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Metabolic, Biochemical and Psychiatric Alterations in Healthy Subjects During Ramadan

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Abstract: The Ramadan is the holiest month in the Islamic calendar and Muslims fast during this month. In this study, we evaluated the effect of the Ramadan fasting on body mass index, carbohydrate and lipid metabolism, renal and hepatic function, as well as psychiatric performances. Thirty nine healthy volunteers (32 women and 7 men) underwent anthropometric, biochemical, hematological and psychiatric evaluation one week before and on the last day of the Ramadan. Biochemical markers were measured by standard laboratory methods. Psychiatric evaluation was done by Spiel Berger's anxiety trait and state scales. Although the body mass index remained stable, fasting blood glucose, triglyceride, total cholesterol levels decreased significantly in the study group. HDL cholesterol levels did not change during the study. Plasma concentration of hemoglobin and proteins decreased. Blood lymphocyte count was also found to have increased during the study. No significant change was observed between the two consequent psychiatric evaluations. Ramadan fasting causes no detrimental effect on health in healthy subjects, on the contrary, it may cause some improvements, particularly on carbohydrate and lipid metabolism. Thus, even in the absence of weight loss, this may contribute to prevention of cardiovascular diseases.

Key words: Fasting, ramadan, metabolism, anxiety

Introduction

The Ramadan is the holiest month in Islamic calendar and it is a religious duty for Muslims to fast during Ramadan. During the Ramadan Muslims abstain from drinking and eating between the sunrise and the sunset. Thus, diurnal rhythm of both sleeping habit and the meal schedule change. It has been long known that the relation between improvements in lipid profile and blood glucose levels and the reduction of risk of cardiovascular events. Although there have been several studies regarding the effect of the Ramadan fasting on various metabolic aspects of human, it remains to be conflicted. In this study, we evaluated the effects of fasting on body mass index, carbohydrate and lipid metabolism. We also examined the changes in the anxiety scale during fasting.

Materials and Methods

This study was conducted during the Ramadan of November 2005. All participants of the study gave their informed written consent. Thirty nine healthy volunteers (32 female and 7 male) were enrolled in the study. The mean age of the subjects was 28±8.18 years. Before and after completion of the Ramadan, body mass index (BMI), and arterial blood pressure were recorded. On the test day, blood samples were drawn from antecubital vein in all study subjects after one overnight fasting.

Using an autoanalyser (Technicon 1000 Autoanalyser), fasting blood glucose, urea, creatinine, AST, ALT, total cholesterol, HDL cholesterol, uric acid, LDH, creatinine kinase, triglyceride, total protein, albumin, leucocytes, hemoglobin, haematocrit, platelet levels were measured one week before and on the last day of Ramadan.

For psychiatric evaluation, all participants were evaluated by the same psychiatrist using by Spiel berger's trait and state scales before and after the Ramadan.

All parameters evaluated in the study were expressed as mean ± standard deviation of mean (M±SEM). Statistical analysis was done using a PC compatible statistics program (SPSS v.13). The significance of differences between means was tested using Student's t test, and p values less than 0.05 were considered to be statistically significant.

Results

The mean number of days of fasting was 26.5±3.5 days (range 25-30 days). Daily fasting duration was 14±2 hours during the Ramadan. No statistically significant change was observed in mean body weight, body mass index, and arterial blood pressures of the subjects during the last day of the Ramadan than they were before the Ramadan. The mean total cholesterol and triglyceride levels decreased significantly during

Ramadan, whereas HDL cholesterol levels remained similar. Fasting blood glucose and creatinine levels were statistically lower during Ramadan than they were before Ramadan. Whole blood counts showed no change after the Ramadan, except for the number of lymphocytes, which were significantly higher during the Ramadan. There was also no change in blood albumin, AST, ALT, uric acid, and urea levels (Table 1).

Discussion

According to the rules of the Islam, which is the second largest religion in the world, it is a religious duty to fast one month every year. This religious duty, called the Ramadan, is a controlled partial type of hunger. Two meals a day, one before dawn and one after sunset is eaten. There are no obligations in the type of foods consumed and this in part may explain why surprisingly, no weight loss is usually observed during the Ramadan even though the total food intake is limited. Although the meal consumed before dawn usually consisted of foods that are usually eaten at breakfast, the meal consumed after sunset consisted of a great variety of foods. This observation and the findings of the prior studies are consistent with our findings that the subjects do not usually lose weight during Ramadan (Sweileh *et al.*, 1992; Maislos *et al.*, 1993).

Although we found no meaningful change in BMI of the subjects after the Ramadan, blood glucose, triglyceride and total cholesterol levels decreased significantly after the Ramadan. Previous studies had conflicting results concerning fasting blood glucose levels, leading to differences especially in the management of type 2 diabetics who are willing to fast. Some of the previous studies have found that Ramadan fasting is not a contradiction for people with type 2 diabetes mellitus if appropriate instruction about meals and hypoglycemic medication is given (Fereidoun and Siahkolah, 1998).

There are conflicting findings about the effect of Ramadan fasting on lipid profile (Maislos *et al.*, 1993; Nagra *et al.*, 1998; Hallak and Nomani, 1988; Adlouni *et al.*, 1997; Namoni *et al.*, 1992; Nomani, 1997). In consistent with our findings, some other studies have shown that the Ramadan might yield a favorable effect on lipid profile (Nagra *et al.*, 1998; Adlouni *et al.*, 1997; Namoni *et al.*, 1992; Nomani, 1997). However, the effect of nutrition on lipid profile must be emphasized clearly that reduction in weight and good metabolic control are of particular importance, although in our study no special diet was conducted and no weight loss was observed. The results found in our study are not in agreement with some of the previous studies and this may partly be attributed to a variety of factors, such as differences in caloric intake, sugar intake, dietary habits, environmental factors, and climate conditions.

The influence of fasting on serum urea and uric acid

Table 1: Effects of Ramadan on study parameters

Parameters	1st day of Ramadan	30th day of Ramadan	p
BMI (kg/m ²)	64.2±12.2	62.8±11.8	NS
ABP (systolic/diastolic, mmHg)	140±24.5	138±19.3	NS
Total protein (g/dl)	8.3	7.06	0.001
Glucose (mg/dl)	83.9	73.6	0.001
Creatinine (mg/dl)	0.84	0.74	0.001
Total cholesterol (mg/dl)	219	193	0.001
Hemoglobin (g/dl)	12.3	11.8	0.001
Triglycerides (mg/dl)	110	94	0.01
Lymphocyte (/mm ³)	1913	2095	0.01
ESR (mm/h)	10.8	8.7	0.03
Uric acid (mg/dl)	4.33	3.98	NS
HDL cholesterol (mg/dl)	45.7	43.9	NS
Albumin (g/dl)	4.76	43.9	NS
ALP (U/l)	163.2	50.1	NS
AST (u/l)	28.1	27.2	NS
ALT (U/l)	20.9	23.6	NS
LDH (U/l)	377	393	NS
CPK (U/l)	77.9	85.3	NS
Hct (%)	35.8	34	NS
Total leucocyte (/mm ³)	5550	5570	NS
Platelet (/mm ³)	208000	202000	NS
Granulocyte (/mm ³)	3403	3256	NS

Abbreviations: BMI; body mass index, ABP; arterial blood pressure, ESR; erythrocyte sedimentation rate, HDL; high density lipoprotein, ALP alkaline phosphatase, AST; aspartat aminotransferase, ALP: alanine aminotransferase, LDH; lactic dehydrogenase, CPK; creatinine phosphokinase, NS; not significant.

levels was not meaningful in our study, as it was conducted during November, when the temperature was approximately 15 degrees Celsius. Uric acid is a byproduct of purine metabolism and increases in parallel with weight loss. However, since there is no dehydration and weight loss, uric acid levels remained to be unchanged. But in some of previous studies, it has been reported that uric acid levels might change (Hallak and Nomani, 1988; Namoni *et al.*, 1992; Nomani, 1997; Fedail *et al.*, 1982; El Ati *et al.*, 1995; Nomani *et al.*, 1990).

Ziaee *et al.* (2006) performed a study about the effect of Ramadan fasting on plasma lipids and lipoproteins in 2002 and found that weight, BMI, glucose and HDL decreased and LDL increased, but no significantly change in total cholesterol, triglyceride and VLDL during fasting in Ramadan. This study also showed that triglyceride level increased with normal BMI while it decreased in overweight subjects. Unfortunately, the association between uric acid and fasting in Ramadan was not evaluated in this study (Ziaee *et al.*, 2006).

Gumaa *et al.* (1978) observed an increase in blood triglyceride level with Ramadan fasting in subjects on a high carbohydrate diet.

Hallak and Namoni (1988) reported that the triglyceride level at the 14th day of Ramadan correlated positively with sugar intake (g/day) during this month.

The increase in blood triglyceride with high sucrose intake was also observed by Albrink and Ullrich, 1986. In our study group, statistically insignificant decrease in

hemoglobin concentration was observed, though this may in part be related to dietary habits of the subjects which is poor in proteins and to the greater number of women attending this study.

We also observed some increase in the number of lymphocytes in the peripheral blood of the subjects, though we have no clear explanation for this finding, which should be confirmed by others.

It is noteworthy that the changes in psychiatric performances that are thought to accompany Ramadan fasting are not observed by standard psychiatric tests, namely Spielberger's trait and state scales.

In conclusion, our study showed that fasting during Ramadan might cause no detrimental effects on health; on the contrary, it may be associated with some favorable effects, especially on lipid profile. Nevertheless, to draw clearer conclusions about this matter, it should be better to perform more studies with both large groups and in various groups of patients.

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