

The Effects of Ramadan Fasting on Heart Transplant Recipients.

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Abstract

Background: Fasting during Ramadan is considered one of the most sacred Islamic rituals. To our knowledge, there is no data about Ramadan fasting in heart transplant recipients.

Objectives: To assess the ability of heart transplant recipients to fast the month Ramadan and to study the fasting effects on their clinical condition

Design: A cross-sectional study of heart transplant recipients attending the heart transplant clinic in the three months following Ramadan in 1439 and 1440 Hijri (May-June 2018 and 2019).

Setting: Heart transplant clinic in a tertiary care hospital in the Kingdom of Saudi Arabia.

Patients and Methods: Heart transplant recipients attending the heart transplant clinic in the Heart Center at King Faisal Specialist Hospital & Research Center (KFSH&RC), Riyadh. Data about Ramadan fasting was documented using standard case report form (CRF), and data was collected from the medical records about their clinical and laboratory findings before and after Ramadan.

Main Outcome Measures : Ability of heart transplant receipts to fast during Ramadan and the effect of fasting on their medical condition.

Sample Size : One hundred twenty heart transplant recipients were approached to participate in this study. Ninety-two patients agreed to participate in the study with seventy-eight patients fasted during Ramadan.

Results : Seventy-eight patients were able to fast Ramadan (84.8%). In comparison to the months before and after Ramadan, 44 of the fasting patients (56.4%) reported no change in their overall health, 29 patients (37.2%) reported feeling better, and 5 patients (6.4%) reported feeling worse during fasting. Sixty patients (76.9%) reported no significant new symptoms, and 18 patients (23.08%) reported one or more new symptoms.

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Conclusions: It seems that the majority of heart transplant recipients beyond one year of transplantation can fast Ramadan without having significant medical issues

Limitations: The small number of participants and the limitations of cross-sectional design.

Keywords: Fasting; Heart transplant; Ramadan; Cardiovascular disease

Introduction

Fasting during Ramadan, the ninth month of the Islamic (Hijri) Calendar is considered one of the most sacred Islamic rituals. During this month, fasting Muslims refrain from eating, drinking, smoking, and sex from dawn until sunset. The philosophy of fasting in the Islamic culture is to teach Muslims tolerance, train patience, and feel for the sufferings of the poor[1]. Although patients with chronic illnesses are exempted from fasting, most elect to fast. The fasting period in the Middle East typically lasts 15 to 16 hours, and two meals are eaten during the night.

Generally, Ramadan fasting is safe for most cardiac patients with stable chronic diseases as shown in several studies investigating Ramadan fasting in patients with heart disease including coronary artery disease, heart failure, valvular heart disease, arrhythmia, and hypertension[2,3]. There are concerns about the safety of Ramadan fasting in organ transplant recipients because of dehydration, accumulation of metabolites, and possibly reduced compliance with immunosuppressant medications, which may cause deleterious effects on organ function and the immune system[1]. In renal transplant, fasting during the month of Ramadan seems to be associated with no significant adverse effects in stable renal transplant recipients[4-8]. However, to our knowledge, there is no data about

Ramadan fasting in heart transplant recipients.

Objective

This study aims to assess the ability of heart transplant recipients to fast the month of Ramadan and to study the fasting effects on their clinical condition.

Patients and Methods

This study is a cross-sectional study of heart transplant recipients attending the heart transplant clinic in the Heart Center at King Faisal Specialist Hospital & Research Center (KFSH&RC), Riyadh, in the three months following Ramadan in 1439 and 1440 Hijri (H) (May-June 2018 and 2019). The patients were approached to participate in this study and if they agreed, data about Ramadan fasting was documented using standard case report form (CRF), and data about their clinical and laboratory findings before and after Ramadan was collected from the medical records.

Inclusion criteria: Heart transplant recipients of more than one year, who voluntarily choose to fast during Ramadan in 1439 H (May and June 2018) and 1440 H (May and June 2019).

Exclusion criteria: Heart transplant recipients of less than one year. Heart transplant recipients not willing to participate in the study.

Statistical analysis

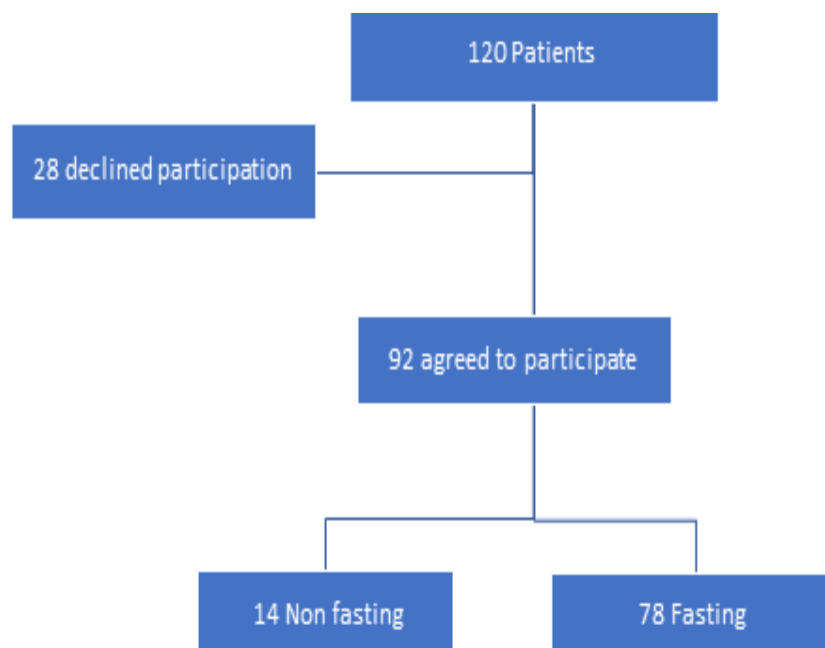
Statistical analysis was performed using the SPSS version 20.0 software (IBM Corp., Armonk, NY, USA). Categorical variables are presented in frequency, and differences between the groups are compared with the chi-square test. Data are presented in mean $\pm$ standard deviation for normally distributed variables or median and interquartile ranges for abnormally distributed variables. Normally distributed variables are compared using a paired t-test with calculating 95% confidence interval for the mean difference. A two-tailed p-value of <0.05 is considered statistically significant.

Results

One hundred twenty heart transplant recipients were approached to participate in this study during their regular follow up in the Heart transplant clinic.

Ninety-two patients agreed to participate, 72 males (78.3%), with a mean age of 40.8 ± 14.1 years (16-66 years). Seventy-eight patients fasted Ramadan (84.8%), with 67 of these patients (85.9%) fasted the whole month and 11 patients (14.1%) fasted part of the month (7-25 days).

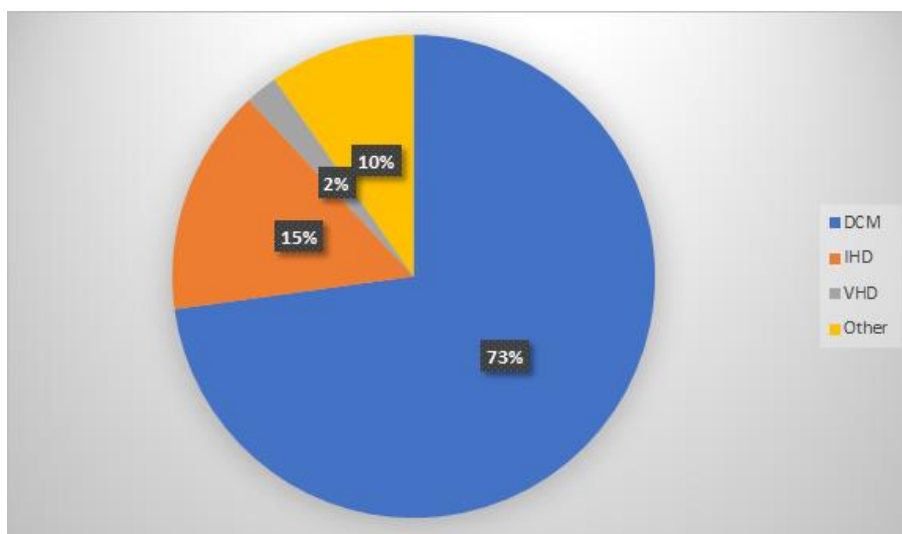
Figure 1: Flowchart of the study participants.



Seventy-one patients (91%) fasted Ramadan in the previous years ranging from 1 to 25 years. The underlying cardiac diseases in all participants were dilated cardiomyopathy in 67 patients (72.8%),

ischemic heart disease in 14 patients (15.2%), valvular heart disease in 2 patients (2.2%), and other causes in 9 patients (9.78%).

Figure 2: The underlying cardiovascular diseases in the heart recipients.



DCM: Dilated cardiomyopathy; IHD: Ischemic heart disease; VHD: valvular heart disease

Twenty-six patients had diabetes mellitus (28.3%), 22 had hypertension (23.9%), and 12 had dyslipidemia (13%). The left ventricular ejection fraction (LVEF) ranged from 25 to 55% (mean 53.7±4.7%). The mean duration of heart transplantation was 90.72±61.36 months (19 to 317 months).

In comparison between fasting and non-fasting patients, there were no significant differences between the two groups except that males are more likely to fast.

Table 1: Demographic data of fasting and non-fasting patients.

	Fasting (78 patients)	Non-fasting (14 patients)	P value
Age (Years)	16-66 (mean 41.9)	18-61 (mean 36.5)	0.54
Sex	67 males (85.9%)	8 males (57%)	0.04
Diagnosis:			
- Ischemic heart disease	14 (17.9)	1 (7.1)	0.3
- Dilated cardiomyopathy	58 (74.4)	11 (78.6)	0.97
- Valvular heart disease	2.0 (2.6)	0	0.56
- Other	8.0 (10.3)	2 (14.3)	0.72
Diabetes Mellitus	27 (34.6)	2 (14.3)	0.16
Hypertension	21 (26.9)	2 (14.3)	0.36
Dyslipidemia	10 (12.8)	3 (21.4)	0.35
Left ventricular ejection fraction (LVEF)	10-55% (38.96%)	20-55% (43.3%)	0.06
Heart transplant duration (years)	1.6-27	2-10	

Medications:			
- Beta blockers	7 (8.9)	1 (7.1)	0.86
- Calcium channel blockers	57 (73.1)	8 (57.1)	0.36
- Angiotensin converting enzyme inhibitors	42 (53.8)	4 (28.6)	0.12
- Corticosteroids	66 (84.6)	9 (64.3)	0.18
- Mycophenolatemofetil (MMF)	75 (96.1)	11 (78.6)	0.14
- Cyclosporin	23 (29.5)	1 (7.1)	0.1
- Tacrolimus (FK-506)	55 (70.5)	12 (85.7)	0.12
- Sirolimus	5 (6.4)	1 (7.1)	0.88
- Azathioprine	5 (6.4)	1 (7.1)	0.88

In comparison to the months before and after Ramadan, 44 of the fasting patients (56.4%) reported no change in their overall health, 29 patients (37.2%) reported feeling better, and 5 patients (6.4%) reported feeling worse during fasting.

After questioning the fasting patients about new symptoms during fasting, 60 patients (76.9%) reported no significant symptoms, and 18 patients (23.08%) reported one or more symptoms; 7 patients (8.97%) had dizziness, 5 patients (6.41%) had shortness of breath, 4 patients (5.13%) had chest pain, 4 patients (5.13%) had palpitations, 2 patients (2.56%) had syncope, and 4 patients (5.13%) had pre-

syncope. Four patients reported at least one hospital admission during Ramadan, and 10 patients reported at least one hospital admission in other months.

The patient's medications are listed in table 1. In fasting patients, 75 (96.1%) on mycophenolatemofetil (MMF), 55 (70.5%) on tacrolimus (FK-506), 23 (29.45%) on cyclosporin, 5 on sirolimus (6.5%), and 5 (6.5%) on azathioprine. For single-dose medications, most patients took it with breaking their fast at sunset or at midnight, and for twice-daily medications, it was taking at sunset and dawn with the suhoor meal.

Figure 3: Patients' overall condition in fasting days during Ramadan compared to non-fasting days.

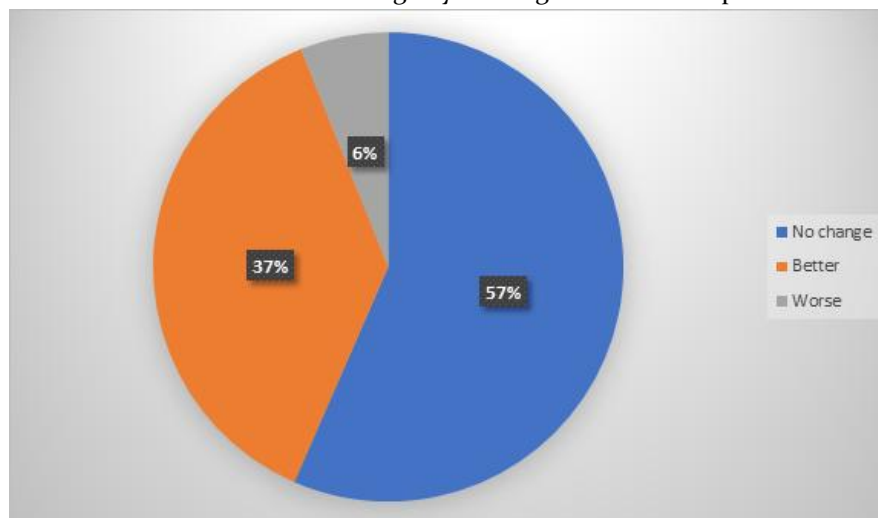


Figure 4: Symptoms reported during fasting.



A. Symptomatic versus non-symptomatic patients B. The reported symptoms.

There was no significant change in the laboratory tests including complete blood count (CBC), renal profile , pro-brain

natriuretic peptide (pro-BNP) and left ventricular ejection fraction before and after fasting.

Table 2: Comparison between mean values of the laboratory test results and left ventricular ejection fraction before and after fasting.

	Before Fasting Mean	After fasting Mean	CI of the deference	P value
Complete blood count (CBC)				
Hemoglobin	136.38	137.79	(-0.73, 3.56)	0.19
White blood cell count (WBC)	7.24	7.68	(-0.045, 0.92)	0.07
Platelets	254.1	261.9	(-1.52, 17.22)	0.09
Renal profile				
Urea	6.34	6.37	(-0.53, 0.60)	0.9
Serum Creatinine	100.86	100.11	(-6.48, 4.97)	0.79
Potassium	4.36	6.08	(-1.64, 5.09)	0,31
Sodium	139.89	137.83	(-5.76, 1.64)	0.27
Lipid profile				
Triglycerides (TG)	1.44	1.35	(-0.22, 0.04)	0.17
low density lipoprotein (LDL)	2.09	2.17	(-0.17, 0.03)	0.16
High density lipoprotein (HDL)	1.31	1.28	(-0.13, 0.071)	0.56
Fasting glucose	7.47	6.65	(-1.78, 0.15)	0.095
Pro-BNP (Brain nitric peptide)	956.9	1178.9	(-254.2, 697.9)	0.454
Left ventricular ejection fraction (LVEF)	53.45%	53.32%	(-0.210, 0.64)	0.31
Body mass index (BMI)	28.21	28.26	(-0.22, 0.31)	0.73
CI: 95% confidence interval				

Discussion

It is well known that glucose and fatty acids are the primary sources of energy for cells during the fed state. After eating a meal, the glucose is used for energy, and fat is stored as triglycerides in adipose tissue. Triglycerides are broken down into fatty acids and glycerol during periods of fasting and they are used for energy. Fatty acids are converted to ketone bodies in the liver. Ketone bodies provide a significant energy source for tissues, especially the brain during fasting. In humans, ketone bodies blood levels rise within 8 to 12 hours after the onset of fasting, which are maintained through 24 hours[9, 10].

In humans, the three most widely studied intermittent-fasting regimens are daily time-restricted feeding, 5:2 intermittent fasting (fasting 2 days each week), and alternate-day fasting[11].

Intermittent fasting improves multiple indicators of cardiovascular health in animals and humans, including blood pressure, glucose, insulin resistance, high-density (HDL), low-density lipoprotein (LDL) cholesterol, triglycerides, and resting heart rate[12].

Preclinical and clinical studies have shown that intermittent fasting has broad-spectrum benefits for many health conditions, such as obesity, diabetes mellitus, cardiovascular disease, cancers, and neurologic disorders[12].

Intermittent fasting has also been shown to reduce markers of systemic inflammation and oxidative stress that are associated with atherosclerosis [12].

Typically improvements in cardiovascular health indicators become evident within 2 to 4 weeks after the start of alternate-day fasting and dissipate over several weeks after resumption of a normal diet[13].

In this study, most heart transplant recipients beyond one year from the heart transplantation date can fast during Ramadan. Most patients reported no significant change in their clinical condition, and some patients reported feeling better during fasting. There were a few patients who reported feeling worse during Ramadan but without an increase in hospital admissions. Although about 9% of the patients reported having dizziness, 2.5% syncope, and 5% pre-syncope during Ramadan, there were no emergency room visits or hospital admissions related to these symptoms. There is a concern about renal impairment due to dehydration during fasting in heart transplant recipients and patients with cardiovascular diseases. However, there has been no significant change in renal function before and after fasting. It seems that hydration during the night is enough to maintain stable renal function. There seems to be no significant negative impact of changing the timing of twice-daily medications, including immunosuppressant drugs, during Ramadan.

Ethical consideration

This study is conducted in accordance with the ethical principles contained in the Declaration of Helsinki (2013), the ICH Harmonized Tripartite Good Clinical Practice Guidelines, the policies and guidelines of the Research Affairs Office (RAC) of the KFSH&RC, and the laws of Saudi Arabia. An approved verbal consent by the research ethics committee (REC) is taken before participation.

Study limitations

The study limitations include the small number of participants and the cross-sectional design limitations with potential selection and recall biases.

Conclusion

It seems that the majority of heart transplant recipients beyond one year of transplantation can fast Ramadan without having significant medical issues. However,

further prospective studies are needed to clarify further the effect of Ramadan fasting on these patients. Furthermore, Ramadan fasting should be individualized, and heart transplant recipients should consult their cardiologists before fasting.

Conflict of Interest

None.

References

1. Khedmat H, Taheri S. Ramadan fasting and transplantation: current knowledge and what we still need to know. *Saudi J Kidney Dis Transpl.* 2010;21(3):417.
2. Chamsi-Pasha H, Ahmed WH, Al-Shaibi KF. The cardiac patient during Ramadan and Hajj. *J Saudi Heart Assoc.* 2014;26(4):212-5.
3. Chamsi-Pasha M, Chamsi-Pasha H. The cardiac patient in Ramadan. *Avicenna J Med.* 2016;6(2):33.
4. Bernieh BO, Mohamed AO, Wafa AM. Ramadan fasting and renal transplant recipients: Clinical and biochemical effects. *Saudi J Kidney Dis Transpl.* 1994;5(4):470.
5. Abdalla AH, Shaheen FA, Rassoul Z, Owda AK, Popovich WF, Mousa DH, et al. Effect of Ramadan fasting on Moslem kidney transplant recipients. *Am J Nephrol.* 1998;18(2):101-4.
6. Ouziala M, Ouziala S, Bellaoui A, Drif M. Fasting during the first year of transplantation: is it safe?. *Saudi J Kidney Dis Transpl.* 1998;9(4):440.
7. Boobes Y, Bernieh B, Al Hakim MR. Fasting Ramadan in kidney transplant patients is safe. *Saudi J Kidney Dis Transpl.* 2009;20(2):198.
8. Emami-Naini A, Roomizadeh P, Baradaran A, Abedini A, Abtahi M. Ramadan fasting and patients with renal diseases: A mini review of the literature. *J Res Med Sci.* 2013;18(8):711.
9. Cahill Jr GF. Starvation in man. *N Engl J Med.* 1970;282(12):668-75.
10. Browning JD, Baxter J, Satapati S, Burgess SC. The effect of short-term fasting on liver and skeletal muscle lipid, glucose, and energy metabolism in healthy women and men. *J Lipid Res.* 2012;53(3):577-86.
11. Anton SD, Moehl K, Donahoo WT, Marosi K, Lee SA, Mainous III AG, et al. Flipping the metabolic switch: understanding and applying the health benefits of fasting. *Obesity.* 2018;26(2):254-68.
12. de Cabo R, Mattson MP. Effects of intermittent fasting on health, aging, and disease. *N Engl J Med.* 2019;381(26):2541-51.
13. Mager DE, Wan R, Brown M, Cheng A, Wareski P, Abernethy DR, et al. Caloric restriction and intermittent fasting alter spectral measures of heart rate and blood pressure variability in rats. *FASEB J.* 2006;20(6):631-7.