

Access this article online

Quick Response Code:



Website:

www.jfcmonline.com

DOI:

10.4103/jfcm.JFCM_148_16

Home-related falls: An underestimated mechanism of injury

Husham Abdelrahman, Ammar Almadani, Ayman El-Menyar¹, Adam Shunni, Rafael Consunji², Hassan Al-Thani

Abstract:

BACKGROUND: The home is a leading location for falls, but the epidemiology and outcome of falls at home (FH) have not been adequately described. Our aim was to evaluate FH, particularly in the bathroom.

MATERIALS AND METHODS: We conducted a retrospective analysis of patients with a history of FH admitted to the Level I trauma center in Qatar. Patients were divided into Group 1: <60 years and Group 2: 60 year or older, and their data were analyzed and compared.

RESULTS: A total of 98 patients with FH in the bathroom with a mean age of 51 ± 18 years, mostly males (73.5%) were identified over 3 years. One out of every 50 trauma patients admitted was a victim of a fall in the bathroom. Group 2 had significantly more females and sustained a single-site injury. Group 1 had more involvement of alcohol ($P = 0.02$) and sustained more multiple injuries (44% vs. 23%; $P = 0.02$). The mean Injury Severity Score and length of hospital stay was comparable among the two groups. Head, abdomen, and facial injuries were significantly higher in Group 1 whereas lower extremity injuries and mortality were significantly higher in Group 2.

CONCLUSION: FH, particularly in the bathroom, is an underrecognized mechanism of injury with a unique dichotomous epidemiology based on age. This needs increased public awareness and primary prevention programs for high-risk populations.

Keywords:

Bathroom, fall, home, trauma, unintentional injury

Introduction

Falls, regardless of the location and cause, are a leading cause of serious injury, necessitating hospitalization, especially for the elderly.^[1] Although they may not be highly fatal, they can be associated with life-long physical and psychological disability.^[1] The majority of these falls occur in the home and are potentially preventable by a variety of proven methods that can also reduce their incidence and resulting severity of injury.^[2]

The home, particularly the bathroom, has been identified as a primary location for household falls,^[1] and a recent report from the Centers for Disease Control showed

that in 2008, there were 189,928 nonfatal injuries caused by bathroom falls in the United States.^[3]

Falls from height (FFH) and motor vehicle crashes are the leading causes of serious injury in Qatar.^[4] Falls from construction sites are also a leading cause of traumatic injury and are documented as a significant cause of the death, disability, and healthcare cost burden in Qatar.^[5]

However, there are no published reports on the epidemiology of bathroom falls in Qatar.

This report describes the epidemiology and patterns of injuries from bathroom falls in Qatar. Its findings will form the basis of identifying high-risk groups and associated

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Abdelrahman H, Almadani A, El-Menyar A, Shunni A, Consunji R, Al-Thani H. Home-related falls: An underestimated mechanism of injury. J Fam Community Med 2018;25:48-51.

Department of Surgery,
Section of Trauma
Surgery, Hamad General
Hospital, ¹Department
of Surgery, Clinical
Research Unit, Section of
Trauma Surgery, Hamad
General Hospital and
Clinical Medicine, Weill
Cornell Medical School,
²Department of Surgery,
Injury Prevention, Section
of Trauma Surgery,
Hamad General Hospital,
Doha, Qatar

Address for correspondence:

Prof. Ayman El-Menyar,
Weill Cornell Medical
School and Clinical
Research, Trauma
Surgery, Hamad General
Hospital, P.O. Box 3050,
Doha, Qatar.
E-mail: aymanco65@
yahoo.com

risk factors and provide evidence for the formulation of prevention programs for falls at home (FH) for high-risk populations and the community in general.

Materials and Methods

A retrospective descriptive review of patients' records from the trauma registry of the Hamad Trauma Center (the National Level I trauma center), Trauma Surgery Section, Department of Surgery, Hamad General Hospital, Doha, Qatar, was conducted between July 1, 2008, and July 31, 2011. All records of patients with a history of a fall at home were extracted using the search terms "fall," "slip," "home," "outhouse," "water closet," "shower," and "bathtub." Patients with a history of neurologic, cardiac, or syncope-related fall were excluded. The records of patients with a history of a bathroom fall were identified and the demographic data (age, gender, and nationality), type of injuries, length of stay in hospital (LOS), Injury Severity Score (ISS), abbreviated injury score, risk factors, or comorbidities including obesity, alcohol intoxication, poor vision, and outcomes were extracted. The main demographic and outcome measures available were age, gender, injury pattern, injuries sustained, ISS, overall hospital LOS, death, as well as alcohol abuse. This study was approved by the Hamad Medical Corporation Medical Research Center, Qatar (IRB#12051/12).

Data were presented as proportions, mean \pm standard deviation, or median as appropriate. Patients demographics, clinical presentation, and outcomes were analyzed and compared according to age. (Group 1: <60 years vs. Group 2: \geq 60 years). Chi-square test was used for categorical variables and Student's *t*-test for continuous variables. A significant difference was considered when the two-tailed $P < 0.05$. Data analysis was carried out using the Statistical Package for Social Sciences version 18 (SPSS Inc. Chicago, Illinois, USA).

Results

During the study period, a total of 98 patients were identified with injuries resulting from a fall at home. The mean age of the patients was 51 ± 18 years, most were males (73.5%), and 36% of the patients were elderly (≥ 60 years). Patients were categorized into two groups by age (Group 1: <60 years vs. Group 2: ≥ 60 years). Group 2 had a significantly higher proportion of females (48.6% vs. 14.3%; $P = 0.004$) and more sustained single-site injuries (77% vs. 55.6%; $P = 0.02$) than Group 1 [Table 1]. Group 1 had a higher proportion of alcohol use (7.9% vs. 0%; $P = 0.02$) and more of them sustained multiple injuries (44.4% vs. 22.9%; $P = 0.02$). There was no significant difference in the mean ISS and length of hospital stay between the two groups. There were only 2 deaths from bathroom falls in our study population. Both were elderly males, older than 75 years,

who succumbed to multiple organ failure after 10 days in the hospital.

Table 2 shows the distribution of region-specific injuries classified by age group. There were significantly more injuries to the head (52.4% vs. 5.7%; $P = 0.001$) in Group 1 than Group 2. Specifically, the frequencies of intracranial hematoma (28.6% vs. 2.9%; $P = 0.001$), skull fracture (16% vs. 3%; $P = 0.02$), and intracranial contusion (8% vs. 0%; $P = 0.02$) were higher in Group 1. Similarly, facial injuries (67% laceration, 33% abrasion) were seen more often in Group 1 compared to Group 2 (none). Injuries to the abdomen (50% spleen, 25% rectoperineal injury, 25% mesentery) were only seen in Group 1. Other than the spleen and intraperitoneal hollow viscus, no solid organ injuries were reported.

There were more thoracic injuries (44.4% pulmonary contusion, 22.2% hemothorax, 16.7% pneumothorax,

Table 1: Demographics, clinical characteristics, and outcomes of patients with bathroom falls by age (Group 1: <60 years vs. Group 2: ≥ 60 years)

	Group 1 (n=63)	Group 2 (n=35)	p-Value*
Age, years (mean \pm SD)	39.1 \pm 11	72.7 \pm 8	0.02
Female (%)	14.3	48.6	0.004
Male (%)	85.7	51.4	0.004
Blood alcohol positive (%)	7.9	0	0.02
ISS (mean \pm SD)	7.6 \pm 4	8.4 \pm 3	0.93
Multiple injuries (%)	44.4	22.9	0.02
Single-site injury (%)	55.6	77.1	0.02
LOS (mean \pm SD)	7.7 \pm 8	12.03 \pm 13	0.78
Deaths (%)	0.0	5.7	0.01

*Two-tailed $P < 0.05$ is considered as significant. ISS = Injury Severity Score, LOS = Length of stay (days), SD = Standard deviation

Table 2: Proportion of patients with region-specific bathroom fall injuries by age group (Group 1: <60 years vs. Group 2: ≥ 60 years)

Region of injury	Group 1 (n=63)	Group 2 (n=35)	p-Value*
Head (%)	52.4	5.7	0.001
Skull fracture	15.9	2.9	0.02
Contusion	7.9	0.0	0.02
Intracranial hematoma	28.6	2.9	0.001
Face (%)	9.5	0.0	0.04
Vertebral fracture (%)	23.8	17.1	0.43
Chest (%)	28.6	14.3	0.09
Rib fracture (%)	25.4	20.0	0.54
Abdomen (%)	6.4	0.0	0.04
Upper extremity (%)	14.3	5.7	0.15
Lower extremity (%)	26.9	62.9	0.001
Laceration	4.8	0.0	0.07
Tibia fracture	1.6	0.0	0.32
Femur fracture	20.6	62.9	0.001

and 16.7% clavicular fracture) and rib fractures (81% multiple fractures) in Group 1, however, the difference between the 2 groups in this regard was statistically not significant. Vertebral fractures were comparable between the two groups. No injuries of cervical vertebrae were reported in Group 2, in which the majority of injuries involved the lumbar vertebrae (66.7%). Lower extremity injuries, particularly femur fractures (62.9% vs. 20.6%; $P = 0.001$), were significantly higher in Group 2.

Discussion

The present study is based on the trauma registry of the national trauma referral center; which is representative of all victims who sustained serious injury from FH in Qatar. However, the real number of overall FH victims might be higher as our study population only included patients who sustained injuries severe enough to warrant hospital admission. Thus, patients who were less seriously injured and those who did not seek help for injuries as a result of FHs were not explored in the present study. FH is an underrecognized cause of injury and mortality in Qatar with a unique epidemiology. There are two distinct patterns of injury and outcome for bathroom falls based on age, with 64% affecting a younger population (<60 years). The male predominance noticed in the younger group was not evident in the older group. Elderly victims (≥ 60 years) of bathroom falls were significantly associated with the female gender, a higher mortality rate, and a single musculoskeletal injury, most commonly a femoral fracture. On the other hand, the younger patients were mainly males, with a history of alcohol consumption and multiple injuries, most commonly of the head, face, chest, and abdomen, but no reported mortality.

Global literature identifies the bathroom as the most hazardous place at home for injury, and it is recommended that the public should be aware of high-risk bathroom activities and the potential environmental modifications to reduce this risk.^[2,3] The American National Electronic Surveillance System All Injury Program (NEISS-AIP) database estimated 234,094 nonfatal bathroom injuries in 2008 and identified falls as the major causal mechanism (81%) and age as a major contributor to severe outcomes.^[3] In Qatar, the bathroom is not the leading site of falls, but around 1 in every 7 victims of falls and about 2% of all trauma cases (approximately 2000 annually) admitted to our hospital was injured in a bathroom fall.

The majority of our FH victims were young males (64%); a finding which is consistent with the predominantly young male expatriate working population in Qatar. However, prior reports showed that elderly females have higher risk for FH than their male counterparts.^[6-8] This

male majority is not seen in older FH victims in whom the gender ratio mirrors that of the general population.^[9]

In our study, the most common injury observed in the elderly population (Group 2) was a femoral fracture (62.9%). Our findings corroborate those from an earlier study by Nordell *et al.*^[8] which showed that indoor falls are likely to result in a fracture of the femur, particularly in elderly individuals. Similarly, other authors have also reported the higher incidence of femoral fractures and mortality in elderly FH patients.^[3,7] Consistently, in our study, one of the two deceased patients had femoral fracture. Both of these patients were males of advanced age (>75 years), and such patients were more likely to die from preexistent comorbid conditions in comparison to females of the same age.^[6]

The role of alcohol was clearly shown in the incidence of staircase falls.^[10] In this series, 8% of the young population was documented to have a positive blood alcohol concentration while none of the elderly patient was under the influence of alcohol in the FH. This might be an undercount, as during the study period, our center had not yet implemented routine alcohol screening.

Given the unique epidemiology of FHs, i.e., affecting a young male population, in Qatar, these injuries must be given due attention. The significantly higher incidence of injury to the head, face, abdomen, and multiple trauma in younger FH patients has not been reported elsewhere. The apparent inadequacy of our trauma registry to provide the necessary prefall information compels us to recommend the creation of a data collection tool with the explicit objective of injury prevention of bathroom falls in Qatar. Zecevic *et al.*^[11] recommend that providing an operational definition of a fall, with explicit inclusion and exclusion criteria, is recommended when conducting research and we will apply the same to define FHs in our population. One of the strengths of our study is that all case records that met the inclusion criteria were identified, and pertinent data were extracted. This increases the validity of the recommendations based on the findings for the prevention of falls, in the diverse populations at risk in Qatar. However, prospective collection of data for circumstantial and risk factors from all victims of FH injuries is important to provide more evidence to support the formulation of targeted injury prevention programs for high-risk groups in Qatar, particularly the elderly and the young males.

Limitations of this study include the retrospective collection of the data with its well-known limitations and the lack of circumstantial details of the falls such as pre-event activity, condition of the patient, physical, and social environment. Details of the cardiac, neurologic disorders, and medications were not documented. The

Table 3: Haddon phase-factor matrix for bathroom falls

	Host	Vehicle	Physical environment	Social environment
Prefall	Underlying medical condition/s: diabetes, hypertension, ischemic heart disease, vertigo, postural hypotension, neurological disease, arrhythmias, visual impairment, urinary incontinence, osteoporosis	Appropriate footwear and/or clothing	Nonslip floor, wet floor, lighting, grab bars, type of toilet	Presence of caretaker or assistance in ambulation
Fall	Bone density	Appropriate footwear and/or clothing	Height of the fall, contact with other objects or surfaces	Public knowledge of bathroom safety
Postfall	General health, comorbidities, health insurance		Availability of a prehospital ambulance system	Presence of companion to call for medical help, availability of trauma care, and rehabilitation

elements that populate the Haddon matrix [Table 3] for bathroom falls are the essential circumstantial data that are not adequately captured by our existing trauma registry. These will be addressed with the prospective application of a preventive designed data sheet that will be part of an FH registry. Moreover, our registry did not document child victims of FHs, which is also an important issue addressed by earlier reports from Pakistan^[12] and global reports on child injuries.^[13]

Conclusion

FH, particularly in the bathroom, is an underrecognized mode of serious injury. It has a unique dichotomous epidemiology that predicts both outcomes and patterns of injury based on age. These are interesting, unexpected, and not fully explained findings that merit further study. More specifically, prospectively collected data are needed to inform the formulation of public awareness and primary prevention programs that aim at preventing falls in each of these two high-risk populations: the elderly at home and the young male worker.

Acknowledgment

We would like to thank all the trauma database registrars, administrators, and staff of the Trauma Section, Department of Surgery, Hamad General Hospital, Doha, Qatar, for their support and assistance.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

- Yoshida S. A Global Report on Falls Prevention – Epidemiology of Falls. World Health Organization. Available from: <http://www.who.int/ageing/projects/1.Epidemiology%20of%20falls%20in%20older%20age.pdf>. [Last accessed on 2014 Feb 02].
- Gillespie LD, Robertson MC, Gillespie WJ, Sherrington C, Gates S, Clemson LM, *et al.* Interventions for preventing falls in older people living in the community. *Cochrane Database Syst Rev* 2012;(9):CD007146. doi: 10.1002/14651858.CD007146.pub3.
- Stevens JA, Haas EN, Haileyesus T. Nonfatal bathroom injuries among persons aged ≥ 15 years – United States, 2008. *J Safety Res* 2011;42:311-5.
- Bener A, Zirie MA, Kim EJ, Al Buz R, Zaza M, Al-Nufal M, *et al.* Measuring burden of diseases in a rapidly developing economy: State of Qatar. *Glob J Health Sci* 2012;5:134-44.
- Tuma MA, Acerra JR, El-Menyar A, Al-Thani H, Al-Hassani A, Recicar JF, *et al.* Epidemiology of workplace-related fall from height and cost of trauma care in Qatar. *Int J Crit Illn Inj Sci* 2013;3:3-7.
- Stevens JA, Ryan G, Kresnow M. Fatalities and injuries from falls among older adults – United States, 1993-2003 and 2001-2005. *MMWR Morb Mortal Wkly Rep* 2006;55:1221-4.
- WHO Global Report on Falls Prevention in Older Age. World Health Organization; 2007. Available from: http://www.who.int/ageing/publications/Falls_prevention7March.pdf. [Last accessed on 2014 Jan 29].
- Nordell E, Jarnlo GB, Jetsén C, Nordström L, Thorngren KG. Accidental falls and related fractures in 65-74 year olds: A retrospective study of 332 patients. *Acta Orthop Scand* 2000;71:175-9.
- Vital Statistics Annual Bulletin (Births & Deaths) (2010) Qatar Statistics Authority; 2010. Available from: <http://www.qsa.gov.qa/eng/index.htm>. [Last accessed on 2013 Dec 15].
- Wyatt JP, Beard D, Busuttill A. Fatal falls down stairs. *Injury* 1999;30:31-4.
- Zecevic AA, Salmoni AW, Speechley M, Vandervoort AA. Defining a fall and reasons for falling: Comparisons among the views of seniors, health care providers, and the research literature. *Gerontologist* 2006;46:367-76.
- Zia N, Khan UR, Razzak JA, Puvanachandra P, Hyder AA. Understanding unintentional childhood home injuries: Pilot surveillance data from Karachi, Pakistan. *BMC Res Notes* 2012;5:37.
- Peden M, Oyegbite K, Ozanne-Smith J, Hyder AA, Branche C, Fazlur Rahman AK, *et al.* World Report on Child Injury Prevention. Geneva, Switzerland: World Health Organization; 2008. Available from: http://www.who.int/publications/2008/9789241563574_eng.pdf?ua=1. [Last accessed on 2014 Mar 23].