ABSTRACT

Introduction: Road traffic accidents (RTAs) are the leading cause of mortality and disability nationally and globally. There is a need to identify the age and gender distribution of individuals involved in nonfatal RTAs.

Methods: This was a cross-section study using electronic trauma registry data from King Abdulaziz Medical City. We included all trauma registry patients older than 14 years, who were involved in a nonfatal RTA from 2015 to 2017. The data collected included patient demographic information (age and gender), injury mechanism, injury type, and severity.

Results: In total, 1314 patients were included in the analysis. The majority of the sample (88%) was male, with a median age of 25 (interquartile range: 21–35) years. A higher proportion of the male group had severe injury scores. Gender was equally distributed in terms of head-and-neck injuries. The majority (66%) of the sample was admitted in a ward. The female group had a higher proportion (17%) of chest injuries. In terms of age, the 65-year and older group had more severe injuries to the head, neck, and chest.

Conclusions: The findings of this study provide updated evidence regarding the age group most frequently involved in nonfatal RTAs. The evidence from this study supports the urgent need for developing prevention programs such as early awareness and education for young drivers and passengers of both genders.

Key Words: Injury, Non-fatal road traffic, trauma

INTRODUCTION

Road traffic accidents (RTAs) are considered a severe public health problem.[1] They are a leading cause of mortality and disability at a young age.[1,2] In 2013, RTA-related injuries were ranked as the fifth leading cause of disability-adjusted life-years (DALYs).[2] Records from the Gulf Cooperation Countries (GCC) indicate that Saudi Arabia has the highest RTA-associated mortality of the GCC participants.[3,4] The leading cause of DALYs in the Saudi population is RTAs (12%),[5] and to contain this rising burden of RTAs, several preventative measures have been planned and implemented.[6,7]

According to literature, the driver’s age and gender are critical risk factors for RTAs and the severity of the...
RTA outcome. Although some studies examined the association between age and gender and the incidence of RTAs, there are few studies describing these factors and differentiating between the effect of age and gender on fatal and nonfatal RTAs. There is an emerging body of evidence related to RTA-associated morbidity trends. Many studies reported that the number of injured individuals is much higher than the number of fatalities, causing an increase in health-care resource utilization to manage, treat, and rehabilitate the injured patients.

Identifying RTA-associated risk factors is essential to reduce the burden of RTA-associated trauma. There is a need for evidence describing the age and gender distribution of injured patients involved in nonfatal RTAs. The aim of this study was to identify the age group distribution of the individuals involved in a nonfatal RTA, using data from the trauma registry database.

**METHODS**

**Study setting and study population**

We conducted a cross-sectional descriptive study using data from the King Abdulaziz Medical City (KAMC) trauma registry. KAMC has the largest trauma center in the region with capacity standards equivalent to a Level 1 trauma center. The trauma registry database contains records of all patients who were admitted to the hospital following traumatic injuries. Multiple studies have been done using the same database, and the validity of the database is evaluated annually.

Information regarding trauma patients who met specific inclusion criteria in the KAMC database was extracted and entered into structured datasheets. The mechanism of injury was collected and classified into 12 groups based on the standardized data collection sheet used at KAMC. One of these classifications is a motor vehicle accident and monocyctic accident. We used the variable to identify adult patients, 14 years and above, admitted to the emergency room (ER) following a motor vehicle accident from 2015 to 2017. Clinical practice in KAMC identifies the age group from 0 to 14 years as the pediatric population. We excluded the pediatric population from our study population because of the relocation of the Pediatric Emergency Department to the new hospital in the study period. As the study focused on nonfatal injury due to a RTA, we exclude patients who died before arrival at the ER. We estimated that the number of patients was included in the KAMC trauma registry to be more than 10,000 patients with at least 1000 patients involved in a nonfatal RTA. We included all participants who met the inclusion criteria.

**Study variables**

The study variables included demographic information (age and gender), mode of arrival, location and nature of injury, illness severity score, emergency department disposition (admission, discharge, and death), and admission location (ward and intensive care unit).

The patient’s age was classified into age groups: 15–25 years, 26–45 years, 46–64 years, and ≥65 years. The severity of the injury was measured using the Injury Severity Score (ISS) with the score ranging from 0 to 75. The ISS was grouped into categories: 1–8, 9–15, 16–24, and 25–75. The anatomical site of the injury was documented according to the main body regions affected, and for the study, we combined the regions in categories including head and neck, chest, abdomen and pelvis, upper limbs, lower limbs, and multiple.

**Statistical analysis**

Descriptive statistics were performed. Continuous variables are described as the median and interquartile range (IQR) and categorical variables as frequency and percentage. We compared the patients by gender (male vs. female), injury severity, clinical outcome, and anatomical site of the injury. We examined the differences in the clinical variables by age group, divided into 10-year bands, based on prior studies. All analyses were performed using the STATA 16 (STATA Corp., College Station, TX, USA).

**RESULTS**

Of 3047 patients in the trauma registry, 1314 patients met the inclusion criteria. The majority (88%) were male, with a median age of 25 years (IQR: 20–34). The median age of the female group was 32 years (IQR: 24–45). The proportion of injured males decreased in the >65-year age group (5%) compared to 54% in the 15–25-year age group [Figure 1]. The mean length of stay in the ER was 7.3 ± 11 h.

Table 1 presents the demographic information of the participants in terms of the gender distribution. The majority of the patients (66%) were discharged from the ER to a ward though the proportion for the female group was higher (84% vs. 63%). The male group had a higher ISS than the female group (19% vs. 12%), including a greater proportion in the higher ISS category. Regarding the anatomical site of injury, the proportion of head injury was almost gender equivalent; however, 12% of the male group had a chest injury compared to 16% of the female group [Table 1].

The injury pattern varied in the age groups. The >65-year age group had a higher proportion in the severe injury score, and more were admitted to a ward from the ER compared to the other age groups [Table 2]. Elderly individuals had a higher rate of head, neck, and chest
injuries compared to the other age categories. The 46–64-year age group had a higher proportion of abdominal and pelvic (11%), upper limb (15%), and lower limb (17%) injuries.

DISCUSSION

RTAs remain an unresolved problem in Saudi Arabia. The current study demonstrated that young males are involved in more severe traumatic injuries compared to older men. In addition, more males are involved in a nonfatal injury compared to females,[11] Previous studies identified gender and age as risk factors associated with the severity of a RTA, primarily attributed to speeding and a risky driving attitude.[1,16] Thus, young males were more likely to have more aggressive behaviors as compared to older drivers. This finding offers supportive evidence of the demographic factors influencing the high burden of traumatic injury in Saudi Arabia.

Many studies demonstrated that the injuries related to RTAs were higher than other injury mechanisms in the trauma registry database.[6] RTA is the majority (52%) in terms of injury mechanisms.[6,17] Literature reports speeding as the primary cause of nonfatal RTA-related injuries and is linked to the severity of the injury.[18,19] The current study found that the majority involved in nonfatal RTAs is male. It should be noted that due to the regulations in Saudi Arabia during the study period, only males were allowed to drive vehicles. As women are also allowed to drive since June 2019, it would be interesting to examine the gender difference after a period.

A recent study examined the underlying effect of gender and age on the severity of RTA outcomes using data

| Characteristics | All (n = 1314) | Male (n = 1161, %) | Female (n = 153, %) |
|-----------------|----------------|-------------------|---------------------|
| Age (median, IQR) | 25 (21-35) | 25 (20-34) | 32 (24-45) |
| Age category | | | |
| 15-25 | 673 (51) | 624 (54) | 49 (32) |
| 26-45 | 450 (34) | 384 (33) | 66 (43) |
| 46-64 | 123 (9) | 96 (8) | 27 (18) |
| > 65 | 68 (5) | 57 (5) | 11 (7) |
| Transportation to ER | | | |
| Ambulance | 876 (67) | 781 (67) | 95 (62) |
| Privet/police | 438 (33) | 380 (32) | 58 (37) |
| Trauma Severity Score (ISS) | | | |
| 1-8 | 490 (37) | 410 (35) | 80 (52) |
| 9-15 | 463 (35) | 421 (36) | 42 (27) |
| 16-24 | 237 (18) | 219 (19) | 18 (12) |
| 25-75 | 124 (9) | 111 (9) | 13 (8) |
| Disposition from ER | | | |
| Burn unit | 5 (0.3) | 5 (0.4) | - |
| Intensive care unit | 304 (23) | 286 (25) | 18 (11) |
| Operation room | 137 (10) | 130 (11) | 7 (4) |
| Ward | 868 (66) | 740 (63) | 128 (84) |
| Anatomical site | | | |
| Head and neck | 411 (31) | 363 (31) | 48 (31) |
| Chest | 171 (13) | 145 (12) | 26 (17) |
| Abdomen and pelvic | 105 (8) | 95 (8) | 10 (6) |
| Upper limb | 145 (11) | 121 (10) | 24 (15) |
| Lower limb | 215 (16) | 192 (16) | 23 (15) |
| Multiple | 267 (20) | 245 (21) | 22 (14) |

IQR: Interquartile range, ISS: Injury Severity Score, ER: Emergency room

Table 2: Characteristics of traffic-related patients in the trauma registry: Injury patterns, severity, and outcomes by age categories

| Age | Median (IQR) | 15-25, n (%) | 26-45, n (%) | 46-64, n (%) | > 65, n (%) |
|-----|--------------|--------------|--------------|--------------|------------|
| Trauma Severity Score (ISS) | | | | | |
| 1-8 | 25 (20-37) | 253 (37) | 166 (36) | 49 (39) | 22 (32) |
| 9-15 | 25 (21-34) | 236 (35) | 161 (35) | 41 (33) | 25 (36) |
| 16-24 | 25 (21-37) | 120 (18) | 77 (17) | 21 (17) | 19 (27) |
| 25-75 | 24 (20-33) | 64 (10) | 46 (10) | 12 (9) | 2 (2) |
| Disposition from ER | | | | | |
| Burn unit | 24 (19-31) | 3 (0.4) | 2 (0.4) | - | - |
| Intensive care unit | 24 (19-33) | 167 (24) | 107 (24) | 16 (13) | 16 (23) |
| Operation room | 24 (20-30) | 76 (11) | 50 (11) | 9 (7) | 2 (3) |
| Ward | 26 (21-36) | 429 (63) | 291 (64) | 98 (79) | 50 (73) |
| Anatomical site | | | | | |
| Head and neck | 24 (20-34) | 219 (32) | 136 (30) | 32 (26) | 24 (35) |
| Chest | 27 (21-46) | 80 (12) | 49 (10) | 27 (22) | 24 (35) |
| Abdomen and pelvic | 24 (20-34) | 54 (8) | 35 (7) | 14 (11) | 2 (3) |
| Upper limb | 25 (20-35) | 77 (11) | 47 (10) | 19 (15) | 2 (3) |
| Lower limb | 25 (21-34) | 108 (16) | 75 (17) | 21 (17) | 11 (16) |
| Multiple | 25 (21-34) | 135 (20) | 109 (24) | 10 (8) | 11 (16) |

IQR: Interquartile range, ISS: Injury Severity Score, ER: Emergency room

Figure 1: The age distribution of patients involved in nonfatal road traffic injury according to the gender
from the Royal Oman Police national database and found that the predominant group at risk of RTAs were young males.\cite{11} They also reported that female drivers were more likely to be involved in minor RTA-related injuries.\cite{13} The Oman study supports the findings of the current study; both studies highlight the necessity to establish early gender-sensitive interventions and preventative measures to minimize the severity of RTA-associated injury and subsequent disability with a priority to males.

In Saudi Arabia, reducing the burden of injury due to RTAs is considered as a national priority, which has been reflected in the Saudi vision 2030.\cite{20} The process of achieving this aim is based on scientific evidence by measuring the quality of health care.\cite{21} The process of ensuring quality health care, developing recommendations, and improving processes must be evidence based.\cite{21,22} The current study provides supporting data for prioritizing strategies to enhance the safety of the driving environment and reducing the unfavorable outcomes.

There were number of limitations of this study. First, data regarding other behavioral and environmental risk factors, which may have contributed to the RTAs, were not available in the trauma registry. In addition, the education level and socioeconomic status were not explored in the study. We acknowledge that the information could have provided a more comprehensive insight into the aim of this study. We cannot rule out the effect of these factors as well other unmeasured confounders on the study findings. The KAMC trauma registry is a valuable data resource related to trauma in Saudi Arabia and has been used in many studies examining traumatic injury and related outcomes\cite{6,13,20} despite this limitation. Findings from this study provided evidence regarding the age and gender distribution related to nonfatal injury at the national level. Additional studies should focus on the driver’s behavioral and environmental risk factors and the interaction with the severity of RTAs to provide more inclusive evidence.

CONCLUSIONS

In this study, we focused on the age and gender distribution of patients involved in a nonfatal road injury. This is because previous evidence indicated an increase in the number of injured individuals compared to the number of fatalities. We used the trauma registry data from a tertiary care center, capturing all nonfatal injuries admitted to the center from 2015 to 2017. The findings of this study clearly highlighted that young males were the most common age group involved in severe traumatic injury. This supports the current evidence indicating the urgent need for developing prevention programs, such as early awareness and education of young drivers. There is a growing body of evidence that necessitates a comprehensive understanding of the trends and behavioral characteristics associated with RTAs nationally and internationally. Increased enforcement of traffic regulations should also be implemented to reduce the burden. The findings of the current study support the targeting of rehabilitation and management of resource as it confirms the expected age group and gender of individuals with RTA-related disabilities.

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Nil.

Conflicts of interest
There are no conflicts of interest.

Research quality and ethics statement
This study was approved by the Institutional Review Board / Ethics Committee. The authors followed applicable EQUATOR Network (http://www.equator-network.org/) guidelines during the conduct of this research project.

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