The Effect of Ramadan Fasting on Lipid Profile in Pregnant Women

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ARTICLE INFO

Article type: Original article

Article History:
Received: 28 Jul 2015
Revised: 7 Aug 2015
Accepted: 8 Aug 2015
Published: 12 Aug 2015

ABSTRACT

Introduction: Abnormal lipid profile causes maternal mortality and impairs fetal development. This study investigated the effect of Ramadan fasting on plasma lipid profile in pregnant women.

Material and Methods: This self-control, cohort study was performed in healthy volunteer fasted pregnant women. Serum cholesterol, triglyceride (TG), low density lipoprotein (LDL), high density lipoprotein (HDL), and body mass index (BMI) were measured on 0, 7th, 14th, and 28th days of Ramadan, and two weeks after Ramadan. Statistical analysis was performed by SPSS.

Results: The mean age and BMI of participants was 26.9±6.4 year and 25±4.2 kg/m² respectively. Weight and BMI of women did not change during the study. Cholesterol and LDL significantly increased during Ramadan and decreased after Ramadan (p<0.05). No significant change was seen in TG and HDL during the study (p>0.05).

Conclusion: Cholesterol and LDL During Ramadan increases and then decreases. There was no change in the levels of TG and HDL in pregnant women. The present study findings may not be sufficient to definitely conclude that Ramadan fasting is safe during pregnancy.

Keywords:
Fasting
Cholesterol, HDL
Cholesterol, LDL
Triglycerides
Pregnancy

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Khoshdel A et al                Ramadan Fasting on Lipid Profile

collects cholesterol from the body tissues and returns it to the liver (1).

Findings about the impact of Ramadan fasting on lipid profile are controversial. Most studies show no change or a slight decrease in concentrations of TC and TG (8, 9). In a study, only TC level increased during Ramadan (10). Few studies have reported increase in HDL-C in diabetics during Ramadan (11, 12).

A study showed increased LDL-C and decreased HDL-C (13). Abnormal lipid profile not only causes maternal mortality but also impairs fetal development during pregnancy (14). There are conflicting data on the effects of fasting on lipid profile in pregnant women. We attempt to evaluate the effect of Ramadan fasting on plasma lipid profile in healthy pregnant women in this study.

Materials and methods

In this self-control, cohort study conducted in Ramadan 2012 (from 21st July to 18th August) in Shahrekord University of Medical Sciences, Iran, 39 healthy pregnant fasted women participated voluntarily.

A written informed consent was provided for all participants and women with diabetic mellitus, hypertension, or metabolic disorder or if they were smoker or on any medication were excluded from the study. This research was approved by the Scientific Advisory and Ethics Committee of Shahrekord University of Medical Sciences.

We registered demographic data including name, age and address, duration of pregnancy, height, weight and body mass index (BMI). BMI was measured to the nearest one kg and height to the nearest one cm.

Blood samples were taken at the 7th, 14th, and 28th days of Ramadan, as well as within the 2nd week after Ramadan between 13:00 and 14:00 o’clock to measure serum level of lipids. The blood samples were centrifuged at room temperature for 5 min at 4000 rpm and serum was collected and stored at -20°C for analysis of lipid profile. TC, TG, and HDL-C were determined enzymatically by Hitachi 917 (Roche, Mannheim, Germany). LDL-C was estimated by the Siemens Dimension RxL Max by using the Siemens enzymatic methods (Siemens Medical Solution Diagnostics, Tarrytown, NY) (15).

The mean ± standard deviation was used for descriptive statistics. The parametric repeated measures analysis of variance was applied to determine whether any differences exist among variables of interest during the study period. The F-tests of Greenhouse-Geisser were used within the subject analysis because of violation in sphericity assumptions. To evaluate relationships among variables, Pearson coefficient of correlation was used. Statistical significance was defined as < 0.05 and data analysis was performed by SPSS version 17 (SPSS Inc, Chicago, IL, USA).

Results

In this self-control cohort study, 39 healthy pregnant fasted women participated voluntarily. Their age range was from 17 to 42 years, with mean of 26.9 ± 6.4 years. Their gestational age was from 7 to 39 weeks with mean of 22.4 ± 7.9 weeks. The BMI of woman at the beginning of the study was from 18.3 to 35.9 kg/m with mean of 25 ± 4.2 kg/m.

The variations in the studied variables during the study are shown in Table 1 and the trends are shown in Figure 1. Weight and BMI of women did not change during the study. Cholesterol and LDL significantly increased

### Table 1: Lipid factors during three measurements during Ramadan and two weeks after Ramadan

<table>
<thead>
<tr>
<th></th>
<th>First Week</th>
<th>Second Week</th>
<th>Fourth Week</th>
<th>Two Weeks after Ramadan</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (kg)</td>
<td>62.31 ± 10.91</td>
<td>62.02 ± 10.69</td>
<td>62.17 ± 10.71</td>
<td>62.53 ± 10.67</td>
<td>0.721</td>
</tr>
<tr>
<td>BMI</td>
<td>25.05 ± 4.24</td>
<td>25.04 ± 4.25</td>
<td>25.11 ± 4.46</td>
<td>25.25 ± 4.26</td>
<td>0.713</td>
</tr>
<tr>
<td>Triglycerides (mmol/L)</td>
<td>171.6 ± 75</td>
<td>167.4 ± 75</td>
<td>169.2 ± 74.4</td>
<td>162.6 ± 80.1</td>
<td>0.368</td>
</tr>
<tr>
<td>Cholesterol (mmol/L)</td>
<td>193.7 ± 42.1</td>
<td>197.9 ± 44.1</td>
<td>212.2 ± 54.3</td>
<td>192.1 ± 48.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>HDL</td>
<td>53 ± 11.2</td>
<td>52.3 ± 10</td>
<td>51.1 ± 8.9</td>
<td>51.4 ± 11.8</td>
<td>0.612</td>
</tr>
<tr>
<td>LDL</td>
<td>107.8 ± 32.9</td>
<td>112.9 ± 33.4</td>
<td>127.1 ± 43.7</td>
<td>108.3 ± 35.1</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

*Body mass index; **High density lipoprotein; ***Low density lipoprotein.*
during Ramadan and decreased after Ramadan. Tests of within subject contrasts showed a significant increase in the cholesterol and LDL in the fourth week of Ramadan compared to the first week (P<0.001). No significant change in TG and HDL was found during the study.

Discussion
In this study we determined the changes in lipid profile throughout the Ramadan in fasted pregnant women for the first time. The results of our study showed that the weight and BMI of pregnant women did not change during fasting. This finding is in agreement with some studies which showed no change in body weight during Ramadan fasting (16, 17). It is likely due to decrease in BMI of mother herself, but the trend of fetal growth is continued.

Weight loss of 1.7 kg (18) and 3.8 kg (19) has been reported in normal weight individuals after they have fasted. Pregnancy is a physiological condition with special nutritional requirements essential for the optimal maternal and neonatal outcomes.

During Ramadan, fasting people normally intake 2 meals, one before dawn (Sahari) and one just after sunset (Iftar). In a study weight and BMI of women did not change during the study. This finding is in agreement with some studies which showed no change in body weight was seen during Ramadan (20).

One of the causes of poor weight gain in our study is decrease in maternal daily caloric intake. Some studies of non obstetrics literature showed reduced energy intake (21, 22), and few studies reported increase in daily energy intake during Ramadan that led to an overall weight gain (23, 24). But, poor weight gain and lack of change in BMI in our study showed that food deprivation caused decrease in energy intake. This probably resulted of decrease in energy resource cause to decrease in lipid reserve that it is expected in that BMI was changed.

As a result of caloric insufficiency, low gestational weight gain may induce maternal hormonal and metabolic response that may have abnormal prognosis for neurological development of the fetus (24).

There are a very limited number of studies investigating the effect of caloric restriction on the risk of preterm labor and preterm delivery (25). Meal pattern variations were shown to influence the frequency of preterm delivery in pregnant women (26).

Siega Riz et al reported that women who ate fewer than three meals and two snacks per day had a 30% higher risk for preterm delivery compared with no increased risk for preterm labor among women with less than optimal meal frequencies (26). Therefore, improving the nutritional status of pregnant women has been suggested as a route to reducing the risk of preterm delivery (27).

Herrmann et al found that 13-"h" fasting in 237 pregnant women significantly increased maternal corticotrophin-relapsing hormone (CRH) concentrations compared with fasting of shorter duration. An inverse linear relationship between maternal CRH concentration and gestational age at delivery was also established (28).

Also we found a significant increase in cholesterol and LDL in fourth week of Ramadan compared to the first week (P < 0.01).

Some studies about the effect of lipid profile in Ramadan fasting in healthy individual have been done, as well. In a study, serum cholesterol and TG significantly decreased in Ramadan fasting (19). According to Adlouni et al study (8), the TC and LDL-C significantly decreased during Ramadan. These two studies are not consistent with our study.

In a study Ramadan fasting led to significant increase in LDL (29). Another important finding in our study was that TC and LDL significantly increased during Ramadan and decreased after the Ramadan. The rise in TC and LDL may be due to an increase in hepatic lipase activity and a decrease in lipoprotein lipase activity (30). This may be resulted from body dehydration. Dehydration trigger blood dilution and increase in lipid profile volume in Ramadan fasting.

Also, maternal hypercholesterolemia has been linked to increased cholesterol deposition in the fetal aorta that may influence risk of long term morbidity (31).

An abnormal lipid profile is known to be strongly associated with atherosclerotic cardiovascular diseases and has a direct effect on endothelial dysfunction. Several studies have shown that endothelial dysfunction is related to hyperlipidemia (32).
Normally, in early pregnancy altered levels of serum lipid profile increase risk of pregnancy-induced hypertension (32).

Pregnancy-induced hypertension may cause several critical problems in pregnancy, such as premature delivery, intrauterine growth restriction, fetal death, and maternal mortality and morbidity (33). In some studies, the birth weight was unaffected by Ramadan fast in babies born at full term (34, 35).

Endothelial dysfunction is the most important event in the pathogenesis of hypertension during pregnancy and abnormal levels of lipid profile play a critical role in its induction of endothelial dysfunction (36, 37). Also, an increase in LDL is associated with the development of atherosclerosis (38).

Conclusion

Cholesterol and LDL during Ramadan increases and then decreases. There was no change in the levels of TG and HDL in pregnant women. Our findings, especially if taken together, indicate that fasted pregnant women could have a risky pregnancy and may put pregnant fasted women at risk. Also, it is important to remember that the effect of abnormal lipid profile in pregnant fasted women may not always be immediate. Therefore, the present study findings may not be sufficient to conclude that Ramadan fasting is safe during pregnancy.

Acknowledgments

The present study is derived from a research project with grant no. 860 and ethical no. 93-3-2 approved by Research and Technology Deputy of Shahrekord University of Medical Sciences. The authors especially thank the women who participated in the study.

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