

Impact of fasting in Ramadan in patients with cardiac disease

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ABSTRACT

Objectives: To investigate whether Ramadan fasting has any effect on patients with heart disease.

Methods: We prospectively studied 465 outpatients with heart disease who were fasting during the month of Ramadan from October 24 to November 24, 2003. These studied subjects were from various medical centers in the Gulf region; State of Qatar, Kuwait, United Arab Emirates, and Bahrain. We performed detailed clinical assessments one month before Ramadan, during Ramadan and one month after Ramadan and analyzed predictors of outcome.

Results: Overall, the mean age was 55.9±11.3 years (age range 32-72). Of the 465 patients treated, 363 (78.1%) were males and 102 (21.9%) females. Among them, 119 (25.6%) patients had congestive heart failure, 288 (62%) patients with angina, 22 (4.7%) patients with atrial fibrillation and 11 (2.4%) patients with prosthetic

metallic valves. Three hundred and seventy (79%) had prior myocardial infarction (MI), 195 (17.2%) had prior coronary artery bypass surgery (CABG), and 177 (38%) had prior percutaneous coronary interventions (PCI). At the time of follow-up, we found that 91.2% could fast and only 6.7% felt worse while fasting in Ramadan. Of the studied subjects, 82.8% were compliant with cardiac medications and 68.8% were compliant with dietary instructions. We hospitalized 19 patients during Ramadan for cardiac reasons (unstable angina, worsening heart failure, MI, uncontrolled hypertension, subtherapeutic anticoagulation or arrhythmias).

Conclusion: The effects of fasting during Ramadan on stable patients with cardiac disease are minimal. Most patients with stable cardiac disease can fast.

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One of the 5 fundamental rituals of Islam, the religion professed by over one billion people, is fasting during the month of Ramadan. The time of observance differs each year because it is a lunar calendar. Fasting is from dawn to sunset, a period that varies with the geographical site and the season. In summer months and northern latitudes, the fast can last up to 18 hours or more. 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. Fasting is not obligatory for children, menstruating women, sick, and traveling people.¹⁻³ During the Ramadan fast, Muslims eat 2 meals, one before sunrise and the other shortly after sunset. Changes in sleep habit (shortening of time to sleep) accompany the change of meal schedule.¹ Fasting during Ramadan may have effects on cardiac patients; the obligation that the daily calorie intake has to be taken in one or 2 meals instead of 3-5, is an effort. Also, the

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obligation that they perform heavy physical worship after a heavy meal. The drug schedule during the daytime changes due to fasting, with an accompanying change in circadian pattern, which may affect cardiac patients.³ Many studies have recently shown that there were no significant differences in the number of hospitalizations for acute coronary syndromes and congestive heart failure.³⁻⁷ Also, our previous study findings revealed that although there were no overall significant differences in the incidence of acute cardiac events in relation to fasting, the timing of onset of symptoms was different.⁶ However, none of these studies stated whether patients with cardiac disease can fast safely in Ramadan and which patients we should discourage from fasting. The aim of this study is to assess the impact of fasting during Ramadan on the clinical status of patients with cardiac disease, and to evaluate the effects of fasting on their biochemical profiles.

Methods. To study the effects of fasting in Ramadan on cardiac patients, 465 fasting outpatients with heart diseases were studied during the month of Ramadan (October 24 to November 24, 2003). These selected subjects were seen in cardiac outpatient clinics at various cardiac centers in the Gulf region (Hamad General Hospital, Qatar [n=299 patients], Mubarak Al-Kabeer Hospital [n=70 patients] and Chest Hospital, Kuwait, [n=41 patients], Al-Jazeera Hospital, Abu Dhabi, United Arab Emirates [n=48 patients] and Bahrain Defense Forces Hospital, Bahrain [n=7 patients]). The Institutional Review Board approved the protocol in each hospital. Baseline clinical characteristics including age, gender, cardiovascular risk factors and principle as well as secondary cardiovascular diagnoses were recorded. Patients with angina pectoris were subclassified according to the Canadian Cardiovascular Society Classification of effort angina (I to IV). In addition, patients with congestive heart failure were subclassified according to the New York Heart Association Classification (I to IV). Patients were carefully examined for the presence of clinical signs of heart failure and findings were recorded. Their body weight and height were recorded, and subsequently body mass index (BMI) was calculated. Electrocardiographic, angiographic, and echocardiographic findings were recorded as well as previous revascularization and cardiac surgical procedures. Patients subsequently were evaluated during the middle of Ramadan to see whether they were able to continue fasting, or they were hospitalized for cardiac reason or developed cardiac events.

Definitions. Congestive heart failure (CHF) was defined using the Framingham Heart Study criteria and acute coronary syndromes including acute myocardial infarction (AMI) and unstable angina

were defined according to the World Health Organization and, as previously reported.³ The presence of diabetes mellitus and hypertension were determined by the documentation in the patient's previous or current medical record of a documented diagnosis of diabetes mellitus and hypertension that had been treated with medication. The presence of hyperlipidemia was determined by the demonstration of a fasting cholesterol >5.2 mmol/L in the patient's medical record, or any history of treatment for hyperlipidemia by the patient's physician.

Statistical analysis. The data were coded and entered into a computer using the Statistical Packages for Social Sciences [SPSS], Norusis.⁸ Data are expressed as mean \pm standard deviation (SD) unless otherwise stated. Student t-test was used to ascertain the significance of differences between mean values of 2 continuous variables and Mann-Whitney test was used for non-parametric test. Chi-square analysis was performed to test for differences in proportions of categorical variables between the 2 groups.

Results. **Table 1** shows the socio-demographic details of cardiac patients. Overall, the mean \pm SD age of studied patients was 55.9 \pm 11.3 years. There were 62.2% of the studied subjects in the age group (45–64) years. The majority of the patients were males 363 (78.1%), with 102 (21.9%) females. **Table 2** details the diagnostic details of the studied cardiac patients. Of the 465 patients studied, 119 patients had a history of congestive heart failure. **Table 3** illustrates the risk factors of the cardiac patients. Of these, 173 patients were diabetic (37.2%), of whom 59 (34.1%) patients were insulin-requiring diabetics. Two hundred and sixteen patients were hypertensive (46.5%), and 211 patients had hypercholesterolemia (45.4%). Thirty-five patients were current smokers (7.5%) and 32 (6.9%) were obese (BMI >30 Kg/m²).

Cardiac evaluation prior to Ramadan. At the time of enrollment, 455 (97.8%) patients were planning to fast in the month of Ramadan. However, only 443 (95.3%) patients were found to be fit for fasting in Ramadan according to the treating physician. Clinically, the mean \pm SD of heart rate was 74 \pm 13 beats per minute, systolic blood pressure 130 \pm 19 and diastolic blood pressure 78 \pm 11 mm Hg. We found that 2.8% of patients had evidence of third heart sound, 3.2% had bibasilar crackles, 6.5% with systolic murmur, 0.4% with diastolic murmur and 3% with peripheral edema. Electrocardiographically, 87.7% of the studied subjects had normal sinus rhythm and 5.6% had atrial fibrillation, 25.6% had electrocardiographic evidence of old MI, 9.5% with non-specific ST-T changes, 2.4% with right bundle branch block, and 4.5% with left

Table 1 - Socio-demographic details of cardiac patients (n=465).

| Variables | Gender | | | |
|---------------------------------|---------------|--------|-----------------|--------|
| | Male N=363 | | Female N=102 | |
| | n | (%) | n | (%) |
| Age group* | | | | |
| 25-44 | 51 | (14.0) | 12 | (11.8) |
| 45-64 | 241 | (66.4) | 48 | (47.1) |
| ≥65 | 71 | (19.6) | 42 | (41.2) |
| Location | | | | |
| Qatar | 229 | (63.1) | 70 | (68.6) |
| United Arab Emirates | 41 | (11.3) | 7 | (6.9) |
| Kuwait | 89 | (24.5) | 22 | (21.6) |
| Bahrain | 4 | (1.1) | 3 | (2.9) |
| Planning to fast Ramadan | | | | |
| Yes | 356 | (98.1) | 99 | (97.1) |
| No | 7 | (1.9) | 3 | (2.9) |
| Recommendation to fast | | | | |
| Yes | 347 | (95.6) | 96 | (94.1) |
| No | 16 | (4.4) | 6 | (5.9) |
| *p<0.001 | | | | |

Table 3 - Risk factors of cardiac patients (n=465).

| Variables | Gender | | | | p value |
|---------------------------------------------|---------------|--------|-----------------|--------|---------|
| | Male N=363 | | Female N=102 | | |
| | n | (%) | n | (%) | |
| Diabetes mellitus | | | | | NS |
| Yes | 129 | (35.5) | 44 | (43.1) | |
| No | 234 | (64.5) | 58 | (56.9) | |
| Insulin requiring | | | | | <0.002 |
| Yes | 37 | (10.2) | 22 | (21.6) | |
| No | 326 | (89.8) | 80 | (78.4) | |
| Hypertension | | | | | <0.001 |
| Yes | 153 | (42.1) | 63 | (61.8) | |
| No | 210 | (57.9) | 39 | (38.2) | |
| Hypercholesterolemia | | | | | NS |
| Yes | 163 | (44.9) | 48 | (47.1) | |
| No | 200 | (55.1) | 54 | (52.9) | |
| Current smoker | | | | | NS |
| Yes | 31 | (8.5) | 4 | (3.9) | |
| No | 332 | (91.5) | 98 | (96.1) | |
| Obesity (BMI ≥30) | | | | | NS |
| Yes | 26 | (7.2) | 6 | (27.3) | |
| No | 337 | (92.8) | 89 | (97.3) | |
| BMI - body mass index, NS - not significant | | | | | |

Table 2 - Diagnosis details of cardiac patients (n=465).

| Variables | Gender | | | | |
|--------------------------------------------------------------------------------|---------------|--------|-----------------|--------|--|
| | Male N=363 | | Female N=102 | | |
| | n | (%) | n | (%) | |
| Congestive Heart failure | | | | | |
| Yes | 94 | (25.9) | 25 | (24.5) | |
| No | 269 | (74.1) | 77 | (75.5) | |
| NYHA class | | | | | |
| Class I | | (71.8) | | (79.4) | |
| Class II | | (16.7) | | (7.4) | |
| Class III | | (8.3) | | (11.3) | |
| Class IV | | (3.2) | | (1.5) | |
| Class angina | | | | | |
| Class I | | (64.3) | | (69.2) | |
| Class II | | (25.6) | | (14.1) | |
| Class III | | (8.1) | | (16.7) | |
| Class IV | | (2.0) | | (0) | |
| Prior myocardial infarction | | | | | |
| Yes | 300 | (82.7) | 70 | (68.6) | |
| No | 63 | (17.3) | 32 | (31.4) | |
| Prior coronary artery bypass surgery | | | | | |
| Yes | 146 | (40.2) | 49 | (48.3) | |
| No | 217 | (59.8) | 53 | (57.7) | |
| Prior percutaneous coronary interventions | | | | | |
| Yes | 149 | (41.1) | 28 | (27.3) | |
| No | 214 | (58.2) | 74 | (72.7) | |
| Mitral regurgitation | | | | | |
| Mild | 45 | (12.4) | 21 | (20.6) | |
| Moderate | 14 | (3.9) | 4 | (3.9) | |
| Severe | 6 | (1.7) | 2 | (2.0) | |
| None | 294 | (81.0) | 74 | (72.5) | |
| Mitral stenosis | | | | | |
| Mild | 0 | (0.0) | 4 | (3.9) | |
| Moderate | 1 | (0.3) | 1 | (1.0) | |
| Severe | 2 | (0.6) | 0 | (0.0) | |
| None | 360 | (99.2) | 97 | (95.1) | |
| Aortic regurgitation | | | | | |
| Mild | 6 | (1.7) | 3 | (2.9) | |
| Moderate | 1 | (0.3) | 2 | (2.0) | |
| Severe | 0 | (0) | 0 | (0) | |
| None | 353 | (99.2) | 97 | (94.1) | |
| Metallic prosthetic | | | | | |
| Yes | 7 | (1.9) | 4 | (3.9) | |
| No | 356 | (98.1) | 98 | (96.1) | |
| Atrial fibrillation | | | | | |
| Yes | 10 | (2.8) | 12 | (11.8) | |
| No | 353 | (97.2) | 90 | (88.2) | |
| BMI - body mass index, NS - not significant, NYHA - New York Heart Association | | | | | |

bundle branch block. Echocardiographically, mean±SD of left ventricular ejection fraction was 51±16%. Of those patients who previously underwent cardiac catheterizations, 10.5% had single-vessel disease (VD), 9.2% had 2VD and 21.1% had 3VD. For medications, 81.5% were on aspirin, 15.1% on warfarin, 61.1% on angiotensin-converting enzyme inhibitors (ACEI), 71.2% on β -blockers, 49.5% on nitrates, and 19.8% on calcium channel blockers.

Cardiac evaluation during mid-Ramadan. During the middle of Ramadan, when patients were evaluated, it was found that 424 patients (91.2%) were able to fast. When they were questioned about their health while fasting, 66.3% did not feel any difference in the month of Ramadan; however, 27.6% felt better, and 6.7% felt worse while fasting. We also found that 81.3% had complaints with medications and 68.6% had complaints with cardiac diet.

Cardiac evaluation after Ramadan. When patients were evaluated one month after Ramadan; 362 (77.8%) patients were able to fast throughout the whole month of Ramadan. While 82.2% had complaints with medications and 78.9% claimed they had complaints with healthy cardiac diet.

Cardiac events with fasting during Ramadan. Twenty-one patients developed cardiac events or were hospitalized for cardiac reasons (4.5%). Two patients died; a 78 female patient with severe heart failure who died after enrollment, and before Ramadan started. So, it is clear that the death is not related to fasting. The second patient, was a 67 male with ischemic heart disease who had Canadian Cardiovascular Classification (CCS) Class III at the time of enrollment and was advised not to fast by his treating physician. He had a sudden cardiac death on the sixteenth day of Ramadan. Eight patients were hospitalized for heart failure, 2 for MI (one had 2 vessel coronary artery disease waiting to undergo coronary artery bypass surgery (CABG) and he fasted despite the advice of his treating physician), 2 for uncontrolled hypertension, one atrial fibrillation and another patient for ventricular tachycardia, one patient hospitalized electively for coronary angiography and subsequently underwent percutaneous coronary interventions (PCI) to the left anterior descending artery. Three patients were hospitalized for unstable angina. One patient with mechanical prosthetic valve was hospitalized for sub-therapeutic anticoagulation.

DISCUSSION. The results of this study show that the effect of fasting during Ramadan on stable cardiac patients is minimal. Stable patients with coronary artery disease or congestive heart failure can observe fasting safely during the month of Ramadan. Previous studies documented an asso-

ciation between Ramadan fasting with hematologic, biochemical, hormonal, mood and alertness changes.⁹⁻¹¹ A number of studies revealed alterations in circadian secretions in basal gastric PH, glucose, calcium, magnesium, zinc, serum bilirubin, liver enzymes, plasma gastrin, insulin, cortisone, testosterone secretions, some of these alterations persisted one month after Ramadan.¹⁰ Aybak et al⁹ documented significant increase in bleeding and coagulation time and a decrease in the platelet responses to different aggregation agents (adenosine diphosphate, adrenaline and collagen) by the end of Ramadan in 20 healthy non-smoking male volunteers. El-Hazmi et al¹⁰ studied the effects of Ramadan fasting in 36 healthy volunteers. There were no prominent changes in the hematologic profile (hemoglobin and red blood cell indices), but there was a decrease in both serum iron levels and total iron-binding capacity. They noted a mild increase in glutamate oxaloacetate transaminase and glutamate pyruvate transaminase activities that normalized after Ramadan. In addition, several investigators reported changes in lipid profile in association with fasting Ramadan; unfortunately, the results were often based on small number and may be contradictory.¹⁰ El-Hazmi et al,¹⁰ demonstrated that triglyceride and total cholesterol levels decreased after the first week and subsequently increased towards the end of Ramadan. However, the incidence of stroke in Ramadan was not significantly different from the rest of the year.¹² Furthermore, Perk et al¹¹ found that Ramadan fasting did not affect blood pressure control on hypertensive patients on medications.¹¹

Despite the fact that more than a billion Muslims worldwide practice fasting in Ramadan, the data on outcome of patients with cardiac disease who fast during Ramadan is lacking. Fasting in Ramadan may have negative effects on cardiovascular disease patients. The obligation that the daily calorie intake has to be taken in 1-2 meals instead of 3-5, is an effort. On the other hand, fasting may be protective; hunger has been associated with catecholamine inhibition (catecholamine surge has been implicated as a trigger for acute coronary syndromes) and reduced venous return causes a decrease in the sympathetic tone, which leads to a fall in blood pressure, heart rate and cardiac output.¹¹ Moreover, Hussein et al reported a reduced heart rate during Ramadan. This could be due to the inhibition of catecholamine production during hunger. In a retrospective analysis of all Qatari patients hospitalized in Qatar between 1991 and 2001, we found no significant difference in the number of hospitalizations for congestive heart failure while fasting in Ramadan when compared to the non-fasting months among the 2160 patients studied. There were also no significant differences in the baseline clinical characteristics or mortality rates in

patients hospitalized in Ramadan when compared to the rest of the year.³ Analysis of the incidence of acute coronary syndromes in Ramadan in the same registry also revealed no significant differences in the incidence of acute coronary syndromes, baseline clinical characteristics, mode of therapy administered or mortality rates among ACS patients admitted in Ramadan when compared to a month before and a month after Ramadan.⁴ Other investigators reported similar findings.⁵ The current multi-center prospective study addresses different aspects of cardiac disease and fasting during Ramadan than previously published studies. The study suggests that stable cardiac patients can safely fast Ramadan. This includes patients with congestive heart failure with New York Heart Association class I and II, patients with stable angina CCS Class I and II and patients on anti-coagulant therapy for atrial fibrillation or those who have prosthetic valves. Further studies are required to assess the ability of patients with more advanced cardiac disease to fast during Ramadan.

Study limitations. The major limitation of this study is that the patients who were stable and their findings cannot be extrapolated to those patients who were unstable, such as those with advanced heart failure or unstable angina.

In conclusion, the effects of fasting during Ramadan on stable patients with cardiac disease are negligible. The majority of patients with stable cardiac disease can fast during Ramadan without significant detrimental effects.

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