The Influence of Ramadan Fasting on Some Hematological and Biochemical Parameters in Healthy Adult Males

Zahid J. Mohammed, PhD*

***Instructor, Basic and Medical Sciences Department, College of Nursing, University of Baghdad**

المستخلص

الهدف: رمضان هو الشهر المقدس لدى المسلمين حيث يمتنعون عن الطعام والشراب من بزوغ الفجر حتى الليل. أجريت الدراسة في شهر رمضان المبارك لمعرفة مدى تأثير الصيام على بعض مكونات الدم، وحالة الدهون، واختبارات وظائف الكلى والكبد لدى الذكور البالغين الأصحاء.
المنهجية: أجريت هذه الدراسة في شهر رمضان - ١٤٣١ هجري (آب - أيلول ٢٠١٠). وكانت عيّنة الدراسة ٥٦ من الأشخاص الذكور البالغين الأصحاء. أخذت خمس عيّنات من الدم لخمسة أوقات (قبل الشهر وفي اليوم ١ و ١٥، ٢٨ من الشهر وبعد انتهاء رمضان). وقد تمّ تقدير الهيموغلوبين، كريات الدم البيضاء والصفائح الدموية، اختبار وظائف الكلى (يوريا الدم، وحمض اليوريك، الالبومين، البروتين الكليّ)، جلوكوز الدم، الكولسترول، الدهون الثلاثية، البروتينات الدهنية عالية ومنخفضة الكثافة، فضلاً عن اختبار وظائف الكبد (أسبارتيت ترانسفيريز، ألنين ترانسفيريز، البيليروبين الكلي).
النتائج: أظهرت الدراسة أنّ متوسط أعمار عيّنة الدراسة هو 48.4 ± 7.15سنة وأنّ معدل أوزانهم 79.92 ± 7.94 كغم.لم تلاحَظ أيّة تغييرات معنوية في الوزن وهيموغلوبين الدم وعدد خلايا الدم البيضاء وعدد الصفائح الدموية وكذلك مستوى يوريا الدم والالبومين، بينما أظهرت مستويات حمض اليوريك والبروتين الكليّفي الدم انخفاضاً معنوياً أثناء وبعد صيام شهر رمضان ($P < 0.05, 0.01$).

وأظهرت مستويات لجوكوز الدم انخفاضاً غير معنوي من الناحية الإحصائية وكذلك التغييرات في الكولسترول والدهون الثلاثية كانت غير معنوية في الأسبوعين الأوليين من شهر رمضان. لوحظت نفس التغييرات بمستوى معنوي ($P < 0.05, 0.01$) في البروتينات الدهنية في اليوم ١٥ و ٢٨ من الشهر. وأظهرت نتائج مستويات وظائف الكبد تغييرات معنوية، في حين لم يتغير مستوى البيليروبين الكليّ خلال الصيام.
التوصيات: توصي الدراسة بإجراء المزيد من الدراسات الأخرى تشمل مجموعة أكبر من العيّنات والتي تمثل شرائح مختلفة من المجتمع الأصحاء وغير الأصحاء.

Abstract:

Objective(s): Ramadan is the Holy month of the Muslims, where they are required to abstain from food and drinks from dawn till the beginning of night. This study was conducted in Ramadan to investigate the effect of fasting on hematological incidences, lipid profile, renal and liver function tests among healthy adult males.

Methodology: The present study was carried out in Ramadan – 1431 of Higira (August-September 2010). The study sample was 56 healthy adult males. Five samples of blood were taken at five intervals (Before, at day 1, 15, 28 and after Ramadan). Estimation was done for hematological markers, (hemoglobin, white blood cells count, platelet count); renal function tests (blood urea, serum uric acid, serum albumin, total serum protein); biochemical parameters, (blood glucose, total serum cholesterol, serum triacylglyceride, high and low density lipoproteins) and liver function tests (AST, ALT, Alkaline phosphatase, total serum bilirubin).

Results: The mean age of the subjects was 48.4 years (SD 7.15) and mean weight was 79.92 kg (SD 7.94). No significant changes were observed in weight, hemoglobin, white blood cell count and platelets count, blood urea and serum albumin values. Whereas, serum uric acid and total serum protein levels were statistically lower during and after Ramadan ($P< 0.05, 0.01$).

Blood levels of glucose showed no significant decrease and serum cholesterol and serum triacylglyceride results were non-significant at first 2 weeks of Ramadan.

The same significant changes ($p< 0.05, 0.01$) were observed in the lipoprotein at day 15 and 28 of Ramadan. Findings of liver functions levels showed significant changes. While, total serum bilirubin still with no significant changes during Ramadan.

Recommendations: The present study recommends performing more studies with both larger groups and in various categories of healthy and unhealthy subjects.

Keywords: Ramadan, hematological index, lipid profile, liver functions, renal functions

Introduction

Ramadan is the ninth Holy month of the Islamic (Hegira) calendar. During this month all healthy adult Muslims, males and females are expected to abstain from food, fluids, oral medications, smoking from dawn till the beginning of night [1]. The Islamic calendar moves forward about 11 days every Gregorian Christian year. Ramadan can, therefore, occur in any of the four seasons and the duration of fasting can vary from 12-18 hours depending upon the exact time of dawn and sunset in each country or region [2].The classic Islamic point of a view is the Ramadan fasting is good for health and spiritual purity of Muslims. Fasting is also necessary to obtain the spiritual rewards of Allah. For these reasons some Muslims who are religiously exempted from fasting insist on fasting (in many instances regardless a medical advice) [1]. In particular, the majority of the Muslims diabetic patients insist on fasting; even those poorly controlled or with serious complications [3]. Several studies are conducted on fasting during Ramadan which does not have any adverse effect on healthy adults [4,5]. Although there have been several studies regarding the effect of fasting on various metabolic aspects of human, it remains to be conflicted.

The aims of this study are to assess the impact of fasting during Ramadan on healthy persons and to evaluate the effect of fasting on some hematological and biochemical profiles on healthy adult males.

Methodology

Samples:

This prospective study is conducted during Ramadan - 1431 Hegira (August – September 2010) in Al-Nauman Hospital in Baghdad. Fifty six healthy adult male, who are volunteers and having no evidence of diabetes mellitus, hypertension, or any other chronic illness. All of them are non-smokers, non-obese and observed fast through Ramadan. None of them is taking any medication affecting carbohydrate and/or lipid metabolism. The mean age of subjects is (48.4 ± 7.15) years. Before, during and after completion of Ramadan, body weight and arterial blood pressure are recorded.

Setting:

For examining the parameters of this study, 5 ml of venous blood obtained at five stages from each subject, one week before the start of fasting, on day 1, 15, 28, and one week after Ramadan. The time of blood sampling in the study was 9-10 a.m., at which all volunteers were fast. Blood was collected in plain tube and EDTA tubes. Serum is obtained by low speed centrifugation at 1000 rpm for 15 minutes, and samples are immediately separated and stored at about -20 C until analysis. All serum samples are analyzed in a single batch to avoid day-to-day laboratory variation. Hematological and biochemical measurements take place in the clinical laboratory of Al- Nauman Hospital.

Fresh EDTA blood is use to determine haematological parameters (hemoglobin Hb, white blood cell counts and platelets.

Serum lipid profile (total cholesterol (TC), serum triglycride (TGs), serum high density-lipoprotein (S. HDL-c), serum low density lipoprotein (S. LDL-c) and serum very low density lipoprotein (S. VLDL-c) are measured by an enzymatic colorimetric method using commercially provided kits by Bio-Mighreb Diagnostic Company.

Fasting blood glucose, urea, serum albumin, serum uric acid, total serum bilirubin, total serum protein, serum AST, serum ALT and Serum alkaline phosphtase as biochemical parameters are measured by kits of Bio-Mighreb. Diagnostic Company.

Statistical analysis:

All data are expressed as mean ± standard deviation (SD). ANOA is used to analyze repeated measures; pre and during Ramadan variables. Differences are considered significantly of p values are and after than 0.05 or 0.01. All analysis is performed using the statistical package (SPSS) version 10.

RESULTS

Table 1. Hematological indices of the subjects before, during and after Ramadan fasting (n=56)

Tests \ Fasting	Week before Ramadan	Day 1 of Ramadan	Day 15 of Ramadan	Day 28 of Ramadan	Week after Ramadan
Hemoglobin (gm/dl)	13.8± 0.12	13.4± 0.6 NS	13.9 ± 0.46 NS	13.12 ± 0.5 NS	**13.32 ± 0.8** **NS**
W.B.C.s count (cell/ml)	$8\times10^3 \pm 4\times10^2$	$8\times10^3 \pm 4\times10^2$ NS	$8.2\times10^3 \pm 4\times10^2$ NS	$8.2\times10^3 \pm 3\times10^2$ NS	**$8\times10^3 \pm 4\times10^2$** **NS**
Platelets count (unit)	**$320\times10^3 \pm 35$**	**$327\times10^3 \pm 28$** **NS**	**$330\times10^3 \pm 27$** **NS**	**$328\times10^3 \pm 25$** **NS**	**$332\times10^3 \pm 35$** **NS**

NS= Not significant; W.B.C.s.= White Blood Cell(s)

Fifty six healthy volunteer males are included in this study. The mean age of the subjects is 48.4 ± 7.15 years (ranging from 36 to 59 years) and their mean weight is 79.92 ± 7.94 kg. No significant changes are observed in weight, hemoglobin, white blood cell count and platelet count values before, during and after Ramadan fasting when compared with values before beginning of Ramadan (P > 0.05, 0.01), and all values are within normal as shown in table 1.

Table 2. Comparison of the effect of Ramadan fasting on renal function tests (n=56)

Tests \ Fasting	Week before Ramadan	Day 1 of Ramadan	Day 15 of Ramadan	Day 28 of Ramadan	Week after Ramadan
B. Urea (mmol/l)	5.6 ± 0.6	5.5 ± 0.5 NS	5.5 ± 0.5 NS	5.3 ± 0.5 NS	**5.2 ± 0.5** **NS**
S. Uric Acid (µmol/l)	366 ± 40	369 ± 39 NS	344 ± 37 P < 0.05	357 ± 38 P < 0.05	**372 ± 39** **P < 0.05**
S. Albumin (g/l)	41 ± 4.7	41 ± 4.2 NS	40.9 ± 3.9 NS	41.3 ± 2.6 NS	**40 ± 5.2** **NS**
T.S. Protein (g/l)	**76 ± 4.0**	**73 ± 7.0** **P < 0.05**	**73.1 ± 0.6** **P < 0.05**	**72.1 ± 7.9** **P < 0.05**	**75 ± 6.5** **NS**

B. Urea= Blood Urea; NS= Not significant; P= Level of probability; S. Albumin= Serum Albumin; S. Uric Acid= Serum Uric Acid; T.S. Protein= Total Serum Protein

This table shows the effect of Ramadan fasting on renal function tests, which there are no significant changes in blood urea and serum albumin, when compared with shows that findings at week before Ramadan with all periods of the study (p > 0.05, 0.01), whereas, serum uric acid and total serum protein levels are statistically low during Ramadan than they are before fasting.

Table 3. Changes in lipid profile and blood glucose upon fasting of Ramadan (n=56)

Tests \ Fasting	Week before Ramadan	Day 1 of Ramadan	Day 15 of Ramadan	Day 28 of Ramadan	Week after Ramadan
B. glucose (Fast.) (mmol/l)	5.3 ± 0.15	4.1 ± 0.3 NS	4.17 ± 0.3 NS	4.2 ± 0.3 NS	**4.62 ± 0.3** **NS**
S. Cholesterol (mmol/l)	5.5 ± 0.6	5.7 ± 0.7 NS	5.3 ± 0.6 NS	4.9 ± 0.6 P < 0.05	**4.5 ± 0.7** **P < 0.05**
S. Triacylglycerides (mmol/l)	1.6 ± 0.4	1.5 ± 0.3 NS	1.53 ± 0.56 NS	0.9 ± 0.7 P < 0.01	**1.1 ± 0.29** **P < 0.01**
S. HDL-C (mmol/l)	0.8 ± 0.2	0.82 ± 0.3 NS	0.1 ± 0.3 P < 0.05	0.9 ± 0.7 P < 0.05	**0.1 ± 0.2** **P < 0.05**
S. LDL-C (mmol/l)	4.4 ± 0.6	4.5 ± 0.6 NS	3.9 ± 0.71 P < 0.05	3.27 ± 0.5 P < 0.01	**4.0 ± 0.5** **P < 0.05**
S. VLDL-C (mmol/l)	**0.3 ± 0.06**	**0.29 ± 0.56** **NS**	**0.2 ± 0.45** **P < 0.05**	**0.23 ± 0.05** **P < 0.05**	**0.2 ± 4.2** **P < 0.05**

B. glucose= Blood glucose; S. Cholesterol= Serum cholesterol; S. HDL= Serum High Density Lipoprotein; S. LDL= Serum Low Density Lipoprotein; S. Triacylglycerides= Serum Triacylglycerides; S. VLDL= Serum Very Low Density Lipoprotein

Results of blood levels of glucose and lipid profile are given in table (3), showed a slightly decrease of blood glucose during the month of Ramadan, but the decrease is statistically non-significant. Changes of serum cholesterol and serum triacylglyceride results are non-significant in the first 2 weeks of Ramadan. Then, the levels are decreased significantly when compared to that result before Ramadan.

The same significant changes ($p < 0.05$ and $p < 0.01$) are observed in the lipoproteins (HDL-c, LDL-c and VLDL-c) on day 15 and 28 of Ramadan and also a week after completion of fasting.

Table 4. Comparison of the effect of Ramadan fasting on liver function tests (n=56)

Fasting / Tests	Week before Ramadan	Day 1 of Ramadan	Day 15 of Ramadan	Day 28 of Ramadan	Week after Ramadan
S. AST (IU/L)	8.9 ± 3.5	8.8 ± 3.5 NS	8.0 ± 3.3 P < 0.05	8.0 ± 3.0 P < 0.05	**8.8 ± 3.5** **NS**
S. ALT (IU/l)	17 ± 7.9	17 ± 7.9 NS	15.4 ± 7.4 P < 0.05	14.0 ± 6.5 P < 0.01	**17 ± 7.8** **NS**
S. Alk. Phosphatase (IU/L)	5.6 ± 0.6	5.5 ± 0.5 NS	5.5 ± 0.5 NS	5.3 ± 0.5 P < 0.05	**5.2 ± 0.5** **P < 0.01**
T.S. Billirubin (µmol/l)	**7.0 ± 0.6**	**6.6 ± 0.6** **NS**	**6.9 ± 0.6** **NS**	**7.0 ± 0.7** **NS**	**5.2 ± 0.5** **NS**

S. AST= Serum Aspartate Aminotransferase; S. ALT= Serum Alanine Transaminase; S. Alk. Phosphatase= Serum Alkaline phosphatase; T.S. Bilirubin= Total Serum Bilirubin

Findings in table (4) show the differences of AST, ALT and alkaline phosphatase, as a liver function tests, in both first half of the month (15th day) and in the end of the month (28th day) compared with week before Ramadan and these differences are significant (p < 0.05 & 0.01), while the level of serum total bilirubin still with no significant change during in this study.

Discussion

Each year millions of Muslims refrain from eating or drinking from dawn (Sahur) to beginning of night (Iftar) during the holy month of Ramadan, which is a controlled partial type of hunger. Two meals a day, one before dawn and one after sunset is eaten. There is no obligation in the type of food consumed and this part may explain why surprisingly no weight loss is usually observed during the Ramadan even though the total food intake is limited. This observation and the findings of the prior studies are consistent with our findings that the subjects do not usually lose weight during Ramadan compared with it before fasting [6-7]. Studies report that the effect of Ramadan fasting on hematological parameters has been conflicting and inconsistent. In this study, hemoglobin and platelet count still unchanged as shown in table (1) which is consistent with Huda and Sarraf-Zadegan [8-9].

Although, other studies showed a significant decrease in hemoglobin and hematocrit [2]. These controversial results may be due to geographic, climatic, economical and nutritional variation [10]. Many previous studies have been published about the effect of fasting on renal function tests -blood urea, serum createnine and albumin- in healthy individuals reported small changes that were statistically not significant. The results of our study are consistent with the previous studies (Table 2) [11-12]. On the other hand, the published literatures deal with the effect on serum uric acid show slight changes that doesn't deviate from normal range, which is probably due to decrease in glomerular filtration rate and uric acid clearance [10], which agreed with our results that show slight decrease during fasting, but still within normal range [7,13].

Carbohydrate and lipid metabolism is influenced by fasting, resulting in changes in blood chemistry. There is no caloric intake during fasting and the continual use of glucose in the body for various vital functions lead to lowering blood glucose level [14].

The depletion of glycogen stores after prolonged fasting further more decreases its level. Our study demonstrated lower levels of blood glucose during the month of Ramadan in contrast with the beginning of fasting, but within normal , that are consistent with the observations reported by earlier workers [15-16]. Post Ramadan increase in glucose level is expected due to an abrupt change in dietary habits and high intake of mono and di sugars.

The variation in lipid levels observed by different researchers may be attributed to the difference in dietary habits and duration of fasting in different seasons and countries [17]. It is also obvious from the present study that the benefits of Ramadan dietary habits in terms of reduction in total cholesterol, triacylglyceride, LDL-c and VLDL-c levels before and at end of fasting and rise in HDL-c levels as listed in (table 3), may be helpful only if the diet pattern is framed according to the routine followed in Ramadan due to the regular basis [18].

In this study, the levels of serum AST, ALT and alkaline phosphotase are slightly decreased specially in 15th and 28th day of Ramadan, and it is statistically significant ($p < 0.05$, $p < 0.01$), while, total serum bilirubin change is not meaningful. The findings in the study of liver function analysis during and after Ramadan are in agreement with other studies [19-20] regarding the observation of non-significant changes occur in any of the above parameters.

In conclusion, this study shows the fasting during Ramadan may cause no detrimental effect on health; on the contrary, it may be associated with some favorable effect, especially on lipid profile. As prophet Mohammed (S) said: “Keep the fast, keep your health” [21].

Recommendations: The present study recommends that it can be better to carry on more studies with both larger groups and with various categories of healthy and unhealthy subjects.

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