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Clinical Studies on the Circulatory Effects of 'Ramadan' Fasting in Healthy Volunteers

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Abstract. Variations in the systolic and diastolic blood pressures, and body weight were studied in 48 volunteers (24 males and 24 females), aged 25-55 years, beginning one week before, during the later days, and one week after the month of Ramadan. The observations were recorded in the morning and evening. The voluteers were divided in six age groups, which ranged between 25-30, 31-35, 36-40, 41-45, 46-50 and 51-55 years. The data of the three phases of the study showed no significant changes in the systolic and diastolic blood pressures and weight of the fasting individuals. There was a slight reduction in the mean weight during the third week of 'Ramadan', which in some cases was restored to normal levels immediately after the 'Ramadan' fasting. It has been concluded from the study that fasting has no adverse effect on the blood circulation and weight of healthy persons.

Keywords: blood pressure, weight, 'Ramadan' fasting

Introduction

Fasting during the holy month of 'Ramadan' requires Muslims to stay away from food and drinks, from dawn to sunset. The period averages between 12 to 18 h a day, depending upon the month of fasting. Fasting is obligatory on healthy muslim adults. Numerous studies have been carried out to observe the possible effect of 'Ramadan' fasting on body weight, biochemical, hormonal and hematological aspects (Bakir *et al.,* 1992a; 1992b; Bakir, 1990 ; 1991; Sulimani, 1988; Frost and Pirani, 1987; Hazmi, 1987; Husain *et al.,* 1987; Saker, 1975; Bloom, 1959). In general, many beneficial effects have been reported in healthy individuals (Athar and Moazzam, 1994; Athar, 1988). It is obvious that duringthe the 'Ramadan' fasting, the pattern of food and fluid intake is changed. The quantity and nature of food, the amount of fluid intake, and the change in daily food consumption routine, may affect the composition of blood plasma, which is dependent upon the metabolic pathways of the body (Guyton and John, 1996).

Earlier investigations have reported that the serum uric acid increased linearly with the increase in serum triglycerides during the entire period of 'Ramadan' (Gumma *et al.,* 1978). In the subsequent studies, carried out on fluid and electrolyte balance, it was found that healthy young adults maintained good control of fluids and electrolytes during the 'Ramadan' fasting (Beg and Khan, 1990). Studies on general body metabolism of the fasting volunteers revealed significant increase in the levels of total serum cholesterol, thyroxine and uric acid (Fedail *et al.,* 1982). During investigations carried out to evaluate changes in metabolism of nutrients and electrolytes in the serum of fasting volunteers, no significant changes in the normal level of total cholesterol, HDL-cholesterol or free fatty acids, and electrolytes was observed (Khalid *et al.,* 1987). However, glucose level decreased significantly, but no hypoglycemia was produced.

Although most of the studies involving the 'Ramadan' fasting have been done on healthy individual, using physiological parameters, which are sensitive to chemical processes in the body, no major study has been carried out to evaluate the variation of blood pressure during the 'Ramadan' fasting in normal persons of various age groups. The present work was undertaken to extend the earlier observations and to assess the effect of 'Ramadan' fasting on the blood circulatory system by investigating the variation of blood pressure and weight after 'sahar' (morning fasting start time) and before 'iftar' (the fast breaking time). The level of blood pressure indicates the state of circulatory system and the functional condition of the tissue cells and organs (Chatterjee *et al.,* 1974).

Materials and Methods

A total of 48 healthy and normal volunteers (24 males and 24 females) were selected from among the employees of PCSIR Laboratories Complex, Karachi, Pakistan for this study. The volunteers were differentiated into six groups, according to their age range, which comprised of 25-30, 31-35, 36-40, 41-45, 46-50 and 51-55 years. The week before the study was started, a complete history was taken and each volunteer was

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given a thorough physical examination. Their weight and blood pressures were recorded one week before, during the third week of 'Ramadan' in which the changed metabolic pattern had stabalized, and one week after the month of 'Ramadan' fasting, which corresponded to the wash out period of one week. Throughout the study, body weight, and systolic and diastolic blood pressures were recorded in the morning at 8:30-9:00 a.m., which corresponded to about 4 h after 'sahar' and at 3:30-4:00 p.m., which corresponded to about 3 h before the 'iftar', when the effect of diet and fasting had stabilized (Pamela and Richard, 1994). Physical findings associated with hypertension, such as oedema of feet, decrease in urine output, heavy head, vertigo and breathlessness on exertion were also observed among each subject during the study. The blood pressure was measured by the Ausculatory method in the sitting position (Guyton and John, 1996).

The volunteers were educated and they were not placed on restricted caloric diet as in Islamic fasting there is no restriction on the type or amount of food intake during 'iftar' or 'sahar'. An early breakfast (sahar) before dawn is taken and then at sunset fast is broken with dates and fruit juices, followed by a regular dinner later on. During the period of fasting, the volunteers were advised to continue with their normal physical activities. The data collected one week before the month of 'Ramadan' was considered as the control for the purpose of the present studies.

Results and Discussion

Results of the present study on the mean weight, and systolic and diastolic blood pressures of 48 volunteers, at the end of each phase of the study are reported in Tables 1 and 2. The data obtained during the study were analyzed by the standard statistical procedure (Ganong, 1993).

The changes in the weight and blood pressure of fasting volunteers were not very significant and were within the normal range as is evident from Tables 1 and 2, respectively. The following is the summary of observations of Table 1, which records the weight and blood presure of males of various age groups:

(a) In group one (age: 25-30 years), the morning systolic blood pressure level decreased by 4.55% and weight decreased by 0.7% during 'Ramadan' as compared to morning levels before 'Ramadan'.

(b) In group two (age: 31-35 years), there was no change in blood pressure of morning fasting levels, while a small weight loss of 0.7% was observed.

(c) In group three (age: 36-40 years), there was an increase in systolic blood pressure of morning fasting levels and a slight decrease of 0.7% in weight.

(d) In group four (age: 41-45 years), both systolic and diastolic blood pressure in the morning fasting level increased about 3.7% with slight decrease of 0.7 % in weight.

(e) In group five (age: 46-50 years), only diastolic pressure level decreased by 6%.

(f) In group six (age: 51-55 years), no change was observed in blood pressure, with small weight loss during fasting.

The following summary of Table 2 relates with women volenteers of different age groups:

(a) In group one (age: 25-30 years), volunteers gained 1.6 % in weight and showed a decrease in both systolic and diastolic blood pressure by about 6.5% and 7%, respectively, during the last days of fasting, which were restored to normal levels after 'Ramadan'.

(b) In group two (age: 31-35 years), a rise of 6% was recorded in diastolic blood pressure, and a fall of 1.7 % in weight occurred during fasting, which were restored to normal levels after 'Ramadan'.

(c) In group three (age: 36-40 years), only 1.8 % weight loss was observed during fasting, whereas diastolic blood pressure decreased only slighty.

(d) In group four (age: 41-45 years), there was loss of 3.3% weight and decrease of 6% in diastolic blood pressure during fasting, which were restored to normal levels after 'Ramadan'.

(e) In group five (age: 46-50 years), only 2.3% loss in weight was observed during fasting.

(f) In group six (age: 51-55 years), there was loss of 0.80% in weight and decrease of 4.5% in systolic blood pressure, which were restored to normal levels after 'Ramadan'.

The observations recorded during the present study showed that during 'Ramadan' fasting the mean systolic and diastolic blood pressures and body weights were not significantly changed in both healthy male and female volunteers and were maintained within the normal range during fasting hours. These observations agree with those reported earlier (Pamela and Richard, 1994). However, a slight decrease in body weight was observed during the third week of 'Ramadan' as compared to body weight one week before 'Ramadan'. The data further showed a small weight loss in both male and female volunteers during evening of 'Ramadan' fasting, as compared to the respective morning body weight levels. This may be attributed to the intake of food and fluids at 'sahar' time (Guyton and John, 1996).

Table 1. Levels* of blood pressure and weight in males of various age groups at the end of three phases of study

Age groups of males (years)	One week before 'Ramadan'						During third week of 'Ramadan'						One week after 'Ramadan'					
	Morning			Evening			Morning			Evening			Morning			Evening		
	Wt	SBP	DBP	Wt	SBP	DBP	Wt	SBP	DBP	Wt	SBP	DBP	Wt	SBP	DBP	Wt	SBP	DBP
25-30	140±2.0	110±1.2	80±2.1	140±1.5	110±1.0	80±2.5	139±2.0	105±1.8	80±2.0	138±1.8	105±1.6	80±2.2	139±2.0	105±1.1	80±1.5	139±1.8	105±1.4	80±1.4
31-35	144±2.5	125±2.0	80±1.0	144±2.5	125±1.8	80±1.1	143±2.2	125±2.0	80±1.5	142±2.0	125±1.2	80±1.2	143±1.8	125±2.2	80±2.0	143±2.0	125±2.1	80±2.6
36-40	152±2.3	130±2.0	80±1.5	152±2.0	130±1.8	80±1.0	151±1.6	135±2.0	80±1.2	150±1.8	130±1.5	80±1.5	151±2.0	130±1.6	75±2.0	151±2.1	130±2.0	80±1.1
41-45	142±3.0	135±2.0	85±1.6	142±2.8	135±1.5	85±1.2	141±2.0	140±1.2	90±1.2	140±2.1	135±1.5	80±1.2	142±2.5	135±1.8	85±1.8	142±2.2	135±3.0	85±1.1
46-50	158±2.5	124±2.0	80±2.0	158±2.5	124±1.8	80±1.2	158±2.0	125±1.5	75±2.0	157±1.2	120±1.9	75±2.5	156±1.4	125±1.5	80±1.0	156±1.5	125±1.1	85±2.0
51-55	164±2.0	110±2.0	80±1.5	164±1.0	110±2.0	78±2.0	163±2.0	110±1.5	75±2.1	162.5±1.8	112± 1.5	75±2.0	163±1.2	110±2.0	80±1.6	163±2.0	110±2.1	80±1.0

*mean value; ± SD (n = 24)
Wt = weight (lbs)
SBP = systolic blood pressure (mmHg)
DBP = diastolic blood pressure (mmHg)

Table 2. Levels* of blood pressure and weight in females of various age groups at the end of three phases of study

Age groups of females (years)	One week before 'Ramadan'						During third week of 'Ramadan'						One week after 'Ramadan'					
	Morning			Evening			Morning			Evening			Morning			Evening		
	Wt	SBP	DBP	Wt	SBP	DBP	Wt	SBP	DBP	Wt	SBP	DBP	Wt	SBP	DBP	Wt	SBP	DBP
25-30	125±3.0	107±2.1	70±1.8	124.6±2.5	108±1.1	65±1.6	126±2.0	100±2.5	65±3.0	125±2.0	100±2.8	65±2.0	126±2.0	110±1.1	70±3.0	126±2.5	105±1.9	70±2.0
31-35	131±2.0	112±3.2	80±1.4	130±2.8	112±3.0	80±1.2	129±1.5	110±2.8	85±2.0	128±0.5	112±1.0	85±3.0	130±1.5	115±1.1	80±2.8	130±1.5	115±1.1	80±2.8
36-40	11±2.0	106±1.2	70±2.0	110±2.1	106±1.5	70±1.8	108±3.0	101±1.2	70±2.5	107±1.0	103±3.0	68±2.2	108±2.8	100±2.0	70±2.2	108±2.0	100±3.0	70±2.0
41-45	120±3.3	110±2.8	80±3.0	120±3.0	110±2.5	75±2.0	116±2.0	110±2.5	75±3.0	115±3.0	110±2.0	75±1.8	120±2.2	110±2.0	80±2.5	120±2.1	110±2.0	80±1.5
46-50	134±3.0	118±1.1	75±2.0	134±2.0	115±2.5	75±1.0	132±2.9	120±1.2	70±1.5	131±2.0	120±1.5	75±1.1	132±2.0	120±1.5	75±2.0	132±2.0	120±1.2	75±2.0
51-55	132±1.0	110±2.0	70±1.8	132±1.5	110±1.1	70±1.2	131±2.0	105±2.5	66.5±1.5	130±1.0	105±1.6	66±1.2	131±1.0	108±1.5	68.5±2.1	132±1.2	110±2.0	70±2.6

*mean value; ± SD (n = 24)
Wt = weight (lbs)
SBP = systolic blood pressure (mmHg)
DBP = diastolic blood pressure (mmHg)

The study indicated that fasting had no adverse effect on blood circulation and body weight of healthy persons as has been concluded earlier also (Athar and Moazzam, 1994; Athar, 1988).

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