

Effect of Islamic Fasting on Mean Arterial Pressure

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ARTICLE INFO	ABSTRACT
<p><i>Article type:</i> Review article</p> <hr/> <p><i>Article History:</i> Received: 22 Apr 2014 Revised: 15 Jul 2014 Accepted: 16 Jul 2014 Published: 23 Jul 2014</p> <hr/> <p><i>Keywords:</i> Blood pressure Fasting Ramadan Mean arterial pressure</p>	<p>Introduction: World Health Organization (WHO) introduced hypertension as an epidemic in developing countries. However, hypertension is adequately controlled in only 12.5% of patients. The aim of this study was to evaluate the relationship between Ramadan fasting and mean arterial pressure (MAP).</p> <p>Method: This clinical, observational study was carried out at Medical O.P.D of Jinnah Medical College Hospital (JMCH), Korangi, Karachi, Pakistan. A total of 150 hypertensive patients (120 males and 30 females) and 150 healthy adults (75 males and 75 females) were evaluated during the month of Ramadan (from August to September 2010). Blood pressure was measured in patients' right arm in the sitting position. The measurements were taken a week before Ramadan and during each week of this month. The average of measurements was calculated, and the results were analyzed by SPSS version 17.</p> <p>Results: A reduction was observed in the MAP of hypertensive patients (from 117.3±4.2 in the first week to 108.3±4.2 in the fourth week). In the control group, the MAP was 93.1±0.6 in the first week and 92.4±0.6 in the fourth week.</p> <p>Conclusion: This study showed that MAP reduces during Ramadan fasting. This effect of fasting may help control blood pressure in hypertensive patients.</p>

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Introduction

Hypertension is defined as systolic blood pressure (SBP) higher than 140 mmHg and diastolic blood pressure (DBP) greater than 90 mmHg. Overall, the prevalence of hypertension appears to be around 30–45% of the general population, which steeply increases by aging (1).

Various studies have been conducted on blood pressure components and their predictive role in cardiovascular diseases (CVD) and death. SBP and mean arterial pressure (MAP) are greatly associated with CVD (2). MAP is the average arterial pressure, and is calculated as DBP plus one third of pulse pressure (3).

MAP is a function of left ventricular contractility defined as an average arterial pressure during a single cardiac cycle (3). MAP is strongly associated with CVD risk in men aged less than 60 years (2). In one study on subjects with previous history of myocardial infarction (MI), a significant 12% increase was observed in

the recurrence of MI for every 10 mmHg increase of MAP (4).

World Health Organization (WHO) recognizes hypertension as an epidemic in developing countries (5). In Pakistan, 18% of people suffer from hypertension, with every third person over the age of 40 becoming increasingly vulnerable to a wide range of diseases. In addition, only 50% of people with hypertension are diagnosed, and only half of these diagnosed patients undergo treatments; thus, only 12.5% of hypertensive cases are adequately controlled (6). In addition, CVDs are the leading cause of death, worldwide (7).

Fasting is a state of abstinence from foods and drinks. Fasting during the month of Ramadan is a religious obligation, practiced by Muslims around the world. The timing of fasting varies from country to country and from season to season, depending on the month in which Ramadan falls.

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Thus, according to the season and geographical location of a country, the duration of fasting varies from 12 hours to 19 hours per day.

Asgary S et al. concluded that fasting for a month may have preventive effects on atherosclerosis (8). Nematy et al. reported that fasting can significantly improve the 10-year risk for coronary heart diseases and other cardiovascular risk factors such as weight, body mass index (BMI), and waist circumference (7). Imtiaz et al. reported decrease in cardiovascular risk factors in healthy individuals and patients with stable cardiac diseases, metabolic syndrome, dyslipidemia, and systemic hypertension, provided that they avoid unhealthy dietary patterns (9).

Limited research has been conducted on the correlation between MAP and fasting. The aim of this study was to evaluate the effects of Ramadan fasting on blood pressure and MAP.

Materials and Method

This study was conducted on 150 subjects in the month of Ramadan in 2010 (from August to September) at Medical Outpatients Department, Jinnah Medical College Hospital. The age of the subjects ranged from 18 to 70 years, and the majority of the subjects were within the age range of 35-70 years.

The subjects were randomly selected. Adults with (uncontrolled) mild to moderate hypertension, who were already receiving one or more than one anti-hypertensive medication, were included in the study. Overall, 150 healthy adults (75 males and 75 females) were included in the control group. Children and the elderly, as well as patients with known co-morbidities other than hypertension, were excluded from the study. Patients with severe hypertension and pregnant woman were excluded, as well.

The subjects were examined twice before Ramadan (with a 5 min interval); the same procedure was repeated every week till the end of Ramadan. Participation in the study was voluntary, and informed consents were obtained from all subjects. All the subjects included in the study were fasting during Ramadan. The participants were allowed to take regular meals during Sahar (before sunrise) and Iftar (after sunset), without any food restrictions during the study period.

Subjects with a previous history of smoking

were advised to quit or reduce smoking during the study period. All study subjects had at least the minimum level of daily activities including household activities or regular paid jobs. Subjects were advised to stop any other regular medications, besides anti-hypertensive medications, during the study period. Daily dosage of anti-hypertensive medication was adjusted, based on Sahar and Iftar timing.

Blood pressure was measured by one of the researchers unaware of patients' medical records. Blood pressure was measured in the subject's right arm in the sitting position, using a standard mercury sphygmomanometer. MAP was calculated for the readings, using the following formula: $MAP = DBP + 1/3 \text{ pulse pressure}$. The differences between the mean MAP during the pre-Ramadan and Ramadan periods were calculated.

Data were entered in Microsoft Excel and analyzed using SPSS version 17.0 for Windows. The average values of MAP during the 1st and 4th weeks of Ramadan were compared using t-test for independent samples. P-value less than 0.05 was considered statistically significant.

Results

Of 150 patients, 120 and 30 cases were male and female, respectively. The healthy control group included 75 males and 75 females. Eighty-three hypertensive patients were within the age range of 40-70 years, and 67 patients were 18-39 years old (Table 1).

For hypertensive patients, SBP and DBP values during the first week of Ramadan were found to be 142.8 ± 5.2 and 106.6 ± 4.8 mmHg, respectively; the average MAP was reported as 117.3 ± 4.2 mmHg. On subsequent reading, we observed a reduction in blood pressure.

SBP was 134.6 ± 6.4 mmHg during the fourth week. DBP reduced to about 98.3 ± 2.7 and MAP decreased to 108.3 ± 4.2 . A reduction of approximately 8 mmHg was observed in all 3 modalities

Table 1. Demographic characteristics of patient and control groups (n=300)

	Patient group (n=150)	Control group (n=150)
Gender		
Male	120	75
Female	30	75
Age Group		
18-39 years	67	72
40-70 years	83	78

Table 2. MAP values of hypertensive patients during the 1st and 4th weeks of Ramadan

	Week 1	Week 4	P-value
SBP (<120 mmHg)	142.8±5.2	134.6±6.4	<0.001
DBP (<80 mmHg)	106.6±4.8	98.3±2.7	<0.001
MAP (<93.3 mmHg)	117.3±4.2	108.3±4.2	<0.001

Table 3. Mean blood pressure measurements in the control group during the 1st and 4th weeks of Ramadan

	Week 1	Week 4	P-value
SBP (<120 mmHg)	118.4±3.0	117.2± 4.8	<0.001
DBP (<80 mmHg)	78.7±3.3	77.5±2.5	<0.001
MAP (<93.3 mmHg)	93.1±0.6	92.4±0.6	<0.001

for measuring hypertension. In comparison, we also observed a slight reduction in blood pressure in the control group, as well. The average of SBP for the control group was 118.4±3.0 in week one, which decreased minutely to 117.2±4.8 in the fourth week. We observed a slight decrease in DBP and MAP, as well. DBP was 78.7±3.3 in the first week of Ramadan and by week four, it decreased to about 77.5±2.5. Similarly, MAP amounted to 93.1±0.6 and 92.4±0.6 during the first and fourth weeks of Ramadan, respectively (Table 2, 3).

Discussion

High blood pressure, or hypertension, is a very common condition. Hypertensive patients have a six-fold increased chance of stroke, and are three times more likely to experience cardiac arrest (10). Hypertension is known to be associated with coronary artery diseases, cerebrovascular diseases, renal failure, atherosclerosis, left ventricular hypertrophy, atrial fibrillation, and congestive heart failure. Obesity-related hypertension is no different in this regard since it predisposes individuals to these conditions, as well (11-15). Therefore, it is essential to control MAP so that hypertension and these fatal conditions are kept at bay.

Hypertension has no signs or symptoms and is known as "the silent killer". Therefore, it is recommended for all adults to have their blood pressure measured routinely at least once every 5 years until 80 years of age. In obese hypertensive patients, weight loss and physical activity are of high importance. Weight loss reduces circulating leptin and insulin levels, partially reverses resistance to these hormones, decreases sympathetic activation, and reduces plasma renin activity and aldosterone levels, which all finally lead to a reduction in blood pressure (11). Recent research indicates that periodic fasting

decreases cholesterol level (9, 17, 18). Our study indicates a reduction in MAP in the month of Ramadan. There could be a number of possible explanations for this. Firstly, although none of our patients were on a dietary restriction, a change of dietary habit is expected during Ramadan.

Although some studies indicated no change in weight during Ramadan (19), many studies have reported a significant reduction in weight during this month (7, 18, 20, 21). Nematy et al. indicated higher high-density lipoprotein cholesterol (HDL-c), white blood count (WBC), red blood cell (RBC) count, and platelet count (PLT); however, plasma cholesterol, triglycerides, low-density lipoprotein cholesterol (LDL-c), very-low-density lipoprotein (VLDL-c), SBP, BMI, and waist circumference decreased after Ramadan (16). It is highly possible that a decrease in weight and plasma cholesterol, as well as an increase in high-density lipoprotein (HDL), may have contributed to the decrease in blood pressure in our study.

Fasting promotes tolerance and patience of an individual. Fasting individuals describe a development of inner peace and self content. Daradkheh (22) indicated minimal hostility during the month of Ramadan, which could be another possible explanation for the current results. Salhamoud AS et al. (20) also observed a decrease in MAP, which is consistent with the findings of the current study; however, the difference was quite insignificant, compared to our research. It is possible that dietary habits, sleep pattern, hydration status, and sample size may have contributed to this slight difference.

Fasting during the month of Ramadan is different from regular fasting or starvation. In Ramadan, the observer is allowed to eat twice a day with no dietary restrictions. Cyclical regular fasting for one month has significant physiological impacts (16). Normally, fasting and water deprivation are sympathomimetic, but daily 12-hour fasting for one month brings about significant positive effects, which in this case is MAP reduction.

To the best of our knowledge, limited number of studies have evaluated the correlation between MAP and Ramadan fasting. The authors wish to have highlighted the benefits of Ramadan fasting.

Conclusion

Islamic fasting in the month of Ramadan

results in a decrease in MAP. This decrement can be beneficial if used strategically in the long-term management of hypertension. Fasting hypertensive patients can benefit from decreased MAP during this month.

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