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The Effect of One-Day Ramadan Fast on Blood Pressure of Hypertensive Patients

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Abstract

Background- The month of Ramadan is the ninth lunar month of the Islamic calendar, during which every year millions of Muslims fast from sunrise to sunset. These fasting episodes are associated with changes in sleeping pattern, medication timing, extra prayers at night, etc. The goal of this work was to evaluate the safety of Ramadan fast with respect to blood pressure for treated hypertensive patients.

Method- This study included 21 controlled hypertensive patients on single or twice-daily medications; each volunteered to perform 24-hour ambulatory blood pressure monitoring (ABPM) twice: during Ramadan and 2 months after Ramadan during a non-fasting day. Mean average awake/asleep and 24-hour blood pressure, also systolic and diastolic load, dipper vs. non-dipper were compared between the two groups.

Result- There were no significant changes between any of these variables (P=1.00) in the two measurement periods.

Conclusion- It seems that treated hypertensive patients can be safely assured that with the continuation of pervious medication(s), Ramadan fast can be observed without the need for further work up ***(Iranian Heart Journal 2003; 4 (4):39-43).***

Key words: Ramadan ■ Fasting ■ Blood pressure ■ Hypertension

Every year millions of Muslims throughout the world fast during the holy month of Ramadan, and each year many hypertensive Muslims refer to their physicians to ascertain whether they can safely observe the fast of Ramadan.

Studies in animal models have shown that repeated cycles of fasting-refeeding may cause or exacerbate hypertension.[1]

These studies have led to the general belief that fasting would be harmful in hypertensive patients, even if their blood pressure is well-controlled during the non-fasting state.

This study was performed to evaluate the effects of Ramadan fasting on the blood pressure of treated hypertensive subjects.

Methods

We selected twenty-one well-controlled hypertensive subjects (18 women and 3 men) aged 45 to 74 years on regular once or twice-daily anti-hypertensive medication who had referred prior to Ramadan to ascertain whether they could perform the fast. None of these patients had other severe disease to be exempt from fasting. Each subject was instructed to fast during the month of Ramadan while wearing the ambulatory blood pressure monitoring device on his or her non-dominant arm for 24 hours. Two months after the completion of Ramadan, 24-hour ambulatory blood pressure monitoring was again performed for each of the patients.

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During the fasting state, they were told to take their usual anti-hypertensive medications early in the morning (before sunrise) and/or after sunset (according to their previous timing schedule as once or twice daily). They were allowed to perform their routine daily activity. The machine was set to measure blood pressure every 15 minutes in awake phase (from 7:00 AM to 9:59 PM) and every 30 minutes in asleep phase (10:00 PM to 6:59 AM). The next day the data were downloaded on a desktop computer which edited the recordings and printed out the report.

Total 24-hour average blood pressure, average day blood pressure, average night blood pressure, pressure load (percentage of ambulatory blood pressure measurements above a threshold) and percentage of day/night "dips" were calculated for each patient (once during a fasting day and once during a non-fasting day). Normal values were obtained from American Society of Hypertension suggested thresholds.[2]

Suggested Thresholds[2]:

average awake BP less than 135/85 mmHg
average asleep BP less than 120/75 mmHg
load (%) less than 15% (awake threshold<140/90
NIDip (%) more than 10%

Statistics

Mean ± SD were calculated for continuous variables (age, average awake-asleep 24-hr. blood pressures and blood pressure loads), and absolute and relative frequencies were measured for discrete variables (sex, dippers); these were measured twice for each patient; once during Ramadan fast, and again 2 months after Ramadan during a non-fasting day.

The mean ± SD was compared using paired t-test. Also, by using normal thresholds for each of these variables, we grouped the subjects as having normal vs. abnormal values. They were again tested with McNemar test. For "dipper vs. non-dipper", McNemar test was used; $p>0.05$ was considered non-significant.

Results

24-hour ambulatory blood pressure monitoring was performed on 21 patients, 18 women (85.7%) and 3 men (14.3%), once during one day of Ramadan fasting and again on a non-fasting day. Their age was 45 to 74 yrs (mean 56.5 ± 7.3 yrs). Average day blood pressure (from 7:00 AM to 9:00 PM), average night blood pressure (from 10:00 PM to 6:59 AM) and average 24-hour BP, and day and night pressure loads were calculated each time separately. Mean ± SD were calculated for each variable and then compared with paired-t-test (Table I).

Table I: Mean, standard deviation and P-value of each of the blood pressure variables.

	Mean	std. Deviation	Paired t-test P-Value
(A.S.D.) 1. Average systolic BP, day (mmHg)	Fast 115. 38	13.16	0.010
	Non- fast 120.09	14.10	
(A.D.D.) 2. Average diastolic BP, day (mmHg)	Fast 68.81	5.46	0.005
	Non- fast 71.76	5.46	
(A.S.N.) 3. Average systolic BP, night (mmHg)	Fast 104.71	14.86	0.408
	Non- fast 106.61	16.05	
(A.D.N.) 4. Average diastolic BP, night (mmHg)	Fast 62.47	7.57	0.423
	Non- fast 63.62	6.83	
(TMP-S) Total Mean 5-Systolic pressure (mmHg)	Fast 111.62	12.44	0.177
	Non- fast 114.24	15.48	
(TMP-D) Total Mean 6- Diastolic pressure (mmHg)	Fast 67.38	6.39	0.391
	Non- fast 68.38	6.36	
(AW-SL) 7- Awake systolic load (%)	Fast 12.57	19.13	0.240
	Non- fast 14.47	21.32	
(AW.DL) 8- Awake diastolic load (%)	Fast 10.90	18.01	0.107
	Non- fast 6.52	7.76	
(AS.SL) 9- Asleep systolic load (%)	Fast 15.28	26.61	0.219
	Non-fast 21.04	32.49	
(AS.DL) 10- Asleep Diastolic load (%)	Fast 13.28	23.23	0.163
	Non-fast 7.00	7.32	

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As seen in Table I, there was no significant difference in variables 3 through 10 (non-significant p-value), but there seems to be a considerable drop in mean average daytime blood pressure (both systolic and diastolic) during Ramadan. However, with a closer observation, we noted that although statistically significant, there is no clinical significance between these measures. To test this, the pairs were again tested with McNemar test. In this test, normal thresholds suggested by the American Hypertension Society were used. Any value above these was considered abnormal (named number 2) and if under the threshold, they were considered normal (named number 1). The McNemar test for average diastolic blood pressure daytime was not performed because both variables were not dichotomous with the same values (Table II).

Table II: McNemar test

	ASD (non F.)		P=0.5		ASN (non F.)		P=1.00
ASD (fast)	1*	2*		ASN (fast)	1	2	
1*	18	2		1	18	1	
2*	0	1		2	0	2	

1* is normal 2* is abnormal

	AND (non F.)		P=1. 00		TMP-S (non F.)		P=1.00
AND (fast)	1	2		TMP-S (fast)	1	2	
1	18	1		1	18	1	
2	2	0		2	0	2	

	TMP-D (non F)		P=1.00		TMP-S (non F.)		P=1.00
TMP-D (fast)	1	2		AWLS (fast)	1	2	
1	20	0		1	17	1	
2	0	1		2	0	3	

	AWLD (non F.)		P=1.00		ASLS (non F.)		P= 1.00
AWLD (fast)	1	2		ASLS (fast)	1	2	
1	19	0		1	13	2	
2	0	2		2	2	4	

	ASLD (non F.)		P=1.00
ASLD(fast)	1	2	
1	15	1	
2	2	3	

Three patients also had proven coronary artery disease (2 previous CABG and one 3-vessel disease) and 2 had diabetes mellitus. As diabetes or target organ damage increases cardiovascular risk, we used less than our usual normal range of blood pressure in these patients, but no more abnormal values were detected other than the previously-mentioned abnormalities.

Discussion

Studies in animal models (especially rodents) have shown conflicting data about the effects of fasting on blood pressure. Some studies have revealed that repeated cycles of fasting-refeeding may cause or exacerbate hypertension.[1] But a study performed by Williams et al. showed that after 48-hours of fasting in hypertensive rats, there was a significant drop in mean arterial pressure possibly due to decreased metabolic function.[3] A study was performed in 1993 by Webber et al. in 29 healthy subjects to evaluate the effects of 12, 36, and 72 hours' fasting. They reported increased systolic blood pressure during 12 to 36 hours of fast, which returned to near pre-fasting values at 72 hours.[4]

The cardiovascular reactivity was evaluated in 11 young adult male Malay Muslims by Hussain et al. during the month of Ramadan.[5] A state of stress is typically accompanied by increased sympathetic relative to vagal discharge to the heart and increased sympathetic discharge to peripheral vasculature. They concluded in this study, however, that in healthy, normotensive individuals, the magnitude of elevation of arterial blood pressure during Ramadan was not excessive and should not pose a cause for concern.[5]

In another work performed by Habbal et al. in Casablanca, blood pressure profiles of

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99 hypertensive patients were studied. All had ambulatory blood pressure monitoring before the fast and during the Ramadan.[6] No statistically significant difference was noted between these two periods, neither for the systolic, nor the diastolic or 24-hour blood pressure. This study was the first to deal with variations of blood pressure during the fast of Ramadan. It concluded that in patients with essential hypertension without complications, the fast is well-tolerated.[6]

Ramadan et al. studied 18 sedentary Kuwaiti adult males during a spring-like month of Ramadan. The aim of this study was to quantify the cardiovascular and respiratory changes that occur during Ramadan. Exercise systolic, but not diastolic pressure, increased slightly (6%) by the end of Ramadan.[7]

The most recent study is that of Perk et al.[1] in Israel, which examined the effects of Ramadan on 24-hour ambulatory blood pressure variables. Seventeen hypertensive subjects were evaluated twice: before and during Ramadan. All continued their medications. 24-hour mean blood pressures as well as average awake and average asleep BPs and BP loads were compared. All were non-significantly changed. They concluded that traditional fasting of Ramadan can be safely undertaken.[1]

According to our observation, the majority of treated hypertensives had normal average 24 hour-awake-asleep and pressure loads during fasting. There was no significant change between fasting and non-fasting episodes except for average systolic and diastolic daytime blood pressures which were significantly reduced during Ramadan. However, each of these paired variables was again tested using McNemar test, and no significant change was seen in any of the pairs. Most normotensives and perhaps 80 percent of hypertensives have at least a 10 percent drop (dip) in blood pressure during sleep compared with daytime average blood pressures. Many studies have shown an increased risk of cardiovascular events among those with "non-dipping" pressure.[8] In our study, only 11 (52.4%) of the subjects were normal dippers during Ramadan. In addition, 15 (71%) were normal dippers during non-fast. When we compared these two, there was no significant change in "dip" pattern during and after Ramadan.

It seems that the devotees initiate the Ramadan practice from childhood. After many years of conditioning, the deprivation of food, drink and sleep is accepted in a spirit of religious calm. Consequently, if our subjects did not perceive Ramadan as a stressful situation, stressor-activated augmentation of sympathetic activity would not occurs.[5]

Conclusion

The fasting month of Ramadan is the most important month for Muslims because it was the month during which the Holy Quran was revealed. Muslims abstain from food and drink from dawn to sunset during this month to express their gratitude to Allah.[9]

This study revealed that treated hypertensive patients on once or twice-daily medication, if well controlled - possibly by having home recording or frequent office recordings, can be assured that with the continuation of their previous medication(s) they can also perform traditional fasting without any harmful rise in blood pressure variables. There seems to be no need for further work up in these subjects.

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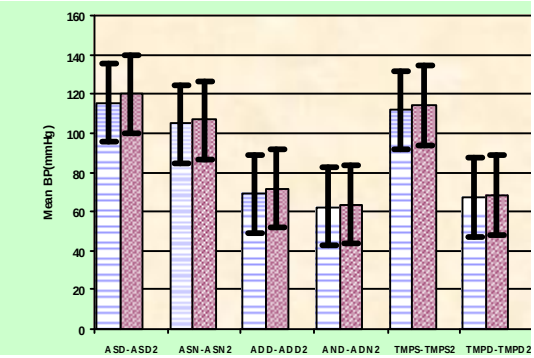

Fig l: Mean and SD of daytime, night and total BP (fasting vs. non-fasting)

ASD= average systolic day time-fasting
ASD2= average systolic day time- non fasting
ADD= average diastolic day time-fasting
ADD2= average diastolic day time- non fasting
ASN= average systolic night-fasting
ASN2= average systolic night-non fasting
ADN= average diastolic night-fasting
ADN2= average diastolic night- non fasting
TMP-S= average diastolic pressure-fasting
TMP-S2= average diastolic pressure-non fasting
TMP-D= total mean diastolic pressure-fasting
TMP-D2= total mean diastolic pressure-non fasting

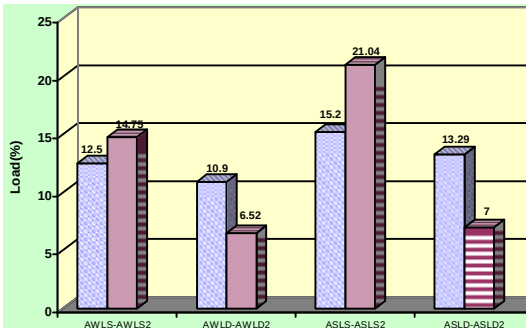

Fig 2: Mean asleep and awake BP loads (Fasting vs. non-fasting)

AWKS= awake systolic load- fasting
AWLS2= awake systolic load-non fasting
AWLD= awake diastolic load-fasting
AWLD2=awake diastolic load-non fasting
ASLS= asleep systolic load-fasting
ASLS2= asleep systolic load- non fasting
ASLD= asleep diastolic load-fasting
ASLD2= asleep diastolic load-non fast

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