

Effect of Ramadan Fasting on Serum Lipid Profile of Bangladeshi Female Volunteers

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ABSTRACT

The study was conducted to evaluate the effects of fasting for a period of one month during Ramadan on the lipid profile of Bangladeshi female volunteers who fasted during the Arabic month of Ramadan, when there occurs a change, both in the pattern and timing of dietary intake. Findings of the study showed that Ramadan fast significantly reduced serum Total cholesterol (TC) ($p=0.030$) and Low density lipoprotein (LDL-C) ($p=0.011$). A statistically nonsignificant elevation of triglyceride (TG) was observed ($p=0.598$). High density lipoprotein cholesterol (HDL-C) also found to be raised significantly at the end of fasting ($p = 0.037$). Findings of the study revealed that fasting during the month of Ramadan changes lipid profile pattern in an antiatherogenic direction and may be beneficial to health.

Key Words: Ramadan Fasting, TC, TG, HDL-C, LDL-C, Female

Introduction

Cholesterol is the principal sterol synthesized by animals and small quantities can be synthesized in other eukaryotes such as plants and fungi. It is almost completely absent among prokaryotes including bacteria¹. Although cholesterol is important and necessary for mammals, high levels of cholesterol in the blood have been linked to the damage of arteries and are potentially associated with atherogenic cardiovascular diseases. Elevated levels of the lipoprotein fractions such as LDL-C, IDL-C and VLDL-C are regarded as atherogenic². Levels of these fractions, rather than the total cholesterol level, correlate more with the extent and progression of atherosclerosis.

Patients with elevated cholesterol levels are usually treated with a strict diet containing no trans fat, low saturated fat and low cholesterol^{3,4} and in some patients with various hypolipidemic agents, such as statins, fibrates, cholesterol absorption inhibitors, nicotinic acid derivatives or bile acid sequestrants⁵.

According to the Islamic Hijri calendar, Ramadan is the holiest month and Muslims fast during this month⁶. It lasts between 29 to 30 days. Believers are commanded to abstain from food, drink and conjugal relationships from sunrise to sunset as a sign of restraint and introspection. It is believed that Ramadan fasting improves health status. During the Ramadan fast, Muslims eat two meals a day, one before dawn and the other shortly after sunset. In addition, there is a tendency to consume foods that are rich in carbohydrate and lipids, particularly those containing mono- and polyunsaturated fatty acids^{7,8}. This change in the meal schedule accompanied by changes in sleeping habits and physical activities bring a change in lifestyle with reduced duration of sleep at night, less daily physical activities along with decrease in smoking frequency and less psychological stress^{7,9,10,11}.

Many physiological and psychological changes take place during Ramadan, most probably due

to the changes in eating patterns, eating frequency and sleep patterns¹². Some studies in the eastern Mediterranean area have shown to increase HDL-C concentration during Ramadan fast^{13,14}. A balanced diet, even less in quantity than normal, is sufficient to keep a person healthy and active during Ramadan fast. It has been established that a given nutrient ingested at an unusual time can induce different metabolic effects¹⁵. Lipid profile is affected by dietary habit, amount and type of fat present in the daily diet, amount of simple sugar intake and exercise performed^{16,17}. Some studies showed positive effects of fasting on the lipid profile changing them in antiatherogenic direction^{8,9,18,19,20}, while opposite effects were observed in some other studies^{21,22}.

Differing results have been reported on the effect of Ramadan fasting on changes in lipid profile in healthy subjects. So this study was undertaken to see the effect of Ramadan fasting on serum lipid profile in Bangladeshi female volunteers.

Materials and Methods

The study was conducted during the period of Ramadan. A total of 28 healthy female volunteers with age range between 25-80 years who were motivated to fast during Ramadan were included in the study. Informed written consent was taken from the study subjects. The detail history about the age, sex, occupation, educational status, marital status, family history and drug history were taken from the subjects. Subjects having any acute or chronic disease or on any lipid lowering medication were excluded from the study but they were allowed to continue other drug they were already taking.

Subjects were evaluated for health status at the beginning of Ramadan. Fasting blood sample was collected for analysis. Just at the end of Ramadan the subjects were reevaluated and all the investigation procedures were repeated. All biochemical parameters for the measurement of lipid profile were estimated using the available reagent kit by semi-auto biochemistry analyzer.

With all aseptic precautions 10 ml of venous blood were collected from the median cubital vein by a disposable plastic syringe. The needle was detached from the nozzle and blood was transferred immediately into a dry, clean, screw-capped plastic test tube with a gentle push to avoid hemolysis. The test tubes were kept in slanting position till formation of clot. Centrifuging the blood at 3000 rpm for 5 minutes, serum was separated and supernatant was taken into two small plastic test tubes (Eppendorf) containing 1 ml each. All the tests were carried out as early as possible.

Anthropometric measurements were taken as height in cm and weight in kg with the use of a manual machine. Participants were shoeless and wore light clothing. Body Mass Index (BMI) was calculated from subject's weight and height ($BMI = \text{weight in kg} / \text{height in m}^2$). Blood pressure (systolic and diastolic) of the subjects was measured by sphygmomanometer following a standard protocol.

Plasma total cholesterol (TC), triglyceride (TG) and high density lipoprotein cholesterol (HDL-C) were measured by enzymatic colorimetric method. Very low density lipoprotein cholesterol (VLDL) was calculated by dividing total triglycerides by five. Low density lipoprotein cholesterol (LDL-C) was calculated using the Friedewald's equation, $LDL-C = [\text{total cholesterol}] - [\text{HDL-C}] - [\text{estimated VLDL}]$.

The recorded data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 17.0. Results were expressed as mean and standard errors (SE). Student's paired 't' test was used to test the level of significance and a $p < 0.05$ was considered to be significant.

Results

The mean (\pm SE) serum total cholesterol (mg/dl) before and after Ramadan fast were 179.07 ± 9.67 and 164.18 ± 6.10 respectively. A statistically significant reduction of serum total cholesterol ($p=0.030$) was observed after Ramadan fast and reduction in total cholesterol was 8.31% (Fig.1).

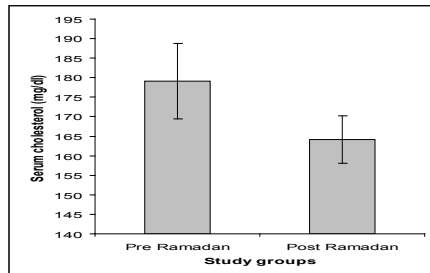


Fig. 1: Mean fasting serum cholesterol of the study groups. Results shown as mean \pm SE. Data were analyzed by Paired 't' test and a 'p' value < 0.05 was considered as significant.

The mean (\pm SE) serum TG (mg/dl) before and after Ramadan fast were 119.61 ± 3.60 and 121.93 ± 3.93 respectively. A nonsignificant rise of serum TG ($p = 0.598$) was observed at the end of Ramadan fast. The finding showed that a month long fasting during Ramadan did not reduce serum TG; rather it was increased by 1.93%. (Fig. 2)

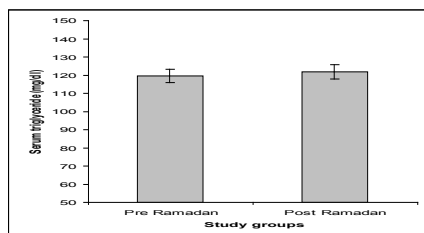


Fig. 2: Mean fasting serum triglyceride of the study groups. Results shown as mean \pm SE. Data were analyzed by Paired 't' test and a 'p' value < 0.05 was considered significant.

The mean (\pm SE) serum HDL-C (mg/dl) before and after Ramadan fast were 38.75 ± 1.01 and 41.14 ± 1.20 respectively and the difference was statistically significant ($p=0.037$). It is observed that HDL-C level was increased by 6.16% after one month of Ramadan fasting (Fig. 3).

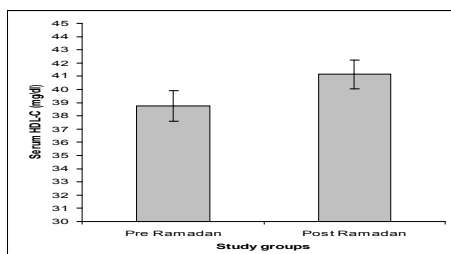


Fig. 3: Mean fasting serum HDL-C of the study groups. Results shown as mean \pm SE. Data were analyzed by Paired 't' test and a 'p' value < 0.05 was considered significant.

The mean (\pm SE) serum LDL-C (mg/dl) before and after Ramadan fast were 116.39 ± 9.41 and 92.78 ± 6.80 respectively. A significant mean difference of LDL-C ($p=0.003$) was observed before and after Ramadan (Fig. 4) and it was found that serum LDL-C was reduced by 20.28% after one month of Ramadan fasting (Fig. 4).

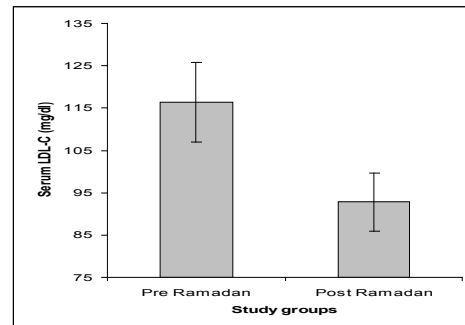


Fig. 4: Mean fasting serum LDL-C of the study groups. Results shown as mean \pm SE. Data were analyzed by Paired 't' test and a 'p' value < 0.05 was considered significant.

Discussion

A significant reduction of serum total cholesterol, LDL-C and a significant rise in serum HDL-C were observed in the present study during one month of Ramadan fasting but serum TG showed no significant difference. During Ramadan Muslims are obliged to fast during daytime. Long lasting modifications in the eating and sleeping schedule may result in various changes in metabolism.

The findings of this study showed that the reduction of serum total cholesterol at the end of one month Ramadan fast was 8.31%. This is in agreement with the study done by Al Hourani et al.²³. Published data also showed inconsistent and even conflicting findings on the effect of Ramadan fasting on blood lipids among healthy individuals. These discrepancies might be attributed to the amount and type of food intake, physical activity, ethnic and genetic background of studied populations. It is also debatable whether a diet containing less dietary fat and cholesterol can lower blood cholesterol levels²⁴, because any reduction in dietary cholesterol intake is compensated by increased endogenous synthesis of cholesterol to keep the blood cholesterol levels constant²⁵.

In this study a nonsignificant small rise of serum TG by 1.93% was observed at the end of Ramadan fast. Our findings are not consistent with the findings of Al Hourani et al.²³. They observed a significant decrease in serum triglyceride after mid of Ramadan and suggested that the reduction in serum triglycerides may be due to changes in fat intake or inherent metabolic changes during Ramadan fast. This study showed a non significant rise in the level of serum level of triglycerides. But some study showed a significant rise of serum TG after Ramadan fasting¹⁴. The rise in serum TG can be due to high intake carbohydrate and fat during Ramadan in Bangladeshi community accompanied by less exercise during this month. Also, there is a tendency for higher sugar consumption during this month.

In this study, a significant mean difference of LDL-C was observed before and after Ramadan fat and it showed that one month fasting during Ramadan reduced serum LDL-C by 20.28%. The significant reduction in LDL-C occurred despite the fact that, tendency to consume fried foods was increased during the month of Ramadan. Consumption of increased fried foods signify a higher intake of fats as compared to non-Ramadan days. It can be assumed that the quality and quantity of fat intake in Ramadan dictate blood cholesterol level. A study reported that, feeding behavior that occurs during Ramadan is beneficial and affects serum apolipoprotein metabolism and may contribute to the prevention of coronary heart disease²⁶. Elevated levels of the lipoprotein fractions, LDL-C, IDL-C and VLDL-C are regarded as atherogenic. Levels of these fractions, rather than the total cholesterol level, correlate better with the extent and progression of atherosclerotic vascular diseases²⁷.

In this study, HDL-C level showed a statistically significant rise after Ramadan fast and it was increased by 6.16%. Our findings are in agreement with the findings of many other studies^{18,19,28,29}. Plasma concentration of HDL-C is said to have a protective role against the development of atherosclerosis and cardiovascular diseases. The mechanism by which fasting increases the level of HDL-C is

not clear. Although we did not measure the amount and type of fatty acid in the dietary regimen of the study population, the findings we observed may be due to the type of fat consumed. Most of the fats consumed during Ramadan are in the form of oil and they contain unsaturated fatty acids. Our findings did not agree with the findings of Ziaee et al who observed decrease in HDL-C and increase in LDL-C at the end of Ramadan fast³⁰. Our findings also agree with the findings of a similar study done on male volunteers in Bangladeshi population³¹. From this study, it can be said that fasting is beneficial so far lipid profile is concerned and may have some protective role against the development of atherosclerotic cardiovascular disease. However a large scale study may be carried out to establish these findings on a sound footings.

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