

## The Effect of Fasting During Ramadan on Blood Pressure in Patients with Controlled and Mild Hypertension

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### Abstract

In the month of Ramadan, many Muslims fast during the day and significant changes in sleeping and eating patterns occur that may affect blood pressure. In the current study, we aimed to evaluate the effect of fasting on blood pressure. The study was performed in June 2014 in Yazd, a city in the center of Iran. Sixteen patients with controlled or mild hypertension on medical therapy underwent 24 hour blood pressure monitoring before the month of Ramadan and again while fasting during Ramadan. The differences in mean systolic and diastolic blood pressure before and during Ramadan were recorded. It was observed that the mean systolic, diastolic, and mean blood pressure, before and during Ramadan were not significantly different (131 vs. 128 mmHg,  $P=0.141$ , 70 vs. 68 mmHg  $P=0.144$  and 99 vs. 96.4 mmHg,  $P=0.085$  respectively). There were no significant differences in changes of blood pressure, throughout the day before and during fasting period of Ramadan. It was concluded that the patients with controlled or mild hypertension on antihypertensive therapy can observe their fasting during Ramadan without significant changes in blood pressure.

**Keywords:** Ramadan; Fasting; Blood pressure

### Introduction

During the month of Ramadan, millions of Muslims throughout the world fast from sunrise to sunset for 29-30 consecutive days. In this month, significant changes in eating habits and sleeping patterns occur which may significantly affect blood pressure. Several animal studies have shown that changes in feeding habits might affect blood pressure [1-4]. They have shown that intermittent periods of fasting and re-feeding (purging and binging) is accompanied with decreased and increased blood pressure, respectively. However, changes in feeding habits in these animal studies are not comparable with the eating habits during Ramadan. During Ramadan, Muslims who want to fast, wake up at about 3 A.M. and eat a meal called Sahari, and then, do not eat anything from about 4 A.M. to 8 P.M. (about sixteen hours). A systematic review has shown improvement of blood pressure with fasting in patients with hypertension [5]. Also, previous studies [6,7] with ambulatory blood pressure monitoring have pointed out that fasting during Ramadan has no effect on mean systolic and diastolic blood pressure in patients with hypertension. These studies have been done in geographic areas with a different climate and fasting period than Iran. In areas with warm climate and also in summer, significant dehydration might be experienced during the fasting period which may decrease blood pressure by reducing preload of the heart or increased blood pressure by stimulating the compensatory mechanisms like sympathetic system, renin system, and antidiuretic hormone. In our warm geographic area (Yazd, Iran, with a mean temperature of 40 centigrade during the day) and during summer, there is a long fasting period (16 hours a day) and significant dehydration might occur which might have important effects on blood pressure. The aim of this study was to evaluate the effect of long

Ramadan fasting during summer on blood pressure, with ambulatory blood pressure monitoring in patients with controlled and mild hypertension. We also evaluated the variability of blood pressure during the day.

### Materials/Subjects and Methods

This was a before-and-after study done in June, 2014 in Yazd, Iran. Sixteen volunteer patients with hypertension were enrolled. They were on medical therapy taking daily drug regimens once or twice, and with one or a combination of drugs for treatment of hypertension. No change in drug doses was done during the study period and the patients took medication before starting fasting or just after eating in the evening. Most patients had controlled blood pressure during the period of study and some patients had mild hypertension. Ambulatory blood pressure was measured (with Suntech) during the month before Ramadan and it was repeated during the last week of Ramadan. The cuff was mounted on non-dominant arm and the subjects were asked to immobilize the arm during inflation and also continue their ADL (activities of daily living).

Both blood pressure monitoring sessions started at about 5 P.M. and lasted for 24 hours. Blood pressure was measured twice per hour and the averages of each hour were considered for analysis. The averages of 24-hour systolic and diastolic blood pressure before and during Ramadan were compared. We also analyzed blood pressure data during 24 hours in 3 periods according to awaking and fasting habits as follows: 4-6 A.M. (waking for breakfast), 4-7 P.M. (near the end of fasting during the day), and 9-11 P.M. (after Iftar, the time that Muslims end fasting and eat dinner). The averages of systolic and diastolic blood pressure and mean blood pressure in these periods before and during Ramadan were compared. Statistical analysis was done with the paired student's T-test using SPSS16.

## Results

This study was a before-after study conducted on 16 patients with hypertension (10 men and 6 women) with controlled or mild hypertension. The mean  $\pm$  SD age of the participants was  $54.4 \pm 11.7$  years ( $55.2 \pm 13.2$  in men and  $35.2 \pm 11.3$  in women) ( $P=0.81$ ). The mean  $\pm$  SD systolic and diastolic blood pressure before Ramadan were

$131.1 \pm 13.6$  mmHg and  $80.6 \pm 9.8$  mmHg, respectively. None of the participants was in stage II hypertension. Also, at the end of study all of them had systolic blood pressure less than 150 mmHg and diastolic blood pressure less than 97 mmHg. Comparison of blood pressure before and during Ramadan (Table 1).

	Before	After	P value
Average systolic blood pressure, mmHg	131.12 $\pm$ 13.6	128.5 $\pm$ 12.6	0.141
Average diastolic blood pressure, mmHg	80.6 $\pm$ 9.5	78.3 $\pm$ 8.3	0.144

**Table 1:** Changes in mean systolic and diastolic blood pressure (mmHg) before and after Ramadan.

	Before	After	P value
Mean systolic blood pressure 4-6 A.M., mmHg	122.6 $\pm$ 17.7	126.1 $\pm$ 19.3	0.256
Mean systolic blood pressure 16-19 P.M., mmHg	138.8 $\pm$ 20	136.8 $\pm$ 17.8	0.59
Mean systolic blood pressure 21-23 P.M., mmHg	130.1 $\pm$ 16.5	126.1 $\pm$ 16.5	0.255
Mean diastolic blood pressure 4-6 A.M., mmHg	77.52 $\pm$ 14.6	74.9 $\pm$ 10.6	0.41
Mean diastolic blood pressure 16-19 P.M., mmHg	83.3 $\pm$ 11.9	85.6 $\pm$ 11.9	0.13
Mean diastolic blood pressure 21-23 P.M., mmHg	81.9 $\pm$ 12.1	75.8 $\pm$ 11.1	0.033

**Table 2:** Changes in mean  $\pm$  SD systolic and diastolic blood pressure (mmHg) at different times during the day before and after Ramadan.

As can be seen, there are no significant changes in the mean systolic and diastolic blood pressure before and during Ramadan. Also, comparison of blood pressure in three different periods (Table 2).

There were no significant changes in the mean systolic and diastolic blood pressure in these periods before and during Ramadan, despite changes in sleep and eating habits. Data had normal distribution (Kolmogorov Smirnov test was performed,  $P=0.8$  and  $P=0.5$  for systolic and diastolic blood pressure, respectively). Paired t-test was used to test the change in blood pressure before and after fasting in Ramadan.

## Discussion

In this study, we evaluated the effect of Ramadan fasting on blood pressure. Many studies had evaluated the effect of fasting on blood pressure in animal and humans, but they didn't mimic the Ramadan fasting. During Ramadan, there are changes in the feeding and sleeping habits that may influence blood pressure with multiple mechanisms. Also psychological aspect of Ramadan may have effect on blood pressure.

We showed that in patients with controlled hypertension, who had not changed their medical therapy during Ramadan, no significant change in blood pressure was seen with long fasting period during the hot summer. We also found no significant changes in systolic and diastolic blood pressure in different periods of the day, before and during Ramadan, despite changes in sleeping and eating habits. Our findings are consistent with another study showing that fasting during Ramadan has no effect on blood pressure in patients with hypertension [6]. Also, our study emphasized that even during summer and very long periods of fasting and accompanying dehydration, no significant

changes in blood pressure were developed during Ramadan. The patients in our study had controlled blood pressure and/or stage one hypertension before Ramadan. However, even in patients with moderate hypertension, fasting during Ramadan may be tolerated. Another study showed that in patients with moderate hypertension who continued their medical therapy during Ramadan, fasting did not change blood pressure [7]. In a systematic review, it was concluded that blood pressure improved in healthy and hypertensive patients with fasting during Ramadan [5]. We live in a different geographical area and have different eating habits than others in these studies, and also in our population fasting did not change blood pressure. Moreover, our study added more evidence that fasting during Ramadan is safe in patients with controlled hypertension. There are also other studies emphasizing that fasting during Ramadan had no deleterious effect on blood pressure and health of patients with a stable cardiac condition and even fasting may reduce blood pressure [8-11]. There is some concern that fasting during Ramadan with accompanying changes in sleeping and eating pattern and dehydration may provoke the renin-angiotensin system causing significant increase in blood pressure during some periods in the day. This study showed that blood pressure did not change in these periods before and during Ramadan. Additionally, there was no significant increase in blood pressure in critical periods of day (awakening in the morning, end of the fasting and eating in the evening) during Ramadan. Habbal et al. also showed that in patients with hypertension, no significant variation in blood pressure was induced by fasting [12].

## Conclusion

Fasting during Ramadan may be well tolerated in patients with controlled and mild hypertension who continue their medication

during Ramadan and there is no significant increase in blood pressure in critical periods of the day during fasting.

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### Conflict of Interest

The authors declare no conflict of interest.

### References

1. Ernsberger P, Nelson DO (1988) Refeeding hypertension in dietary obesity. *Am J Physiol* 254: R47-55.
2. Ernsberger P, Nelson DO (1988) Effects of fasting and refeeding on blood pressure are determined by nutritional state, not by body weight change. *Am J Hypertens* 1: 153S-157S.
3. Contreras RJ, King S, Rives L, Williams A, Wattleton T (1991) Dietary obesity and weight cycling in rats: a model of stress-induced hypertension? *The American Journal of Physiology* 261: R848-857.
4. Ernsberger P, Koletsky RJ, Baskin JS, Foley M (1994) Refeeding hypertension in obese spontaneously hypertensive rats. *Hypertension* 24: 699-705.
5. Salim I, Al Suwaidi J, Ghadban W, Alkilani H, Salam A (2013) Impact of religious Ramadan fasting on cardiovascular disease: a systematic review of the literature. *Current Medical Research and Opinion* 29: 343-354.
6. Perk G, Ghanem J, Aamar S, Ben-Ishay D, Bursztyn M (2001) The effect of the fast of Ramadan on ambulatory blood pressure in treated hypertensives. *Journal of Human Hypertension* 15: 723-725.
7. Ural E, Kozdag G, Kilic T, Ural D, Sahin T, et al. (2008) The effect of Ramadan fasting on ambulatory blood pressure in hypertensive patients using combination drug therapy. *Journal of Human Hypertension* 22: 208-210.
8. Chamsi-Pasha H, Ahmed WH, Al-Shaibi KF (2014) The cardiac patient during Ramadan and Hajj. *J Saudi Heart Assoc* 26: 212-215.
9. Salahuddin M, Sayed Ashfak AH, Syed SR, Badaam KM (2014) Effect of Ramadan Fasting on Body Weight, (BP) and Biochemical Parameters in Middle Aged Hypertensive Subjects: An Observational Trial. *J Clin Diagn Res* 8: 16-18.
10. Al-Shafei AI (2014) Ramadan fasting ameliorates arterial pulse pressure and lipid profile, and alleviates oxidative stress in hypertensive patients. *Blood Pressure* 23: 160-167.
11. Bener A, Hamad A, Fares A, Al-Sayed HM, Al-Suwaidi J (2006) Is there any effect of Ramadan fasting on stroke incidence? *Singapore Med J* 47: 404-408.
12. Habbal R, Azzouzi L, Adnan K, Tahiri A, Chraibi N (1998) Variations of blood pressure during the month of Ramadan. *Arch Mal Coeur Vaiss* 91: 995-998.