

# Trends and Characteristics of Head and Neck Injury from Falls

## A hospital based study, Qatar

\*Abdulbari Bener,<sup>1,2</sup> Yassir S. Abdul Rahman,<sup>3</sup> Eltayib Y. Abdel Aleem,<sup>4</sup> Muayad K. Khalid<sup>4</sup>

## اتجاهات وخصائص إصابات الرأس والرقبة نتيجة السقوط دراسة تستند على إحصائية للحوادث والطوارئ بمؤسسة حمد الطبية - دولة قطر

عبد الباري بنر، ياسر عبد الرحمن، الطبيب عبدالعليم، مؤيد خالد

**الخلاصة:** الهدف: تهدف هذه الدراسة الوصفية الاستيعابية التي أجريت في المستشفى إلى تحديد خصائص وأنماط وعدد إصابات الرأس والرقبة نتيجة السقوط. الطريقة: أجريت الدراسة على 1,952 مريضاً تمت معالجتهم في قسم الطوارئ والحوادث في مؤسسة حمد الطبية بدولة قطر حيث كان عدد إصابات الرأس 1,629 وعدد إصابات الرقبة 225 بينما وصل عدد الإصابات لكل منهما 98 خلال الفترة 2001-2006. تم تحديد إصابات الرأس والرقبة وفقاً لمعايير التصنيف الدولي للأمراض - 10. تم استخراج تفاصيل عن المرضى الذين تعرضوا لإصابات نتيجة للسقوط من قاعدة البيانات لخدمات الإسعاف والطوارئ بمؤسسة حمد الطبية. النتائج: ظهر أن غالبية المصابين (78.6%) هم من غير القطريين، وهم من الذكور (86.6%)، ووصلت النسبة عند الفئة العمرية من 20-29 سنة (26.8%). أظهرت البيانات حدوث ارتفاع في إصابات الرأس والرقبة خلال عطلة نهاية الأسبوع (27.1%). حوالي نصف إصابات الرأس والرقبة حدثت في أماكن العمل (49.4%). كانت إصابات الرقبة (10.2%) أكثر شدة من إصابات الرأس (7.3%). معدل حدوث إصابات الرأس والعنق لكل 10,000 شخص ارتفع من 2.1 في العام 2001 إلى 5.5 في عام 2006، ولا سيما بين المسنين الذين تتجاوز أعمارهم 60 سنة (من 13.1 في عام 2003 إلى 18.6 في عام 2006). أما فيما يتعلق بالإصابات السطحية للرأس فكانت نسبتها (29.4%) وهي أكثر شيوعاً بين المرضى الذين أصيبوا بإصابات بالغة أو شديدة. الخلاصة: أظهرت نتائج الدراسة الحالية أن حدوث إصابات الرأس والرقبة أعلى بين البالغين الشباب والمسنين.

كلمات البحث: إصابة الرأس، إصابة الرقبة، السقوط المهني، السقوط المنزلي، حدوث الإصابة، اعتلال، صدمة، قطر.

**ABSTRACT: Objectives:** The aim of this retrospective descriptive hospital-based study was to determine the trend in the number, incidence and pattern of head and neck injuries involved with falls. **Methods:** A retrospective analysis was carried out of 1,952 patients who were treated at the Accident and Emergency and Trauma centres of Hamad Medical Corporation, Qatar, for head (n = 1,629), neck (n = 225) and both (n = 98) injuries during the period 2001-2006. Head and neck injuries were determined according to the International Classification of Disease, ICD-10 criteria. Details of all the trauma patients who were involved in falls were extracted from the database of the Emergency Medical Services (EMS), Hamad Medical Corporation. **Results:** The majority of the victims were non-Qataris (78.6%), men (86.6%) and in the age group 20-29 years (26.8%). There was a disproportionately higher incidence of head and neck injuries from falls during weekends (27.1%). Nearly half of the head and neck injuries from falls occurred at work (49.4%). Neck injuries (10.2%) were more severe than head injuries (7.3%). The incidence rate of head and neck injuries per 10,000 population increased from 2.1 in the year 2001 to 5.5 in 2006, particularly among the elderly population above 60 years of age (13.1 in 2003 to 18.6 in the year 2006). Superficial injury to the head (29.4%) was more common among trauma patients. **Conclusion:** The present study findings revealed that the incidence of head and neck injuries was higher among young adults and the elderly population.

**Keywords:** Head injury; Neck injury; Occupational falls; Home falls; Incidence; Morbidity; Trauma; Qatar

### ADVANCES IN KNOWLEDGE

1. This is the first study in Qatar to investigate the number, incidence and trends of head and neck injuries from falls.
2. The high risk groups of fallers were elderly people and younger workers.
3. This study highlighted the emerging trend of traumatic morbidity from fall induced head and neck injuries in the general population.

### APPLICATION TO PATIENT CARE

1. The findings of this study emphasise the need for urgent steps to be taken in Qatar for injury prevention, especially among workers and those in the elderly population.

<sup>1</sup>Department of Medical Statistics & Epidemiology, Hamad General Hospital, Hamad Medical Corporation, Doha, Qatar; <sup>2</sup>Evidence for Population Health Unit, School of Epidemiology & Health Sciences, University of Manchester, Manchester, U.K.; <sup>3</sup>Hamad Trauma Center, Hamad Medical Corporation, Doha, Qatar; <sup>4</sup>Accident and Emergency Department, Hamad Medical Corporation, Doha, Qatar.

\*Corresponding Author email: abener@hmc.org.qa

FALLS AND FALL-INDUCED INJURIES ARE a major public health problem in modern societies with ageing populations.<sup>1</sup> As a measure of burden, disability adjusted life years (DALYs) quantify the total amount of healthy life lost because of disease or injury. In high income countries, injuries due to falls are the fourteenth leading cause of DALYs for all age groups combined.<sup>2</sup> In industrialised countries like the USA, Canada and Japan, injuries caused by falls have increased dramatically.<sup>3</sup> Falls are the second leading cause of unintentional injury deaths in the USA. It was reported that an estimated 3.4 million non-fatal injuries occurred among workers of all ages and were treated in US hospital emergency departments in 2004.<sup>4</sup>

Falls are the most common cause of head injuries in children and adolescents, followed by motor vehicle crashes, pedestrian and bicycle accidents, sports-related trauma, and child abuse.<sup>5</sup> Falls are a common source of traumatic injuries, and it was revealed that fall injury patterns differ between adults and children. Fall rates are highest for children age 0 to 4 years and adults aged 75 years and older. Falls are usually the most common cause of injury seen in hospitals, accounting for 25–52% of all treated child injuries.<sup>6</sup> Falls and subsequent head injuries among the elderly are the result of a complex interaction between physical changes due to ageing, disease, lifestyle and environment related and social factors. Also, older fallers are more likely to fall indoors than outdoors.<sup>7</sup>

Head injury is a common and serious consequence of falling among older adults, and a great majority of elderly people's non-fatal and fatal head injuries are caused by falls.<sup>8</sup> Although the head, face and neck comprise only 12% of the total body surface area exposed during impact, injuries sustained in these areas are more likely to be fatal.<sup>9</sup> Head and neck injuries from falls are a common cause of occupational morbidity and mortality, resulting in significant losses of life and wages, as well as significant medical expenses. Males are at greater risk of sustaining a fall-related injury while at work and during recreational activities.

Although fall injuries comprise a major health burden, the risk factors for such injuries have not been examined in a systematic and comprehensive manner. In practice, knowledge of risk factors for head and neck injuries from falls can assist injury

practitioners, programme developers, and policy makers in determining appropriate intervention. Only two previous studies have been conducted in Qatar to document trends in traumatic brain injury<sup>10</sup> and traumatic spinal injury.<sup>11</sup> Both of these studies were very preliminary and neither study specifically focused on head and neck injuries as a result of falls. In fact, to our knowledge, no nationwide study investigating the number, incidence and trends of head and neck injuries from falls has been published from Qatar. Therefore, this study aimed to determine the trends of head and neck injuries from falls in absolute number, incidence and pattern of injuries during the period 2001 to 2006.

## Methods

This is a retrospective, descriptive hospital based study. This study included a total of 1,952 patients with head and neck injuries who were treated in the Accident & Emergency Department of the Hamad General Hospital (HGH) and other 8 Trauma Centres of the Hamad Medical Corporation (HMC) following fall incidents during the period 2001 to 2006. All trauma cases occurring in the State of Qatar are treated in the Accident and Emergency Department of the HGH and the 8 trauma centres of the HMC. Hence, the data collected in this study not hospital based, but covers all head and neck injuries occurring in Qatar during the period of the study. The electronic Emergency Medical Service database has complete information on trauma cases year by year. We took the frequency of head and neck injury from falls by year and population of the respective year. Then, we calculated the incidence of the head and neck injury per 10,000 of the population based on the population of the country for the respective year.

This is a retrospective, descriptive hospital based study. This study included a total of 1,952 patients with head and neck injuries who were treated in the Accident & Emergency Department of the Hamad General Hospital and other 8 Trauma Centres of the Hamad Medical Corporation following fall incidents during the period 2001 to 2006. The population in Qatar was estimated to be 838,065 in the year 2006 and has a unique distribution of population according to gender and ethnicity.<sup>12</sup> Only about 30% of the total population are nationals and the majority of the total population (66.7%) are

**Table 1:** Characteristics of patients with head and neck injuries resulting from falls in the period 2001–2006

Variables	Head n = 1,629, n (%)	Neck n = 225, n (%)	Both n = 98, n (%)	Total N = 1,952, n (%)
<b>Age (Mean ± Standard deviation)</b>	30.4 ±18.1	29.8 ± 15.0	32.2 ± 17.6	30.4 ± 17.6
<b>Age groups in years §</b>				
< 10	243 (14.9)	19 (8.4)	5 (5.1)	267 (13.7)
10–19	150 (9.2)	29 (12.9)	13 (13.3)	192 (9.8)
20–29	419 (25.7)	71 (31.6)	33 (33.7)	523 (26.8)
30–39	368 (22.6)	53 (23.6)	19 (19.4)	440 (22.5)
40–49	225 (13.8)	25 (11.1)	16 (16.3)	266 (13.6)
50–59	104 (6.4)	20 (8.9)	6 (6.1)	130 (6.7)
≥60	120 (7.4)	8 (3.6)	6 (6.1)	134 (6.9)
<b>Ethnicity</b>				
Qatari	343 (21.1)	52 (23.1)	22 (22.4)	417 (21.4)
Non Qatari	1,286 (78.9)	173 (76.9)	76 (77.6)	1,535 (78.6)
<b>Gender</b>				
Male	1,415 (86.9)	192 (85.3)	84 (85.7)	1,691 (86.6)
Female	214 (13.1)	33 (14.7)	14 (14.3)	261 (13.4)
<b>Day of the week</b>				
Week days	1,189 (73.0)	167 (74.1)	6 (67.0)	1,422 (72.9)
Weekend‡	440 (27.0)	58 (25.9)	32 (33.0)	530 (27.1)
<b>Place of fall</b>				
At work	817 (50.1)	99 (44.2)	50 (50.7)	965 (49.4)
Home	519 (31.9)	85 (37.6)	30 (31.0)	635 (32.5)
School	106 (6.5)	14 (6.1)	3 (2.8)	123 (6.3)
Recreational places	187 (11.5)	27 (12.2)	15 (15.5)	229 (11.8)
<b>Status at the time of admission*</b>				
Conscious	1,510 (92.7)	215 (95.6)	87 (88.8)	1,812 (92.8)
Breathing	1,619 (99.4)	225 (100)	98 (100)	1,942 (99.5)
Bleeding	677 (41.5)	59 (26.2)	39 (39.8)	775 (39.7)
<b>Glasgow coma score</b>				
Severe score 3–8	119 (7.3)	23 (10.2)	7 (7.2)	147 (7.5)
Moderate score 9–12	149 (9.1)	30 (13.3)	11 (11.2)	186 (9.5)
Mild score 13–15	1,361 (83.6)	172 (76.5)	80 (81.6)	1,619 (82.9)

Notes: § = significant *P* value = 0.005; ‡ = weekend is Friday and Saturday; \*Multiple options: sum of percentage may not add to 100%.

males.<sup>12</sup>

Hamad General Hospital is the main tertiary care centre in the country; all major and most of the minor trauma cases are treated in this hospital. The study was based on the Emergency Medical Services

(EMS) registry, an electronic database in Qatar. This registry records complete information of the patients who had accidents and were brought to the Accident & Emergency Department and Trauma centres for treatment. The details of the falls were

collected regularly by the EMS staff using a standard questionnaire. The questionnaire included variables such as age, sex, time of injury, place of fall, the type of injury, the region of the body injured and the severity of injury. The data provided by this register are well suited for epidemiological purposes.

Medical records of the victims were thoroughly reviewed in the event of any missing information. The patient information was extracted from the EMS registry and analysed. Head and neck injuries were defined according to the International Classification of Disease (ICD) ICD-10 criteria and external causes of injury recorded. Head injuries, neck injuries and a combination of both injuries together were mutually and exclusively reported. Fall-induced head and neck injuries were recorded by evaluating the primary and secondary diagnosis. Descriptive statistics were performed on the socio-demographic characteristics, place of fall, status of the injury at the time of admission and diagnosis. According to ICD-10, injuries to the head were classified under categories S00–S09 and injuries to the neck were classified under S10–S19. The age-specific incidence rate was calculated based on the population in that specific age group in that year.

The severity of head or neck injury was classified by Glasgow Coma Scale (GCS). This a tool for measuring degree of unconsciousness and is thus a useful tool for determining severity of head injury.<sup>13</sup> The GCS classifications are as follows: 1) Severe: score of 3–8; 2) Moderate: score of 9–12, and 3) Mild: score of 13–15. The GCS score of patients was taken when they were examined and, for the intubated patients, the score was taken prior to intubation. Informed consent by all participants was not required in this study, as it was a retrospective hospital based study. The study was approved by the Research Ethics Committee at Hamad General Hospital of Hamad Medical Corporation.

Data are expressed as mean and standard deviation (SD) unless otherwise stated. The Fisher exact and chi-square test for trend were used to compare frequencies between two or more than two categories. A *P* value of <0.05 was considered as the cut-off value for significance.

## Results

Table 1 shows the socio-demographic characteristics of patients with head and neck injuries resulting

from falls during the period 2001–2006. A total of 1,952 patients were diagnosed with head and neck injuries from falls. The majority of them were non-Qataris (78.6%), males (86.6%) and in the age group 20–29 years (26.8%). Men outnumbered women by 6.5:1. A total of 27.1% of the head and neck injuries from falls occurred during weekends, while 72.9% occurred on week days. Nearly half of the head and neck injuries from falls occurred at work (49.4%), followed by falls at home (32.5%), then at recreational places (11.8%) and school (6.3%). According to the GCS score, 7.5% had severe and 9.5% had moderate injury. The majority of the patients had mild head (83.6%) and neck injury (76.5%). Neck injuries (10.2%) were more severe than head injuries (7.3%) among trauma patients. A significant difference was observed in the age group of fallers and the injuries occurred between week days and weekends (*P* = 0.005).

Table 2 shows the distribution of diagnosis of injuries and place of fall according to the age group of trauma patients. Most of the head and neck injuries were occupational injuries (49.5%) and 32.5% of injuries happened at home. Older people above 60 years-old had more frequent injuries to the head and neck region from falls at home (70.9%), followed by children below 10 years (66.7%). Major fall related injuries included superficial injury of the head (29.4%), followed by an open wound on the head (23.4%), then blunt injury (19.5%). Superficial injury of head was more frequent among children below 10 years (33%). An open wound to the head was more common among patients above 60 years (32.8%).

Table 3 shows the incidence rate of head and neck injuries sustained from falls per 10,000 of the population according to age group and year during the period 2001–2006. There was a clear increase in the incidence of head and neck injuries: 2.1/10000 in 2001 to 5.5/10000 in 2006. The elderly population above 60 years of age had the highest increase in incidence of head and neck injuries from falls (6.7 to 18.6/10,000) across the study period. There was a significant difference found in the number of injuries in different age groups of fallers (*P* <0.001).

Figure 1 shows the incidence rate of head, neck injuries and both together per 10,000 of the population resulting from falls during the period 2001–2006. The number of neck injuries also increased to 4.9/10,000 population in 2006

Table 2: Place of fall and diagnosis by age group (N = 1,952)

Variables	Age group in years							Total n (%)
	<10 n (%)	10–19 n (%)	20–29 n (%)	30–39 n (%)	40–49 n (%)	50–59 n (%)	60+ n (%)	
<b>Place of fall</b>								
At work	0 (0.0)	22 (11.5)	347 (66.3)	317 (72.0)	196 (73.7)	55 (42.3)	29 (21.6)	966 (49.5)
Home	178 (66.7)	49 (25.5)	81 (15.5)	91 (20.7)	67 (25.2)	73 (56.2)	95 (70.9)	634 (32.5)
Recreation	0 (0.0)	91 (47.4)	91 (17.4)	32 (7.3)	3 (1.1)	2 (1.5)	10 (7.5)	229 (11.7)
School	89 (33.3)	30 (15.6)	4 (0.8)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	123 (6.3)
<b>Diagnosis</b>								
Superficial injury to head	88 (33.0)	48 (25.0)	150 (28.7)	131 (29.8)	76 (28.6)	38 (29.2)	42 (31.3)	573 (29.4)
Open wound on head	57 (21.3)	36 (18.8)	126 (24.1)	96 (21.8)	68 (25.6)	29 (22.3)	44 (32.8)	456 (23.4)
Blunt head injury	62 (23.2)	38 (19.8)	92 (17.6)	84 (19.1)	51 (19.2)	24 (18.5)	30 (22.4)	381 (19.5)
Superficial injury of neck	16 (6.0)	31 (16.1)	67 (12.8)	39 (8.9)	20 (7.5)	17 (13.1)	7 (5.2)	197 (10.1)
Soft tissue contusion	23 (8.6)	17 (8.9)	25 (4.8)	25 (5.7)	14 (5.3)	7 (5.4)	2 (1.5)	113 (5.8)
Traumatic amputation on head (ear & nose)	3 (1.1)	13 (6.8)	23 (4.4)	21 (4.8)	9 (3.4)	7 (5.4)	1 (0.7)	77 (3.9)
Dislocation, sprain, strain of joints of head	6 (2.2)	1 (0.5)	15 (2.9)	16 (3.6)	9 (3.4)	2 (1.5)	3 (2.2)	52 (2.7)
Fracture of skull & Facial bone	4 (1.5)	3 (1.6)	6 (1.1)	6 (1.4)	3 (1.1)	2 (1.5)	0 (0.0)	24 (1.2)
Multiple injuries of head	2 (0.7)	0 (0.0)	4 (0.8)	5 (1.1)	7 (2.6)	1 (0.8)	2 (1.5)	21 (1.1)
Open wound of neck	2 (0.7)	2 (1.0)	4 (0.8)	4 (0.9)	2 (0.8)	1 (0.8)	1 (0.7)	16 (0.8)
Burns & corrosions	3 (1.1)	1 (0.5)	3 (0.6)	4 (0.9)	3 (1.1)	0 (0.0)	1 (0.7)	15 (0.8)
Injury of nerves & spinal cord	0 (0.0)	0 (0.0)	4 (0.8)	6 (1.4)	3 (1.1)	2 (1.5)	0 (0.0)	15 (0.8)
Penetrating head injury	1 (0.4)	2 (1.0)	4 (0.8)	3 (0.7)	1 (0.4)	0(0.0)	1 (0.7)	12 (0.6)

compared to 1.8/10,000 population in 2001.

## Discussion

Falls are the commonest cause of head and neck injuries in children, adults and elderly people. Although fall-induced injuries among older adults are said to be a major public health concern in modern societies with ageing populations, reliable epidemiologic information on their trends and the pattern of injuries is limited. To our knowledge, this is the first study in Qatar examining and comparing fall related head and neck injuries in young, middle-

aged and older men and women. The focus was on the faller's activity, the incidence of head and neck injuries, and the severity and type of injuries. Of all hospitalisations with head and neck injuries, 18.4% had head and neck injuries from falls, while 7.5% had a GCS score of <9 (severe), 9.5% a score of 9–12 (moderate) and 82.9% a score of 13–15 (mild). Most of the patients with head and neck injuries were conscious (92.7%) at the time of admission after the fall. Head injuries accounted for the majority of the fall cases (83.5%), followed by neck injuries (11.5%). A similar result was observed in another study where 63.2% of the fall cases were

**Table 3:** Incidence rate of head and neck injuries resulting from falls per 10,000 population during the period 2001–2006

Age group	2001	2002	2003	2004	2005	2006
<10	1.4	3.5	5.5	4.5	5.5	2.4
10–19	2.4	3.4	2.7	3.4	4.1	4.0
20–29	3.4	6.1	4.8	5.4	8.7	8.7
30–39	1.7	2.4	4.0	4.4	6.2	5.4
40–49	1.3	2.7	3.8	3.5	4.8	4.0
50–59	3.4	4.4	3.6	3.3	4.9	5.4
60+	2.8	6.7	13.1	11.9	19.0	18.6
<b>All Ages</b>	<b>2.1</b>	<b>3.7</b>	<b>4.4</b>	<b>4.4</b>	<b>6.3</b>	<b>5.5</b>

Note:  $P < 0.001$

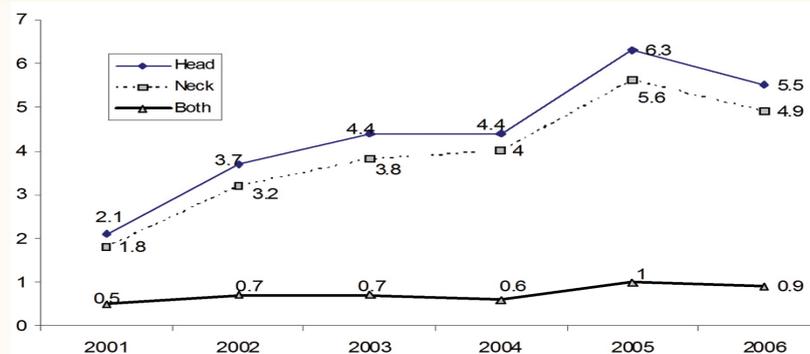
head injuries, followed by neck injuries (19.8%).<sup>14</sup>

Our findings revealed that both the head and neck injuries from falls were higher in young adults in the age group 20–29 years (25.7% and 31.6%) and 30–39 years (22.6% and 23.6%). A study by Hausdorff *et al.* documented that more than a third of older adults fall each year and 10–20% of falls cause serious injuries such as fractures or head trauma.<sup>15</sup> This runs contrary to the study in Canada on fall-related emergency department visits, where the head and neck were injured most often (49%) among children below 20 years.<sup>16</sup> In Ontario, 80% of head injury hospitalisations were reported among people aged 65 years and older, while only 17% were reported in the 15 to 34 years age group.<sup>17</sup> Another study by Cheng *et al.* also reported that there was a trend for the elderly to have more frequent injuries to the head (53.2%) and neck (47.5%) region.<sup>18</sup>

The reason for the low proportion of falls among

elderly people in Qatar is that the majority of the fall-induced head (78.9%) and neck injuries (76.9%) occurred in the non-Qatari population. These people leave Qatar once they reach their retirement age of 60 years. This is evident from the data as half of the head and neck injuries were occupational injuries (49.5%). Thus, falls are a common cause of occupational morbidity and mortality, resulting in significant losses of life, wages, as well as significant medical expenses. Falls are a risk factor for disability and frailty and exacerbate disablement among the adult non-Qatari population. Even in the United Arab Emirates, occupational injuries resulting from falls were frequent with 66.7% of hospitalisations.<sup>18</sup> Similar to Qatar, falls were the most frequent cause of head and neck injuries among non-nationals in the United Arab Emirates, whereas for injuries among nationals the main cause was road traffic crashes.<sup>18</sup> Many studies indicate that falls continue to pose a serious problem to the elderly population, whereas it was a more serious issue for both the middle-aged working population and the elderly in Qatar.<sup>18,19</sup>

The incidence rate of fall induced head and neck injuries among the general population rose considerably in the study period: from 2.1 in 2001 to 5.5 in 2006. Although the frequency of fall induced head and neck injuries was higher in young adults, the incidence rate in the elderly population above 60 years of age seemed to show an alarming rise with a rate that cannot be explained merely by demographic changes: from 2.8 in 2001 to 19/10,000 in 2005 and 18.6/10,000 in 2006. The incidence rate in people above 60 years-old was four times higher than the incidence rate observed in younger people. A similar finding was observed in



**Figure 1:** Incidence rate of head injury, neck injury and both injuries per 10,000 of the population resulting from falls during the period 2001–2006.

a study by Stevens and Soglow where the incidence rates for fall related head injuries increased with advancing age with a rate four to five times higher in people aged 85 years and older compare to those aged 65–74 years.<sup>20</sup> Rubenstein *et al.* reported that beyond 50 years of age, there is a steady increase in the occurrence of falls and the magnitude of fall related complications.<sup>21</sup> In Qatar, after the elderly population, young adults in the age group 20–29 years were the most frequent victims of head and neck injuries from falls; 8.7/10000 in the years 2005 and 2006.

The relationship between fall and injury varies by gender. In the study sample, 86.6% of the head and neck injuries were reported among men. Men outnumber women by 6.5:1. It was found that men sustain more fall injuries than women, perhaps due to the underlying causes or circumstances of their falls. This result differs to that of another study<sup>22</sup> where women had a higher risk of falling than men in general population studies, a trend not seen in the present study. Jenson *et al.* reported that the cause of the gender discrepancy may lie in divergent activity patterns between men and women over separate periods of the day and night or in differences in personal risk assessment between the genders.<sup>23</sup> In Qatar, expatriates (70% of the total population), especially the male labour force, are greater in number than nationals. A good proportion of the expatriate men are employed on construction sites where they are at high risk for occupational injuries. Elderly people are mostly nationals and they have a better life expectancy due to better health care and a higher standard of living.

In Qatar, superficial injuries of head have been observed overall with a frequency up to 29.4% in falls, followed by open wound on the head (23.4%). Superficial injury was more common among children below 10 years (33%) and in elderly population above 60 years (31.3%). However, an open wound to the head was more frequent among people above 60 years (32.8%). Nonetheless, blunt head injury was more frequent in children (23.2%) and the elderly population (22.4%) compared to other age groups. In another study by Turk and Tsoko, a higher frequency of blunt neck injuries were observed (33%) in falls from heights.<sup>24</sup> Neck injuries were less common in falls in the studied population compared to head injuries. In Canada, 74% of fall related hospital admissions are due

to fractures and dislocations, with serious head injuries (20%).<sup>15</sup> Elderly trauma patients differed from younger adult trauma patients in their injury patterns and the mode of presentation of significant injuries.

The present study showed some differences and some similarities when compared to other studies related to fall injuries. The risk in our study increased with age and was higher among men, a similar finding to other studies. The findings of our study confirm the findings of previous studies<sup>25,26</sup> with regard to older age which is a well-recognised risk factor for falling in the general population. Additional efforts in Qatar are needed to reduce the occurrence of fall related occupational injuries. It is important to identify the risk factors related to fall induced head and neck injuries and develop comprehensive intervention programmes to reduce the risk for such falls. Falls have significant economic impact on the country, including costs to individuals and their families, to work places and the health system as well as to community and social services.

## Conclusion

A relatively high rate of head and neck injuries from falls was demonstrated in this study. The incidence of head and neck injuries rose during the study period. Occupational fall injuries were most frequent in the general population, particularly among non-nationals. Findings show that the age-specific incidence of fall-induced severe head injuries in the Qatar population above 60 years of age has increased steeply during the study period and also has not declined in more recent years. According to the GCS score, neck injuries were more severe than head injuries. The injuries represent an alarming epidemic and the predicted ageing of populations will soon exacerbate the burden on our health care systems.

## CONFLICT OF INTEREST

The authors reported no conflict of interest.

## References

1. Close J, Ellis M, Hooper R, Glucksman E, Jackson S, Swift C. Prevention of falls in the elderly trial: A randomized controlled trial. *Lancet* 1999; 353:93–7.

2. World Health Organization. Assessment of fractures risk and its application to screening for postmenopausal osteoporosis. Geneva: World Health Organisation, Techn Rep Ser No. 843, 1994.
3. Krug EG, Sharma GK, Lozano R. The global burden of injuries. *Am J Public Health* 2000; 90:523–6.
4. Hoskin AF. Fatal falls: Trends and characteristics. *Stat Bull Metrop Insur Co* 1998; 79:10–15.
5. Centers for Disease Control. Nonfatal Occupational Injuries and Illness - United States, 2004. *MMWR Morb Mortal Wkly Rep* 2007; 56:395–7.
6. Bartlett S. The problem of children's injuries in low-income countries a review. *Health Policy Plan* 2002; 17:1–13.
7. Prudham D, Evans JG. Factors associated with falls in the elderly: A community study. *Age Aging* 1981; 10:141–6.
8. Kannus P, Parkkari J, Koskinen S, Niemi S, Palvanen M. Fall induced injuries and deaths among older adults. *JAMA* 1999; 281:1895–9.
9. Pitone ML, Attia MW. Patterns of injury associated with routine childhood falls. *Pediatr Emerg Care* 2006; 22:470–4.
10. Mezue WC, Bashir EM. Head injury patterns in Qatar. *Pan Arab J* 1998; 75:364–9.
11. Quinones MPO, Nassal M, Al Bader KI, Al Muraikhi AE, Al Kahlout SR. Traumatic spinal cord injury in Qatar- An epidemiological study. *Mid East J Emerg Med* 2002; 2:1–4.
12. Qatar Statistics Authority. From: <http://www.qix.gov.qa/portal/page/portal/qix/home> Accessed: September 2010.
13. Teasdale G, Jennett B. Assessment of coma and impaired consciousness: A practical scale. *Lancet* 1974; 2:81–4.
14. Warrington SA, Wright CM, Team AS. Accidents and resulting injuries sustained in pre-mobile infants: Data from ALSPAC study. *Arch Dis Child* 2001; 85:104–7.
15. Hausdorff JM, Rios DA, Edelber HK. Gait variability and fall risk in community living older adults: A one year prospective study. *Arch Phys Med Rehabil* 2001; 82:1050–6.
16. Rivara FP, Alexander B, Johnson B, Soderberg R. Population-based study of fall injuries in children and adolescents resulting in hospitalizations or death. *Pediatrics* 1993; 92:61–3.
17. Falls Primary Cause of Head Injury hospitalizations among Ontario Seniors, Report of Canadian Institute for Health Information, 2001. From: [http://Secure.cibi.ca/cibiweb/dispage.jsp?cw\\_page\\_media](http://Secure.cibi.ca/cibiweb/dispage.jsp?cw_page_media). Accessed: October 2010.
18. Cheng CH, Cheung NK, Yeung JHH, Man CY, Graham CA, Rainer TH. Difference in injury pattern and mortality between Hong Kong elderly and younger patients. *Hong Kong J Emerg Med* 2009; 16:224–32.
19. Barss P, Addley K, Grivna M, Stanculescu C, Abu-Zidan F. Occupational injury in the United Arab Emirates: Epidemiology and prevention. *Occup Med* 2009; 59:493–8.
20. Steven JA, Soglow ED. Gender differences for non-fatal unintentional fall related injuries among older adults. *Inj Prev* 2005; 11:115–19.
21. Rubenstein LZ, Poers CM, MacLean CM. Quality indicators for the management and prevention of falls and mobility problems in vulnerable elders. *Ann Intern Med* 2001; 135:686–93.
22. Ashburn A, Stack E, Pickering RM, Ward CD. Predicting fallers in a community based sample of people with Parkinson's disease. *Age Ageing* 2001; 30:47–52.
23. Jensen J, Laundin-Olsson L, Nyberg L. Falls among frail older people in residential care. *Scand J Public Health* 2002; 30:54–61.
24. Turk EE, Tsoko SM. Pathologic features of fatal fall from height. *Am J Forensic Med Pathol* 2004; 25:194–199.
25. Blake AJ, Morgan K, Bendall MJ, Dallosso H, Ebrahim SB, Arie TH, et al. Falls by elderly people at home. Prevalence and associated factors. *Age Ageing* 1988; 17:365–72.
26. Tinetti ME, Speechley M, Ginter SF. Risk factors for falls among elderly persons living in the community. *N Engl J Med* 1988; 319:1701–7.