Circadian pattern of acute coronary syndrome patients in Ramadan fasting

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Background
Over one billion Muslims fast worldwide during the month of Ramadan. The impact of fasting on circadian presentation with acute cardiac events is unknown.

Objectives
This study aims to determine whether fasting during Ramadan has any effect on the circadian pattern of acute coronary syndromes (ACS) or not.

Patients and methods
This is a prospective observational study that included all patients with ACS. Patients were divided into two groups based on the history of fasting. Information about age, sex, cardiovascular risk factor profiles, and outcome was collected. The relationship of time of presentation of initial symptoms with fasting and time of seeking medical advice was evaluated and statistically analyzed.

Results
Of the 494 patients with ACS hospitalized during the study period, 85 patients were fasting during Ramadan. Fasting patients were more likely to have their symptoms between 3 a.m. and 4 a.m. (15.3%), whereas nonfasting patients were more likely to have their symptoms between 7 a.m. and 8 a.m. (16.6%) ($P < 0.005$). In addition, fasting patients were more likely to present to the hospital early within the first hour of onset of symptoms (35.3%), whereas nonfasting patients were less likely to present to the hospital early within the first hour (23.7%). These differences were also statistically significant ($P < 0.04$).

Conclusion
The changes in food intake and/or sleep timings affect the circadian rhythm and influence the timing of presentation of ACS.

Keywords:
acute coronary syndrome, coronary heart disease, Ramadan fasting

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Introduction

One of the five fundamental rituals of Islam is fasting during the month of Ramadan. The time of observance differs each year because the timing of Ramadan is decided according to the lunar calendar. The devotees are supposed to fast from dawn to sunset and the duration of fasting every day depends on the geographical site and season. For example, in the summer months, like in Egypt in the year 2015, the fast could last up to 16 h. Muslims observing the fast must not only abstain from eating and drinking but also from taking oral medications, as well as intravenous fluids and nutrients.

During Ramadan fast, devotees take two meals, one before sunrise (Al Souhor) and the other shortly after sunset (Al Iftar). This change of meal schedule is accompanied with changes in the sleep habit (shortening of time to sleep). It was thought that a change in the number and timing of meals, portioning the entire intake into two (instead of the usual four or five), and alterations in the schedule of drug intake could have an effect on patients with acute coronary syndromes (ACS).

Interestingly, it has been known since the late 1980s that almost all cardiovascular events exhibit a pronounced circadian rhythm, with ACS being more common in the morning when patients wakeup, and begin activities than during sleep.

Patients and methods

This is a prospective study and was carried out on all patients with ACS who have been admitted to Coronary Care Unit in Assiut University Hospital during the month of Ramadan and the following

3 months after Ramadan (the period between 18 June 2015 and 16 October 2015), after obtaining oral consents from the patients and a clearance from the ethics committee in the faculty of medicine in Assiut university. Then, the patients were divided into two groups: fasting and nonfasting.

All patients were subjected to full history taking including risk factors for developing ACS (age, sex, diabetes mellitus, hypertension, and smoking). Complaints such as chest pain – typical or atypical – palpitations, and shortness of breath; the time of onset of symptoms; and time of presentation and seeking medical advice were recorded.

General examination was done including vital signs: pulse and blood pressure. In addition, a standard 12-lead ECG was done to detect STEMI, NSTEMI/UA, and any related arrhythmias or left bundle branch block. Troponin and creatine kinase–myoglobins were done upon admission and repeated after 6 h.

Statistic analysis

Data were analyzed by statistical package for the social sciences (SPSS, version 16.0; SPSS Inc., Chicago, Illinois, USA). The following statistics were carried out.

Descriptive statistics

The ranges, mean, and SD were calculated for interval and ordinal variables and the frequencies and percentages for categorical variables.

Comparisons

Between the two groups of patients, comparisons were made by two-sample *t*-tests for continuous variables and by χ^2 analysis for categorical variables.

The *P* value less than 0.05 was taken as the limit of statistical significance.

Results

It is an observational cross-sectional study that was conducted in Assiut University Hospital and consists of two groups: group A, fasting during Ramadan, which included 85 patients, of whom 63 were male (74.1%), and group B, nonfasting during Ramadan and the following 3 months, which included 409 patients, of whom 271 were male (66.3%). Their age ranged from 17 to 85 years, with mean ± SD of 57.4 ± 11.1 (Table 1).

The final diagnosis was as follows: in the fasting group, 39 patients were diagnosed as myocardial infarction (MI) (45.9%) and 46 patients as unstable angina (UA) (54.1%), and in the nonfasting group, 208 patients were diagnosed as MI (50.9%) and 201 patients as UA (49.1%) (*P* = 0.404) (Fig. 1).

There is a shift to right toward a later presentation of the nonfasting patients compared with fasting ones who tended to present at earlier hours. Fasting patients were more likely to have their symptoms between 3 a.m. and 4 a.m. (15.3%), whereas nonfasting patients were more likely to have their symptoms between 7 a.m. and 8 a.m. (16.6%) (*P* < 0.005) (Fig. 2).

Fasting patients were more likely to present to the hospital early within the first hour of onset of symptoms (35.3%), whereas nonfasting patients were less likely to present to the hospital early within the first hour (23.7%) (*P* < 0.04) (Fig. 3).

We also found that the percentage of patients in whom the door to treatment time was 1 h or less was significantly less during Ramadan than in the 3 months following Ramadan (47.1 vs. 60.4, 93.5, 90.3%) (Fig. 4).

Discussion

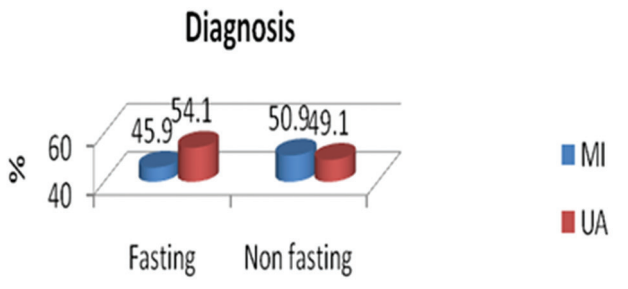
In the present study, the proportion of patients presenting with acute myocardial infarction (AMI) and UA were not significantly different between fasting and nonfasting groups (45.9 and 54.1% vs. 50.9 and 49.1%; *P* = 0.404).

This in agreement with a population-based study of Ramadan fasting and ACS conducted by Al Suwaidi J *et al* in 2004 [1]; they observed no significant difference

Table 1 Demographic data of fasting and nonfasting groups

	Fasting (*n*=85)	Nonfasting (*n*=409)	*P*
Age (mean±SD)	55.3±10.9	57.8±11.2	0.059
Sex (male) (*n* (%))	63 (74.1)	271 (66.3)	0.159
Smoking (yes) (*n* (%))	33 (38.8)	152 (37.2)	0.774

Figure 1



Comparison between fasting and nonfasting groups as regards diagnosis. MI, myocardial infarction; UA, unstable angina.

among the three periods (1 month before, during, and after Ramadan) as regards the incidence of AMI. The same study also showed no significant difference among patients admitted with UA during the three periods.

In contrast to the previous study, Al Suwaidi J *et al* in 2006 [2] reported the results of their study, which showed that the proportion of patients presenting with AMI was significantly higher in the fasting group than in the nonfasting group (79.6 vs. 47.0%; $P < 0.001$).

This may be attributed to the different design of each study. The present study is a prospective study over a period of 4 months (Ramadan 2015 and the following 3 months), and it included 494 patients.

Although the study that was published in 2004 was a retrospective population-based study over a period of 10 years (from 1991 to 2001), it included a large number of patients (8446 patients) who were admitted with ACS, 1 month before, during, and after Ramadan.

The other study in 2006 was a prospective study over a period of 9 months (from October 2002 to June 2003) and included 1019 patients.

In the present study, the fasting patients significantly have their symptoms between 3 a.m. and 4 a.m. in the morning (15.3 vs. 5.4%; $P = 0.005$).

This is in agreement with the study by Al Suwaidi *et al.* [2], in which fasting patients had their symptoms significantly between 3 a.m. and 4 a.m. (11.1 vs. 6.9%), the wakeup time to have their last meal (Al Souhor) before starting their fasting day.

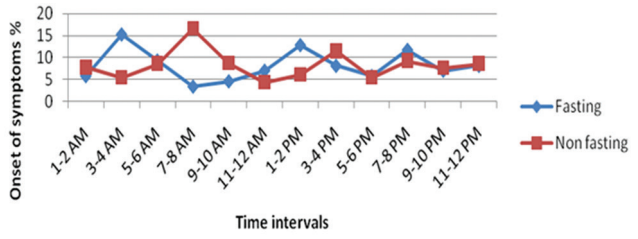
In agreement with the results of the present study, Stokholm *et al.* [3] showed a reduction of cardiac events during hunger. The latter was associated with catecholamine inhibition and reduced venous return, causing a decrease in the sympathetic tone, which leads to a fall in blood pressure, heart rate, and cardiac output. In addition, Hussein *et al.* [4] reported a reduction in heart rate during Ramadan, concluding that this was owing to the inhibition of catecholamine production during hunger.

In our study, fasting patients were more likely to present to the hospital early within the first hour of onset of symptoms (35.3%), compared with nonfasting patients (23.7%; $P = 0.033$). This is mostly attributed to being awake at the time of Al Souhor (3–4 a.m.) and also the time of dawn prayer. Therefore, both patients and their families were already awake at this time. This also may be explained by the psychology of the fasting patients, being more worried and attentive regarding any complaint, especially if they were known to be diabetic, hypertensive, cardiac, or have any other comorbidities, with changes in the timing of their medications during fasting.

Interestingly, Kim *et al.* [5] observed that patients who developed symptoms at night tended to have more prolonged overall time delay compared with those who had their symptoms during early day hours.

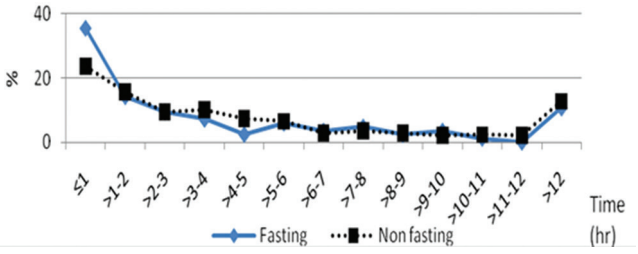
Surprisingly, we observed a significant delay in the door to treatment time during Ramadan compared with the following 3 nonfasting months. The percentage of patients in whom the door to treatment time was 1 h or less was significantly less in Ramadan (47.1 vs. 60.4, 93.5, 90.3%; $P < 0.001$).

Figure 2



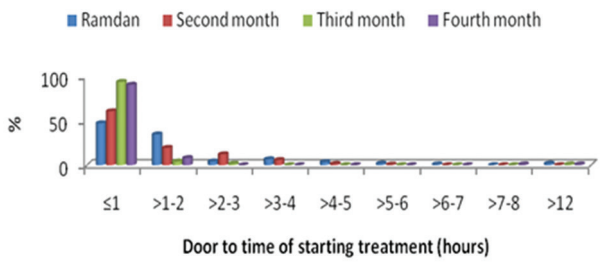
Comparison between fasting and nonfasting groups as regards timing of onset of symptoms.

Figure 3



Comparison between fasting and nonfasting groups as regards symptoms to door time.

Figure 4



Comparison between Ramadan and following 3 months as regards door to treatment time.

According to Muller *et al.* [6], the time to start treatment is shorter during the night shift than during the day shift. This was explained by less number of patients during the night shift, and thus care is provided faster.

In the present study, the number of patients who presented to the emergency department, including those with ACS, during the night and the early morning shift were more than those who presented during the day shift. Therefore, care was provided slower during Ramadan than in the other nonfasting months. In addition, the number of medical and paramedical staff was sometimes less during Ramadan night shifts. Other times, part of the medical team was busy with their Al Souhor.

This also could be attributed to the fatigue and tiredness of some of the medical team related to long hours of fasting and work in Ramadan. This is in agreement with Glaser *et al.* [7], who attributed the delay in the door to needle time to fatigue of the medical team and the possibility of the presence of less-experienced physicians in teaching hospitals during night shifts and off hours.

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Conflicts of interest
There are no conflicts of interest.

References

1 Al Suwaidi J, Bener A, Suliman A, Hajar R, Salam AM, *et al*. A population based study of Ramadan fasting and acute coronary syndromes. Heart 2004; 90: 695–696.

2 Al Suwaidi J, Bener A, Gehani AA, Behair S, Mohanadi DAl, Salam A, *et al*. Does the circadian pattern for acute cardiac events presentation vary with fasting? J Postgrad Med 2006; 52: 30-33.

3 Stokholm KH, Breum L and Astrup A. Cardiac contractility, central hemodynamics and blood pressure regulation during semistarvation. Clin Physiol 1991; 11: 513-523.

4 Hussain R, Duncan MT, Cheah SH, Ching SL. Effects of fasting in Ramadan on tropical Asiatic Moslems. Br J Nutr 1987; 58: 41–48.

5 Kim JA, Jeong JO, Ahn KT, Park HS, Jang WI, Kim MS, *et al*. Causative factors for time delays in patients with acute ST-segment elevation myocardial infarction undergoing primary percutaneous coronary intervention. Korean J Med 2010; 78: 586-594.

6 Muller LA, Rabelo ER, Moraes MA, Azzolin K. Delay factors on the administration of thrombolytic therapy in patients diagnosed with acute myocardial infarction in a general hospital. Rev. Latino-Am. Enfermagem 2008; 16:1.

7 Glaser R, Naidu SS, Selzer F, Jacobs AK, Laskey WK, Srinivas VS, *et al*. Factors associated with poorer prognosis for patients undergoing primary percutaneous coronary intervention during off-hours: biology or systems failure? J Am Coll Cardiol Intv. 2008; 1: 681–688.