# Effect of Ramadan Fasting on Clinical Biochemical and Immunological Parameters in Healthy Fasting and Type Two Diabetes Mellitus Patients

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## ABSTRACT:

**BACKGROUND:**

Ramadan fasting is one of the pillaris of islam. The fasting time is about 12-19 hours depending on the season in which Ramadan falls and the geographic position of the country. It is often a subject of discussion nether or not Ramadan fasting confer any harmful effect on the body.

**OBJECTIVES:**

The aim of this study was to evaluate the effect of Ramadan fasting on some clinical, biochemical and Immunological aspects of the healthy and type two *Diabetes mellitus* patients.

**METHODS:**

The study was performed on (30) healthy fasting and (30) patients with type two diabetes mellitus in the month of Ramadan (2005). Blood samples were obtained on the second and fourth week's of Ramadan and were analyzed for fasting blood sugar, urea, uric acid, lipid profile, Immunoglobulins and complement component concentration, in addition, lymphocyte was separated to study the lymphocyte transformation assay *in vitro* compared with healthy non-fasting.

**RESULTS:**

There was slight elevation in the HDL-C, B. urea, S. Triglyceride, VLDL, S. uric acid and slight reduction in LDL-C at the end of fasting. There was slight reduction but the difference was non-significant (P>0.05) in the value of immunoglobulins (IgA, IgG, IgM) and (C3, C4) also, there was no difference in the sensitization rate of lymphocyte transformation in both healthy and type two diabetic patients compared with healthy non-fasting control.

**CONCLUSION:**

Slight elevation of HDL-C and slight elevation of B. urea, S. uric acid, S. Triglyceride, VLDL and there is non significant changes in Immunoglobulins and complement concentration and sensitization rate of lymphocyte transformation. Thus, Ramadan is safe for type two diabetic patients with the proper education of diabetic management.

***KEYWORDS:*** Ramadan fasting, lipid profile, Immunoglobulins, complement.

## INTRODUCTION:

Ramadan is the ninth month of the Islamic lunar calendar and is strictly observed by millions of Muslims world wide. The experience of fasting teaches Muslims self-discipline and self-restraint and reminds them of the feeling of the impoverished. Fasting isn't obligatory for children. Menstruating women as well as sick and traveling people are excused, and pregnant and lactating women are permitted to postpone fasting during Ramadan, however they should fast during another month of the year, when they have no reason for exemption[1].

During Ramadan the majority of Muslims have two good sized meals. One immediately after sunset (Iftaar) and the other just before dawn (Ishur). They are allowed to eat and drink between sunset and dawn but not after dawn. From the physiological stand point, Islamic fasting provides a unique model of fasting. It is distinct from regular voluntary or experimental fasting by the fact the observant of the fast does not drink during fasting hours. In addition. The eyes, ears, tongue and indeed the whole body are equally obligate to be restrained. Therefore the functional changes occurring during Islamic fasting would be different from those noted during an experimental fast[2].

The effect of Ramadan fast on body and plasma composition, hematology, and response to steady state were studied[3]. Low density lipoprotein (LDL) has been implicated in the pathogensis of atherosclerosis, the underlying cause of heart attack[4]. High level of LDL and low level of HDL are associated by accelerated development of atherosclerosis in both vein graft and native coronaries[5]. The aim of this study was to evaluated the effect of Ramadan fasting on some

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biochemical and Immunological parameter's in healthy, and diabetic patients.

## MATERIALS & METHODS:

Samples: The study included (60) blood samples, were taken from (30) apparently healthy fasting subjects and and (30) fasting patients with diabetes mellitus type II during Ramadan month.

Biochemical Study:

Fasting blood sugar, blood urea, serum uric acid, total cholesterol (TC), triglyceride (TG). Serum very low density lipoprotein (VLDL-C), high density lipoprotein (HDL-C) and low density lipoprotein (LDL-C) for patients and healthy fasting control were done according to methods of (6).

Immunological Study:

1 -Quantitative estimation of Immunoglobulins and complement in the serum of patients and healthy control: specimens for patients and healthy fasting persons for Immunoglobulins (IgA, IgG, IgM) and complement (C3,C4) were done by radio immunodiffusion plate (Biomegreb) according to method of (Mancini, 1965)[7].

2 -Lymphocyte transformation test (LTT):

Lymphocyte cells were separated from healthy fasting control and diabetic patients according to methods of Gerlier & Thomass (1968)[8]. The separated cells concentrated with $1 \times 10^6$ cells and cultured in 400µl tissue culture media RPMI-1640 (flow laboratories), a positive and negative control from healthy non-fasting are done by treatment with PHA then, the tubes cultivated for successive six days and for three days for tubes containing the PHA in incubator with 37°C and 5% $CO_2$. Then lymphocyte transformation activity measured by adding 40µL of MTT solution for 4 hr., then 300µL of 0.04 N HCl-isopropanol. Reading the absorbance at 520nm, then the sensitization rate calculated according to this formula.

$$S.R = \frac{\text{O.D. of samples with PHA or fasting}}{\text{O.D. of samples without PHA and non} - \text{fasting}}$$

Statistical Analysis:

ANOVA test was used to compare the results according to[9].

## RESULTS:

Biochemical Study:

The results of biochemical parameters have been summarized in (Table-1) blood glucose level showed non significant change with Ramadan fasting in healthy fasting and significant ($P < 0.05$) in fasting patients with diabetes mellitus type II. A slight increase in blood urea was observed toward the end of the study in both healthy and diabetic subjects non-significant change ($P > 0.05$) with Ramadan fasting in serum uric acid no significant change in total cholesterol, triglycerides, VLDL in healthy fasting and fasting patients with *Diabetes mellitus* compared with the normal value. Also, slightly reduction in the level of LDL-cholesterol, and slight elevation of HDL-cholesterol at the end of fasting was noticed.

Immunological Study:

There is no-significant difference in the level of Immunoglobulins of the study subject, the level of the IgA reached (234, 344.7) mg/dL in the end of fasting while it reached (232.7, 321.4) mg/dL after two week's for healthy fasting and patient's respectively. Also, the level of IgG have reached on the end of fasting to (1319.4, 1226.5) mg/dL while it reached (1412.4 , 1210.3) mg/dL after two week's for healthy fasting and patients respectively, and the level of the IgM reached at the end of fasting to (101.9, 122.1) mg/dL while it reached (108.6, 118.5) mg/dL after two week's for healthy fasting and patients respectively (Table-2). There is no significant difference in the level of C3, C4 (Table-3). The level of C3 reach in the last of fasting to (112.9, 123.5) mg/dL while it reach (118.3, 120.5) after two week's for healthy and patients fasting respectively. Also, the level of C4 reach (31.1, 39) mg/dL in the last of fasting while it reach (30.2, 34.2) mg/dL after two week's of fasting for healthy and patients respectively.

Also, there was no statistically difference ($P > 0.05$) in the lymphocyte transformation and sensitization rate in fasting patients with *Diabetes mellitus* type II and healthy fasting persons compared with healthy non fasting (Table-4).

**Table-1: Effect of ramadan fasting on various biochemical parameters (mg/dL) in healthy fasting and Diabetes mellitus type II fasting patients.**

| Parameters (mg/dL) | Healthy fasting | | D.M. fasting | | Normal value |
|---|---|---|---|---|---|
| | 2 w | 4 w | 2 w | 4 w | |
| Glucose | 78.5 ± 10.1 | 76.2 ± 11.3 | *176.5 ± 35 | *180.4 ± 52.4 | 75-115 |
| B. urea | 25.6 ± 5.1 | 42.5 ± 3.2 | 29.8 ± 2.5 | 47.4 ± 4.2 | > 50 |
| S. uric acid | 4.2 ± 0.4 | 4.6 ± 0.7 | 4.5 ± 0.2 | 5.1 ± 0.3 | 1 – 7 |
| S. cholesterol | 186.5 ± 28.2 | 161.7 ± 29.6 | 218 ± 29 | 215 ± 39 | > 250 |
| HDL-cholesterol | 44.5 ± 7.5 | 47.8 ± 6.1 | 43.3 ± 5.2 | 44.7 ± 76 | > 50 |
| LDL-cholesterol | 141.3 ± 40.6 | 120.7 ± 30.5 | 163 ± 22 | 160.4 ± 41.8 | 90-190 |
| Triglycerides | 113.6 ± 64.7 | 110.4 ± 54.6 | 151.9 ± 31 | 162.8 ± 99.8 | 65 – 180 |
| VLDL | 23.3 ± 14.2 | 22.5 ± 10.1 | 31.6 ± 12.2 | 33.7 ± 20.2 | 12 - 36 |

* P < 0.05 statistically significant.

**Table-2: Effect of ramadan fasting on immunoglobulins concentration (mg/dL) after the second and fourth week in healthy fasting and Diabetes mellitus type II patients.**

| Parameter's (mg/dL) | Healthy fasting | | D.M. fasting | | Normal value |
|---|---|---|---|---|---|
| | 2 w | 4 w | 2 w | 4 w | |
| IgA | 232.7 ± 91.4 | 243 ± 88.9 | 321.4 ± 10.5 | 344.7 ± 93.8 | 90-400 |
| IgG | 1412.4 ± 214 | 1319.4 ± 245.3 | 1210.3 ± 215 | 1226.5 ± 261.3 | 600-1650 |
| IgM | 108.6 ± 37.4 | 101.9 ± 33.2 | 118.5 ± 40.6 | 122.1 ± 43.3 | 75-300 |

P > 0.05 statistically non-significant

**Table-3: Effect of ramadan fasting on complement component concentration (mg/dL) in healthy fasting and diabetes mellitus type II patients.**

| Parameter's (mg/dL) | Healthy fasting | | D.M. fasting | | Normal value |
|---|---|---|---|---|---|
| | 2 w | 4 w | 2 w | 4 w | |
| C3 | 118.3 ± 20.2 | 112.9 ± 261 | 120.5 ± 15.4 | 123.5 ± 20.1 | 80 – 160 |
| C4 | 30.2 ± 8 | 31.1 ± 11.8 | 34.2 ± 5.6 | 39 ± 11.5 | 20 - 40 |

P > 0.05 statistically non significant.

**Table-4: Effect of ramadan fasting on lymphocytes transformation and sensitization rate after second and fourth weeks fasting Diabetes mellitus type II patients.**

| Parameter's (mg/dL) | Absorbance at 520nm | | Sensitization rate (S.R) | |
|---|---|---|---|---|
| | 2 w | 4 w | 2 w | 4 w |
| Healthy fasting | 0.37 ± 0.23 | 0.33 ± 0.31 | 0.86 | 0.75 |
| Diabetes mellitus fasting | 0.32 ± 0.24 | 0.35 ± 0.20 | 0.74 | 0.77 |
| Healthy non fasting treated PHA (+ve control) | **1.5 ± 0.22 | **1.60 ± 0.31 | **3.48 | **3.55 |
| Healthy non-fasting (negative control) | 0.43 ± 0.31 | 0.45 ± 0.34 | 1.0 | 1.0 |

** P < 0.05 statistically significant , LSD = 1.04

## DISCUSSION:

The results of the study above showed non-significant change in healthy subjects fasting during Ramadan. These results are in line with those of Irak *et al.*[10]. Prentice *et al.*[11] and Nagra *et al.*[12] carried out glucose tolerance tests along with before and after fasting and did n't observe any difference. The slight rise by the fourth week's of fasting especially in patients with type II *Diabetes mellitus* may occur individually according to the food habits and individual differences in mechanisms involved the metabolism and energy regulation[13]. The slight elevation of urea towards the end of fasting we attributed to dehydration effect. Since, Ramadan lasts for one month, this is temporary elevation in urea concentration unlikely to cause any problem. Our results in line with Noman.[14] Uric acid is a waste product of purine metabolism, Serum uric acid value remained a non-significant in its value after two and fourth weeks our results partially agree with these of Mustafa *et al.*[15] whoever, the slight increase of urice acid in the last of fasting attributed to reduction in

glomerular infiltration, decrease in uric acid clearance and attention in renal transport of uric acid.

Total cholesterol and LDL-cholesterol level decreased slightly despite the fact that tendency to consume fried foods, was increased during Ramadan, slightly increased of HDL-cholesterol, consumption of increased of fried foods suggest higher intake of fats in Ramadan compared to non-Ramadan days, it appeared as the quality and quantity of the fat intake during Ramadan govern blood cholesterol level[16]. The slight elevation in the serum triglyceride observed during fasting especially in those fasting patient's with *Diabetes mellitus* type II attributed to lipolytic effect of prolonged fasting. Serum immunoglobulin (Table-2) and complement component (Table-3) level were slightly decreased towards the end of fasting. However, this decrease was found non-significant statistically when compared with normal value. These finding indicated that Ramadan fasting didn't lead to states of malnutritions and immunological disturbances.

Also, the results of lymphocyte transformation test (Table-4) revealed no significant change in sensitization rate of healthy fasting and fasting patients with *Diabetes mellitus* type II, compared with healthy non-fasting control. This finding also indicate that Ramadan fasting didn't effect the alteration of lymphocyte transformation, the study partially in line with[17] which found no-change occur in white blood cells count during fasting.

## CONCLUSION:

The safety of Islamic fasting for healthy and *Diabetes mellitus* type II was evaluated by blood analysis for glucose, urea, uric acid, lipid profile, Immunoglobulins, complement component and lymphocyte transformation assay. Though the levels of serum biochemical and immunological parameters dropped during fasting but these value were statistically not significant. The results indicated that fasting of Ramadan is safe for healthy and *Diabetes mellitus* type II patients with proper education and diabetic management.

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