

# Fall-related injuries at home: Descriptive analysis from a Middle Eastern level 1 trauma center

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## ABSTRACT

**BACKGROUND:** Injuries caused by falls from heights (FFH) and fall of heavy objects (FHO) in residential settings are underestimated in the Middle East. We aimed to describe the fall-related injuries at home requiring admission at a level I trauma center.

**METHODS:** We conducted a retrospective analysis of patients who were admitted following fall-related injuries at home between 2010 and 2018. Comparative analyses were performed based on age groups (<18, 19–54, 55–64, and ≥65 years), gender, severity of injuries, and height of fall. Time series analysis of fall-related injuries was performed.

**RESULTS:** A total of 1402 patients were hospitalized due to fall-related injuries occurred at home (11% of total trauma admissions). Three quarters of victims were male. The most injured subjects were young and middle-aged (41.6%), followed by pediatric (37.2%) and elderly subjects (13.6%). FFH was the most frequent mechanism of injury (94%) followed by FHO (6%). Head injury was most common (42%) followed by lower extremity injury (19%). Older adults (≥65 years) had more complications, longer hospital stay, and higher in-hospital mortality. Patients who fell from greater heights had more chest and spinal injuries with greater severity and longer stay in the hospital. Time-series analysis did not show a seasonal variation of fall-related hospitalization.

**CONCLUSION:** This study showed that 11% of trauma hospitalizations were related to fall at home. FFH was common in all age groups; however, FHO was more evident in the pediatric group. Preventive efforts should address the circumstances of trauma in the residential settings to better inform evidence-based prevention strategies.

**Keywords:** Fall from height, fall of heavy objects, home, hospitalization, injury, residential settings, trauma

## INTRODUCTION

Injuries are a global public health problem that accounts for more than 5 million deaths each year (9% of the global mortality).<sup>[1]</sup> Non-fatal consequences of injuries are even higher with tens of millions of hospitalizations, emergency department

(ED) care, general practitioner treatment, or alternative care.<sup>[1]</sup> A significant proportion of survivors suffer from temporary or permanent disabilities.<sup>[1]</sup> Falls are the second leading cause of unintentional injury-related deaths worldwide with an estimated 646,000 deaths per year.<sup>[2]</sup> Older adults, over 65 years old, usually suffer the greatest number of fatal falls.<sup>[2]</sup>

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Injuries from falling objects are mainly described in workplace settings, especially at construction sites, leading to traumatic brain injury (TBI), disabilities, and deaths.<sup>[3,4]</sup> However, injuries at residential settings (home), particularly injuries caused by falls from heights (FFH) or fall of heavy objects (FHO), are also of concern. A previous study revealed that 35% of patients who required hospitalization for fall-related injuries were injured at their residential settings.<sup>[5]</sup> Another study reported that one out of every 50 trauma patients admitted to the level I trauma center in Qatar was a victim of a fall at home; namely, in the bathroom, which led to a high mortality among the older adults.<sup>[6]</sup> Evidence suggests that the incidence rate of fall-related injuries increases with advancing age, and therefore, home-based fall prevention interventions among older adults should be prioritized.<sup>[7-11]</sup> However, pediatric injuries that take place at residential settings in Qatar remain crucial as well; as 65% of the pediatric fall injuries requiring hospitalization occurred at home.<sup>[5]</sup> Another study reported that pediatric TBI accounted for 18% of total TBI admissions, and the most affected group was teenagers followed by infants/toddlers.<sup>[12]</sup> However, injuries that occurred in the residential settings remain underestimated or underreported in the Middle East. The present study aims to describe the epidemiology, patterns, and in-hospital outcomes of fall-related injuries that occurred at home and required hospitalization based on the mechanism of injury, patient age, and gender, severity of injuries, and height of fall.

## MATERIALS AND METHODS

A retrospective analysis of the Qatar national trauma registry (QTR) was conducted on records of patients who were admitted to the Hamad trauma center (HTC) following fall-related injuries at home (FFH and FHO). The study duration was between January 2010 and December 2017. The HTC is the only level I trauma center in the state of Qatar which treats patients with moderate-to-severe injuries free of charges for all the country residents. The collected data included age, gender, height of fall [meters]; injured body regions; and injury severity score (ISS), Glasgow coma score (GCS), diagnostic tests such as computed tomography, focused assessment with sonography in trauma (FAST) and X-ray, blood alcohol concentration (BAC), in-hospital complications, length of stay in the intensive care unit (ICU) and hospital (HLOS), and in-hospital mortality.

Comparative analyses of data were performed by categorizing patients according to age, gender, ISS, and height of falls (<1 m, 1.0–2.9 m, 3.0–5.9 m and ≥6 m). Age subgroups included ≤18 years, 19–54 years, 55–64 years, and ≥65 years old group.

Fall-related injuries data were prospectively recorded by the QTR using the International Classification of Diseases-10<sup>th</sup> Revision (ICD-10) codes from W00 to W19 which describes unintentional falls in 20 subcategories, and W20 describes falling objects.

The ISS score ranges from 0 to 75, estimated based on the most severely injured body regions to provide an overall score for polytrauma.<sup>[13]</sup> The ISS scores were defined as 1–8 (mild), 9–15, (moderate), 16–24 (serious), 50–74 (critical), and 75 (non-survivable).<sup>[10]</sup> The GCS recorded at the ED was used in the analyses. The GCS provides information on consciousness following injury which ranges from 3 to 15; <8 is severe, 9–13 is moderate, and >13 is minor head injury.<sup>[14]</sup>

As data were retrieved anonymously and retrospectively with no direct contact with patients, it was not possible to involve patients or public in the design or conduct of this study. Ethical approval was obtained from the medical research center (MRC) and institutional review board (IRB) of Hamad Medical Corporation, Doha, Qatar (IRB#MRC-01-18-004).

## Statistical Analysis

Data were expressed as numbers, percentages, and mean±standard deviation or medians with interquartile range whenever appropriate. Comparative analyses were performed by classifying patients into subgroups by gender; age; height of fall in meters; and ISS. Chi-square test was performed for the analysis of differences in categorical variables between groups, and Fisher exact test was used when observed cell values  $n < 5$ . Normality of continuous variables was checked by Kolmogorov–Smirnov test. Continuous variables were compared using Student's t-test for two groups or ANOVA test for >2 groups, for parametric data. Mann–Whitney U-test and Kruskal–Wallis test were used for non-parametric data; whenever applicable. Two-tailed  $p < 0.05$  were considered as significant. Time-series analysis was performed for hospitalized FFH-related injuries at home. Data analysis was carried out using the Statistical Package for the Social Sciences version 18 (SPSS Inc. Chicago, Illinois, USA).

## RESULTS

Overall, the study population: Across the study duration, a total of 1402 patients were admitted to the HTC following fall-related injuries at home (11% of the total trauma admissions). Nearly 94% of injuries were due to FFH, whereas 6% were FHO (Table 1 and Fig. 1). The median age of patients was 29 years and the majority were male gender (77%). The age was missing in seven cases (0.49%). Young children, <5 years old, were the most frequently injured (23%) followed by the age group between 25 and 34 years (16.3%) and age group of 65 and above (13.6%). Head injuries were the most encountered (42%), followed by lower extremities (20%), chest (18%), and spine injuries (16%). The median ISS was 9 and GCS was 15. BAC was positive in 110 cases (7.8%), almost all ( $n=109$ ) cases sustained FFH. During hospitalization, few patients developed pneumonia (2%) and sepsis (1%). Acute respiratory distress syndrome (ARDS) was reported in three patients. A quarter of patients required ICU admissions, and the median ICU length of stay was 2 days. The

**Table 1.** Trauma admissions for home-related falls injuries (n=1402)

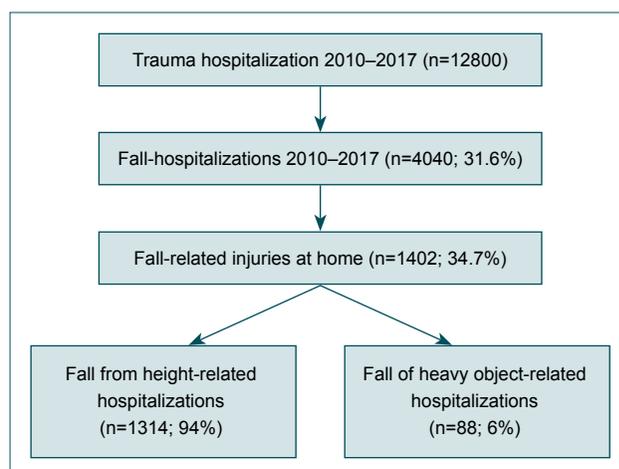
Gender (n=1402), n (%)	
Male	1074 (76.6)
Female	328 (23.4)
Median age in years	29 (IQR 5–49)
Age groups (n=1395) <sup>a</sup> , n (%)	
0–18	519 (37.2) <sup>b</sup>
19–54	580 (41.6)
55–64	106 (7.6)
≥65	190 (13.6)
Mechanism of injury (n=1402), n (%)	
Fall from height	1314 (93.7)
Falling objects	88 (6.3)
Injured body region (n=1402), n (%)	
Head	593 (42.3)
Chest	247 (17.6)
Spine	228 (16.3)
Abdomen	120 (8.6)
Upper extremities	162 (11.6)
Lower extremities	274 (19.5)
Glasgow Coma Scale	15 (IQR 15–15)
Median injury severity score	9 (IQR 5–14)
<sup>***</sup> Positive BAC, n (%)	110 (12)
Complications, n (%)	
Pneumonia	33 (2.4)
Sepsis	18 (1.3)
ARDS	3 (0.2)
ICU admissions, n (%)	354 (25.3)
ICU length of stay	2 (IQR 2–6)
Hospital length of stay	4 (IQR 2–10)
In-hospital mortality, n (%)	32 (2.3)

<sup>a</sup>Data excluded children below 13 years old; <sup>b</sup>age was missing in 7 cases; <sup>c</sup>Children <5 years old constituted 23.6% (n=329). ARDS: Acute respiratory distress syndrome; IQR: Interquartile range; BAC: Blood alcohol concentration; ICU: Intensive care unit.

median hospital length of stay in all patients was 4 days. The overall in-hospital mortality was 2.3%.

### Age Groups

Table 2 demonstrates the characteristics and outcomes of patients following fall-related injuries at home by age groups. FFH injuries were more likely to occur among the older adults, whereas injuries caused by FHO were more likely to happen in children. In addition, head injuries were more frequent among the pediatric population (59%). Notably, spine injuries occurred among the young and middle-aged group were significant (26%). Although the median ISS scores among the



**Figure 1.** Study design: Fall-related hospitalizations.

three study groups were 9, the IQR showed that older adults suffered injuries with higher severity. No significant difference in GCS was observed, between age groups. Complications developed more frequently during hospitalization among the older adults. Moreover, the median length of stays in ICU (4 days) and hospital (9 days) and in-hospital mortality (7%) were significantly higher among the older adults (p=0.001).

### Gender Groups

Table 3 shows the results of comparative analysis of the characteristics and outcomes of fall-related injuries at home among males and females. There was a significant difference in the median age of patients by gender; females were younger than males (25 vs. 30 years, p<0.05). Head, chest, and spinal injuries were comparable among both genders. Injuries of lower extremities were more common among females, whereas males had more upper extremity injuries than females (p<0.05). Injuries due to FHO were more likely among females (p<0.05). There were no significant differences between the two genders regarding ISS, ICU admissions, length of stays, and in-hospital mortality.

### ISS Subgroups

Table 4 compares the severity of injuries among fall-related injuries at home. Patients were categorized into minor, moderate, and severely injured. The mechanisms of injury (FFH and FHO) were comparable among the three groups. The lower the age, the lower the ISS was in home-related fall injuries.

### Height of Fall Subgroups

Table 5 describes the height of falls in patients who sustained FFH. Falling from <1 m was more common in older patients (40 years, IQR 13–63), whereas falling from 6 m and above was more common in younger patients (28 years, IQR 10–37).

### Trend of Falls

Time series analysis for the incidence of FFH is given in Figure

**Table 2.** Trauma admissions for home-related falls injuries by age-groups (n=1395)\*

	0–18 y (n=519, 37.2%)	19–54 y (n=580, 41.6%)	55–64 (n=106, 7.6%)	≥65 y (n=190, 13.6%)	p-value
Gender, n (%)					
Male	360 (69.4)	516 (89.0)	82 (77.4)	111 (58.4)	0.001
Female	159 (30.6)	64 (11.0)	24 (22.6)	79 (41.6)	0.001
Median Age; years	3 IQR (2–6)	35 IQR (28–43)	59 IQR (57–62)	76 IQR (71–82)	0.001
Mechanism of injury, n (%)					
Fall from height	459 (88.4)	558 (96.2)	102 (96.2)	188 (98.9)	0.001
Falling objects	60 (11.6)	22 (3.8)	4 (3.8)	2 (1.1)	0.001
Injured body region, n (%)					
Head	305 (58.8)	201 (34.7)	27 (25.5)	56 (29.5)	0.001
Chest	48 (9.2)	123 (21.2)	31 (29.2)	44 (23.2)	0.001
Spine	25 (4.8)	145 (25.0)	30 (28.3)	25 (13.2)	0.001
Abdomen	37 (7.1)	65 (11.2)	12 (11.3)	6 (3.2)	0.002
Upper extremities	40 (7.7)	91 (15.7)	11 (10.4)	19 (10.0)	0.001
Lower extremities	68 (13.1)	110 (19.0)	22 (20.8)	72 (37.9)	0.001
Glasgow Coma Scale	15 (IQR 15–15)	15 (IQR 15–15)	15 (IQR 15–15)	15 (IQR 15–15)	0.65
Median ISS	9 IQR (4–10)	9 IQR (5–14)	9 IQR (8–13)	9 (IQR 9–13)	0.001
Diagnosis tests, n (%)					
FAST	374 (72.1)	499 (86.0)	88 (83.0)	140 (73.7)	0.001
CT scan	458 (88.2)	501 (86.4)	88 (83.0)	133 (70.0)	0.001
X-Ray	254 (48.9)	419 (72.2)	83 (78.3)	144 (75.8)	0.001
Complications, n (%)					
Pneumonia	4 (0.8)	10 (1.7)	4 (3.8)	15 (7.9)	0.001
Sepsis	1 (0.2)	5 (0.9)	2 (1.9)	10 (5.3)	0.001
ARDS	0	0	0	3 (1.6)	0.001
ICU admissions required, n (%)	104 (20.0)	149 (25.8)	32 (30.2)	65 (34.2)	0.001
ICU length of stay	2 IQR (1–3)	3 IQR (2–6)	3 IQR (2–8)	5 IQR (2–15)	0.001
Hospital length of stay	2 IQR (1–4)	5 IQR (2–11)	7 IQR (4–12)	11 IQR (4–23)	0.001
In-hospital mortality**, n (%)	6 (1.2)	6 (1.0)	4 (3.8)	13 (6.8)	0.001

\*\*Age was not known in 7 cases of the cohort; of them 3 died\*\*; ISS: Injury severity score; FAST: Focused assessment with sonography in trauma; CT: Computed tomography; ARDS: Acute respiratory distress syndrome; ICU: Intensive care unit; Chi Square and ANOVA tests were used for statistical analysis.

2. It demonstrated a slightly increasing trend for FFH but did not show a seasonal variation.

## DISCUSSION

The present study showed that 11% of all patients who required hospitalization in a level I trauma center were due to fall-related injuries at home; of them 94% had FFH. Notably, most of the events were reported among the young and middle-aged subjects followed by pediatric and older adults. Males were predominant in all the study sub-groups. FFH was the most frequent mechanism of injury in every age group; however, FHO was common among the pediatric population. Notably, spine injury was more prominent among the young and middle-aged persons following the head injuries. Data on

the height of fall demonstrated that 20% of FFH were from a height of 3 m and above. Almost 54% of patients with FFH fell from the same level or <1 m and most of them were older adults. Patients who fell from greater heights had more chest and spinal injuries with higher severity and longer hospital length of stay.

Fall-related injuries are more common among older adults and pose a significant economic burden worldwide. Almost one-quarter of people aged 65 and above fall every year. [15] Runyan et al. [16] explored fatal unintentional injuries that occurred at home in the United States, based on data obtained from the National vital statistics system, and estimated the unintentional home injury deaths rate per year as

**Table 3.** Trauma admissions for home-related falls injuries by gender (n=1402)

	Male 1074 (76.6%)	Female 328 (23.4%)	p-value
Median age years	30 (IQR 6–47)	25 (IQR 3–65)	0.03
Injured body region			
Head	463 (43.1)	130 (39.6)	0.27
Chest	201 (18.7)	46 (14.0)	0.05
Spine	185 (17.2)	43 (13.1)	0.08
Abdomen	100 (9.3)	20 (6.1)	0.07
Upper extremities	135 (12.6)	27 (8.2)	0.03
Lower extremities	191 (17.8)	83 (25.3)	0.003
Mechanism of injury			
Fall from height	1015 (94.5)	299 (91.2)	0.03
Falling objects	59 (5.5)	29 (8.8)	
Median ISS	9 (IQR 5–14)	9 (IQR 4–12)	0.05
Complications			
Pneumonia	27 (2.5)	6 (1.8)	0.47
Sepsis	15 (1.4)	3 (0.9)	0.50
ARDS	3 (0.3)	0	1.0
ICU admissions	278 (25.9)	76 (23.2)	0.31
ICU length of stay	3 (IQR 2–6)	2 (IQR 2–5)	0.94
Hospital length of stay	4 (IQR 2–9)	5 (IQR 2–12)	0.70
In-hospital mortality	26 (2.4)	6 (1.8)	0.53

Student-t and Chi-square tests were used for statistical analysis. ISS: Injury severity score; ARDS: Acute respiratory distress syndrome; ICU: Intensive care unit.

6.83/100,000 population. The mortality is fewer in the present analysis (2.3%), with an exponential increase with age. The time-series analysis of the incidence of FFH demonstrated a slight upward trend but did not show seasonal variations.

A retrospective study from a city in Iran over a 6-year period reported that home-related injuries constitute 25% of the total injuries.<sup>[17]</sup> Most of the studies reported the predominance of males in home-related injuries.<sup>[16–18]</sup> Our findings were also similar as 77% of patients were males. On the other hand, Mohammadi et al.,<sup>[19]</sup> reported that among children under 15 years of age, most of patients were male; however, females were predominant in all other age groups. Males were predominant in the young and middle-aged age groups of our study population, but less so in the very young and elderly age groups. This phenomenon is due to the fact that this working age group made up of more than 75% male expatriate workers, a situation that is commonly seen in the Arab Gulf region rather than the other countries. Construction site-related FFH in the present study was reported to have four-fold higher mortality (9.7%) that was significantly higher than FFH at home, a product of the higher falling height for this type of injury.<sup>[20]</sup>

In the USA, there are around 4 million emergency visits due to home injuries, of them 39% occurred in children.<sup>[18]</sup> A prior study found a greater variation in injury rates that vary

**Table 4.** Trauma admissions for home-related falls injuries by Injury severity score (n=1384)\*

	ISS (0-9) (798, 57.7%)	10-15 (305, 22.0%)	≥16 (281, 20.3%)	p-value
Gender				
Male	596 (74.7)	236 (77.4)	229 (81.5)	0.06
Female	202 (25.3)	69 (22.6)	52 (18.5)	0.06
Median age in years	28 (IQR 4–49)	32 (IQR 9–51)	32 (IQR 10–53)	0.04
Injured body region				
Head	229 (28.7)	167 (54.8)	193 (68.7)	0.001
Chest	88 (11.0)	73 (23.9)	84 (29.9)	0.001
Spine	92 (11.5)	67 (22.0)	69 (24.6)	0.001
Abdomen	43 (5.4)	27 (8.9)	47 (16.7)	0.001
Upper extremities	78 (9.8)	45 (14.8)	39 (13.9)	0.03
Lower extremities	189 (23.7)	45 (14.8)	40 (14.2)	0.001
Mechanism of injury				
Fall from height	752 (94.2)	279 (91.5)	269 (95.7)	0.08
Falling objects	46 (5.8)	26 (8.5)	12 (4.3)	0.08
Complications				
Pneumonia	5 (0.6)	4 (1.3)	24 (8.5)	0.001
Sepsis	2 (0.3)	3 (1.0)	13 (4.6)	0.001
ARDS	0	1 (0.3)	2 (0.7)	0.08
ICU admissions; days	99 (12.4)	77 (25.2)	177 (63.2)	0.001
ICU length of stay	2 (IQR 1–4)	2 (IQR 2–4)	3 (IQR 2–10)	0.001
Hospital length of stay	3 (IQR 1–8)	4 (IQR 2–9)	9 (IQR 3–21)	0.001
In-hospital mortality	2 (0.3)	6 (2.0)	24 (8.5)	0.001

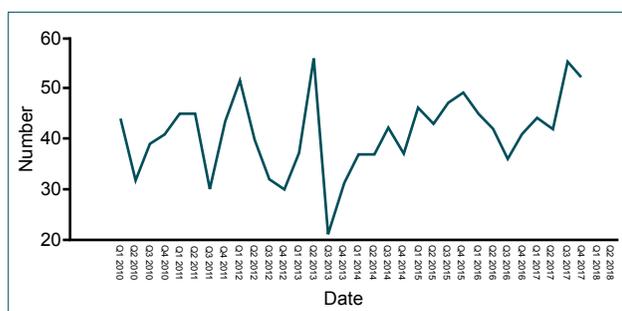
Data of injury severity score were not captured for 18 patients\*. Chi Square and ANOVA tests were used for statistical analysis. ISS: Injury severity score; ICU: Intensive care unit.

**Table 5.** Trauma admissions for home-related falls by height of fall (n=1217)\*

	<1 m (690, 56.7%)	1-2.9 m (284, 23.3%)	3-5.9 m (158, 13.0%)	≥6 m (85, 7.0%)	p-value
Gender					
Male	523 (75.8)	227 (79.9)	134 (84.8)	65 (76.5)	0.07
Female	167 (24.2)	57 (20.1)	24 (15.2)	20 (23.5)	0.07
Median Age in years	40 (IQR 13–63)	10 (IQR 3–37)	26 (IQR 7–36)	28 (IQR 10–37)	0.001
Injured body region					
Head	295 (42.8)	148 (52.1)	45 (28.5)	24 (28.2)	0.001
Chest	111 (16.1)	40 (14.1)	36 (22.8)	29 (34.1)	0.001
Spine	89 (12.9)	49 (17.3)	44 (27.8)	30 (35.3)	0.001
Abdomen	44 (6.4)	28 (9.9)	15 (9.5)	15 (17.6)	0.003
Upper extremities	48 (7.0)	38 (13.4)	33 (20.9)	23 (27.1)	0.001
Lower extremities	135 (19.6)	26 (9.2)	38 (24.1)	32 (37.6)	0.001
Median ISS	9 (IQR 5–13)	9 (IQR 5–13)	10 (IQR 5–14)	11 (IQR 7–20)	0.001
Complications					
Pneumonia	13 (1.9)	9 (3.2)	6 (3.8)	0	0.20
Sepsis	6 (0.9)	5 (1.8)	3 (1.9)	1 (1.2)	0.60
ARDS	1 (0.1)	0	1 (0.6)	0	0.43
ICU admissions	177 (25.7)	58 (20.4)	38 (24.1)	37 (43.5)	0.001
ICU length of stay	2 (IQR 2–6)	2 (IQR 2–5)	3 (IQR 2–5)	4 (IQR 2–11)	0.09
Hospital length of stay in days	4 (IQR 2–10)	3 (IQR 1–7)	5 (IQR 2–12)	9 (IQR 4–23)	0.001
In-hospital mortality	18 (2.6%)	3 (1.1%)	3 (1.9%)	3 (3.5%)	0.40

Data on height of fall were not captured for 97 patients\*, m= meter. Chi Square and ANOVA tests were used for statistical analysis. ARDS: Acute respiratory distress syndrome; ICU: Intensive care unit.

between families than between neighborhoods.<sup>[21]</sup> Kendrick et al.<sup>[22]</sup> revealed that the ED attendance rates were higher amongst boys living in places with a higher number of play areas and parks. Another study on falls of furniture in young children found that lack of safety gate use at home and climbing on kitchen objects were significant risk factors.<sup>[23]</sup> Among the infants aged ≤12 months, leaving them unattended on raised surfaces was the main reason for fall injuries. On the other hand, children of 3 years and above were likely injured due to playing or climbing on furniture.<sup>[20]</sup> Studying unintentional injuries at home in USA, Runyan et al.,<sup>[16]</sup> demonstrated that death rate was higher among males than females, and older adults than other age groups. Our study focused on



**Figure 2.** Time series for hospitalized fall from height-related injuries at home.

two mechanisms of injuries at home, that is, FFH and FHO, revealed that male children were the main victims, their median age was 3 years, they suffered more head injuries, and one out of five cases required ICU care. However, their lower fall heights, when compared to adults’ fall heights, resulted in significantly lower in-hospital mortality.

Fitzharris et al.<sup>[23]</sup> demonstrated that falls resulting in injury and requiring medical care can be reduced with a combination of exercise, vision, and home hazard reduction interventions. In our study, falls were the most frequent mechanism of injury among the older adults which resulted mostly in lower extremity injuries. A significant proportion of injured older adults (35%) required ICU care, developed more complications in the hospital, and stayed longer in the ICU and hospital, when compared to other age groups. In addition, the mortality rate among this age group was significantly higher when compared to the other groups.

Although our study demonstrated that fall-related injuries at home most affected the ≤4 years old age group, the middle-age group, were also of concern. The young and middle-aged (19–54 years) population in our study experienced significantly higher spinal and abdominal injuries. This age group required more ICU admissions, and longer duration

of ICU and hospital stay when compared to the pediatric population. However, mortality was lower when compared to the other age groups. A previous study from Qatar on bathroom injuries revealed that mortality was higher among the older adults, though the injury severities of patients in all age groups were comparable.<sup>[6]</sup> Another study reported that patients with age 46–64 years who experienced FFH had significantly higher mortality when compared to the age group 20–45 years.<sup>[5]</sup> Notably, 47% of the 46–64 years age group in that study were injured at home while only 18% of the young age group suffered home injuries.<sup>[5]</sup>

The major strength of the study is that data were obtained from the QTR at the only level I trauma center in the country that has regular internal and external validation. Although the study included only two main mechanism of home-related fall injuries (FFH and FHO), it provides some valuable epidemiologic information which ultimately strengthens injury prevention strategies.

### Limitations

The main limitation of the study was the retrospective design; however, such studies are required to address an important public health concern, and to inform and improve injury prevention efforts. Long-term outcomes or disability outcomes and pre-hospital deaths due to home-related injuries were not captured in this study. An in-depth inquiry and analysis of pre-injury risk factors for home-related injuries should be the subject of future research in this field.

As we do not have routine postmortem examination, the cause of death was not definitely reported. A recent study from Turkey assessed 213 cases of fatal falls from a height and autopsies were performed. The study found that 60.6% of the cases had fallen at home.<sup>[24]</sup> Another study from Jordan evaluated 352 autopsy reports of falling victims.<sup>[25]</sup> The authors found that head injury was the most common fatal injury in all distances, whereas chest injuries were prominent in distances >3 m and abdominal injuries were mainly due to fall from >9 m.

Finally, intentional or self-inflicted falls may be inadvertently included in this study along with the unintentional falls. Further studies are needed to explore the trend of fall at home in situations that mandate the long stay at home as we currently encounter during the COVID-19 pandemic.<sup>[26]</sup>

### Conclusion

This study demonstrates that a significant health burden is due to fall-related injuries at home which represents 11% of all trauma hospitalizations. FFH was the dominant mechanism of injury in all age groups; however, FHO was more common in the children. There is a significantly higher mortality for fall-related injuries at home in the elderly. Preventive efforts should address these two residential patterns of traumatic

injuries with their corresponding high-risk group and detail of injuries to better inform, develop, and implement evidence-based injury prevention strategies.

**Ethics Committee Approval:** This is retrospective study that was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Institutional Review Board at the medical research center at Hamad Medical Corporation, Doha, Qatar (IRB#MRC-01-18-004).

**Data Availability Statement:** All data generated or analyzed during this study are included in this published article. Data are accessible upon agreement with the national trauma registry and the Medical Research Centre at HMC.

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## ORİJİNAL ÇALIŞMA - ÖZ

### Evde düşmeye bağlı yaralanmalar: Orta Doğu'daki birinci düzey bir travma merkezinden tanımlayıcı analiz

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**AMAÇ:** Orta Doğu bölgesinde mesken ortamında yüksekten düşme ve ağır nesnelerin düşmesi nedeniyle oluşan yaralanmalar hafife alınmaktadır. Bu yazıda, birinci düzey travma merkezine yatış gerektiren evde düşmeye bağlı yaralanmaları tanımlamayı amaçladık.

**GEREÇ VE YÖNTEM:** 2010 ve 2018 yılları arasında evde düşmeye bağlı yaralanmaları takiben merkeze başvuran hastaların retrospektif bir analizini yaptık. Yaş grupları (<18, 19–54, 55–64, ≥65 yaş), cinsiyet, yaralanma şiddeti ve düşme yüksekliğine göre karşılaştırmalı analizler yapıldı. Düşmeye bağlı yaralanmaların zaman serisi analizi yapıldı.

**BULGULAR:** Toplam 1402 hasta evde meydana gelen düşmeye bağlı yaralanmalar nedeniyle hastaneye kaldırılmıştı (toplam travma başvurularının %11'i). Yaralananların dörtte üçü erkekti. En çok yaralananlar genç ve orta yaşlı bireylerdi (%41.6); bunu çocuk (%37.2) ve yaşlı bireyler (%13.6) takip etmekteydi. En sık yaralanma mekanizması yüksekten düşme (%94), ardından ağır nesnelerin düşmesi (%6) idi. Kafa travması en yaygın olanıydı (%42); bunu alt ekstremitte yaralanması (%19) takip etmekteydi. Yaşlı yetişkinlerde (≥65 yaş) daha fazla komplikasyon, daha uzun hastanede kalış süresi ve daha yüksek hastane içi mortalite görülmüştür. Yüksekten düşen hastalarda şiddetli daha fazla olan daha fazla göğüs ve omurilik yaralanması ve hastanede daha uzun süre kalma gözlemlendi. Zaman serisi analizi, düşmeyle ilgili hastaneye yatışta mevsimsel bir değişiklik göstermemiştir.

**TARTIŞMA:** Bu çalışma, travma nedeniyle hastaneye yatışların %11'inin evde düşme ile ilişkili olduğunu göstermiştir. Yüksekten düşme tüm yaş gruplarında yaygındı; ancak ağır nesnelerin düşmesi pediatrik grupta daha belirgindi. Önleyici çabalar, kanıt dayalı önleme stratejileri konusunda daha iyi bilgilendirmek adına mesken ortamındaki travma koşullarını ele almalıdır.

**Anahtar sözcükler:** Ağır nesnelerin düşmesi; ev; hastaneye yatış; mesken ortamları; travma; yaralanma; yüksekten düşme.

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