



Effect of Ramadan on Patient Presentation to the Emergency Department due to Orthopedic Trauma

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Abstract

Objective: Ramadan is a holy month for Muslims and is characterized by lengthy fasting. While Ramadan has been found associated with increased ED use, there is a paucity of research regarding its effect on ED patient presentation due to an orthopedic trauma. This study aimed to examine differences in the characteristics of patients who present to the ED with orthopedic trauma during the month of Ramadan, compared to a non-Ramadan month.

Design Settings and Participants: This retrospective comparative study included patients who presented to the ED of a hospital in Israel with orthopedic trauma in the month of Ramadan (n=508) and in the control period of March 2022 (n=765), those groups were compared. For statistical analysis, the X^2 , t-test for independent samples and Fisher's exact test, and logistic regression analysis were used.

Results: Patients who presented in the month of Ramadan were on average older (44.75 ± 23.13 vs. 39.45 ± 19.65), more likely to be female (85.6% vs. 42.5%), more likely to be Muslim citizens of Israel (55.7% vs. 39.3%), and more likely to present with trauma due to a fall (31.1% vs. 12.9%), than patients who presented in a non-Ramadan month. Older age, Ramadan, being Muslim citizens of Israel and female, increase the likelihood that the patient will present with a trauma following a fall.

Conclusion: During Ramadan, hospital EDs should anticipate and be prepared for an increased influx of Muslim patients with orthopedic trauma, and particularly trauma due a fall. Efforts should be made to prevent falls among Muslims during Ramadan.

Keywords: Ramadan; Emergency; Trauma; Orthopedic patients

Introduction

Trauma is a major cause of death and disability, especially among young people [1]. Patterns of patient presentation to Emergency Departments (ED) for trauma are vary by time of day and day of the week. In addition, seasonal patterns in patient presentation have been observed. Moreover, the demand for trauma services has been shown to rise in times of local community events, school holidays, a sudden influx of visitors to the city, or the celebration of religious holidays such as Ramadan [2].

Ramadan is the ninth month in the Islamic lunar calendar. Fasting is one aspect of Muslim worship in this month. Fasting is achieved by abstaining from food, drink, and sexual intercourse from pre-dawn to Iftar, which is the evening meal during Ramadan. It is estimated that during the month of Ramadan, about 400 million Muslims fast worldwide. During the Ramadan fast Muslims eat two meals, one before dawn and the other shortly after sunset. It is a holy month for Muslims, and it includes lengthy periods of fasting [3].

During Ramadan there is a change in the sleep cycle due to changes in meal schedules, increased food consumption during the night, reduced daytime alertness and reduced psychomotor performance [4]. Moreover, certain diseases may become aggravated [5]. Although fasting is not required of the sick, children, older people, travelers, patients with serious mental problems, pregnant or lactating women, as well as menstruating women [2], many of these try to fast to fulfill their religious obligations [6]. One epidemiological study indicated that the majority (79%) of Muslims with type 2 diabetes fasted at least 15 days during Ramadan, and in another study more than half (58%) the peritoneal dialysis patients chose to fast [5]. All these factors may lead to increased patient

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Received Date: 19 Dec 2022

Accepted Date: 13 Jan 2023

Published Date: 17 Jan 2023

Citation:

Masarwa R, Yonai Y, Merav BN, Steinfeld Y, Berkovich Y. Effect of Ramadan on Patient Presentation to the Emergency Department due to Orthopedic Trauma. *Clin Surg*. 2023; 8: 3612.

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presentation to Eds [2].

It appears from the literature that Ramadan is associated with increased ED use and a higher incidence of emergency cases [1]. Moreover, Ramadan seems to affect the profile of patients who present to the ED. Thus, a study conducted in a Jordanian hospital to examine the effect of the Ramadan period on ambulatory ED visits, revealed that most of the patients who presented to the ED during the month of Ramadan were young men who arrived between 6 pm and 11 pm and were diagnosed with a respiratory tract infection [7]. Moreover, it appears that Ramadan may have an effect on the cause of trauma among patients who present to the ED with trauma. Thus, a study conducted in a Turkey ED revealed that falls were the leading cause of trauma during the month of Ramadan [1]. The literature also reveals that during Ramadan, the number of visits due to violence is reduced, attributed to a drop in crimes committed during this holy month. Moreover, accidents associated with alcohol consumption (trauma, violence, traffic accidents) are also significantly reduced during Ramadan [8].

To the best of our knowledge, no study has examined the characteristics of orthopedic trauma patients who present to the ED during Ramadan, nor the effect of Ramadan on ED visits due to orthopedic trauma. Therefore, the purpose of this study was to examine differences in the characteristics of patients who present to the ED with orthopedic trauma during the month of Ramadan, compared to a non-Ramadan month. This information may contribute to decision-making by policymakers for effective management of EDs during Ramadan.

Materials and Methods

This study is a retrospective comparative study. The study included patients who presented with orthopedic trauma to the ED of a hospital located in northern-central Israel in the month of Ramadan 2022 (from April 1 to May 1) (n=508) and in the control period of March 2022 (n=765). Inclusion criteria were patients who presented with an orthopedic trauma due to a traffic accident, violence, occupational accident, or a fall, another inclusion criterion for patients of Arab Muslim origin was fasting during the month of Ramadan. Fifty patient records were not included due to data incompleteness. Patient characteristics of the two groups were compared.

Data collection

The study was approved by the institutional Helsinki

Committee. The following data were retrieved from patient records: sociodemographic characteristics (such as age, sex and nationality), cause of orthopedic trauma, hospital Length of Stay (LOS) and 30-day readmission.

Statistical analysis

Analyses were performed using the Statistical Package for the Social Sciences (SPSS, version 26, SPSS Inc., Chicago, IL, US). Data were presented as mean \pm SD for continuous variables and frequencies with percentages for categorical variables. A comparison was conducted between the characteristics of patients who presented to the ED with orthopedic trauma in Ramadan and non-Ramadan months. Normality test was applied. A t-test and a Fisher's exact test for independent samples were used for comparing continuous variables between the two groups. The Chi square test was used for comparing categorical variables between the two groups. Moreover, logistic regression analysis was used as appropriate. P-value <0.05 was considered statistically significant.

Results

A total of 1,273 patients with orthopedic trauma were included in the study, 508 (40.0%) of whom presented to the ED in the month of Ramadan and 765 (60.0%) in a non-Ramadan month. The characteristics of the patient population are presented in Table 1. On average, patients who presented in the month of Ramadan were found to be older (M=44.75, SD=23.13) than patients who presented in a non-Ramadan month (M=39.45, SD=19.65). In addition, patients who presented in the month of Ramadan were more likely to be female than were patients who presented in a non-Ramadan month (85.6% vs. 42.5%). Moreover, patients who presented in the month of Ramadan were more likely to be Muslim citizens of Israel, than were patients who presented in a non-Ramadan month (55.7% vs. 39.3%). Notably, the number of Muslim patients who presented with orthopedic trauma in the month of Ramadan did not vary significantly compared to the non-Ramadan month.

Furthermore, patients who presented with orthopedic trauma in the month of Ramadan had a longer LOS on average (M=1.83, SD=4.2) than patients who presented in a non-Ramadan month (M=0.12, SD=0.34). Notably, only in the month of Ramadan were several patients re-admitted (n=14), while in the majority of these patients the cause of trauma was a fall (64.3%).

Patients who presented with orthopedic trauma in the month of

Table 1: Comparison of patients' characteristics between Ramadan and non-Ramadan months.

		Non-Ramadan month (n=765)	Ramadan month (n=508)	p-value
		n (%)	n (%)	
Sex	Female	325 (42.5%)	435 (85.6%)	0.01
	Male	440 (57.5%)	73 (14.4%)	
Religion	Muslim	300 (39.3%)	283 (55.7%)	0.01
	Jewish	464 (60.7%)	225 (44.3%)	
Age (years) M (SD)		39.45 (19.65)	44.75 (23.13)	0.01
Cause of orthopedic trauma	Traffic accident	411 (53.7%)	167 (32.9%)	0.01
	Violence	30 (4.7%)	32 (6.3%)	
	Occupational accident	220 (28.7%)	151 (29.7%)	
	Fall	99 (12.9%)	158 (31.1%)	
Length of stay (days) M (SD)		0.12 (0.344)	1.83 (4.20)	0.01
30-day readmission		0	14 (2.7%)	0.01

Table 2: Logistic regression analysis for factors that increase the likelihood that falls were the cause of trauma among patients who presented to the Emergency Department with an orthopedic trauma.

Factor	OR	95% CI		P-value
		Lower	Upper	
Age	3.634	2.406	5.488	0.0001
Ramadan	2.131	1.477	3.075	0.0001
Muslim	1.908	1.314	2.771	0.001
Female sex	1.059	1.051	1.067	0.0001

Ramadan were more likely to present with trauma due to a fall, than were patients who presented in a non-Ramadan month (31.1% vs. 12.9%). In contrast, patients who presented in the month of Ramadan were less likely to present with trauma due to a traffic accident, than were patients who presented in a non-Ramadan month (32.9% vs. 53.7%).

The analysis also revealed that most patients who presented with orthopedic trauma due to a fall in the month of Ramadan (n=158) were female (n=107, 67.7%). In addition, most were Muslim (n=132, 83.5%). Moreover, patients who presented with trauma due to a fall in the month of Ramadan were on average older (M=63.62, SD=2.3) than patients who presented with trauma in this month due to other causes (M=36.21, SD=1.7) [t= -14.77(df=505), p<0.01].

A logistic regression analysis was conducted to identify factors that increase the likelihood that falls were the cause of trauma among patients who presented to the trauma ED. Older age, Ramadan, being Muslim and female sex were found to increase the likelihood that falls were the cause of trauma among patients presenting to the ED (Table 2). The regression model explained 26% of the variance in the type of orthopedic trauma (due to a fall vs. due to other causes).

Discussion

The present study examined differences in the characteristics of patients who presented to the ED with orthopedic trauma in the month of Ramadan, compared to a non-Ramadan month. Patients who presented with orthopedic trauma in the month of Ramadan were more likely to be Muslim. Moreover, the number of Muslims who presented with orthopedic trauma in the month of Ramadan showed almost no change compared to a non-Ramadan month, whereas the number of Jewish patients with orthopedic trauma diminished significantly during the month of Ramadan. These findings suggest that the Muslim population is more susceptible to orthopedic trauma during Ramadan compared to a non-Ramadan month, consistent with previous studies [1,2,7]. Moreover, these findings also suggest that the Muslim population is more susceptible to orthopedic trauma than the Jewish population during Ramadan.

In this study, patients who presented to the ED with orthopedic trauma in the month of Ramadan were on average older and more likely to be female, than patients who presented in a non-Ramadan month. These findings contradict those found in a study conducted in Turkey, where the patient population admitted to the ED during Ramadan showed no difference in terms of age and gender, compared with a control period [1]. A possible reason for this inconsistency is that the present study included a diverse population in terms of religion-both Muslims and Jews-in contrary to previous studies that included a Muslim sample only.

The differences in the present study between patients who

presented in Ramadan vs. a non-Ramadan month in terms of age and gender may also be attributed to the type of orthopedic trauma typically sustained by patients in the Ramadan vs. non-Ramadan months. Namely, in the present study, patients who presented with orthopedic trauma in the month of Ramadan were significantly more likely to present with trauma due to a fall, compared to patients who presented in a non-Ramadan month. As patients who presented with an orthopedic trauma due to a fall in the Ramadan month were typically older women in accordance with the literature [8], this may explain the differences in the present study between patients who presented in the Ramadan vs. non-Ramadan months in terms of age and gender.

In the present study, patients who presented in the month of Ramadan were less likely to present with trauma due to a traffic accident than patients who presented in a non-Ramadan month. These findings are consistent with a study conducted in Tunisia [9]. It seems that in Ramadan, the incidence of trauma due to a fall increases, while the incidence of trauma due to a traffic accident decreases. Ramadan fasting affects postural balance and attentional capacities, especially in older adults, and it may therefore increase the risk of falls and fall-related injuries. In contrast, the Ramadan celebration may lead to reduced traffic congestion, and consequently to a reduced incidence of traffic accidents [10-12].

The present study found that Ramadan, being Muslim, older age and female sex increase the likelihood of presenting to the trauma ED due to a fall. The findings confirm that Ramadan is associated with an increased incidence of trauma due to a fall among the Muslim population. Moreover, the findings suggest that older women have an increased risk of sustaining trauma due to a fall during Ramadan.

The present study found that patients who presented with an orthopedic trauma in the month of Ramadan had a longer LOS on average than patients who presented in a non-Ramadan month. This finding may be attributed to the increased incidence of fall-related injuries in Ramadan, as fall-related injuries often require a prolonged LOS [13,14]. In addition, fasting people often do not take their medications regularly, which may lead to an aggravation of chronic illnesses [11] and consequently to a longer LOS.

Notably, the present study showed that only in the month of Ramadan were several patients re-admitted, while in most of these patients the cause of trauma was a fall. This finding suggests that not only does the incidence of falls and fall-related injuries increase in Ramadan, rather falls tend to recur. It has been noted that older adults need more than three weeks to recover their postural balance following its impairment due to Ramadan fasting [15].

Research Limitations

The present study was conducted in a single facility, limiting the generalizability of the research results. Multicenter studies conducted in a wider geographical area are needed, in order to more accurately reflect the actual state of affairs in Israel. In addition, the study was based on patient records, possible generating concerns related to data accuracy and completeness. Moreover, in a database study the ability to control for confounding factors is limited. Furthermore, the retrospective research design does not allow establishing causality. Finally, the data were collected from one year only, increasing the risk that the associations could be accidental.

Conclusion

The research findings indicate that in the month of Ramadan

hospitals should anticipate an increased influx of Muslim patients with orthopedic trauma to EDs, particularly patients with orthopedic trauma due a fall. At the same time, hospitals should anticipate a reduced influx of patients with orthopedic trauma due to traffic accidents. Hospitals should prepare accordingly in terms of staffing and other resources.

Aside from implications on the management level, the research findings may also have implications on the practical level. The findings indicate that efforts should be made to prevent falls among the Muslim population in the month of Ramadan, especially in older women. Prevention efforts may include educational activities for the population at risk of falls.

Declaration

Ethics approval and consent to participate: Ethical approval for the study was obtained from the Helsinki Committee of the Hillel Yaffe Medical Center.

Author Contributions

Rawan Masarwa: Conceptualization, Methodology, Investigation, Writing: Original Draft, Writing-review and editing. Yaniv Yonai: Conceptualization, Methodology, Investigation, Writing-Original Draft, Writing-review and editing. Merav Ben Natan: Conceptualization, Methodology, Data Curation, Formal analysis, Investigation, Writing-Original Draft, Writing-review and editing. Yaniv Steinfeld: Conceptualization, Methodology, Investigation, Writing-Original Draft, Writing-review and editing. Yaron Berkovich: Conceptualization, Methodology, Investigation, Writing-Original Draft, Writing-review and editing.

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