Effects of Ramadan fasting on body weight and metabolic profile

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Abstract

Background and objective: Fasting during the Ramadan month is a religious duty and it is obligatory for all healthy adult Muslims. The aim of this study was to investigate the effects of fasting during Ramadan in different times and place on body weight, blood sugar, serum lipids and blood pressure.
Methods: Fifty three healthy adult fasting volunteers were included in the study. Peripheral venous blood samples were taken three days before Ramadan, at the end of the first week, and at the end of the fourth week of fasting. The last blood sample was taken one week after the end of Ramadan. Serum total cholesterol, HDL and LDL, triglycerides and glucose were measured. Vital signs and body mass index were taken by one of the researchers.
Results: Thirty three (62.3%) volunteers were males, 93.4% were below 40 years of age. Weight changed significantly during Ramadan. Mean systolic blood pressure decreased by 11 mmHg while diastolic blood pressure decreased by 9 mmHg (P <0.001). Fasting blood sugar decreased by 14.96 mg/dl (P <0.001). Plasma lipids; cholesterol decreased by 19.3 mg/dl (P <0.027), LDL by 23 mg/dl (P <0.001), triglyceride by 44 mg/dl (P <0.003) but the HDL increased by 5.4 mg/dl (P <0.002) during Ramadan fasting. Before Ramadan, 19% of participants had abnormal serum cholesterol and 37% had abnormal LDL level, while after Ramadan all had normal lipid levels **(**P <0.001). The proportion of participants with abnormal HDL decreased from 94% before Ramadan to 50% after Ramadan (P <0.001).
Conclusion: Ramadan affects the body physiology and lowers the weight, serum lipids, blood pressure and blood glucose levels.
Keywords: Ramadan, fasting, lipid profile.

Introduction

Fasting during the day time in Ramadan month (29-30days) is a religious duty and it is obligatory for all healthy adult Muslims. Hundreds of millions of Muslims fast during Ramadan worldwide. Children, menstruating women, travelers and sick people during Ramadan are excused from fasting during this month. Those who fast have two good-sized meals during Ramadan, one immediately after sunset (Iftar) and the other one just before dawn (Suhur). They are allowed to eat, and drink between sunset and dawn but not after dawn. Since Ramadan month is according to the lunar calendar and because of the difference with Gregorian calendar, Ramadan month occurs 10.25 days earlier every year and may occur in any of the four seasons. The length of fasting hours is also variable ranging from 11 to 18 hours per day in tropical countries for 29- 30 days.[1] Ramadan 2011 occurred during July 10th, to August 20th, 2011. The duration of fasting was about 18 hours and the temperature was around 45 degree centigrade during the day time in Iraq. Long-term fasting in animals has a negative effect on the body, while short-term fasting during Ramadan regularly has many advantages and

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positive effects on the body.[2] The following parameters go down during fasting: serum lipids,[3] blood sugar,[4] blood pressure (BP) [5]and body weight.[6] This study sought to investigate the effects of Ramadan fasting during summer time on the body physiology particularly in terms of body weight, blood sugar, serum lipids and BP. To our knowledge, this is the first study conducted in our region on this issue.

Methods

Setting: This study was performed during Ramadan of July 10th, to August 20th, 2011 (1432 Hijre) in Erbil, Kurdistan Region, Iraq.

Subjects: Fifty three fasting healthy adult volunteers (33 males and 20 females) from three different locations in Erbil City. Their mean age was (33±8years). The participants did not change their life style during the study period. They were fast nearly 16 hours.

Exclusion Criteria: Participants with any acute or chronic diseases or those who are on regular medication during the study were excluded from the study. Pregnant ladies were also excluded from the study.

Blood Collection: Venous blood samples were withdrawn from cubital vein of the participants three days before Ramadan, at the end of the first week, and at the end of fourth weeks of Ramadan month. The last blood sample was taken one week after the end of Ramadan.

Blood Analysis: Blood samples were centrifuged directly after collection and the serum either immediately analyzed or stored at ≤ -20°C in the Medical Research Centre, Hawler Medical University. Serum total cholesterol (TC) normally (<200mg/dl), high density lipoprotein cholesterol (HDL-C) male normally >40mg/dl, female>50mg/dl, low-density lipoprotein cholesterol (LDL-C) normally<130mg/dl, triglycerides (TG)male normally<164mg/dl, female<132mg/dl, were measured using the commercially available kits (Enzymatic colorimetric method used according to Trinder method).

Physical Examination: Vital signs were taken by one of the researchers (specialist physician). Blood pressure was measured by mercury sphygmomanometer first before Ramadan and second at 22nd of Ramadan. The pulse rate and respiratory rate were taken once, at the same time of taking blood sample. Body mass index was measured according to the height and weight: (weight divided by the squared height in meter), so any BMI more than 30 regarded as obese: as it´s a disease in which excess body fat has accumulated to such an extent that health may be negatively affected.

Ethical considerations: Approval was obtained from the ethics committee of the Medical Research Centre, Hawler Medical University. Participants were fully informed about the methods and objectives of the study.

Statistical Analysis:
Statistical Packages for the Social Sciences (Version 19) was used for analysis of the data. Student's t test for two independent samples was used to compare between means. Paired t test was used to compare between readings before Ramadan, during and after Ramadan. Chi square test of association (or McNemar test) was used to compare between proportions. A P value of ≤ 0.05 was considered as statistically significant.

Results

Fifty three volunteers were recruited in this study. Most of them (94.3%) were below 40 years. Their age was between 20-39 years and the mean (±SD) age was 33±8 years. 83% were married and 28.3% underwent previous surgery. Around 70% had their own car and 18.9% had history of obesity (Table1). Ten (18.8%) participants were at primary education or illiterate, 9.4% of them at the secondary school level and 71.7% were graduates of institutes or higher levels (Table 2). Nine (17%) participants were unemployed (free work or trading) while the rest (83%) had governmental work (sedentary) (Table 3). The participants eat sweets on daily bases especially during Ramadan e.g. dates (100%), juice (81%), sweet (55%) while other items are less frequently consumed e.g. sugar containing cola (15%) and cakes (6%). Other items consumed by study participants included rice (100%) chicken meat (92%) and red meat (60%) (Table 4).

Table 1: Distribution of samples by some demographic data.

Demographic data	No.	Percentage n = 53
Male sex	33	62.3
Age less than 40 years	50	94.3
History of operation (any)	15	28.3
Marriage	44	83
Car ownership	37	69.8
History of obesity	10	18.9

Table 3: Distribution of samples by occupation.

Occupation	No.	Percentage
Nurse	14	26.4
Teacher	8	15.1
Employed	17	32.1
Physician	5	9.4
Freeworker	9	17
Total	53	100

Table 2: Distribution of samples by educational level.

Education	No.	Percentage
Illiterate	5	9.4
Primary	5	9.4
Secondary	5	9.4
Institute	15	28.3
College	18	34
Postgraduate	5	9.4
Total	53	100

Table 4: Food preferences of the studied samples.

Type of food	No.	Percentage n = 53
Juice	43	81
Cake	3	6
Sweet	3	6
Another sweet (cake)	29	55
Dates	53	100
Rice	53	100
Chicken meat	49	92
Every day eating meat	22	41.5
Red meat	32	60
Cola (normal)	8	15

The weight of the participants changed significantly during Ramadan as it decreased at all readings (Table 5). Blood pressure of the participants significantly reduced during fasting; systolic BP decreased by 11 mmHg while diastolic BP decreased by 9 mmHg ($P <0.001$). Fasting blood sugar decreased by 14.96 mg/dl ($P <0.001$). Plasma lipids have decreased significantly during Ramadan; cholesterol decreased by 19.3 mg/dl ($P <0.027$), LDL by 23 mg/dl ($P <0.001$), triglyceride by 44 mg/dl ($P <0.003$) but the HDL increased by 5.4 mg/dl ($P <0.002$) during Ramadan fasting (Table 6).

Table 5: Weight changes during Ramadan fasting.

Weight	Mean difference ± SD	95% CI	p value
weight1- weight2	1.50 ± 1.61	1.06 - 1.95	<0.001
weight1- weight3	1.75 ± 2.03	1.19– 2.31	<0.001
weight1- weight4	0.68 ± 2	0.11 - 1.24	<0.019

Weight 1, before Ramadan; weight 2, at the end of first week of Ramadan fasting; weight 3, at 22nd day of fasting, and weight 4, one week after Ramadan fasting.

Table 6: Effect of fasting on some parameters.

Physiological parameters	Mean difference	±SD	p value
SBP(mmHg) before -SBP during	11.03	12.26	< 0.001
DBP before- DBP during Ramadan	9.15	10.03	< 0.001
cholesterol1- cholesterol2 (mg/dl)	12.43	39.72	<0.027
cholesterol1 - cholesterol3	19.32	43.93	<0.002
cholesterol1 - cholesterol4	12.75	38.33	<0.019
LDL1 - LDL2(mg/dl)	19.52	31.46	< 0.001
LDL1 - LDL3	23.66	38.19	< 0.001
LDL1 - LDL4	34.68	41.3	< 0.001
HDL1 - HDL2(mg/dl)	-6.02	10.13	< 0.001
HDL1 - HDL3	-5.46	12.14	<0.002
HDL1 - HDL4	-11.96	11.56	< 0.001
TG1 - TG2(mg/dl)	44.11	101.21	<0.003
TG1 - TG3	25.7	128.08	<0.150
TG1 - TG4	-2.08	81.2	<0.853
Glucose before Ramadan: glucose during Ramadan (mg/dl)	14.96	29.15	<0.001

Reading 1: the samples have been taken 1 week before Ramadan, Reading 2; the samples have been taken at the end of the first week of Ramadan, Reading 3; the samples have been taken at 22nd days of Ramadan and reading 4; that the samples have been taken 1 week after Ramadan.

Table 7: Comparison between the proportions of individuals with abnormal serum lipids, before Ramadan with those during and after Ramadan.

Test	Before Ramadan*	6th day of fasting	p value	22nd day of fasting	p value	6days after Ramadan	p value
Cholesterol	19%	7%	<0.001	3%	<0.002	0	
Triglyceride	49%	24%	<0.07	41%	<0.523	47%	<1.0
LDL	37%	13%	<0.01	7%	<0.001	0	
HDL	94%	73%	<0.007	73%	<0.007	50%	<0.001

*All readings during and after Ramadan were compared with proportions before Ramadan

Results showed that 19% of the participants had abnormal serum cholesterol and 37% had abnormal LDL level before Ramadan. After Ramadan all participants had normal lipid levels (P <0.001).The proportion of participants with abnormal HDL decreased from 94% before Ramadan to 50% after Ramadan (P <0.001). Triglyceride level decreased during Ramadan but increased soon after Ramadan (P <0.007) (Table 7).

Discussion

Short term fasting during Ramadan affects the body physiology, especially the metabolic state. People fasts during Ramadan for about 16 hours per day during the summer time, so they suffer from both hunger and thirst. Although 70% of the participants own a car but only 18.9 % were obese before Ramadan. Using cars for daily activity encourage sedentary life and the people will not perform any physical activities during their fasting. Sweets and fatty meals are commonly and frequently used in our community. Most of our people eat these types of food on daily bases, especially during Ramadan fasting e.g. dates (100%), chicken meat (92%), juice (81%), red meat (60%) and sweet 55%. Other sorts of sweets are less frequently drunk or eaten e.g. cola is only drunk by15% and cakes are only eaten by 6% of the sample. Weight changed significantly during Ramadan. It decreased at all readings during and after Ramadan

, which is in agreement with Mansi et al[7] and Ziaee et al,[8] although Temizhan et al showed no change in the body weight during Ramadan fasting,[9] possibly because of his small sample size. Blood pressure of the participants significantly reduced during fasting period; systolic BP decreased by 11 mmHg while diastolic blood pressure by 9 mmHg, which is in agreement with another study.[7] Fasting blood sugar decreased by 14.96 mg/dl, which is in accordance with Mansi et al who reported 9 mg/dl reduction in sugar[7] but contrary to Adlouni et al who observed no change in blood sugar,[10] in which may be because of variability of time of taking blood sample. Plasma lipids have decreased significantly during Ramadan; cholesterol decreased by 19.3 mg/dl although less decrease was detected by Mansi[7]or no effect on cholesterol found by Ziaee et al.[8] LDL decreased by 23 mg/dl and such decrease was similar to another study.[7] Triglyceride decreased by 44 mg/dl although Mansi found 9mg/dl reduction in triglyceride[7] but Ziaee et al found no effect on triglyceride.[8] Triglyceride decreased during Ramadan but increased soon after Ramadan. HDL increased by 5.4 mg/dl during Ramadan fasting which is in contrary to Temizhan et al[9] but in agreement with Mansiwho found 12.73mg/dl increase in HDL.[7] Results showed that 19% of the samples had abnormal serum cholesterol and 37% had abnormal LDL level before Ramadan. All participants had normal

lipid levels after Ramadan, a part of triglyceride. The proportion of participants with abnormal HDL decreased from 94% before Ramadan to 50% after Ramadan. These changes might suggest that fasting has significant effects on the lipid profile and can normalize the abnormal lipid profiles, which has been reported for the first time in Erbil city.

Conclusion

Ramadan affects the body physiology. It decreases the body weight and lowers the serum lipids, BP and blood glucose levels.

Conflicts of interest
The authors report no conflicts of interest.

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