

EFFECTS OF RAMADAN FASTING ON BLOOD PRESSURE CONTROL, LIPID PROFILE, BRAIN NATRIURETIC PEPTIDE, RENAL FUNCTIONS AND ELECTROLYTE LEVELS IN HYPERTENSIVE PATIENTS TAKING COMBINATION THERAPY

İbrahim Faruk Aktürk,¹ İsmail Bıyık,² Cüneyt Koşuş,³ Ahmet Arif Yalçın,¹ Mehmet Ertürk,¹ Fatih Uzun¹

¹ Istanbul Mehmet Akif Ersoy Thoracic and Cardiovascular Surgery Center and Research Hospital, Department of Cardiology, Istanbul

² Private Oztan Hospital, Department of Cardiology, Uşak, Turkey

³ Siverek State Hospital, Department of Cardiology, Şanlıurfa, Turkey

ABSTRACT

Objective: Muslims fast for a month in Ramadan every year. In this study, we aimed to investigate the effects of Ramadan fasting on blood pressure control, lipid profile, brain natriuretic peptide (BNP), renal functions and electrolyte levels in hypertensive patients taking combination therapy.

Material and Method: Twenty hypertensive patients who intended to fast during Ramadan were included to study. Ambulatory blood pressure and blood sample measurements were made in the month before Ramadan, at the last week of Ramadan and one month after Ramadan.

Results: Ten patients were men and 10 patients were women. The mean age was 52±14 years. The results revealed a significant reduction in HDL cholesterol levels in Ramadan. There were no significant changes in other lipid parameters, BNP, electrolyte levels and

renal functions. Significant reductions in mean daytime systolic and diastolic blood pressures ($p=0.03$ and $p=0.04$, respectively) and in twenty four hour average systolic and diastolic blood pressures ($p=0.01$ and $p=0.01$, respectively) were observed during Ramadan. These reductions were not more than enough to warrant changing the treatment.

Conclusion: Ramadan fasting might cause significant reductions on daytime and twenty four hour average systolic and diastolic blood pressures in hypertensive patients with combination therapy. These reductions may not be more than enough to warrant changing the treatment. Ramadan fasting might also cause significant reduction in HDL cholesterol levels in hypertensive patients with combination therapy.

Key Words: Ramadan fasting, hypertension, lipid profile, brain natriuretic peptide, combination therapy, renal function *Nobel Med 2013; 9(2): 43-46*

KOMBİNASYON TEDAVİSİ ALAN HİPERTANSİF HASTALARDA RAMAZAN ORUCUNUN KAN BASINCI KONTROLÜ, LİPİD PROFİLİ, BRAİN NATRİÜRETİK PEPTİD, RENAL FONKSİYONLAR VE ELEKTROLİT DÜZEYLERİ ÜZERİNE ETKİLERİ

ÖZET

Amaç: Müslümanlar her yıl bir ay süreyle Ramazan orucuna niyetlenirler. Bu çalışmada, kombinasyon tedavisi almakta olan hipertansif kişilerde Ramazan orucunun kan basıncı kontrolü, lipid profil, brain natriüretik peptid (BNP), renal fonksiyonlar ve elektrolit düzeylerine olan etkilerini araştırmayı amaçladık.

Materyal ve Metod: Ramazan orucuna niyetlenen yirmi hasta çalışmaya dahil edildi. Ambulatuvar kan basıncı ve kan numunesi ölçümleri Ramazan ayından bir ay önce, Ramazan ayının son haftasında ve Ramazan ayından bir ay sonra yapıldı.

Bulgular: Hastaların 10'u erkek 10'u kadındı. Ortalama

yaş 52 ± 14 idi. Sonuçlar Ramazanda HDL kolesterol düzeylerinde anlamlı azalma ortaya koydu. Diğer lipid göstergelerinde, BNP, elektrolit düzeylerinde ve renal fonksiyonlarda anlamlı değişiklik yoktu. Ramazanda gündüz ortalama sistolik ve diyastolik kan basınçlarında ($p=0,03$ ve $p=0,04$, sırasıyla) ve yirmi dört saatlik ortalama sistolik ve diyastolik kan basınçlarında ($p=0,01$ ve $p=0,01$, sırasıyla) anlamlı düşüşler görüldü. Bu değişiklikler tedaviyi değiştirmeyi gerektirecek kadar fazla değildi.

Sonuç: Ramazan orucu, kombinasyon tedavisi alan hipertansif hastalarda gündüz ve yirmi dört saatlik ortalama sistolik ve diyastolik kan basınçlarında anlamlı düşüşlere neden olabilir. Bu düşüşler tedaviyi değiştirmeyi gerektirecek kadar fazla olmayabilir. Ramazan orucu aynı zamanda kombinasyon tedavisi alan hipertansif hastalarda HDL kolesterol düzeylerinde anlamlı düşüşlere neden olabilir.

Anahtar Kelimeler: Ramazan orucu, hipertansiyon, lipid profili, beyin natriüretik peptid, kombinasyon tedavisi, renal fonksiyon *Nobel Med* 2013; 9(2): 43-46

INTRODUCTION

People with Islamic belief engage in Ramadan fasting for a month every year world-wide. In the period of Ramadan, eating, drinking and smoking are halted from sunrise to sunset. The time of fasting lasts about 12 to 18 hours. Religious patients are generally willing to engage in this ritual. Changes in the sleeping patterns in Ramadan month may also have an adverse effect on blood pressure control. Blood pressure decreases during fast thing and rises during the re-feeding period.¹ Studies on the effects of this ritual on blood lipids, hematological profile, kidney and other system functions have revealed various results.² Whether or not this duty might cause significant effects on blood pressure control, lipid profile and electrolyte levels in hypertensive patients with combination therapy is not well documented. In this study, we aimed to investigate the effect of Ramadan fasting on blood pressure control, lipid profile, brain natriuretic peptide (BNP), renal functions and electrolyte levels in hypertensive patients with combination therapy.

MATERIAL and METHOD

Patients having well-controlled blood pressure and being compliant to treatment recommendations were invited to take part in this observational study. Patients who accepted to join in the study were informed the purpose and methods of study and informed consent was obtained. Twenty hypertensive patients who intended to

fast during Ramadan and who did not have diabetes and coronary heart disease were included to study. Exclusion criteria of the study were uncontrolled, malignant or secondary hypertension, diabetes mellitus, congestive heart failure, known coronary or peripheral artery disease, known renal or hepatic disease. Amongst the involved patients, eight of them were taking combination of two drugs, three people were taking three, three people were taking four and one patient was taking five. No change was made in their antihypertensive medicines throughout the study period. Patients in the study were receiving angiotensin converting enzyme inhibitors (10 patients), angiotensin receptor blockers (10 patients), diuretics (18 patients), beta blockers (5 patients), calcium channel blockers (9 patients), aldosterone antagonists (1 patient) and alpha receptor blockers (4 patients). During Ramadan, patients received their medicines just before beginning of their fasting and break from fasting. Their ambulatory blood pressure and blood sample measurements were made in the month before Ramadan, at the last week of Ramadan month and one month after Ramadan. Blood samples were taken after fasting period of 12 hours. Before and after Ramadan, samples were taken during morning hours. In Ramadan, samples were taken during afternoon hours. The data were analyzed using the statistical package for social sciences for windows, version 13.

RESULTS

Ten of patients were men and ten were women. →

The mean age was 52±14 years. Their mean systolic and diastolic blood pressure levels with daytime and night variations before Ramadan, in Ramadan and after Ramadan are shown in Table 1. Significant reductions in mean daytime systolic and diastolic blood pressure measurements of patients were observed during the month of Ramadan (p=0.03 and p=0.04, respectively). Significant reductions in twenty four hour average systolic and diastolic blood pressure measurements were also observed during Ramadan (p=0.01 and p=0.01, respectively). However, these reductions were not more than enough to warrant changing the treatment. The results of the blood sample measurements before Ramadan, during Ramadan and after Ramadan are shown in Table 2. Results revealed significant reduction in high density lipoprotein (HDL) cholesterol levels. There was not any significant change in other lipid parameters, BNP, electrolyte levels and renal functions.

DISCUSSION

Quite a number of hypertensive patients with Islamic believe insist on engaging in Ramadan fasting for a month every year world-wide and visit their physicians. This study showed that there were significant reductions in mean daytime systolic and diastolic blood pressure measurements and in twenty four hour average systolic and diastolic blood pressure measurements during Ramadan fasting. However, these reductions were not more than enough to warrant changing the treatment. The study also showed that there was significant reduction in high density lipoprotein cholesterol levels but there was not any significant change in other lipid parameters, BNP, electrolyte levels and renal functions during Ramadan fasting. This study reveals that Ramadan fasting appears to be safe also in patients with hypertension treated with combination therapy. Perk et al. showed that Ramadan fasting can be safely achieved by treated hypertensive patients.¹ In this study, most of the patients were treated with monotherapy (12 of 17). Ural et al. also revealed that Ramadan fasting can safely be fulfilled by moderate to severe hypertensive patients treated with combination therapy.³ That study was performed in winter which had relatively shorter fasting period than in summer, 12 to 13 hours and 17 to 18 hours, respectively. Our study was conducted in summer (August 2011) with longer fasting period and with higher temperatures. The longer fasting hours and higher temperatures could have posed an additional risk for blood pressure control but study showed that these effects did not require changing the treatment regimens. In this study, we also measured BNP levels which were associated with high blood pressure. Recently, Soualmia et al. showed that increase of the natriuretic peptides is related to the blood pressure elevation.⁴ Andreadis et al. also reported that increased

Table 1: The results of Ramadan fasting on blood pressure levels

	Before Ramadan (mean±SD mmHg)	In Ramadan (mean±SD mmHg)	After Ramadan (mean±SD mmHg)	p value
24h Sys BP	140.34±17.01	129.26±10.58	136.30±17.61	0.01
24h Dia BP	82.10±10.8	77.33±8.08	83.23±11.44	0.01
Daytime Sys BP	138.90±14.72	129.91±10.94	138.97±17.72	0.03
Daytime Dia BP	83.29±11.83	77.00±8.94	84.81±11.90	0.04
Night Sys BP	134.22±15.66	128.56±14.27	130.35±21.53	0.31
Night Dia BP	76.80±11.34	74.12±9.20	76.15±14.13	0.58

BP: Blood pressure

Table 2: Effects of ramadan fasting on lipid profile, BNP, renal functions and electrolytes

	Before Ramadan (mean±SD)	In Ramadan (mean±SD)	After Ramadan (mean±SD)	p value
Glucose	100.7±12.8 mg/dl	114.6±19.1 mg/dl	110.8±23.2 mg/dl	0.27
Uric acid	5.42±1.23 mg/dl	5.53±1.33 mg/dl	5.39±1.29 mg/dl	0.85
Triglyceride	165.31±106.7 mg/dl	174.38±101.2 mg/dl	187.18±99.13 mg/dl	0.99
Total Cholesterol	193.94±29.8 mg/dl	190.76±34.01 mg/dl	198.41±25.5 mg/dl	0.93
HDL	47.76±16.93 mg/dl	43.94±12.96 mg/dl	49.53±17.20 mg/dl	0.014 (2-3 0.009)
LDL	123.82±30.35 mg/dl	125.35±25.76 mg/dl	129.18±19.64 mg/dl	0.12
VLDL	28.72±17.90 mg/dl	29.25±13.34 mg/dl	31.20±12.50 mg/dl	0.43
BNP	87.07±103.9 pg/ml	80.29±65.95 pg/ml	72.00±58.97 pg/ml	0.43
K	4.28±0.38 meq/L	4.38±0.36 meq/L	4.28±0.34 meq/L	0.34
Ca	9.55±0.20 meq/L	9.27±0.17 meq/L	9.4±0.27 meq/L	0.47
Na	139.76±2.1 meq/L	138.82±1.84 meq/L	138.94±2.5 meq/L	0.29
BUN	15.36±4.05 mg/dl	15.81±3.76 mg/dl	13.54±13.05 mg/dl	0.29
Creatinine	0.84±0.18 mg/dl	0.84±0.14 mg/dl	0.80±0.15 mg/dl	0.55

HDL: high density lipoprotein , LDL: low density lipoprotein , VLDL: very low density lipoprotein , BNP: brain natriuretic peptide , BUN: Blood urea nitrogen

BNP concentrations are associated with higher blood pressure levels and systolic blood pressure variability.⁵ In our study, there was no significant increase of BNP levels during Ramadan compared to before and after Ramadan measurements, which demonstrated that there was no significant blood pressure change during Ramadan.

It has been reported that serum cholesterol levels may decrease in earlier days of Ramadan and subsequently rise to pre-fasting levels.² HDL cholesterol levels may increase after Ramadan and LDL cholesterol and triglycerides may decrease in relation to the significant reduction in energy intake during Ramadan.² Our results showed that HDL cholesterol levels decrease in Ramadan and increased after Ramadan. Khafaji et al. reported that HDL cholesterol levels decrease and LDL cholesterol levels increase in Ramadan.⁶ Maislos et al. reported that there was marked increase in plasma HDL cholesterol levels and no significant change in very low density lipoprotein cholesterol levels.⁷ It has been claimed that these changes in lipid profile seemed to be variable and probably depend on the quality and quantity of food consumption and weight changes.^{2,8} It has been also reported that there is no →

EFFECTS OF RAMADAN FASTING ON BLOOD PRESSURE CONTROL, LIPID PROFILE, BRAIN NATRIURETIC PEPTIDE, RENAL FUNCTIONS AND ELECTROLYTE LEVELS IN HYPERTENSIVE PATIENTS TAKING COMBINATION THERAPY

significant changes in serum blood urinary nitrogen, creatinine, uric acid, sodium and potassium levels in Ramadan.^{2,9-11} Studies on blood glucose showed a mild increase or variation.^{2,12} There was no significant change in hemoglobin levels.^{2,7} Our results confirmed these results reported in literature. Our study had also some limitations: 1- this study included a small number of hypertensive patients with combination therapy; 2- patients with uncontrolled, malignant or secondary hypertension, diabetes mellitus, congestive heart failure, known coronary or peripheral artery disease, known renal or hepatic disease were excluded from the study. Large scale studies are needed to demonstrate the importance of our results. Ramadan fasting has no adverse effect on clinical status of stable cardiac patients with hypertension.⁶ However, the decision to engage in

to Ramadan fasting should be individualized to every patient according to their clinical status.

CONCLUSION

Ramadan fasting in Islamic populations of the world may cause significant reductions on daytime and twenty four hour average systolic and diastolic blood pressures and significant reduction in HDL cholesterol levels in hypertensive patients taking combination therapy. These reductions may not be more than enough to warrant changing the treatment. Although, the duration of Ramadan fasting is too short to increase the risk of atherosclerosis, large scale studies are needed to demonstrate the importance of significant reduction in HDL cholesterol levels.

C	CORRESPONDING AUTHOR: İ. Faruk Aktürk, İst. Mehmet Akif Ersoy, Thoracic and Cardiovascular Surgery Center and Research Hosp. Dept. of Cardiology, İstanbul farukakturk@gmail.com
✓	DELIVERING DATE: 17 / 04 / 2012 • ACCEPTED DATE: 18 / 07 / 2012

REFERENCES

1. 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.
2. Azizi F. Islamic fasting and health. *Ann Nutr Metab* 2010; 56: 273-282.
3. Ural E, Kozdag G, Kilic T, et al. The effect of Ramadan fasting on ambulatory blood pressure in hypertensive patients using combination drug therapy. *J Hum Hypertens* 2008; 22: 208-210.
4. Soualmia H, Ayadi I, Omar S, et al. Atrial natriuretic peptide and brain natriuretic peptide release in human essential hypertension. *Clin Lab* 2009; 55: 120-127.
5. Andreadis EA, Georgiopoulos DX, Tzavara CK, et al. Plasma brain natriuretic peptide: a biochemical marker of effective blood pressure management? *J Hypertens* 2009; 27: 425-432.
6. Khafaji HA, Bener A, Osman M, Al Merri A, Al Suwaidi J. The impact of diurnal fasting during Ramadan on the lipid profile, hs-CRP, and serum leptin in stable cardiac patients. *Vasc Health Risk Manag* 2012; 8: 7-14.
7. Maislos M, Kamayashi N, Assali A, et al. Marked increase in plasma high-density-lipoprotein cholesterol after prolonged fasting during Ramadan. *Am J Clin Nutr* 1993; 57: 640-642.
8. Lamri-Senhadj MY, El Kebir B, Belleville J, Bouchenak M. Assessment of dietary consumption and time-course of changes in serum lipids and lipoproteins before, during and after Ramadan in young Algerian adults. *Singapore Med J* 2009; 50: 288-294.
9. El-Hazmi MAF, Al-Faleh FZ, Al-Mofteh IB. Effect of Ramadan fasting on the values of hematological and biochemical parameters. *Saudi Med J* 1987; 8: 171-176.
10. Sliman NA, Khatib FA. Effect of fasting Ramadan on body weight and some blood constituents of healthy muslims. *Nutr Rep Int* 1988; 38: 1299-1306.
11. Leiper JB, Molla AM, Molla AM. Effects on health of fluid restriction during fasting in Ramadan. *Eur J Clin Nutr* 2003; 57: 30-38.
12. Temizhan A, Tandogan I, Dönderici O, Demirbas B. The effects of Ramadan fasting on blood lipid levels. *Am J Med* 2000; 109: 341-342.