

Patterns of pediatric trauma in Ramadan: an observational study

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Introduction Motor vehicle crashes are a major cause of death among the Saudi population. In Ramadan, the working hours and the road traffic rush hours differ from other months of the year; the pattern of trauma may also differ. We compared trauma in the pediatric age group in Ramadan with non-Ramadan months in terms of frequency, patterns, and severity.

Methods We conducted a retrospective study, which included all pediatric trauma cases, from 2001 to 2009, who were registered in King Abdulaziz Medical City Trauma Registry. Trauma patterns were divided into two groups according to the date of occurrence: victims in Ramadan versus victims in non-Ramadan.

Results A total of 3766 patients were included. The average number of trauma per month was 39.2 versus 44 for non-Ramadan and Ramadan months, respectively ($P=0.79$). The mean patient age in Ramadan was 8.04 years compared with 8.07 years in non-Ramadan months ($P=0.037$). Blunt trauma was the most common type in both groups. The median of the Injury Severity Score was

the same and equal to 4. In both groups, neurological and vascular injuries were more common in Ramadan: $P=0.02$ and $P=0.03$ respectively.

Conclusion There were no significant differences between trauma in Ramadan and non-Ramadan months, except for the higher percentage of vascular and neurological injuries in Ramadan. *Ann Pediatr Surg* 8:9–11
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Introduction

In Saudi Arabia, motor vehicle crashes (MVCs) are considered to be one of the leading causes of death. MVCs affect 3.5% of the total population in Saudi Arabia, a figure equivalent to one person killed and four injured every hour [1]. A study conducted over a 1-year period revealed that 16% of trauma victims were less than 10 years and 47% were between 11 and 30 years of age. Half of the children injured were pedestrians. There was a 4:1 male-to-female ratio [2]. Another study conducted in the Eastern Province hospitals showed that 80% of the victims of MVC were below 40 years of age, with children below the age of 12 constituting 30% [3]. The yearly estimated cost of MVCs is 21 billion Saudi Riyals, an approximate loss of 2.2–9.5% of the national income in Saudi Arabia compared with 1–2% loss in industrial countries [3]. Seasonal variation in MVCs was evident, being maximal during the summer season, particularly between 12 noon and 3 p.m. [4]. A. Kimia *et al.* [5] studied the pattern of injuries in the pediatric age group during Christmas holidays, especially those related to the holiday ornaments. They found that injuries are primarily due to foreign body ingestion and glass-related injuries. Therefore, the purpose of this study was to compare the pattern of trauma in Ramadan months with trauma in non-Ramadan months in a level one trauma center.

Methods

This is a retrospective observational study. It included all pediatric patients from 0 to 18 years of age, who were involved in trauma between May 2001 and 2009 and registered in the King Abdulaziz Medical City Trauma Registry, which is a prospectively recorded database of all trauma patients admitted to the center. Data collected include demographic variables, site and time of injury, mechanism and severity of injury, organ involved in the trauma, resuscitative measures, in-hospital course, and final in-hospital outcomes. Data regarding postdischarge visits, trauma requiring treatment in the emergency department, and those that did not need in-hospital admission are not included in King Abdulaziz Medical City Trauma Registry. We divided all pediatric trauma patients who were included in the study into two groups: those who were subjected to trauma during Ramadan months and those during non-Ramadan months. The data abstracted include demographic data, such as age, weight, and sex, and data with regard to the injury itself, such as site, type, severity of the injury, organ involved, and the final outcomes. The Injury Severity Score (ISS) was used to assess the severity of the injury at the time of presentation at the emergency department. ISS is a scoring system that provides an overall score for patients with multiple injuries. Each injury is assigned an Abbreviated Injury Scale (AIS) score and is allocated to one of six body regions [head, face, chest,

abdomen, and extremities (including pelvis)]. Only the highest AIS score in each body region is used. The three most severely injured body regions have their scores squared and added together to produce the ISS score. The ISS score takes values from 0 to 75. If an injury is assigned an AIS of 6 (unsurvivable injury), the ISS score is automatically assigned to 75. The ISS score correlates linearly with mortality, morbidity, hospital stay, and other measures of severity [6]. Institutional ethics board approval was obtained before the commencement of the study.

Statistical analysis

Descriptive statistics in the form of mean, median, and SD were provided. Analysis of continuous variables was performed using the Student *t*-test and that of categorical variables was performed by a χ^2 -test. The level of significance was set at a *P*-value of less than 0.05. Data were analyzed using SPSS software (release 11.5.0; SPSS, Chicago, Illinois, USA).

Results

From our trauma database, 8941 trauma patients were identified during the study period. Among them, 3766 were pediatric trauma patients. Also, 3414 patients suffered trauma in non-Ramadan months and 352 patients suffered trauma in Ramadan months. The study period was 95 months: 8 Ramadan months and 87 non-Ramadan months. We calculated the average number of patients per non-Ramadan month and Ramadan month by dividing 3414 by 87 and 352 by 8, respectively. These were equal to 39 and 44 patients, respectively: *P*-value = 0.79.

The mean age of trauma patients during Ramadan was 8.04 years compared with 8.07 years in non-Ramadan trauma patients: *P*-value = 0.037. Males constituted 74.3% of the patients and females constituted 25.7% in non-Ramadan months compared with 75.6 and 24.4%, respectively, during Ramadan: *P* = 0.59. The mean weight was 17.27 in Ramadan trauma patients, whereas in non-Ramadan trauma patients, it was equal to 19.19: *P*-value = 0.004. The median of the ISS was the same in both groups and equal to 4.

The most common type of trauma in both groups was blunt trauma. It was the cause of 76.7% of Ramadan trauma patients and 78.6% in non-Ramadan trauma patients: *P*-value = 0.341 (Table 1).

The mean time of arrival of trauma cases was around 14:52 p.m. in non-Ramadan months and 14:49 p.m. during Ramadan, (*P* = 0.038). Four percent of Ramadan trauma patients died in the hospital, 2.8% were dead on arrival, and 0% were transferred to other hospitals, compared with 3, 3, and 0.2% of non-Ramadan trauma patients, respectively. During Ramadan months, 3.9% of trauma patients required ventilation either by facemask or by mechanical ventilation, in comparison with 2.14% of non-Ramadan trauma patients (*P* = 0.03). The mean ventilation days needed for Ramadan trauma patients were 0.86 compared with 0.85 in non-Ramadan trauma patients (*P* = 0.94). Table 2 summarizes the patient's hospital disposition.

Table 1 Trauma types

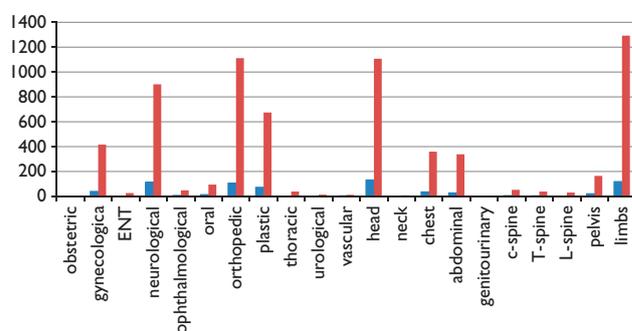
| Types of trauma | Ramadan (%) | Non-Ramadan (%) | Total (%) |
|------------------------|-------------|-----------------|-------------|
| Blunt | 270 (76.6) | 2682 (78.6) | 2952 (78.4) |
| Penetrating-gunshot | 3 (0.9) | 28 (0.8) | 31 (0.8) |
| Penetrating-stab wound | 5 (1.4) | 87 (2.5) | 92 (2.4) |
| Penetrating-other | 32 (9.1) | 229 (6.7) | 261 (6.9) |

Table 2 Hospital disposition

| Hospital disposition | Ramadan (%) | Non-Ramadan (%) | <i>P</i> -value |
|-----------------------|-------------|-----------------|-----------------|
| DOA | 9 (2.8) | 102 (3) | 0.65 |
| Death in hospital | 14 (4) | 103 (3) | 0.143 |
| Mean length of stay | 8.65 | 9.55 | 0.339 |
| Mean ICU days | 2.18 | 2.85 | 0.372 |
| Mean ventilation days | 0.86 | 0.85 | 0.94 |

DOA, Dead on Arrival.

Fig. 1



Organs involved in trauma in Ramadan and non-Ramadan months. Left columns represent Ramadan injuries and right columns represent non-Ramadan injuries. C-spine, cervical spine, ENT, ear, nose, and throat, L-spine, lumbar spine, T-spine, thoracic spine.

Vascular and neurological injuries were found to be more common in Ramadan trauma compared with non-Ramadan trauma, with *P* = 0.031 and *P* = 0.021, respectively (Fig. 1).

Discussion

MVCs are one of the leading causes of death in Saudi Arabia. Sixteen per cent of victims are under 10 years and 47% between 11 and 30 years of age [2]. In addition, trauma is one of the leading causes of death in children in many of the Middle East countries, and approximately 50% of child mortality is related to different types of trauma [7,8]. There is a belief that trauma occurs more during Ramadan, the Muslims' holy month, compared with other months of the year, and the patterns of trauma are different and injuries are more severe. This could be attributed to the Saudi rituals during that time of the year. Muslims start fasting from dawn to sunset, when the family gathers to eat their breakfast. The working hours change, to adapt to the fasting situation, and start in average from 9 a.m. to 4 p.m. The traffic rush hours are more after 4 p.m., when people are driving home. However, there is no supporting evidence that proves that Ramadan's trauma is worse. On reviewing the literature, some studies described trauma in holidays and compared it with trauma happening at other times of

the year, with differences in the types and patterns of injuries [5]. Our present study is the first study that compares trauma in Ramadan with trauma in non-Ramadan months. In this study, there was no significant difference in the number of trauma cases between Ramadan and non-Ramadan months, with a *P*-value of 0.79. This can be attributed to the long fasting hours earlier on the day, which limits people from going out and people compensate by going out late in the evening. Because of this change in the traffic rush hour, we expected to see a difference in the time of injury. However, in our study, the mean time of arrival of trauma cases was around 14:52 p.m. in non-Ramadan months and 14:49 p.m. in Ramadan, which is almost the same.

Although both groups were similar with regard to demographic characteristics, results of this study show no difference with regard to the mechanism of injury, ICU days, ventilator days, length of stay, ISS, and mortality. Obesity and adverse outcomes in trauma have been studied in the literature with different results [9]. In our study, the mean weight was 17.27 in Ramadan trauma patients, whereas in non-Ramadan trauma patients, it was 19.19, with *P*-value = 0.004. In addition, there was no difference in the patterns of injury between the two groups, except for an increase in the vascular and neurological injuries in Ramadan months, with *P*-values of 0.031 and 0.021. Nevertheless, no clear explanation could be found to elucidate this difference.

This is a retrospective study with all its inherent limitations. One of its limitations is that it included only patients who were admitted at King Abdulaziz Medical City and did not include other patients who were not admitted or admitted elsewhere. Another limitation is that this study was conducted in Riyadh region and did not include other regions in the kingdom. As Riyadh is considered as a working and studying destination, it may lower the number of patients during Ramadan, taking

into consideration the fact that the last half of Ramadan is considered as a national holiday and a lot of people return to their hometown.

Conclusion

In conclusion, there are no significant clinical differences between trauma in Ramadan and trauma in non-Ramadan months, except for the higher percentage of vascular and neurological injuries in Ramadan trauma.

We recommend increasing the public awareness about the high incidence of MVCs in Saudi Arabia and their related complications. More data are needed with regard to trauma in Ramadan to either support or refute the ‘belief’ that trauma in Ramadan is more common and has worse outcomes compared with other times of the year.

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Conflicts of interest

There are no conflicts of interest.

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