

CHANGES IN BLOOD GLUCOSE AND LIPID PROFILE DURING RAMADAN FASTING

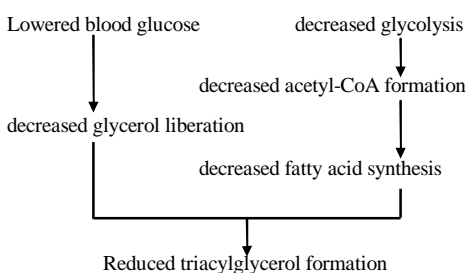
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Background: It is an established fact that fasting influences carbohydrate and lipid metabolism resulting in changes in blood levels of glucose and lipid profile. This study describes the changes observed in the volunteers who fasted throughout the month of Ramadan. **Methods:** After screening, 24 volunteers were included in the study on the basis of their fasting blood glucose and cholesterol levels and different tests were conducted on serum. **Results:** Blood glucose, cholesterol, TAG and LDL-C levels decreased significantly, while HDL-C level rose considerably at the end of month. But the blood chemistry picture almost returned back to the pre-Ramadan level once fasting was discontinued for two weeks. **Conclusion:** It can therefore, be interpreted that the beneficial changes observed during the month of Ramadan are transient and could only be maintained if the dietary habits of Ramadan are continued afterwards.

INTRODUCTION

Fasting in biochemical terms is to abstain from caloric intake through any route for 12-14 hours, while in Islamic terms, it stands for abstaining not only from caloric intake but also from drinking water since dawn to sunset. Fasting does have an implication on the blood levels of several biochemical parameters.¹ Blood glucose level is decreased due to dietary restriction and its continuous metabolism by the body.² Cholesterol synthesis is reported to decrease during fasting.³ Moreover, formation of triacylglycerol is also reduced probably by the following mechanism.⁴



This will result in altered picture of blood chemistry particularly in regard to glucose and lipid profile. Several workers have investigated this aspect of fasting especially Ramadan fasting, but their results are inconsistent.^{1,5} Thus, the question as to the ascertainancy of incurrance of these changes during Ramadan fasting remains to be resolved. Present study was, therefore, undertaken to seek

a deeper insight of the biochemical changes, if any, brought about by the Islamic fasting.

MATERIAL AND METHODS

The present study was carried out in the healthy male adult volunteers having no evidence of diabetes mellitus, or any other chronic illness. All of them were non-smokers, non-obese and observed fast throughout Ramadan. None of them were taking any medication affecting carbohydrate and/or lipid metabolism. They were residents of a local bachelor hostel and were taking almost similar diet as they were being served from one kitchen with a fixed menu. After screening, 24 volunteers were included in the study on the basis of their fasting blood glucose and cholesterol levels (mean of the respective normal range $\pm 10\%$ of mean), the assigned inclusion criterion for the study subjects.

Blood (5 ml) was taken from each subject after a 14 hours fast one day before Ramadan (day 1) and then after every two weeks (i.e., day 15, 29 and day 43). Blood glucose level was determined within half an hour of blood taking using kit supplied by Elitech Belgium. Remaining sera were stored at -20°C for further analysis. Serum triacylglycerol (TAG), cholesterol, and high-density-lipoprotein-cholesterol (HDL-C) were determined using kits provided by Wiener Lab (Argentina), Human (Germany) and Merck respectively. LDL-Cholesterol levels were calculated according to the formula of Friedwald et al.⁷ The results were

expressed as mean±SEM. Statistical significance was evaluated by applying students' "t" test.

RESULTS

Mean age (±SEM) of the study subjects was 42.5 ± 2.0 years. Blood glucose level was 78±2.1 mg/dl (mean ± SEM) which decreased gradually during the month of Ramadan. The decrease was highly significant (P<0.001) on day 15 and day 29 as compared to day 1. Post Ramadan (day 43) blood glucose level rose sharply (P<0.001) as compared to that on day 29 (Table-1). Blood cholesterol and TAG levels followed the same pattern as did blood glucose though the decrease was less significant than that observed for blood glucose (Table-1).

Blood HDL-Cholesterol level showed a significant (P<0.05) rise both on day 15 and day 29 as compared to day 1. Post-Ramadan (day 43) decrease in its level was, however, non-significant as compared to day 29 (Table-2). Blood LDL-Cholesterol level showed a slight decrease during the month of fasting but the decrease was non-significant. However, the post-Ramadan (day 43) increase as compared to day 29 could attain statistical significance (P<0.05) (Table-2).

Table-1: Variation in the levels of blood glucose, cholesterol and triacylglycerol (n = 24)

Parameters	DAYS			
	Day 1	Day 15	Day 29	Day 43
Glucose (mg/dl)	78 ± 2.1	71 ± 1.6***	70 ± 1.4***	81 ± 1.3+++
Cholesterol (mg/dl)	172 ± 4.9	160 ± 4.2*	157 ± 5.1*	182 ± 5.7+++
Triacylglycerol (mg/dl)	121 ± 5.2	106 ± 4.7*	101 ± 5.3**	132 ± 5.6+++

Values are expressed as mean±SEM

* P<0.05 as compared to Day 1.

** P<0.01 as compared to Day 1.

*** P<0.001 as compared to Day 1.

+++ P<0.001 as compared to Day 29.

Table-2: Variation in the levels of blood HDL-Cholesterol and LDL-Cholesterol (n = 24)

Parameters	DAYS			
	Day 1	Day 15	Day 29	Day 43
HDL-C (mg/dl)	40 ± 1.9	45* ± 1.6	48* ± 2.1	46 ^{NS2} ± 2.2
LDL-C (mg/dl)	108 ± 8.7	94 ^{NS1} ± 9.1	89 ^{NS1} ± 8.2	110 ⁺ ± 10.3

Values are expressed as mean ± SEM

NS1 Non-significant as compared to Day 1.

* P<0.05 as compared to Day 1.

NS2 Non-significant as compared to Day 29.

+ P<0.05 as compared to Day 29.

DISCUSSION

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 functions⁸ lead to lowering of blood glucose level. The depletion of glycogen stores after prolonged fasting further decreases its level. Our study subjects demonstrated lower levels of blood glucose during the month of Ramadan that are consistent with the observations reported by earlier workers.^{5,9} Post-Ramadan increase in glucose level was expected due to an abrupt change in dietary habits and high intake of simple sugars.

There is a marked decrease in the activity of HMG-CoA-reductase during fasting resulting in reduced synthesis of cholesterol depicted as low blood cholesterol levels.³ Triacylglycerol (TAG) biosynthesis is also decreased due to lesser availability of the precursor molecules acetyl-CoA and glycerol in fasting as a consequence of reduced glucose oxidation. Furthermore, the activity of dehydrogenases of pentose phosphate pathway is also reported to decrease in fasting and are mandatory requirements for the synthesis of fatty acids and cholesterol.¹⁰ This will lead to lowering of the blood levels of cholesterol, TAG, and LDL during fasting. We observed reduced levels of these biochemical variables in our subjects during the month of Ramadan. Our findings uphold the results yielded by earlier workers.⁶ Some workers, however, failed to demonstrate any significant decrease in cholesterol level during Ramadan fasting.⁵ This might be due to the heterogenous nature of their study population and also the dietary habits might not have been taken into account which do affect the blood levels of these variables. The rise in HDL and decrease in LDL levels, as observed in our study, is in agreement with the findings of Aziz et al.⁶

The variation in lipid levels observed by different workers may be attributed to the difference in dietary habits and duration of fasting in different seasons and countries. It is also obvious from the present study that the benefits of Ramadan dietary habits in terms of reduction in cholesterol, TAG and LDL levels and rise in HDL levels are transient and may be helpful only if the diet pattern is framed

according to the routine followed in Ramadan on regular basis.

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