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# Evaluation of the Effects of Islamic Fasting on the Biochemical Markers of Health

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**ABSTRACT**

**Introduction**: Ramadan is the ninth month of the lunar Islamic calendar, during which Muslims are obliged to perform specific rites and rituals. Fasting is considered the most important ritual during the holy month of Ramadan. Fasting variably influences the health of individuals, which could be attributed to the changes in the concentrations of certain biochemical markers. This study aimed to elucidate the health effects of fasting through evaluating the impact of this Islamic duty on blood biochemistry.

**Methods:** This quasi-experimental study was conducted on 40 male volunteers employed at North Khorasan University of Medical Sciences, Iran.Data collection and phlebotomy were performed before fast breaking(Iftar) on the first and last day of Ramadan. Fasting duration was 11 hours per day. Serum biochemical factors, including blood glucose, uric acid, albumin, low-density lipoprotein (LDL), high-density lipoprotein (HDL), total cholesterol and triglyceride(TG), were measured in all the participants at the beginning and end of Ramadan. Data analysis was performed in SPSS using paired-samples T-test to compare the mean variables.

**Results:** Mean age of the participants in this study was 39.11±8.602 years. After one month of fasting, a significant reduction was observed in the mean levels of blood glucose, uric acid, TG, and LDL ($P<0.05$). Moreover, mean levels of total cholesterol and HDL-cholesterol had an insignificant decrease, while mean albumin level significantly increased at the end of Ramadan ($P=0.000$).

**Conclusion:** According to the results of this study, Ramadan fasting could lower blood cholesterol and uric acid, while enhancing the level of albumin in healthy adults.

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## Introduction

Ramadan is the ninth month in the lunar Islamic calendar, during which Muslims are obliged to perform special rites and rituals. Fasting is considered the most important ritual during the holy month of Ramadan, in which healthy individuals abstain from eating and drinking liquids from sunrise to sunset. In Ramadan, the two main meals of fasting Muslims are at Sohur (before dawn) and Iftar (after sunset) (1).

Since Ramadan coincides with different seasons, duration of fasting may vary between 11-18 hours. Ramadan fasting has specific features associated with changes in the eating habits, received energy, sleep patterns, and physical activities of individuals (2). From the Islamic perspective, fasting remarkably improves physical health as stated in the Holy Quran: "If you had enough knowledge, you would know that fasting is beneficial for you".

Several studies in Islamic countries across the world have investigated the role of fasting in enhancing health, the results of which have confirmed the positive effects of this Islamic duty on weight control, fat metabolism, and reduction of blood pressure (3). Furthermore, these effects have been shown to accompany

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adjusted physical activities (4). It is noteworthy that some researchers have reported the beneficial effects of Ramadan fasting on diseases such as diabetes, digestive disorders, and cardiovascular diseases (1, 5, 6).

According to the literature, effects of fasting on health could be attributed to the changes in the concentrations of biochemical markers (7). For instance, in a study conducted on a group of students, fasting was shown to decrease blood glucose and triglyceride (TG) (8). However, findings regarding the improvement of bio-chemical markers are inconsistent. In one research in this regard, no changes were reported in the serum levels of LDL-C, TG, HDL-C and glucose after Ramadan compared to the levels before this month, while only the TG/HDL-C ratio showed a significant reduction after Ramadan (1). In another study conducted on fasting women, TG concentration was reported to increase significantly three days after Ramadan compared to three days before this month (9).

This study aimed to elucidate the effects of fasting on health through investigating the changes of blood biochemistry.

## Material and methods

This quasi-experimental study aimed to evaluate the effects of Islamic fasting on some serum biochemical factors. Sample size consisted of 40 male participants employed at North Khorasan University of Medical Sciences, Iran. Selecting male subjects was due to the fact that women experience hormonal changes during the menstrual period and are not able to complete Ramadan fasting.

Inclusion criteria were fasting for 28 consecutive days and no use of medications that might affect the biochemical factors assessed in this study. On average, fasting duration in this study was 11 hours per day.

Data collection was performed in two stages; the first stage was performed on the first day of Ramadan before Iftar, and the second stage was carried out on day 28 of Ramadan before Iftar. Both stages of data collection were performed after 11 hours of fasting.

Blood samples were obtained from the right hand of the participants using a 5-cc Syringe 23 Gauge in the sitting position by the same specimen collector. Afterwards, the samples were immediately transferred to the laboratory, and blood serum was separated using the HITCH centrifuge at 3500 rpm to measure the levels of blood glucose, uric acid, albumin, LDL, HDL, total cholesterol and TG. Concentrations of the mentioned biochemical factors were determined using an auto-analyzer (Pars-Azmoon kit, Tehran, Iran).

### *Statistical Analysis*

Data analysis was performed in SPSS version 11.5 using paired-samples T-test and data were presented as mean and standard deviation.

## Results

Mean age of the participants in this study was 39.11±8.6 years. Out of 40 participants, two cases were excluded due to the use of medications that affected blood cholesterol (statins), and two others were eliminated from the study due to travelling. Finally, 36 partici-pants received further evaluations. The other findings of the study are listed in Tables 1 to 3 According to results in the tables, FBS, TG, LDL-

**Table 1.** The compare of fasting blood sugar in the subjects before and after the intervention

| Variable | FBS(mg/dl) | | *P-value* |
|---|---|---|---|
| | Day 1: Mean±SE | Day 28: Mean±SE | |
| Fasting Blood Sugar | 75.78±8.46 | 80.06±9.26 | 0.02 |

**Table 2.** The compare of lipid profile in the subjects before and after the intervention

| Variable | Day 1: Mean±SE | Day 28: Mean±SE | *P-value* |
|---|---|---|---|
| Cholesterol (mg/dl) | 214.08±36.30 | 209.56±33.6 | 0.19 |
| Triglyceride (mg/dl) | 162.72±94.23 | 144.22±67.06 | 0.03 |
| LDL- cholesterol (mg/dl) | 115.28±25.25 | 109.89±21.09 | 0.04 |
| HDL- cholesterol (mg/dl) | 51.78±12.27 | 49.81±12.14 | 0.27 |

**Table 3.** The compare of serum uric acid and albumin in the subjects before and after the intervention

| Variable | Day 1: Mean±SE | Day 28: Mean±SE | *P-value* |
|---|---|---|---|
| Uric Acid (mg/dl) | 6.66±1.62 | 6.31±1.35 | 0.01 |
| Albumin (gr/L) | 5.10±0.26 | 5.38±0.25 | < 0.001 |

cholesterol, and uric acid increased, and albumin decreased significantly after Islamic fasting compared to before that.

## Discussion

According to the results of the present study, fasting during the month of Ramadan changed some serum biochemical factors, and reduction of blood glucose concentration is in line with a study conducted on male students in Kermanshah city, Iran (8). In another study performed on obese individuals, weight and blood glucose were reported to decrease significantly (10). However, findings of Ajabnoor in this regard indicated that although the concentration of fasting blood glucose remained within the normal range, it significantly increased at the end of the second week of Ramadan (11). Similarly, in the study performed by Radhakishun to evaluate the effects of fasting on obese adolescents, no changes occurred in glucose metabolism and body weight after one month of fasting (12).

In the current study, LDL and TG serum concentrations significantly reduced, while no changes were observed in the levels of total cholesterol and HDL. Consistent with these results, Haghdoost reported a significant decrease in the serum concentration of TG, while serum levels of HDL and LDL had no changes.

In a similar research conducted in Ilam province (Iran), findings regarding blood glucose and lipid profile in fasting individuals were in congruence with the results of the present study. In another study, serum concentrations of LDL, HDL and total cholesterol increased after one month of fasting, which was accompanied with the reduction of body fat percentage (12). In the study by Akanji, although fasting did not deteriorate parameters such as LDL, TG and total cholesterol, no significant weight loss was observed in the subjects (13).

Metabolism is influenced by various factors, including dietary habits, physical activity and sleep patterns, all of which change during Ramadan. These changes may vary in different individuals depending on geographical diversities and various populations. As such, conflicting results in the aforementioned studies could be due to these variations.

On the other hand, changes of the lipid profile could be attributed to the weight loss induced by Ramadan fasting. In this regard, the study by Akanji showed that fasting exerted no significant effect on weight, and no significant increase was reported in the serum concentrations of LDL, HDL and total cholesterol (13). However, in the study by Radhakishun, along with the reduction of body fat percentage after one month of fasting, serum concentrations of LDL, HDL and total cholesterol were reported to increase (12). This could be due to the higher hydrolysis of fat tissues and increased fatty acid metabolism induced by prolonged fasting and limited calorie intake (14).

In another study conducted in Morocco, serum concentrations of TG, LDL and total cholesterol decreased significantly after one month of fasting, while HDL concentration increased. It is also noteworthy that these changes remained significant within one month after the end of Ramadan.

Improvement of lipid profile in the current research could be due to the changed pattern of fat consumption since our participants significantly reduced the consumption of saturated fatty acids and increased the use of monounsaturated and polyunsaturated fatty acids. In this regard, it should be noted that changes in the pattern of fat consumption (i.e., increased intake of saturated fatty acids) are associated with higher levels of LDL and total cholesterol, while increased TG concentration could be attributed to the high intake of carbohydrates (15-17).

In the present study, serum concentration of uric acid decreased, while albumin concentration increased after one month of fasting compared to before Ramadan. In a similar study, serum uric acid concentration dropped after Ramadan compared to before this month (13). However, other studies in this regard have shown increased uric acid concentration as a result of fasting (18, 19).

Discrepancies in the aforementioned findings could be due to body weight changes, different dehydration status, and changes in protein intake during Ramadan (20). In the study by Ajabnoor, fasting was reported to cause a significant decrease in albumin concentration (11), which is inconsistent with the results of the present study. This could be due to the differences in study populations, especially in terms of nutrition status before the holy month of Ramadan.

It is recommended that future studies in this regard control or modify the effects of important

metabolism factors (e.g., weight changes, sleep patterns, physical activities and changes of nutrient intake) on fasting individuals. Furthermore, findings in this regard could be affected by the duration of fasting and the coinciding season with Ramadan.

## Conclusion

So far, studies focusing on the effects of fasting on the blood parameters associated with metabolism have proposed variable results. Although the majority of these studies have denoted beneficial effects in this regard, further investigation with accurate methodologies, control groups and important confounding variables are required in order to confirm these findings.

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