Anthropometric measurements and lipid Profile Study during Ramadan Fasting

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Abstract

This study was designed to examine the influencer of Ramadan fasting on various anthropometric measures and lipid profile in young healthy Iraqi house physicians. The participants were 28 subjects, age range 25-33 years during Ramadan of 1415 Hijra.

Anthropometrics and plasma lipids were measured on first morning of Ramadan, mid–Ramadan, and of Ramadan, and two erks after Ramadan. Fasting in Ramadan changes the plasma lipids positively; cholesterol is reduced, HDL is increased, and both LDL and triglycerides are reduced.

Weight, BMI, and skin fold thickness showed some parallel changes to that of lipids Mid–arm muscle circumference (MAMC) had been altered, a point in favor of the sparing effect of fasting on muscle glycogen breakdown.

This work add a new data in relation to adaptive mechanism during Ramadan fasting and its hypolipidimic influence.

Introduction

Ramadan fasting is a duty for Muslim every year, which entails a daily voluntary intermittent deprivation of food and drink from dawn till sunset for one lunar month. Though it is an obligatory above the age of puberty but it is practiced at a much earlier age than that, in a discontinuous manner such as part of the day, like from dawn till mid-day or for few days and this will be increased at a subsequent Ramadan each year, which helps for acclimatization later on.
Owing to the nature of Ramadan fasting, Muslims live at an altered biological rhythm, which leads to a change in the pattern of their whole human activity, such a change necessitates a chronobiological adaptation for the human body, so as to sustain this type of biological stress[1].

The liver plays a significant role as a glucostat. In Ramadan, the catabolic process with glycogenolysis to supply glucose for energy is set up and such process will proceed to supply energy, particularly for brain tissue. The liver can sustain the blood glucose level for 8-10 hours, this process is supported by the lipolysis at the fat storing sites, with resultant glycerol and Free Fatty Acids and some of it will form ketones which is being used efficiently as an energy source at an extrahepatic tissues so that to spare the glucose for utilization by the Central Nervous System[2].

In Ramadan, fasting took more than 10 hours and the adaptive mechanisms have to deal with such situation and during this prolonged state of fasting an active lipolysis was set up to supply energy.

The aim of the present work is to investigate the effect of Ramadan fasting on weight, lipid profile and anthropometric measurements at the beginning, mid, and two weeks after Ramadan.

**Materials and Methods**

Twenty-three male volunteers house physicians with age range 25-32 (26.5 ±2.6) and had a mean body weight of 63.38 ± 7.28 at Mosul Teaching Hospital, in Northern Iraq have participated in this study. They were non smokers and none of them were taking any medication known to affect the lipid metabolism. The study was conducted for 6 weeks, so that it gives a better profile during Ramadan month and two weeks post fasting, for various anthropometrics and serum plasma lipids. This was made possible because all participants were living in the same hospital.

The dietary source was supplied from hospital restaurant at fast break and salaur times. The food constitutes were of weight maintenance diet.

A fasting venous blood sample of each subject was taken at 8.00 AM on days 0 (base line) which corresponds to day 1 of the Ramadan fasting month. The blood samples were analyzed for plasma TGs, Tot - Chol and HDL-Chol by using Varley et al. Method & LDL-Chol was obtained by calculation as follows: LDL-chol = Total-Chol-TGs/5 - HDL-Chol.

**Anthropometric measurement**

Each subject was weighed at the same time of the day at 10.00 AM in light clothing and without shoes, the reading was taken to the nearest 0.1 Kg., the height of each subject was taken without shoes. The body mass index (BMI) was calculated by dividing the weight in kg by square of the height in meters. On measuring mid-arm muscle circumference, the relative contribution of fat and muscle can be calculated (Mid-Arm Muscle Circumference MAMC = Ann Circumference - Triceps Skin Fold)

An accurate skin fold thickness measurements require special calipers such as Harpenden caliper (Holtain Ltd., Bryberian, Cryninmych, Pembrokeshire)[5,6,7]. Other anthropometrics like triceps, biceps, infrascapular, suprailiac, upper arm circumference, upper thigh and calf were all measured and recorded in mm.

**Statistical Analysis**

Results are expressed as mean ± SD. The significance of difference among the means of day 1 (base line), day 14, day 28 and 14 days post fasting were obtained on using paired t-test. The P-value at 5% level was considered significant.

**Results**

**Body Weight**

The body weight, body mass index, and skin fold thickness are listed in Table(1).
With Ramadan fasting, there was a range reduction in mean body weight (0.10 - 1.10Kg) during the study period. However, the B was not changed during the same period. The mean weight loss for the 4 weeks period was 0.67 Kg and 1.10 Kg two weeks after Ramadan. The body weight loss increased during the later part of Ramadan, and continued to do so 14 days post fasting. There was significant reduction (P < 0.001) among skin fold thickness of triceps, biceps, infrascapular, upper arm circumference, upper thigh during the study period, also with calf at day 28 compared with base line values. The Mid Arm Muscle Circumference MAMC was nearly unchanged all through Ramadan and 2 weeks after in this study.

Blood Lipids
Tot-Chol, HDL-Chol, LDL-Chol, blood TGs and the ratio of Tot chol: BDL-Chol are listed in Table (2). There was a significant reduction in the means of blood lipids at days 14, 28 and 14 days post fasting compared with base line values.

Discussion
The reduced body weight during the study period, the decrease in blood TGs: phase 1 and 2 as well as 14 days post fasting are indications of excess lipolysis. Fasting is effective in lowering TGs level even in those consuming high carbohydrate diet and with high sugar intake[8]. The mobilization of body fat is associated with weight loss and a decrease in TGs level. This study has reported a lowered blood cholesterol, while a previous study showed a decrease in blood cholesterol like ours[9], others showed an increase[10,11]. The Total-Chol: HDL-Chol ratio was <4.5, the ratio above which the chances of coronary problems are enhanced[12,13]. LDL-Chol in this study demonstrated a decline in the mid and end of Ramadan and even two weeks later. The value of this observation awaits further longitudinal study.

Previous studies showed that when the subjects are kept on a weight-maintenance diet, the HDL-chol level was enhanced[14,15] which is in accordance with the present study. Exercise brought no changes in HDL-Chol [16], increasing it[7], and even decreasing it[18]. Our results were associated with an increase in HDL. Maintenance through appropriate energy intake and exercise seems a practical way to attain an optimal HDL-Chol level. Ramadan fasting provides an opportunity to achieve this goal. Muslims are used to fast twice per week and more through the year in addition to Ramadan fasting which gives them usefulness of intermittent fasting with weight maintenance diet. This study showed a reduction in LDL-chol that was associated with a similar reduction in total cholesterol.

In several studies, a decrease in blood LDL-chol was accompanied by a reduction in total cholesterol[19]. Furthermore, a reduction in LDL-chol along with an increase in HDL chol has also been observed. In this study, there is to a certain extent a steady source of energy intake through weight maintenance diet, which is associated with a useful chronobiological and metabolic adaptation. Gluconeogensis from body protein is indicated by the reported decrease in total serum proteins, including albumin, in the first week of Ramadan fasting. The return of serum proteins to prefasting levels in the second week of Ramadan onwards despite continuous need for glucose and the lack of evidence of frank fat catabolism justifies concluding that glycogen stores, which normally covers 8-10 hours of fasting as a source of glucose, have increased to bridge a longer fast as evidenced from anthropometric measurements of upper arm circumference, mid arm muscle

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circumference, calf and upper thigh circumferences.

The tradition of consumption of excess sweets during Ramadan between sunset and dawn may be a subconscious means to increase the glycogen storage. There is an evidence that glycogen stores are dictated by body needs, muscle biopsies in trained athletes show much increased glycogen contents[20].

Glycogen is a most economical form of storing energy, particularly so when formed from absorbed glucose. They develop an acclimatization to the Ramadan fast through an increase in glycogen storage during the break of the fast and its release as glucose during fasting. It starts partly at the expense of protein gluconeogenesis, which could produce glycogen, but soon depends on ingested carbohydrates.

Glycogen storages act to bridge the usual internal and overnight glucose needs. When internal intervals become prolonged, as in the Ramadan fast, glycogen stores have to increase so as to suffice maintaining glucose demands for the new wider tune interval. This process develops over a period of a “few” days without its developments a protein catabolic state and undesirable production of excess ketone bodies become inevitable. The latter is the status on the first day of fasting Ramadan.

In conclusion, Ramadan fasting is associated with a useful hypolipidaemic effect with a decrease in Total - Chol, LDL - Chol and a rise in HDL-Chol, tile associated weight reduction which slowed down in the second phase of Ramadan fasting, is regained two weeks post fasting.

The unchanged anthropometric measurements of the mid arm muscle circumference gives a clue to an increase in the glycogen muscle storage for further energy supply during long fasting hours, and an excess lipolysis. The intermittent way of Ramadan fasting is useful for the human body and it activates a chronobiological rhythm of adaptive mechanisms.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean ± SD</th>
<th>First morning of Ramadan</th>
<th>Mid Ramadan</th>
<th>End of Ramadan</th>
<th>Two weeks after Ramadan</th>
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</thead>
<tbody>
<tr>
<td>HDL-Chol</td>
<td>50.0±3.0</td>
<td>51.2±9.8</td>
<td>53.8±4.3</td>
<td>55.9±5.4***</td>
<td>55.9±5.4***</td>
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<td>LDL-Chol</td>
<td>137.2±10.8</td>
<td>132.2±15.2</td>
<td>128.9±11.3*</td>
<td>122.8±11.1*</td>
<td>129.9±4.2</td>
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<td>TGs</td>
<td>136.9±5.6</td>
<td>133.7±4.4*</td>
<td>132.4±5.0**</td>
<td>129.9±4.2</td>
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<tr>
<td>T-Chol/HDL</td>
<td>2.8±0.3</td>
<td>3.7±6.7</td>
<td>2.4±0.4</td>
<td>2.2±0.4</td>
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</table>

* Significant difference from first morning of Ramadan at p≤0.05, ** at p≤0.01, *** at p≤ 0.001.
**Table 2** Anthropometric measurements of 23 subjects during and after two weeks of end of Ramadan fasting.

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
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<th>4</th>
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<tbody>
<tr>
<td>Triceps</td>
<td>4.56(1.45)</td>
<td>4.55(1.37)</td>
<td>4.29(1.25)</td>
<td>4.15(1.26)</td>
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<tr>
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<td>&lt;0.001</td>
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<td>Biceps</td>
<td>3.06(0.61)</td>
<td>2.66(0.49)</td>
<td>2.32(0.47)</td>
<td>2.34(0.47)</td>
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<td>&lt;0.001</td>
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<tr>
<td>Infrascapular</td>
<td>9.54(2.85)</td>
<td>8.93(2.65)</td>
<td>8.44(2.73)</td>
<td>8.60(2.68)</td>
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<tr>
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<td>&lt;0.001</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
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<tr>
<td>Suprailiac</td>
<td>6.95(2.86)</td>
<td>6.59(2.79)</td>
<td>6.05(2.44)</td>
<td>6.12(2.41)</td>
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<td>&lt;0.001</td>
<td>&lt;0.05</td>
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<td>Upper arm circumference</td>
<td>26.78(2.35)</td>
<td>25.69(2.13)</td>
<td>25.29(2.41)</td>
<td>25.53(2.35)</td>
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<td>Upper thigh</td>
<td>53.75(2.19)</td>
<td>51.64(5.67)</td>
<td>50.50(5.39)</td>
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<td>Calf</td>
<td>36.28(2.19)</td>
<td>35.03(2.33)</td>
<td>33.50(2.33)</td>
<td>31.89(2.56)</td>
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<td>MAMC</td>
<td>25.17(1.94)</td>
<td>24.30(1.78)</td>
<td>24.02(1.78)</td>
<td>24.53(1.90)</td>
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<td>NS</td>
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<tr>
<td>BMI</td>
<td>22.44(2.32)</td>
<td>22.26(2.39)</td>
<td>22.05(2.29)</td>
<td>22.53(2.50)</td>
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<td></td>
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<td>NS</td>
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<tr>
<td>Weight</td>
<td>62.00(7.41)</td>
<td>61.90(7.36)</td>
<td>61.43(7.11)</td>
<td>60.90(7.01)</td>
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<tr>
<td></td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
<td>&lt;0.001</td>
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</table>

Height: 1.50(0.26); Age=26.5(2.60); P-value is significant at 5% level.
1. First morning of Ramadan.
2. Mid Ramadan
3. End of Ramadan.
4. Two weeks after Ramadan.

**References**
8. Hallak NH, Nomani MZA. Body weight loss and changes in blood lipid