

# Violence –related injuries in a rapidly developing Middle Eastern country: A Retrospective Study from a Level 1 Trauma Center

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## Research article

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## Abstract

**Background:** Violence is a global public health problem leading to injuries, long-term physical, sexual or mental health problems and mortality. The burden of violence-related injuries remains understudied in the Arabian Gulf region. The present study aimed to describe the epidemiology of hospitalized violence-related injuries in Qatar.

**Methods:** A retrospective analysis of trauma registry data from a level 1 trauma center was conducted by including all patients presented to the hospital following violence-related injuries in the duration between June 2010 and June 2017. We analyzed and compared the hospitalized interpersonal and self-inflicted violence groups.

**Results:** The hospitalization rate of violence-related injuries was 4.6 per 100,000 population per year; it was significantly higher in males (5.5/100,000 males/year vs. 1.8/100,000 females/year) and in younger population, specifically in the 25-34 years age-group (41%). South Asians constituted 55% of the affected study population. Interpersonal violence (76.7%) was the commonest type of violence. Significant differences between interpersonal and self-inflicted violence were evident especially the type of trauma (i.e. blunt or penetrating), injured body regions, alcohol use, injury severity, intubation and psychiatric referrals ( $p < 0.05$ ). Overall in-hospital mortality was 6.4%; higher rate was reported in females (16% vs. 5%,  $p = 0.001$ ). Outcomes including length of hospital stay and mortality were comparable regardless of the type of violence. Multivariable analysis showed that male gender and Blood Alcohol Concentration (BAC) positivity were predictors for interpersonal violence whereas Injury Severity Score and Glasgow Coma Scale were predictors of mortality among violence patients.

**Conclusions:** The rate of hospitalization for violence-related injuries in Qatar is low; however, its burden on the trauma system is of concern. Although it comprised only 9.6% of the study population, females are more likely to get hospitalized following self-inflicted injuries when compared to interpersonal violence. Disproportionate burden of violence in the South Asians and young population warrants an evidence-based public health approach in violence prevention to well address the risk factors.

## Introduction

Violence-related injuries refer to injuries resulting from intentional use of physical force or power against oneself or others. The World Health Organization (WHO) defined violence broadly by incorporating self-directed violence; interpersonal violence and collective violence leading to injury or has a high probability of contributing to injury, death, psychological harm, mal-development or deprivation [1]. According to the year 2000 estimates, over 1.6 million deaths (28.8 per 100,000 population) worldwide were attributed to violence, and many were injured and/or suffered long-term physical, sexual or mental health problems [1].

The worldwide data showed that young age (15-44 years) and male gender (14% vs. 7%) are the prime victims of violence [2]. Interpersonal violence remains as a major contributor to the violence-related mortality across the globe with a rate of 8.8 per 100,000 population [1]. Nearly 28 million deaths out of 50 million global deaths in 2013 were related to interpersonal violence whereas self-directed violence accounted for 1.7 million deaths [3]. Interpersonal violence includes family and intimate partner violence (child, partner or elder) and community violence (stranger or acquaintance). The lifetime prevalence of intimate partner violence estimated in women in the United States was 28% to 54% [4, 5]. Prevalence of sexual abuse in children was reported as 3% to 40% based on reports from Canada and Switzerland [6, 7].

Determinants and contributory factors varies with types of violence, however multiple factors such as certain demographic factors, drugs and alcohol abuse, access to firearms, gender, and social, economic inequalities in the distribution of or use of power increase risks of violence [8]. In addition to the potential mortality, the morbidity and associated economic costs warrant public health approaches in prevention based on interdisciplinary and scientifically-based action [2]. It was demonstrated that approximately 20–40 victims of non-fatal youth violence receive hospital treatment for every youth homicide [9]. The economic cost associated with violence was estimated as nearly 3.3% of the gross domestic product (GDP) in the United States [10]. Intimate partner violence accounted for 1.6% of the GDP lost in Nicaragua and 2% of GDP lost in Chile [10]. In England and Wales, the cost of violence was estimated as approximately £20 billion per year [10]. Direct medical cost associated with child abuse alone was between 13,781 and 42,518 USD per abused child [10].

Burden of violence-related injuries to the healthcare system in the Western countries are well documented but it remains understudied in the Middle Eastern region, especially in the Arabian Gulf region. Published studies on violence-related injuries among the general population in Qatar are not available. The government of Qatar had developed several strategies to increase the efficiency in reporting violence, especially the domestic violence. Community awareness programs were identified as crucial to provide a safe environment to report such incidents. The healthcare system in Qatar offers most advanced medical facilities, which is accessible for all regardless of residency, nationality or socio-economic status. Charges are waived for all trauma patients entering the health system via emergency services by an Amiri Decree that mandates care provided for all trauma patients to be free of charge throughout their hospitalization. Only minimum fees to be paid out of pocket for any care provided after discharge. The main service providers in Qatar are Hamad Medical Corporation (HMC) and Primary Health Care Corporation (PHCC). HMC is the principal provider of inpatient care with three general and five specialized hospitals. The PHCC have 21 primary healthcare centers across the country. In addition, the Supreme Council of Health (SCH) owns four health centers and two medical commission facilities.

Albeit, addressing the existing gaps in knowledge in the country is crucial to inform the decision makers in order to contribute to develop evidence-based strategies and ultimately strengthen the capacity of health system to prevent injuries and violence. The present study is first of its kind from Qatar that

aims at the epidemiology of hospitalized patients with violence-related injuries (interpersonal vs self-inflicted) based on the national trauma registry.

## Methods

The objective of this study was to describe the epidemiology and pattern of violence-related injuries which required hospitalization at the Hamad Trauma Center (HTC) in the state of Qatar. A retrospective analysis of data obtained from the Qatar National Trauma Registry at HTC was conducted. This is a mature database participates in both the National Trauma Data Bank and Trauma Quality Improvement Program of Committee on Trauma by the American College of Surgeons (TQIP-ACS). The study received ethical approval from the Institutional Review Board (IRB) of Hamad Medical Corporation (#MRC-01-18-189). The HTC is the only level 1 trauma center in Qatar which sees and treats moderate to severely injured patients across the country including referrals from other hospitals. Each year, trauma code (Level I, II or III Trauma Criteria) is activated for nearly 2500 patients. Of these patients, an average of 1500-1800 require hospital admission in the HTC, 500-700 patients receive treatment at the ED without need for hospitalization and an average of 80 patients die before arrival as a consequence of their injuries. This study included all patients admitted to the level 1 HTC following violence-related (interpersonal violence and self-inflicted) injuries in the duration between June 2010 and June 2017. Patients brought as dead to the hospital and patients did not require hospital admission were excluded from the final analysis. Patients were categorized into two groups based on the types of violence such as interpersonal and self-inflicted and their demographics, injury characteristics, management and in-hospital outcomes were analyzed and compared.

Data abstracted included age, gender, nationality, mechanism of injury, Glasgow Coma Scale (GCS), Ethanol level (alcohol consumption), injured regions, injury severity score (ISS), major procedures and outcome. Glasgow Coma Scale (GCS) is a neurological scale ranges from 3 to 15 to assess consciousness in which GCS < 8 severe, 9-12 moderate and  $\geq 13$  minor head injuries [11]. The term "alcohol" denotes "ethyl alcohol or ethanol". Blood alcohol concentration (BAC) was reported as millimoles of ethanol per liter of blood (mmol/L). Any BAC level above zero mmol/L was reported as BAC-positive; levels 0.1–10.9 were "less intoxicated"; 10.9–21.7 were "intoxicated", and >21.7 were "very intoxicated" (at CNS depression level) [12].

The Abbreviated Injury Scale (AIS) refers to severity of injuries in different body regions; scores range from 1-6, representing minor, moderate, serious, severe, critical and non-survivable injuries respectively [13,14]. Three most severely injured body region AIS scores are squared and added together to estimate the Injury Severity Score (ISS) in order to provide an overall score for polytrauma [13,14]. ISS ranges from zero to 75 where 0-9 is minor; 10-15 moderate; 16-24 severe; and >25 is critical [13]. Data elements are abstracted concurrently. Injury details are obtained from the final radiology reports, operative notes as well as physician and nursing documentations. The abstracted injury data are used for the AIS and ISS calculation during the patient's hospitalization.

The study patients were grouped by nationality: Arabs, South Asians, Africans and westerns. The population data were obtained from the website of the Ministry of Development, Planning and Statistics in Qatar [15].

Patients in this study were identified from the Qatar national trauma registry. This registry refers to the electronic medical records, reviews patient history, searches for police documentation, social worker notes and referrals to the Women and Child Protection Team for the confirmation of a violent event. The trauma registry was using the Classification of External Cause of Injury and Poisoning (E-Codes) of the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) in the study duration. The E-codes for suicide and self-inflicted injury (E950-E959) included: injuries in suicide and attempted suicide, self-inflicted injuries specified as intentional. The codes for homicide and injury purposely inflicted by other persons (E960-E969) included: injuries inflicted by another person with intent to injure or kill, by any means. The codes for legal intervention (E970-E978) included: injuries inflicted by police or other law enforcing agents. Each patient record was given a unique study number, and patient anonymity was maintained throughout the study. The trauma registry data validation is done internally and externally and on regular basis. This manuscript adheres to the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) guidelines (Suppl table) [16].

### Statistical analysis:

Descriptive and bivariate analysis of trauma registry data were carried out based on the inclusion and exclusion criteria in the study duration. Data were summarized in form of proportions for categorical variables and, mean ( $\pm$ standard deviation) and median (range) for continuous variables. Categorical variables were compared using Chi-square test and Fisher exact test depending on the size of the data set. Independent student t-test was used for continuous variables. Multivariable analysis models for predictors of the type of violence and predictors of mortality were performed using the relevant and significant variables such as age, sex, nationality, mechanism and type of injury, injury severity score, admission GCS, and alcohol consumption (BAC status) and data were expressed as odd ratio (OR) and 95% confidence intervals (CI). Hosmer and Lemeshow test was used for *goodness of fit* for logistic regression models. A two-tailed *P* value of < 0.05 was considered to be statistically significant. All data analyses were carried out using the Statistical Package for the Social Sciences, version 18 (SPSS, Inc., Chicago, IL).

## Results

The study identified 658 hospitalized patients (595 (90.4%) males & 63 (9.6%) females) who sustained violence-related injuries in seven years study duration in Qatar. This accounts for hospital admission rate for violence-related traumatic injuries as 4.6 per 100,000 population per year. This rate was higher among males (5.5 per 100,000 males per year) when compared to females (1.8 per 100,000 females per year). Females represented less than 10% in the study population. The total population in Qatar increased nearly 60% in the study duration. Population growth in this duration was

comparable in both genders. Although the number of injured patients increased from 86 to 116 in 2010 and 2017 respectively, corresponding hospitalization rate showed a decreasing trend by 15% from 5.3 to 4.5 per 100,000 population (**Table 1 & Figure 1**).

| Duration                              | Number of admissions at the trauma center |         |       | General population in Qatar (Mid-year) |         |         |
|---------------------------------------|---|---------|-------|--|---------|---------|
|                                       | Males                                     | Females | Total | Males                                  | Females | Overall |
| 2010-2011                             | 80  | 6       | 86    | 1228635                                | 408808  | 1637443 |
| 2011-2012                             | 82  | 7       | 89    | 1271194                                | 436562  | 1707756 |
| 2012-2013                             | 75  | 9       | 84    | 1364063                                | 472613  | 1836676 |
| 2013-2014                             | 87  | 12      | 99    | 1530101                                | 515138  | 2045239 |
| 2014-2015                             | 80  | 12      | 92    | 1686228                                | 549203  | 2235431 |
| 2015-2016                             | 83  | 9       | 92    | 2423175                                | 1853001 | 570174  |
| 2016-2017                             | 108                                       | 8       | 116   | 2597453                                | 1974699 | 622754  |
| Total number/ Rate of hospitalization | 595                                       | 63      | 658   | 4.6                                    | 5.5     | 1.8     |

The mean age of patients was 31 years ranging from <2 years to 77 years. Approximately 7% were pediatric population under 18 years. The majority of victims fell in the 25-34 age-group (41%). The elderly population aged over 60 years represented around 1% of the patients (**Figure 2**).

The type of violence was not documented in 48 cases, the majority of injuries were interpersonal violence-related (76.7%) followed by self-inflicted injuries (23.3%). Although males were predominant in any type of violence; the proportion of males involved in interpersonal violence were significantly higher when compared to self-inflicted injuries ( $p=0.001$ ) (**Table 2**). Females were more commonly exposed to self-inflicted violence compared to interpersonal type. More than half (55%) of interpersonal violence -related injuries was reported in patients from South Asia. Nearly 11% were reported in Qatari nationals. The type of trauma was almost equally distributed between blunt and penetrating. However, there was a significant difference by type of violence; penetrating trauma was more common in interpersonal violence whereas blunt trauma was more frequent in self-inflicted injuries ( $p=0.003$ ).

|                                | Overall*        | Interpersonal (76.7%) | Self-inflicted (23.3%) | P-value |
|--------------------------------|-----------------|-----------------------|------------------------|---------|
| Age; mean $\pm$ SD             | 30.8 $\pm$ 11.1 | 30.7 $\pm$ 11.5       | 30.4 $\pm$ 8.9         | 0.004   |
| Males; n (%)                   | 595 (90.4)      | 446 (95.3)            | 102 (71.8)             | 0.001   |
| Type of trauma; n (%)          |                 |                       |                        |         |
| • Blunt                        | 331 (50.5)      | 229 (48.9)            | 76 (53.5)              | 0.003   |
| • Penetrating                  | 324 (49.5)      | 239 (51.1)            | 63 (44.4)              |         |
| GCS; mean $\pm$ SD             |                 |                       |                        |         |
| • ED                           | 13.63 $\pm$ 3.0 | 13.45 $\pm$ 3.8       | 13.29 $\pm$ 4.10       | 0.001   |
| • After 1 hour                 | 13.29 $\pm$ 3.9 | 12.4 $\pm$ 4.67       | 11.96 $\pm$ 5.06       | 0.001   |
| BAC Positive; n (%)            | 143 (23.4)      | 116 (24.8)            | 17 (12.0)              | 0.001   |
| BAC; mean $\pm$ SD             | 36.9 $\pm$ 17.0 | 36.3 $\pm$ 16.9       | 37.8 $\pm$ 16.8        | 0.75    |
| Injury at body sites; n (%)    |                 |                       |                        |         |
| • Head                         | 177 (26.9)      | 141 (30.1)            | 21 (14.8)              | 0.001   |
| • Face                         | 86 (13.1)       | 60 (12.8)             | 11 (7.7)               | 0.063   |
| • Neck                         | 48 (7.3)        | 21 (4.5)              | 27 (19.0)              | 0.001   |
| • Chest                        | 137 (20.8)      | 108 (23.1)            | 22 (15.5)              | 0.053   |
| • Abdomen                      | 161 (24.5)      | 116 (24.8)            | 36 (25.4)              | 0.891   |
| • Spine                        | 53 (8.1)        | 27 (5.8)              | 26 (18.3)              | 0.001   |
| • Arm                          | 59 (9.0)        | 40 (8.5)              | 15 (10.6)              | 0.462   |
| • Pelvis                       | 39 (5.9)        | 19 (4.1)              | 21 (14.8)              | 0.001   |
| • Leg                          | 57 (8.7)        | 33 (7.1)              | 23 (16.2)              | 0.001   |
| • External                     | 433 (65.8)      | 321 (68.6)            | 84 (59.2)              | 0.037   |
| AIS; mean $\pm$ SD             |                 |                       |                        |         |
| • Head                         | 3.4 $\pm$ 0.9   | 3.5 $\pm$ 1.1         | 4.3 $\pm$ 2.2          | 0.008   |
| • Face                         | 1.8 $\pm$ 0.4   | 1.8 $\pm$ 0.5         | 1.9 $\pm$ 0.6          | 0.371   |
| • Neck                         | 2.4 $\pm$ 1.2   | 2.6 $\pm$ 1.8         | 2.7 $\pm$ 1.8          | 0.799   |
| • Chest                        | 2.7 $\pm$ 0.9   | 3.0 $\pm$ 1.6         | 2.9 $\pm$ 1.6          | 0.847   |
| • Abdomen                      | 2.3 $\pm$ 0.8   | 2.7 $\pm$ 1.6         | 2.2 $\pm$ 0.7          | 0.050   |
| • Spine                        | 2.3 $\pm$ 0.9   | 2.4 $\pm$ 1.0         | 2.2 $\pm$ 0.7          | 0.498   |
| • Arm                          | 1.9 $\pm$ 0.6   | 1.9 $\pm$ 0.6         | 2.0 $\pm$ 0.5          | 0.564   |
| • Pelvis                       | 2.2 $\pm$ 0.7   | 2.4 $\pm$ 1.7         | 2.4 $\pm$ 0.7          | 0.864   |
| • Leg                          | 2.2 $\pm$ 0.5   | 2.4 $\pm$ 1.3         | 2.2 $\pm$ 0.4          | 0.571   |
| • External                     | 1.1 $\pm$ 0.5   | 1.2 $\pm$ 0.7         | 1.3 $\pm$ 0.9          | 0.208   |
| ISS; median (range)            | 9 (1-75)        | 9 (1-75)              | 5 (1-75)               | 0.05    |
| Management; n (%)              |                 |                       |                        |         |
| • Intubation                   | 158 (24.0)      | 106 (22.6)            | 48 (33.8)              | 0.007   |
| • Exploratory Laparotomy       | 122 (18.5)      | 86 (18.4)             | 29 (20.4)              | 0.585   |
| • Thoracotomy                  | 12 (1.8)        | 10 (2.1)              | 0                      | 0.079   |
| • Chest tube insertion         | 82 (12.5)       | 66 (14.1)             | 12 (8.5)               | 0.077   |
| • Craniotomy/Craniectomy       | 23 (3.5)        | 21 (4.5)              | 2 (1.4)                | 0.092   |
| • ORIF surgery                 | 39 (5.9)        | 24 (5.1)              | 11 (7.7)               | 0.240   |
| • Psychiatric referrals; n (%) | 133 (20.2)      | 25 (5.3)              | 101 (71.1)             | 0.001   |
| • ICU LOS; median (range)      | 3 (1-142)       | 3 (1-123)             | 4 (1-142)              | 0.451   |
| • Hospital LOS; median (range) | 4 (1-142)       | 3 (1-1032)            | 4 (0-142)              | 0.520   |
| Mortality                      | 42 (6.4)        | 26 (5.6)              | 13 (9.2)               | 0.125   |

\*Type of violence was not documented in 48 cases (excluded), AIS: abbreviated injury score, BAC: blood alcohol concentration, LOS: length of stay, ORIF: open reduction and internal fixation, ISS: injury severity score

Blood alcohol screening revealed 23% were having a blood alcohol concentration (BAC) above zero; with mean BAC level of 37±17 mmol/L. The victims of interpersonal violence were more likely to be BAC positive than self-inflicted injuries (25% vs. 12%, p=0.001).

The mean GCS upon arrival to trauma room was 13.0. Head, abdomen, chest, face and neck injuries were reported in 27%, 24.5%, 21%, 13% and 7.3%, respectively. Head injuries were more common in interpersonal violence whereas neck, spinal and pelvic injuries were more likely in self-inflicted injuries (p<0.001). The mean ISS was 10±9, mean head AIS (3±1), chest AIS (3±1) and abdomen AIS (2±1). Although the proportion of head injured patients were higher in interpersonal violence group; the head AIS was significantly higher in self-inflicted injuries (p=0.008). There was no significant difference between these groups in terms of AIS for other body regions. However, the ISS showed that self-inflicted injuries were mild when compared to interpersonal violence victims (p=0.05).

Twenty eight percent of patients required ICU admission. Intubation was required in 24% of cases followed by exploratory laparotomy (19%) and chest tube insertion (13%). Only significant difference in management between interpersonal and self-inflicted injuries were reported in use of intubation; self-inflicted injury patients were more likely to be intubated (34% vs. 23%, p=0.007).

Twenty percent of patients were referred for psychiatric evaluation. Nearly 70% of the patients with self-inflicted injuries were referred for psychiatric evaluation whereas it was only 5% in interpersonal violence group (p=0.001). The median hospital length of stay was 4 days, while the ICU length of stay was 3 days. Both hospital and ICU stay were comparable across the groups based on the type of violence. Overall in-hospital mortality was 6.4%; this was also comparable across the study groups (**Table 2**).

Multivariable logistic regression analysis (enter method) using relevant variables (age, gender, BAC positivity and nationality) showed that male gender (OR 7.5; 95% CI 4.144-13.828) and BAC positivity (OR 2.4; 95% CI 1.327-4.316) were predictors for interpersonal violence whereas South Asian nationality (OR 0.36; 95% CI 0.213-0.626) was predictor of self-inflicted violence (**Table 3**). In another multivariable analysis model using age, gender, mechanism of injury, type of violence, BAC status, ISS and GCS on admission, the predictors of mortality were ISS (OR 1.14; 95% CI 1.079-1.203) and GCS (OR 0.75; 95% CI 0.666-0.848) as shown in **Table 4**.

| Variable  | P value | Odd ratio | 95% confidence interval |
|---|---------|-----------|-------------------------|
| Age (years) <sup>‡</sup>  | 0.389   | 1.009     | 0.989-1.034             |
| Gender (male)   | 0.001   | 7.570     | 4.144-13.828            |
| <b>Nationality</b>  |         |           |                         |
| Arabs (reference)   |         | 1         |                         |
| South Asian   | 0.001   | 0.365     | 0.213-0.626             |
| Africans  | 0.070   | 0.414     | 0.159-1.076             |
| Westerns  | 0.640   | 0.705     | 0.160-3.106             |
| BAC (positive)  | 0.004   | 2.393     | 1.327-4.316             |
| <sup>‡</sup> continuous variables , BAC=blood alcohol concentration<br>Hosmer and Lemeshow test: Chi-Square 7.9 , DF 8 , p=0.44 |         |           |                         |

| variable  | P value | Odd ratio | 95% confidence interval |
|---|---------|-----------|-------------------------|
| Age (years) <sup>‡</sup>  | 0.919   | 1.003     | 0.950-1.058             |
| Gender (male vs female)   | 0.371   | 0.480     | 0.096-2.395             |
| Type of violence (IPV vs self-inflicted)  | 0.157   | 3.397     | 0.625-18.476            |
| Mechanism of injury (blunt vs penetrating)  | 0.191   | 2.349     | 0.654-8.440             |
| Injury Severity Score <sup>‡</sup>  | 0.001   | 1.139     | 1.079-1.203             |
| Admission Glasgow coma scale <sup>‡</sup>   | 0.001   | 0.751     | 0.666-0.848             |
| BAC (positive vs negative)  | 0.194   | 0.341     | 0.067-1.717             |
| continuous variables , BAC=blood alcohol concentration<br>Hosmer and Lemeshow test: Chi-Square 3.15 , DF 8 , p=0.92 |         |           |                         |

## Discussion

The present study described the epidemiology and outcomes of hospitalized violence-related traumatic injuries in Qatar. Although the number of victims increased over the years, the hospitalization rate was decreasing, as there was 60% population growth in the study duration. The hospitalization rate estimated based on the present study was 4.6 per 100,000 population per year. Significantly higher rate was found in males and in younger population, specifically in 25-34 years age-group. Notably, pediatric (<18y) population represented 7% of the victims. In agreement with the population distribution by nationality in Qatar, South Asians were the principal victims in our study. Multivariable analysis showed that male gender and BAC positivity were

predictors for interpersonal violence whereas Asian nationality was predictor of self-inflicted violence. One fifth of cases were referred to psychiatric consultation; three-quarter of them was self-inflicted violence victims. The admission GCS and ISS were independent predictors of mortality in hospitalized violence related trauma patients in our analysis.

Interpersonal violence was the major contributor in most of victims followed by self-inflicted injuries. More than one out of five patients were proven to be under alcohol abuse and had a mean BAC level corresponding to the central nervous system depression level. Head and chest injuries were the most common severe injuries. The ISS data showed that polytrauma was not much frequent in our study population. Two out of seven patients required ICU admission. In-hospital mortality was 6.4%.

As per our knowledge, this is a pioneer trauma registry-based study conducted on violence-related trauma in the Qatar. Such studies based on trauma registry data are very rare in the Arabian Gulf region. A hospital-based retrospective study in Jordan demonstrated that violence (71%) was the most frequent cause of ED visits followed by road traffic injuries (23%) [17]

Bala et al studied the prevalence of physical fighting and its associated factors among adolescent population in Qatar [18]. This study was based on a student health survey in school to determine the prevalence and factors associated with being engaged in a physical fight. On the other hand, authors from Saudi Arabia reported factors of intimate partner violence against Saudi women based on survey among participants attended primary healthcare clinics [19]. Similarly, Barnawi estimated the prevalence of different types of domestic violence and its associated risk factors among Saudi women attending a primary care center [20].

The Osman et al study from the United Arab Emirates (UAE) was the only trauma registry- based study on violence published from the Arabian Gulf region, which was specific for interpersonal violence [21]. Notably, the majority of patients in our study were victims of interpersonal violence. Both studies (from Qatar and Saudi Arabia) were based on trauma hospitalization; however, a significant number of admissions were mild cases, which is evident from our overall ISS. Osman et al estimated that the interpersonal violence-related hospitalization rate in Saudi Arabia was 6.7 per 100,000 population, higher than the rate estimated in our study [21].

The UAE study findings on violence-related trauma by age and gender were comparable to our findings. The mean age in the UAE and our study was 30 and 31 years respectively. Similarly, male predominance among the victims was also evident in the UAE (85%) and Jordan (87%) based studies [17, 21]. Male predominance in our study was over 90%; more predominant in patients admitted following interpersonal injuries. Our study demonstrated that females were more likely to involve in self-inflicted injuries by showing higher proportion of females in this group when compared to interpersonal violence group.

Blunt injuries were common in our study population, especially in self-inflicted injuries. This is in contrast to studies from level 1 trauma centers in Western settings where a large number of penetrating injuries especially by gunshots are more common. In addition to the differences in geographical, cultural and religious backgrounds in the Middle Eastern settings, factors such as urbanization, crime rates, and legislation concerning firearm use could contribute to these existing variations. Dijkink et al recently demonstrated that the proportion of admitted patients with gunshot wounds was almost twice as high in level 1 trauma centers in the United States when compared to level 1 trauma centers in Netherlands, even though the geographical areas in both countries had comparable urbanization and violent crime rates [22].

Overall in-hospital mortality rate was 6.4% in our study. On the other hand, there were no deaths reported in the UAE study. The in-hospital mortality rate reported in our study can be related to the severity of injuries. Nearly 28% of our patients required ICU admission whereas the UAE based study revealed that less than 3% were admitted to the ICU [21].

**Strength and limitation:** The major strength of our study is its internal and external validity since the data are obtained from the Qatar national trauma registry and the only referral level 1 trauma center in the country therefore our findings provides information on hospitalized violence victims in Qatar. In the process of submitting our registry data to TQIP, the submission file goes through validation and the file will be checked, a submission frequency report will provided for reference, and the file will be rejected if any major errors are found for correction. The TQIP reports are reviewed to pick up any outliers to review and correct any errors that might have been missed and then resubmit the changes.

The main limitation of the study was the retrospective design of the study; however it provided valuable information about the epidemiology and pattern of the hospitalized violence-related injuries in Qatar. Also, selection bias cannot be ruled out as in some situations the victims may not be willing to report the occurrence of violence and minor injuries may not attend HTC. Although the frequency of hospital visits following violence-related injuries by nationality data was available, the nationality-wise population data by year was unavailable and therefore the disproportionate burden of injuries were not estimated based on the rate. In addition, several other important socio-economic data were unavailable; however, the available data addressed the main objectives of the study. The present study excluded those who died at the site of injury or on arrival to the ED and therefore the data represent those with comparatively less severe injuries. In addition, the population structure in Qatar showed that females make up approximately a quarter of total population [23]. Changes in population growth rates over the years due to the influx of foreign workers recruited for the major development projects in Qatar could explain the changes in the rates of violence related injuries across the study period [23].

## Conclusions

The rate of hospitalization for violence-related injuries in Qatar is low. Higher rate of hospitalization among South Asians and younger population reflects the population structure in the country. Pediatric hospitalization and mortality associated with violence-related injuries need more attention. Although it comprised only 9.6% of the study population, females were more likely to get hospitalized following self-inflicted injuries when compared to interpersonal violence. Further studies for the violence risk factors are required to develop an evidence-based public health approach in violence prevention.

## List Of Abbreviations

**ISS:** injury severity score

**GCS:** Glasgow Coma Scale

**BAC:** blood alcohol concentration

## Declarations

**Ethical approval and consent to participate:** This is a retrospective study that was conducted anonymously without any direct contact with participants. It obtained ethical approval from Research Ethics Committee, at Medical Research Center, Hamad Medical Corporation (HMC), Doha (#MRC-01-18-189) with a waiver of consent.

**Consent for publication:** not applicable.

**Availability of data and material:** all data were shown in the study analysis. Further data need approval from the Qatar national trauma registry and medical research center.

**Competing interests:** none

**Funding:** none

**Author contribution:** all authors have contributed substantially in the study design, data interpretation, writing and critical reviewing of the manuscript

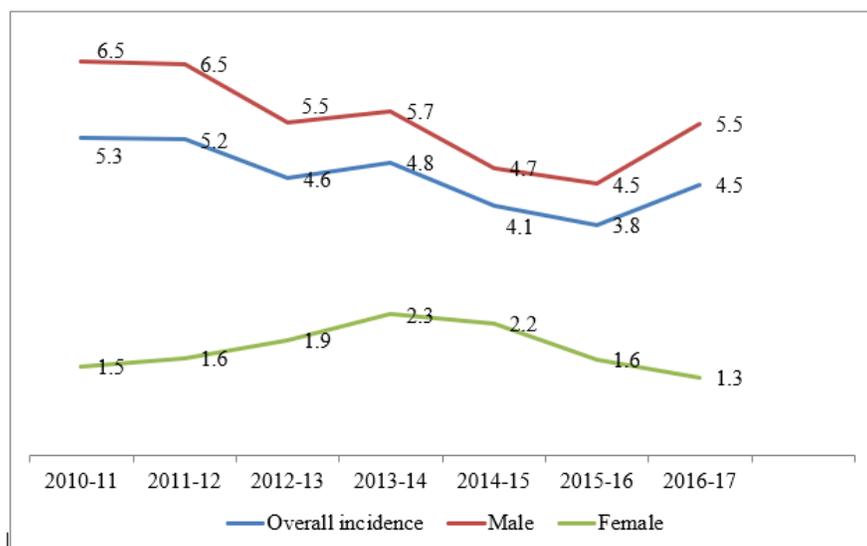
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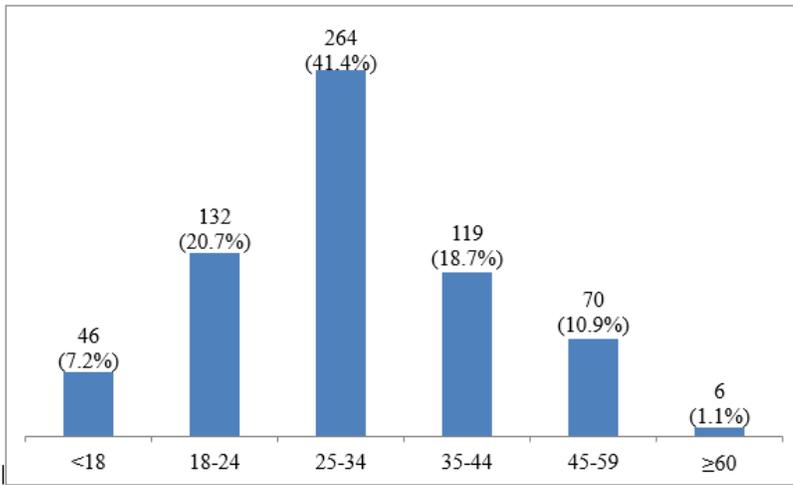
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## Figures



**Figure 1**

Hospitalization rate for violence-related traumatic injuries by gender in Qatar (2010-2017)



**Figure 2**

Number (percentage) of violence-related injuries by age-group of patients admitted at the Hamad Trauma Center, Doha, Qatar (2010-2017)

## Supplementary Files

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- [STROBEchecklistviolence.docx](#)