

The effect of fasting in Ramadan on patients with heart disease

Hassan Chamsi-Pasha, FRCP, FACC, Waqar H. Ahmed, FACP, FACC.

ABSTRACT

Objective: To determine the clinical and biochemical effects of fasting during Ramadan on patients with cardiac disease.

Methods: Eighty-six outpatients with heart disease with intention to fast were studied in the month of Ramadan 1996 (1416 H) at the King Fahd Armed Forces Hospital, Jeddah, Kingdom of Saudi Arabia. Detailed clinical and biochemical assessments were performed within 3 days before the start of Ramadan and then on the last day of Ramadan.

Results: There were 54 (62.8%) males and 32 (37.2%) females with a mean age of 56.3 years (range, 17-84). Forty-six patients (53%) had coronary artery disease, 23 patients (27%) had valvular heart disease, 13 patients (15%) had congestive heart failure and 4 patients (5%) were treated

for arrhythmia. Sixty-two patients (72%) were in New York Heart Association (NYHA) Class I, 18 patients (21%) in Class II, and 6 patients (7%) were in Class III. Seventy-four patients (86%) managed to fast during the entire Ramadan, 9 patients (10.4%) missed the fasting for up to 7 days, and 3 patients (3.5%) could not fast. There were no significant changes in the NYHA Class ($p=0.12$). No significant changes occurred in any of the hematological or biochemical parameters during the fasting of Ramadan.

Conclusion: The effects of fasting during Ramadan on stable patients with cardiac disease are minimal. The majority of patients with stable cardiac disease can fast during Ramadan without significant detrimental effects.

Saudi Med J 2004; Vol. 25 (1): 47-51

Ramadan, one of the 5 pillars of Islam, is observed by approximately 400 million Muslims all over the world.¹ During Ramadan, Muslims abstain from food and drink from dawn until sunset. While a significant number of patients with heart disease insist on fasting despite the physician's medical advice, physicians do not always know how to advise such patients regarding fasting during Ramadan. Several studies have been published on the effects of fasting in healthy adults, but little is known on the clinical problems during the fast of Ramadan.^{1,2} Only few have studied the metabolic implications of Ramadan fasting.^{3,4} The aim of this study was 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. To our knowledge, this is the first study on the effects of fasting on patients with cardiac disease.

Methods. To study the effects of fasting Ramadan on cardiac patients, 86 patients seen in the cardiac outpatient clinic with intention to fast were studied. Patients were recruited to the study during the 3 days prior to the onset of Ramadan. Detailed clinical and biochemical assessments were performed within 3 days before the start of Ramadan and then on the 29th day of Ramadan. Fasting blood was taken for full blood count (EDTA 4.5 ml tube, Beckman Coulter Gen-S automated analyzer), erythrocyte sedimentation

From the Department of Cardiology, King Fahd Armed Forces Hospital, Jeddah, Kingdom of Saudi Arabia.

Received 15 July 2003. Accepted for publication in final form 20th September 2003.

Address correspondence and reprint request to: Dr. Hassan Chamsi-Pasha, Director of Non-Invasive Cardiology, King Fahd Armed Forces Hospital, PO Box 9862, Jeddah 21159, Kingdom of Saudi Arabia. Tel/Fax. +966 (2) 6651868. E-mail: drhchpasha@hotmail.com

rate (ESR) (EDTA 4.5 ml tube, Westergen method), prothrombin time (PT), partial thromboplastin time (PTT) (citrate blood 4.5 ml tube, Dade-Behring analyzer), sodium, potassium, urea, creatinine, total cholesterol, triglycerides, low density lipoprotein (LDL), high density lipoprotein (HDL), fasting blood sugar, uric acid, aspartate aminotransferase (AST), lactic acid dehydrogenase (LDH) and alkaline phosphatase (Hitachi 917 Roche Diagnostic analyzer, 5 ml BD Vacutainer (SST) with no additives). The blood was drawn between 12 and 2 o'clock p.m. The patients were advised to take their medications regularly and adjustment to once or twice daily drugs was made.

Statistical analysis All values are expressed as mean ± standard deviation. Continuous variables are compared with 2 tailed t-test. Categorical variables are compared using the chi-square test. The *p* value ≤ 0.05 was considered significant.

Results. The baseline characteristics are shown in **Table 1**. The majority of the patients were men (62.8%). The mean age was 56.3 years (range, 17-84). Forty six patients (53.4%) had CAD, including 18 patients who had coronary artery bypass grafting (CABG) and 11 patients with percutaneous transluminal coronary angioplasty (PTCA). Twenty-three patients (26.7%) had valvular heart disease, 13 patients (15.1%) had congestive heart failure (CHF) and 4 patients (4.6%) were treated for arrhythmia. All of the patients were on one or more cardiac drugs. Twelve patients were on warfarin. The majority of the patients were in NYHA Class I or II. Seventy-four patients (86%) managed to fast during the entire Ramadan, 9 patients (10%) missed the fasting of up to 7 days (only one of them was female), and 3 patients (4%) could not fast. Patients were fasting for approximately 12 hours during this month of Ramadan. The mean weight decreased by 1.4 kg but was not statistically significant (*p*=0.5). Subjectively, 67 patients (78%) reported no change in their symptoms, 7 patients (8%) experienced that their symptoms had improved and 10 patients (11.6%) reported worsening of their symptoms. However, there were no significant changes in the NYHA class (*p*=0.12) nor there were any significant changes in the Canadian Cardiac Society (CCS) class in patients with coronary artery disease (*p*=0.45). Subjectively, 80 patients were compliant with their drug therapy. None of the patients required hospitalization during the month of Ramadan.

No significant changes occurred in any of the hematological or biochemical parameters during the fasting in Ramadan (**Table 2**). Analysis of data of patients with CAD (46 patients) showed no significant changes in hematological or biochemical parameters by the end of Ramadan (**Table 3**). Since females may miss few days of fasting due to their monthly period

Table 1 - Baseline characteristics.

Characteristics	n	(%)
Males	54	(62.8)
Females	32	(37.2)
Age (years)	56.3	(range 17-84)
Coronary artery disease	46	(53.4)
Valvular heart disease	23	(26.7)
Congestive heart failure	13	(15.1)
Arrhythmia	4	(4.6)
NYHA Class I	62	(72)
NYHA Class II	18	(20.9)
NYHA Class III	6	(6.9)
Diabetes mellitus	28	(32.5)
Hypertension	27	(31.3)
Hyperlipidemia	37	(43)
Obesity or overweight	47	(54.6)
Smoker	18	(20.9)

NYHA - New York Heart Association

Table 2 - Clinical and metabolic characteristics before and at the end of Ramadan.

Characteristics	Before Ramadan	End of Ramadan	<i>p</i> value
Weight (kg)	78.5	77.1	0.50
Mean systolic BP (mm Hg)	132	131	0.62
Mean diastolic BP (mm Hg)	82	81	0.85
Mean NYHA Class	1.4	1.2	0.12
Hemoglobin (g/dl)	13.9	13.6	0.37
ESR	24.2	22.7	0.52
Sodium (mmol/L)	139	139	0.88
Potassium (mmol/L)	4.3	4.4	0.52
Urea (mmol/L)	6.4	5.9	0.5
Creatinine (Umol/L)	85.8	86.5	0.88
Total cholesterol (mmol/L)	5.4	5.3	0.47
High density lipoprotein (mmol/L)	1.0	1.0	0.82
Low density lipoprotein (mmol/L)	4.2	4.1	0.59
Triglycerides (mmol/L)	1.69	2.94	0.23
Uric acid (Umol/L)	313	322	0.59
Aspartate amino-transferase (U/L)	20.6	20.9	0.86
Lactic acid dehydrogenase (U/L)	144.3	141.1	0.57
Alkaline phosphatase (U/L)	76.8	75.7	0.80
Fasting blood glucose (mmol/L)	7.9	9.0	0.24

BP - blood pressure, NYHA - New York Heart Association Classification, ESR - erythrocyte sedimentation rate

Table 3 - Clinical and metabolic characteristics in the subgroup with coronary artery disease.

Characteristics	Before Ramadan	End of Ramadan	p value
Mean systolic BP (mm Hg)	131.8	131.2	0.27
Mean diastolic BP (mm Hg)	83.7	82.3	0.41
Mean NYHA Class	1.2	1.1	0.57
Hemoglobin (g/dl)	14.3	13.8	0.2
ESR	25.7	25.3	0.89
Sodium (mmol/L)	139.2	139.2	1
Potassium (mmol/L)	4.37	4.4	0.82
Urea (mmol/L)	5.5	5.78	0.57
Creatinine (Umol/L)	86.8	86.7	0.99
Total cholesterol (mmol/L)	5.59	5.44	0.5
High density lipoprotein (mmol/L)	0.95	0.95	1
Low density lipoprotein (mmol/L)	4.38	4.16	0.31
Triglycerides (mmol/L)	1.96	2.19	0.66
Uric acid (Umol/L)	321	329	0.74
Aspartate amino-transferase (U/L)	19.4	20.2	0.71
Lactic acid dehydrogenase (U/L)	138	131	0.32
Alkaline phosphatase (U/L)	78.4	74.5	0.58
Fasting blood glucose (mmol/L)	8.5	10.3	0.3

BP - blood pressure, NYHA - New York Heart Association Classification, ESR - erythrocyte sedimentation rate

and this may affect the results, analysis according to gender was performed (Table 4). There were no significant changes in the parameters before and at the end of Ramadan in either males or females. There were no significant changes in the blood glucose level in both diabetics and non-diabetic patients (Table 5). In the group of patients receiving warfarin, no significant changes occurred in the prothrombin time ($p=0.4$) though statistically significant change observed in partial thromboplastin time ($p=0.04$). No complications related to anticoagulants were observed.

Discussion. The results of this study show that the effects of fasting during Ramadan on stable cardiac patients are minimal. Stable patients with heart disease can observe fasting during the month of Ramadan safely. Few studies have reported the metabolic effects of fasting during the month of Ramadan but the assessment of cardiac patients fasting during Ramadan has not been reported.²⁻⁴ In an 18 sedentary adults reported by Ramadan et al,⁵ no significant changes occurred in maximal exercise capacity or treadmill walking efficiency during the month of Ramadan. Heart rate and ventilatory responses to moderately intense bouts of sub-maximal aerobic exercise (70% of maximum volume of oxygen utilization) were reduced but the actual difference was clinically small.⁵ The ambulatory blood pressure in treated hypertensive patients did not differ before and

Table 4 - Clinical and metabolic characteristics in men and women.

Characteristics	Male			Female		
	Before Ramadan	End of Ramadan	p value	Before Ramadan	End of Ramadan	p value
Weight (kg)	80.1	78.6	NS	76	75	NS
Mean systolic BP (mm Hg)	130	128	NS	137	135	NS
Mean diastolic BP (mm Hg)	82	82	NS	82	82	NS
Mean NYHA Class	1.3	1.2	NS	1.4	1.3	NS
Hemoglobin (g/dl)	14.5	14.4	NS	12.9	12.5	NS
ESR	20.8	20.2	NS	30.7	27.0	NS
Sodium (mmol/L)	139	139	NS	139	139	NS
Potassium (mmol/L)	4.4	4.4	NS	4.2	4.3	NS
Urea (mmol/L)	7.3	6.2	NS	4.8	5.3	NS
Creatinine (Umol/L)	92.3	94.6	NS	74.8	73.8	NS
Cholesterol (mmol/L)	5.3	5.3	NS	5.71	5.30	NS
HDL (mmol/L)	1	1	NS	1	1	NS
LDL (mmol/L)	4.1	4.1	NS	4.3	4.2	NS
Triglycerides (mmol/L)	1.95	3.9	NS	1.24	1.28	NS
Uric Acid (Umol/L)	335	337	NS	274	294	NS
Aspartate amino-transferase, (U/L)	22.8	22.3	NS	17.0	18.7	NS
Lactic acid dehydrogenase (U/L)	147.8	139.3	NS	139.8	144.0	NS
Alkaline phosphatase (U/L)	75.8	74.8	NS	78.7	77.4	NS
Fasting blood glucose (mmol/L)	8.1	9.8	NS	7.61	7.75	NS

NS - non significant, BP - blood pressure, NYHA - New York Heart Association, ESR - erythrocyte sedimentation rate, HDL - high density lipoprotein, LDL - low density lipoprotein

Table 5 - Fasting blood sugar in diabetics and non-diabetics (mmol/L).

Patients	Before Ramadan	End of Ramadan	p value
Non-diabetics	6.6	7.04	0.27
Diabetics	10.82	13.36	0.34

during Ramadan.⁶ Patients on thrice daily medications should be switched to twice daily or once daily regimens. Similarly our data show that systolic and diastolic blood pressures do not change significantly at the end of Ramadan compared to the beginning of Ramadan. It is not known if mild dehydration and hemoconcentration may harm those with moderate to severe coronary artery disease. Temizhan et al⁷ speculated that fasting during Ramadan does not lead to an increase in the number of acute coronary events. In their study, the number of patients admitted with Acute Coronary syndrome was significantly lower in Ramadan than before or after Ramadan. However, this may be due to reluctance of the patients to be admitted to hospital during the month of Ramadan, which will disrupt their fasting. Weight loss of 1.7-3.8 kg after fasting has been reported in normal weight individuals.^{1,4,8} In our study, the mean body weight declined by 1.4 kg at the end of Ramadan. However, this was not statistically significant. Studies performed in healthy subjects on blood levels of blood urea nitrogen, serum creatinine, uric acid, protein, albumin, alanine amino-transferase, aspartate amino-transferase, hemoglobin, white blood cell count and the sedimentation rate did not show significant changes during Ramadan.^{1,9} Although PT did not change significantly in patients on warfarin, an unexplained increase in PTT was observed in our patients at the end of Ramadan. Prior studies on the effect of fasting during Ramadan on blood lipids show variable results. Some have reported an increase in the level of cholesterol with fasting.^{4,10} Others have found no change or decrease in cholesterol level during Ramadan.^{2,11} A marked increase in plasma HDL cholesterol of 23-30% after fasting was reported in smaller studies of healthy subjects.^{2,12} The changes in blood lipids are probably related to the quality and quantity of food consumption and the degrees of weight loss. The adoption of low fat, low calories diet by hyperlipidemic healthy individuals may have lead to reduction in total cholesterol, LDL cholesterol and triglyceride levels.¹³ In our study, no significant changes were observed in the total cholesterol, LDL or HDL cholesterol levels. Although there was a trend toward an increase in the level of triglycerides at the end of Ramadan, this was not statistically significant.

Few studies have reported the effect of fasting during Ramadan on serum glucose. One study reported a decrease in serum glucose level by the end of Ramadan.¹⁴ Other studies have shown a mild increase or variation in serum glucose concentration which may be due to amount or type of foods consumed during Ramadan.^{1,11}

This study has important limitations. The sample size is relatively small, the lack of measurements during each week of Ramadan and the heterogeneity of the patient population. We did look at CAD patients alone since they represent the largest number of patients with heart disease. The conclusions from this study can not be extrapolated to patients with worse functional classes or those who are unstable. It is clear that more work should be carried out to evaluate the impact of fasting on cardiac patients with higher NYHA class. Assessment of functional class using specific measures such as the Minnesota Score should be performed in future studies. With an estimated 400 million Muslims in different states of health observing the fast annually, there is a vital need for more studies to document the effects of Ramadan on different states of illnesses. To our knowledge, this is the first study to systematically assess the effects of fasting during Ramadan on patients with cardiac disease. It opens the way to further research aimed at discovering the significance of Ramadan fasting in patients with heart disease.

Acknowledgment. We would like to thank Dr. Fawaz Akhras and Dr. Majd Rustum for their contribution to the study; Zackaria Pandor for data management and analysis and Ms. G. Ropeta for typing the manuscript.

References

1. Rashed AH. The Fast of Ramadan (editorial). *BMJ* 1992; 304: 521-522.
2. Belkhadir J, El-Ghomari H, Klocker N, Mikou A, Nasciri M, Sabri M. Muslims with non-insulin dependent diabetes fasting during Ramadan: treatment with glibenclamide. *BMJ* 1993; 307: 292-295.
3. Maislos M, Khamaysi N, Assali A, Abou-Rabiah Y, Zvili I, Shany S. Marked increase in plasma high-density-lipoprotein cholesterol after prolonged fasting during Ramadan. *Am J Clin Nutr* 1993; 57: 640-642.
4. Hallak MH, Nomani MZ. Body weight loss and changes in blood lipid levels in normal men on hypocaloric diets during Ramadan fasting. *Am J Clin Nutr* 1988; 48: 1197-1210.
5. Ramadan JM, Barac-Nieto M. Cardio-respiratory responses to moderately heavy aerobic exercise during the Ramadan fasts. *Saudi Med J* 2000; 21: 238-244.
6. Perk G, Ghanem J, Aamar S, Ben-Ishay D, Bursztyn M. The effect of the fast of Ramadan on ambulatory blood pressure in treated hypertensives. *J Hum Hypertens* 2001; 15: 723-725.
7. Temizhan A, Donderici O, Quz D, Demirbas B. Is there any effect of Ramadan fasting on acute coronary heart disease events? *Int J Cardiol* 1999; 70: 149-153.
8. Sulimani RA. Effect of Ramadan fasting on thyroid function in healthy male individuals. *Nutr Res* 1988; 8: 549-552.

9. El-Hazmi MAF, Al-Faleh FZ, Al-Mofleh IB. Effect of Ramadan fasting on the values of hematological and biochemical parameters. *Saudi Med J* 1987; 8: 171-176.
10. Fedail SS, Murphy D, Salih SY, Bolton CH, Harvey RF. Changes in certain blood constituents during Ramadan. *Am J Clin Nutr* 1982; 36: 350-353.
11. Temizhan A, Tandogan I, Donderici O, Demirbas B. The effects of Ramadan fasting on blood lipid levels. *Am J Med* 2000; 109: 341-342.
12. Maislos M, Abou-Rabiah Y, Zuili I, Iordash S, Shany S. Gorging and plasma HDL-cholesterol-the Ramadan model. *Eur J Clin Nutr* 1998; 52: 127-130.
13. Afrasiabi A, Hassanzadeh S, Sattarivand R, Nouri M, Mahbood S. Effects of low fat and low calorie diet on plasma lipid levels in the fasting month of Ramadan. *Saudi Med J* 2003; 24: 184-188.
14. Nomani MZ, Hallak MH, Nomani S, Siddiqui IP. Changes in blood area and glucose and their association with energy - containing nutrients in men on hypocaloric diet during Ramadan fasting. *Am J Clin Nutr* 1989; 49: 1141-1145.

[Access www.smj.org.sa](http://www.smj.org.sa)

Saudi Medical Journal Online features

- Instructions to Authors
- Uniform Requirements
- STARD
- Free access to the Journal's Current issue
- Future Contents
- Advertising and Subscription Information

All Subscribers have access to full text articles in HTML and PDF format. Abstracts and Editorials are available to all Online Guests free of charge who can access link references to PubMed.