< 0.001), working of mother (<sup>a</sup>OR= 4.5 95% CI 2.40-7.65, *p*< 0.001), frequent family social gatherings (<sup>a</sup>OR= 2.7, 95% CI 1.54-4.61, *p*< 0.001), number of children at home (<sup>a</sup>OR= 2.6, 95% CI

1.43-4.64, *p*= 0.002), chewing khat by father (<sup>a</sup>OR= 2.4, 95% CI 1.38-4.10, *p*= 0.002), presence of staircase in the house (<sup>a</sup>OR= 2.1, 95% CI 1.24-3.70, *p*= 0.006), number of rooms at home (<sup>a</sup>OR= 2.2, 95% CI 1.17-3.99, *p*= 0.014) and disabled children (<sup>a</sup>OR= 3.3, 95% CI 1.20-9.27, *p*= 0.021).

**Table 5: Multivariate analysis predicting fall injury (n=439)**

Variables	B	S.E	P value	OR (95% CI)
Young mother	-0.15	0.03	< 0.001	0.9 (0.81 - 0.91)
Working of mother	1.45	0.30	< 0.001	4.5 (2.40 - 7.65)
Frequent family social gatherings	0.98	0.28	< 0.001	2.7 (1.54 - 4.61)
More than three children at home	0.95	0.30	0.002	2.6 (1.43 - 4.64)
Father chewed khat	0.87	0.28	0.002	2.4 (1.38 - 4.10)
Presence of staircase at home	0.76	0.28	0.006	2.1 (1.24 - 3.70)
Big house(>3 rooms)	0.77	0.31	0.014	2.2 (1.17 - 3.99)
Disabled child	1.20	0.52	0.021	3.3 (1.20 - 9.27)
Constant	-0.00	0.75	0.997	

Multiple logistic regression was used in this analysis

**DISCUSSION**

Generally, children under 5 years old are less aware of danger and they are more vulnerable group to have an unintentional indoor injury especially fall injury. These injuries often have long-term consequences and can substantially reduce children’s quality of life. Most home injuries involving the children under 5 years are caused by falls, burns/scalds and poisonings, and are presumed to be preventable through removal of particular hazards<sup>17</sup>.

This study is a cross sectional study was conducted to identify the potential associated factors with fall injury among children under 5 years old in Yemen. The prevalence of fall injury also was calculated and this study found that only 21.2 % of our sample had injury due to fall. It is lower percentage compared to 31.0% of what was reported by Ministry of Interior in 2009 as this survey was done for many hospitals from different states. However, both of them showed a

high rate of fall injury among Yemeni children.

The health of children and their families are influenced by education, income, employment, housing and other factors. Parents play a main role to protect children from the possible danger from fall injury according to their age, education and job status. Younger mother showed significant associations with fall injury among their children while no association was identified with education. However, working of mother was strongly associated with fall injury. This attributed to less supervision as they leave their children at home with siblings or alone if there is a caregiver at home.

Social habits are one of the main and new factors in this study as Yemeni society has a unique traditions and social habits. Parents chew khat and family social gatherings were studied and both of them were statistically significant with fall injury; (*p*= 0.002 and *p*< 0.001)

respectively. Parents chew khat at the afternoon and night with their friends or alone in a special khat session. During this time, they prefer to stay alone or with friends in a quiet place without any annoyed. So they leave children without any supervision if both parents are chewers. Sometimes when they gather in one family house, they bring their children to play together and that may increase the probability to have injury including falls.

According to one study from Egypt, homes of injured children were not significantly different from the homes of non-injured children even when the fall injury was 35.3% compared to other type of injuries<sup>18</sup>. However, our study has revealed that presence of staircase at home also showed a positive result when tested with fall injury ( $p= 0.006$ ). Most occur on staircases, especially those without barriers. Hence, staircases without protection present high risks for fall injury. This finding supports a previous UK study showing that 34% of children, aged 0-4, have accidents on stairways<sup>19</sup>. This is high compared to other locations at home. Although there are rare reports to determine the relationship between the numbers of domiciled rooms and childhood injury as injuries can happen anywhere in the house, the number of rooms at home in this study was associated with fall injury in our study ( $P = 0.014$ ).

In this study, higher number of children at home was associated with fall injury ( $p= 0.002$ ). This finding supports a previous study from Canada as they found that families with more than four children were two times more likely to have injuries compared to families with less than four children<sup>20</sup>. In addition, disabled children may often be related to health problems that include injuries. Such children experience mental health problems leading to different risks, including death. Our study revealed that disabled children was associated with fall injury ( $p= 0.021$ ). Similarly, study in

Egypt reported that handicaps were more strongly associated with falls (6.6%)<sup>18</sup>.

This study is limited by its cross sectional design that cannot prove causal relationship between variables. In addition, the consequences of injury such as disability, blood transfusion, or surgical intervention were not included in this study. This study recommended that measures should be taken to prevent children from the most frequently recorded home injuries such as falls<sup>18</sup> in order to reduce the incidence and severity of injury from falls and the impact of fall-related injury on the health and wellbeing of children in Yemen<sup>18</sup>.

## CONCLUSION

About one-quarter of the children selecting in this study were injured due to falls. This study also demonstrated that social habits and traditions such as: chewing khat and frequent social habits clearly play significant roles of fall injury among Yemeni children aged less than five years. Home design and family factors were associated with fall injury as well as socio-demographic and socioeconomic factors. Based on this study, we recommend the development of a program that promotes the reduction of home injury among children in Yemen.

## Abbreviations

YR: Yemeni Riyal (the current Yemeni currency unit), CI: Confidence interval, OR: Crude odds ratio, <sup>a</sup>OR: Adjusted odds ratio, s.d: Standard deviation, n: number of all respondents, B: Unstandardized Coefficients, SE: Standard Error, df: Degree of Freedom, P value: Level of Significant.

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