

# ANALYSIS OF PATIENTS WHO PRESENT TO EMERGENCY DEPARTMENTS DURING RAMADAN

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## ABSTRACT

**INTRODUCTION:** Fasting is one of the five basic obligations of Islam. Muslims fast during the month of Ramadan according to the lunar calendar. Fasting during Ramadan involves abstinence from food and drinks from sunrise to sunset. The present study investigated the effect of fasting during Ramadan in patients who presented to emergency departments. Results of this study may guide healthcare authorities in countries that provide health services to Muslim communities because of increased migration.

**MATERIAL AND METHODS:** This is the first prospective multicentre study to examine emergency department applications for Ramadan. The study was performed between 05.26.2017 and 06.24.2017. Patients were classified according to cardiopulmonary complaints, trauma-associated complaints, neurological complaints, gastrointestinal complaints, headache, renal colic, upper respiratory tract complaints, and malaise. Vital signs, age, gender, presentation type, complaint type, hospital stay duration, requested laboratory examination, radiological examination, treatment outcomes, application time, smoking status, and fasting status of the study patients were recorded by using a questionnaire.

**RESULTS:** Fasting and non-fasting patients showed a significant difference with respect to presentation type, gastrointestinal complaints, upper respiratory tract complaints, hospitalization status, requested radiological and biochemical examinations, hospitalization duration, and application time ( $p < 0.05$ ).

**CONCLUSIONS:** To the authors' knowledge, the present study is the first to compare the complaints of fasting and non-fasting patients during Ramadan. The authors feel that this study is superior to several previous studies because it has been performed using a different perspective and provides more accurate and objective data than those reported in previous studies.

**KEY WORDS:** Ramadan, fasting, patient care, demographic analysis, emergency

*Disaster Emerg Med J 2019; 4(2): 33–41*

## INTRODUCTION

Fasting is a type of devotion in which Muslims consciously abstain from consuming food and drinks for

spiritual discipline and self-control. Fasting, which is one of the fundamentals of Islam, is performed from dawn (sahur) to sunset (iftar) during the month of

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Ramadan according to the lunar calendar. In addition to abstaining from consuming food and drinks, Muslims avoid taking intravenous medication and intramuscular treatment during the fasting period. However, they can consume food and drinks from sunset to sunrise during this month [1].

Ramadan is the ninth month of the year according to the lunar calendar and includes 29 or 30 days depending on the year. According to the Gregorian calendar, the month of Ramadan begins 11 days earlier each year than the previous year because the lunar year is 11-days shorter than the solar year (354 days vs. 365 days). Therefore, the fasting period can last for 18 hours, especially during the summer months. The Islamic religion exempts patients with chronic illnesses, children, elderly individuals, psychiatric patients, healthy passengers, pregnant women, and nursing mothers from fasting [2, 3].

Prediction of the number of patients visiting emergency departments and characteristics of these patients is difficult and may vary according to seasons, local events, school terms, increase in the number of visitors from the outside city, or special periods such as Ramadan [2]. To maintain the quality of patient care, to ensure effective patient flow, and to decrease the length of hospital stay, it is important to maintain a balance between available healthcare resources and patient demand. Health administrators should closely follow changes in social dynamics and make preparations accordingly [2]. In communities with large Muslim populations, the month of Ramadan is associated with important changes in the presentation of patients to hospitals, especially emergency departments. This is because the eating habits of people, the amount of consumed food and liquid, duration and period of sleeping, and period of physical activity change considerably during Ramadan. These compulsory changes in the way of life associated with Ramadan exert inevitable effects on human metabolism. A long period of hunger and dehydration may cause some discomforts and may result in the remission of some illnesses [1]. The present study investigated the effect of fasting during Ramadan in patients presenting to emergency departments. Results of such studies may help healthcare authorities in Muslim countries, which are home to approximately one billion Muslim people, and other countries that have seen an increase in Muslim population because of the recent increase in migration but have less experience in providing improved healthcare services to this population [4].

## MATERIALS AND METHODS

### Study design and setting

This prospective multicentre study was performed at two centres in Turkey, namely, the emergency department of Atatürk University, a tertiary-care centre in the east of Turkey, i.e., in Erzurum province (hospital 1), and the emergency department of Private Ufuk University Hospital, which is located in the capital city of Turkey, i.e., in Ankara province (hospital 2).

### Patients

This study was performed between the dates 05.26.2017 and 06.24.2017, which corresponded to the month of Ramadan in Turkey. Patients who presented to the emergency departments of both the hospitals during the specified period were included in the study. Patients who did not agree to participate in the study, who left the emergency departments without permission during treatment and follow-up periods, and who provided incomplete information in study forms were excluded from the study. Patients included in the study were grouped according to their complaints. Only one complaint per patient was accepted and was indicated as the most disturbing complaint. In the process of grouping complaints, the symptoms associated with each other were grouped under the same heading. Thus, the study patients were classified according to cardiopulmonary complaints (chest pain, dyspnea, and palpitations), trauma-related complaints (in-car traffic accident, traffic accident without a vehicle, minor trauma, fall, and assault), neurological complaints (syncope, side findings, speech disorder, dizziness, and seizure), gastrointestinal complaints (abdominal pain, nausea/vomiting, and diarrhoea), headache, renal colic, upper respiratory tract complaints, and fatigue. Patients who presented to the emergency departments with complaints besides the abovementioned complaints were not included in the study.

### Measurements

All the patients included in the study completed study forms that were previously prescribed by physicians in the emergency departments. Vital signs (blood pressure, pulse rate, temperature, and oxygen saturation), age, sex, presentation type, complaint type, hospital stay duration, requested laboratory examination (whole blood count analysis,

biochemical analysis, and urinalysis) and radiological examination (direct radiography, computed tomography [CT], ultrasonography [USG], and magnetic resonance imaging [MRI]), treatment outcome (hospitalization and discharge), application time, smoking status, and fasting status were recorded. Presentation type included an outpatient presentation and ambulance presentation. The time (in minutes) between arrival to the hospital and treatment outcome was recorded as the duration of emergency department stay. The requested laboratory and radiological examinations were recorded as done or not done. Application time was determined by considering the beginning and end time of fasting. At hospital 1, the beginning time of fasting during Ramadan was between 02:44 and 02:54 hours and the end time of fasting was between 19:41 and 19:55 hours. At hospital 2, the beginning time of fasting during Ramadan was between 03:17 and 03:27 hours and the end time of fasting was between 20:15 and 20:29 hours. Application time was divided into six periods, namely, sahur (1:00–4:00 hours), dawn (4:00–8:00 hours), morning (08:00–12:00 hours), afternoon (12:00–18:00 hours), iftar (18:00–21:00 hours), and night (21:00–01:00 hours).

### Statistical analysis

Statistical analyses were performed using SPSS 20 statistical analysis program (IBM). Data were presented as mean, standard deviation, median, minimum, maximum, percentage, and number. Normal distribution of continuous variables was assessed using Shapiro–Wilk and Kolmogorov–Smirnov tests. Independent samples *t*-test was used for comparing normally distributed data between two independent groups, and the Mann–Whitney *U* test was used to compare non-normally distributed data. Categorical variables were compared using Chi-square and Fisher's exact tests. A *p* value of < 0.05 was considered statistically significant.

## RESULTS

This study included 2502 patients (1905 [76.1%] patients from hospital 1 and 597 [23.9%] patients from hospital 2). The proportion of male patients was 44.9% (*n* = 1124). The age and vital signs of the patients are shown in Table 1.

In all, 23.1% (*n* = 577) patients included in the study were smokers; moreover, 6.4% (*n* = 159) patients presented to the emergency departments by using an ambulance. In all, 33.3% (*n* = 833) patients requested for whole blood count analysis, 31.1% (*n* = 778) patients requested for biochemical analysis, 9.7% (*n* = 242) patients requested for urinalysis, 37.7% (*n* = 943) patients requested for direct radiography, 9.8% (*n* = 246) patients requested for CT, 2.6% (*n* = 66) patients requested for USG, and 1% (*n* = 25) patients requested for MRI. Furthermore, 8.2% (*n* = 206) patients required hospitalization, while the remaining patients were discharged. The median stay of the patients at the emergency departments was 30 minutes (IQR1: 15 minutes, IQR3: 60 minutes, mean: 52.29 minutes, minimum: 5 minutes, maximum: 540 minutes). In all, 46.7% (*n* = 1169) patients who presented to the emergency departments during the month of Ramadan were fasting. Distribution of patients' complaints according to the fasting status of the patients is shown in Table 2.

Among non-fasting patients, the number of women was significantly higher than that of men (*p* = 0.001). The incidence of gastrointestinal complaints was 26.9% among non-fasting patients and 18.7% among fasting patients. Moreover, there was observed a significantly higher number of fasting patients presented to the emergency departments with upper respiratory tract complaints than non-fasting patients (21.8% vs. 14.7%; *p* = 0.000).

However, no significant differences were observed between fasting and non-fasting patients with respect to trauma-related complaints, neurological complaints, headache, side pain, and fatigue.

**Table 1. Age and vital signs of the study patients**

	Median	± SD	Minimum	Maximum
Age [year]	41.09	18.1	18	97
Systolic blood pressure [mm Hg]	124.88	16.27	74	230
Diastolic blood pressure [mm Hg]	76.93	10.189	40	138
Temperature [°C]	36.62	0.49	36	40
Oxygen saturation [%]	95.21	3.52	54	100
Pulse rate [beats/min]	83.99	11.99	40	164

**Table 2. Distribution of patients' complaints according to the fasting status of the patients**

		Fasting Status				Total		p
		No		Yes		n	%	
		n	%	n	%			
Sex	Female	775	58.1%	603	51.6%	1378	55.1%	$\chi^2 = 10.822$ $p = 0.001$
	Male	558	41.9%	566	48.4%	1124	44.9%	
Presentation type	Outpatient	1235	92.6%	1108	94.8%	2343	93.6%	$\chi^2 = 4.765$ $p = 0.029$
	Ambulance	98	7.4%	61	5.2%	159	6.4%	
Trauma-related complaints	No	1097	82.3%	954	81.6%	2051	82.0%	$\chi^2 = 0.199$ $p = 0.655$
	Yes	236	17.7%	215	18.4%	451	18.0%	
Cardiopulmonary complaints	No	1179	88.4%	1046	89.5%	2225	88.9%	$\chi^2 = 0.673$ $p = 0.412$
	Yes	154	11.6%	123	10.5%	277	11.1%	
Neurological complaints	No	1261	94.6%	1117	95.6%	2378	95.0%	$\chi^2 = 1.201$ $p = 0.273$
	Yes	72	5.4%	52	4.4%	124	5.0%	
Gastrointestinal complaints	No	974	73.1%	950	81.3%	1924	76.9%	$\chi^2 = 23.651$ $p = 0.000$
	Yes	359	26.9%	219	18.7%	578	23.1%	
Headache	No	1219	91.4%	1059	90.6%	2278	91.0%	$\chi^2 = 0.562$ $p = 0.453$
	Yes	114	8.6%	110	9.4%	224	9.0%	
Upper respiratory tract complaints	No	1141	85.6%	914	78.2%	2055	82.1%	$\chi^2 = 23.304$ $p = 0.000$
	Yes	192	14.4%	255	21.8%	447	17.9%	
Abdominal or side pain	No	1267	95.0%	1123	96.1%	2390	95.5%	$\chi^2 = 1.504$ $p = 0.220$
	Yes	66	5.0%	46	3.9%	112	4.5%	
Malaise	No	1283	96.2%	1125	96.2%	2408	96.2%	$\chi^2 = 0.00$ $p = 0.986$
	Yes	50	3.8%	44	3.8%	94	3.8%	
Complete blood count analysis	No	811	60.8%	858	73.4%	1669	66.7%	$\chi^2 = 44.210$ $p = 0.000$
	Yes	522	39.2%	311	26.6%	833	33.3%	
Biochemical analysis	No	853	64.0%	871	74.5%	1724	68.9%	$\chi^2 = 32.152$ $p = 0.000$
	Yes	480	36.0%	298	25.5%	778	31.1%	
Urinalysis	No	1153	86.5%	1107	94.7%	2260	90.3%	$\chi^2 = 47.930$ $p = 0.000$
	Yes	180	13.5%	62	5.3%	242	9.7%	
Direct radiography	No	818	61.4%	741	63.4%	1559	62.3%	$\chi^2 = 1.084$ $p = 0.298$
	Yes	515	38.6%	428	36.6%	943	37.7%	
Computed tomography	No	1185	88.9%	1071	91.6%	2256	90.2%	$\chi^2 = 5.196$ $p = 0.023$
	Yes	148	11.1%	98	8.4%	246	9.8%	
Ultrasonography	No	1287	96.5%	1149	98.3%	2436	97.4%	$\chi^2 = 7.342$ $p = 0.007$
	Yes	46	3.5%	20	1.7%	66	2.6%	
Magnetic resonance imaging	No	1316	98.7%	1161	99.3%	2477	99.0%	$\chi^2 = 2.199$ $p = 0.138$
	Yes	17	1.3%	8	0.7%	25	1.0%	
Hospitalization	Discharged	1189	89.2%	1107	94.7%	2296	91.8%	$\chi^2 = 24.927$ $p = 0.000$
	Hospitalized	144	10.8%	62	5.3%	206	8.2%	

Significantly higher number of fasting patients requested for whole blood count analysis (39.2% vs. 26.6%), biochemical analysis (36.5% vs. 25.5%), and urinalysis (13.5% vs. 5.3%) than non-fasting

patients ( $p = 0.000$ ). In contrast, 11.1% non-fasting patients requested for CT compared with 8.4% fasting patients ( $p = 0.023$ ). Moreover, a higher number of non-fasting patients requested for USG than

fasting patients (3.5% vs. 1.7%;  $p = 0.007$ ). However, no difference was observed between fasting and non-fasting patients with respect to the request for MRI and direct radiography. In all, 5.3% ( $n = 206$ ) fasting patients were hospitalized compared with 10.8% ( $n = 144$ ) non-fasting patients ( $p = 0.000$ ).

Differences in the vital signs of fasting and non-fasting patients are shown in Table 3. It was observed that although the values of fever, systolic blood pressure, and oxygen saturation were significantly different between fasting and non-fasting patients ( $p < 0.001$ ), the means of these values were not clinically significant between the two groups. Moreover, no significant difference was observed between fasting and non-fasting patients with respect to diastolic blood pressure and heart rate.

The median duration of hospital stay was 45 minutes (min. 5 minutes, max. 540 minutes) in non-fasting patients and 20 minutes (min. 5 minutes, max. 40 minutes) in fasting patients, which was significantly different ( $p = 0.000$ ). Moreover, patients in the two groups showed a signifi-

cant difference with respect to age ( $p = 0.002$ ), with the median age of non-fasting patients being 37 years (min.18 years, max. 97 years) and that of fasting patients being 36 years (min.18 years, max.93 years).

Assessment of the time of presentation to the emergency departments indicated that 59.3% of patients who presented between 08:00 and 12:00 hours and 63.9% of patients who presented between 12:00 and 18:00 hours did not fast. In contrast, 58.8% of patients who presented to the emergency departments between 21:00 and 01:00 hours fasted. These results indicate that the time of presentation to the emergency departments was significantly different between the fasting and non-fasting patients ( $p = 0.000$ ). However, no significant difference was observed between fasting and non-fasting patients who presented to the emergency departments between 01:00 and 04:00, 04:00 and 08:00, and 18:00 and 21:00 hours. Distribution of the study patients according to the time of presentation to the emergency departments and fasting status is shown in Table 4.

**Table 3. Effect of fasting status on the vital signs of the study patients**

Variables	Fasting	n	Median $\pm$ SD	p
Fever	No	1333	36.67 $\pm$ 0.48	0.000
	Yes	1169	36.56 $\pm$ 0.49	
Systolic blood pressure	No	1333	123.91 $\pm$ 17.15	0.001
	Yes	1169	125.98 $\pm$ 15.13	
Diastolic blood pressure	No	1333	76.63 $\pm$ 10.42	0.119
	Yes	1169	77.27 $\pm$ 9.91	
Pulse rate	No	1333	84.08 $\pm$ 13.11	0.675
	Yes	1169	83.88 $\pm$ 10.59	
Oxygen saturation	No	1333	95.38 $\pm$ 3.65	0.010
	Yes	1169	95.01 $\pm$ 3.36	

**Table 4. Effect of fasting status on the time of presentation to the emergency departments**

Time period	Fasting status		Total (n [%])
	No (n [%])	Yes (n [%])	
01:00–04:00 hours	61 (49.6%)	62 (50.4%)	123 (100%)
04:00–08:00 hours	57 (56.4%)	44 (43.6%)	101 (100%)
08:00–12:00 hours	229 (59.3%)	157 (40.7%)	386 (100%)
12:00–18:00 hours	462 (63.9%)	261 (36.1%)	723 (100%)
18:00–21:00 hours	202 (52.2%)	185 (47.8%)	387 (100%)
21:00–01:00 hours	322 (41.2%)	460 (58.8%)	782 (100%)
Total	1333 (53.3%)	1169 (46.7%)	2502 (100%)

## DISCUSSION

This is the first prospective multicentre study to examine patients presenting to emergency departments according to their fasting status during Ramadan, which indicates the uniqueness of this study. Although many studies have reviewed patients presenting to emergency departments during Ramadan, these studies have been retrospective in nature. Moreover, these studies did not assess the fasting status of patients presenting to emergency departments. The presented study assessed the fasting status and emergency services required by patients during Ramadan more accurately and objectively than previous studies [1, 2, 4–7].

One study assessed 40000 Muslim subjects, of which 93% fasted during Ramadan [8, 9]. In Turkey, 99% of the population is Muslim, of which 66% are estimated to fast during Ramadan. [7]. The present study is the first to assess the fasting rate of patients presenting to emergency departments. These results do not overlap those of the above survey. In the present study, 46.7% (n = 1169) patients presenting to emergency departments fasted during Ramadan. This difference may be due to the fact that the patients with chronic illnesses are exempted from fasting according to the Islamic religion. Although the rate of fasting is high in Muslim communities. But the rate of fasting is lower in patients who admitted emergency departments than the normal population. This study clearly reported the complaints of the fasting population during Ramadan.

Most previous studies have assessed the effects of fasting during Ramadan on the general health of the fasting population. Nevertheless, the number of studies that have not examined the relationship between the month of Ramadan and the number of applications is very small [6]. A previous study reported patients presented to emergency departments during Ramadan because of the following complaints: upper respiratory tract infection (24%); acute gastroenteritis (17%); abdominal pain (9%); skin infection, kidney infection, renal colic (6%); and resting (3%) [10]. Fasting, circadian rhythm changes, and improper treatment commonly result in gastroduodenal ulcers and complications [10].

Measurement of vital signs is the easiest method to assess the effects of the onset of hunger on metabolism. Hussain et al. reported that fasting during Ramadan was associated with a decrease in heart rate, which was caused by a decrease in catecholamine production [11]. Although the

heart rate of fasting patients was lower than that of non-fasting patients ( $83.88 \pm 10.59$  beats/min and  $84.08 \pm 13.11$  beats/min, respectively) in the present study, the difference was not statistically significant ( $p > 0.05$ ). However, the present study reported a statistically significant difference in systolic blood pressure, fever, and finger-tip oxygen saturation values between fasting and non-fasting patients ( $p < 0.001$ ). This difference, however, was not clinically significant because these parameters were within the expected normal range. Therefore, these findings indicate that fasting does not alter the meaning of the vital findings.

Results of studies assessing the relationship between fasting and cardiopulmonary complaints are highly controversial. Some studies have shown that fasting exerts protective effects on the cardiovascular system and that there is no difference in the requirement of emergency services for cardiac complaints between Ramadan and non-Ramadan months [1, 4, 6, 12–16]. However, few studies have provided contradictory results. These studies indicate that the incidence of acute coronary syndromes is higher during Ramadan than in the other months, especially among people with advanced age and with hypertension [14, 17]. However, the present study could not establish an association between fasting and the incidence of cardiopulmonary complaints.

Trauma-related complaints were not different between fasting and non-fasting patients, which is inconsistent with that reported in previous related studies. Some studies have shown that the number of pounding and assault incidents and car accidents decrease during Ramadan because of a decrease in alcohol consumption [10, 12, 18]. In contrast, Bener et al. showed that more people were injured in traffic accidents during Ramadan than in the other months [19]. Langford et al. [20] investigated traffic accidents during Ramadan and did not report a statistically significant increase in the number of casualties in the Muslim population due to traffic accidents during Ramadan.

The present study did not show any association between fasting and incidence of neurological complaints, which is consistent with that reported in previous studies. Results of previous studies suggest that hunger does not play a role in triggering neurological diseases and that changes in eating habit, diurnal rhythm, and sleep regimen are not risk factors of neurological diseases [1, 6, 12, 21, 22].



Hunger, however, directly affects the gastrointestinal system. Therefore, it is not surprising that the number of patients presenting to emergency departments with gastrointestinal complaints increases during Ramadan. Hunger-associated gastrointestinal complaints are caused by an increase in gastric acid levels [4, 23–25]. Increased gastric acid levels increase abdominal pain and may lead to peptic ulcer. Many studies have reported an increased incidence of these illnesses during the month of Ramadan compared with that during the other months [4, 12, 23, 26]. However, there is no difference in the incidence of cholecystopathies such as acute cholecystitis, which are not directly associated with gastric acid levels [27]. In this regard, the results of the present study are different from those of previous studies. In the present study, the incidence of gastrointestinal complaints was lower in fasting patients (18.7%) than in non-fasting patients (26.9%) ( $p < 0.001$ ). Peptic ulcer and its related complications were the most common gastrointestinal complaints in previous studies. In the present study, all the patients with gastrointestinal complaints were classified as having peptic ulcers. Generally, fasting exerts a protective effect against gastrointestinal complaints. It is believed that gastrointestinal complaints reported in the present study may be related to the resting of the gastrointestinal organs and to hunger.

Hunger alone is considered to be the cause of headache. In addition, lifestyle changes such as deterioration of sleep and decreased caffeine and tobacco intake during Ramadan are suggested to cause headaches [1, 7, 28–30]. However, some studies have not established any association between fasting during Ramadan and the incidence of headaches. Al Assaad et al. compared the incidence of headaches during Ramadan and non-Ramadan months and observed no difference [1]. In the present study, no statistically significant difference was observed in the incidence of headaches between fasting and non-fasting patients. This may be due to the fact that Muslims choose a spiritual way of life during Ramadan by trying to stay away from emotional grief and by adopting a sedative lifestyle by decreasing the duration and intensity of daily physical activity.

Fluid and dietary restrictions during Ramadan can trigger biochemical factors related to stone formation. Liquid loss and dehydration caused by sweating in hot air reduce urine volume and increase urine density. This may result in the formation

of renal stones. Therefore, the incidence of renal colic is expected to be higher during Ramadan than during the other months. However, the association between the incidence of renal colic and fasting during Ramadan has not been clearly established. Although many studies have suggested an association between the incidence of renal colic and fasting during Ramadan, many other studies have provided an opposite view [1, 4, 31–35]. The present study did not report a statistically significant difference in the incidence of renal colic between fasting and non-fasting patients. This may be because fasting patients were not dehydrated and their need for liquids was met between iftar and sahur hours.

In the present study, upper respiratory tract infection was the most common cause of presentation to the emergency departments. In all, 21.8% fasting patients presented with an upper respiratory tract infection compared with 14.4% non-fasting patients, which was significantly different ( $p < 0.001$ ). This may be because of the restriction of fluid intake and increased susceptibility of mucous membranes to dryness and infection. Consistently, previous studies have shown that the incidence of upper respiratory tract infections increases during Ramadan [10]. To the authors' knowledge, the present study is the first to assess the incidence of fatigue in fasting and non-fasting patients during Ramadan and did not report any significant difference in the incidence of fatigue between these two patients groups.

In addition to comparing the incidence of different health-related complaints between fasting and non-fasting patients, the present study compared the length of hospital stay, time of presentation to the emergency departments, and required physical and radiological examinations between fasting and non-fasting patients to ensure the maintenance of the quality of health services offered to Muslim communities during Ramadan. The average duration of hospital stay was 45 minutes (min. 5 minutes, max. 540 minutes) among non-fasting patients and 20 minutes (min. 5 minutes, max. 40 minutes) among fasting patients ( $p = 0.000$ ). This difference may be because fasting patients may refuse to receive intravenous medication or treatment for intrinsic cirrhosis because of the concern that this may break their fast and therefore leave the emergency department quickly.

Assessment of the time of presentation to emergency departments during Ramadan indicates an increased number of patients presented to the

emergency departments at night. A study conducted during Ramadan showed most patients presented to emergency departments between 20:00 and 23:00 hours [4]. In another study, 40% of patients presented to emergency departments between 23:00 and 8:00 hours [10]. Butt et al. showed that during Ramadan, approximately 60% of patients were presented to emergency departments during the night [2]. Another study reported most patients presented to emergency departments between 16:00 and 20:00 hours [6]. Only one related study assessed patients admitted to a cardiology clinic according to their fasting status and presentation time at the clinic during Ramadan. Results of this study showed that the fasting status of patients was not significantly associated with the time of presentation to the cardiology clinic. The present study showed that fasting patients were more likely to present to the emergency departments at night hours than during day and evening hours. In this case, the fasting population can be explained by referring to the hospital when there is no fasting. Next, the patient outcomes were investigated in the present study. It was observed that the hospitalization rate was 10.8% in fasting patients compared with 5.3% in non-fasting patients ( $p < 0.001$ ). This difference indicates that patients with a serious illness are less likely to fast and that 10.8% of fasting patients continue to fast despite their illness.

In the present study, 7.4% non-fasting patients and 5.2% fasting patients were brought to the emergency departments by an ambulance ( $p < 0.01$ ). It is explained with the view that the non-fasting group uses more ambulances because the fasting population constitutes of individuals who have chronic diseases that prevent them from fasting. Patients with chronic illnesses are critical and need to be transported to hospitals by an ambulance. The present study is the first to assess diagnostic tests requested by patients who presented to emergency departments during Ramadan. It was observed that more of the fasting patients requested for complete blood count analysis, biochemical analysis, urinalysis, CT, and USG than the non-fasting patients. This may be because non-fasting patients may include an increased number of patients with chronic illnesses.

During Ramadan, Muslims abstain from using recreational items such as cigarettes in addition to abstaining from consuming food and drinks. Therefore, in the present study, the association between fasting and smoking habit was examined and no signifi-

cant difference in smoking habit between fasting and non-fasting patients was observed. This finding indicates that smokers prefer to perform religious duties rather than smoke during the month of Ramadan.

## CONCLUSION

Fasting during Ramadan may be associated with changes in some but not all disease states. The results of the present study have added substantial new information to the existing literature on this topic. This study provides important information on gastrointestinal and upper respiratory tract infections, length of hospital stay, and time of presentation to emergency departments of fasting and non-fasting patients during Ramadan. Moreover, the present study is the first to assess diagnostic tests requested by and cigarette use by fasting and non-fasting patients during Ramadan.

**Acknowledgements:** There are no acknowledgements for the manuscript

**Conflict of interest:** The authors have no conflict of interest to declare

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