Study of some biochemical parameters in young men as effected by Ramadan Fasting

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ABSTRACT *The effect of Ramadan fasting on some blood parameters i.e. serum glucose, urea, uric acid, lipids and proteins, were investigated on young men in Ar Rohmah Islamic dormitory. Nineteen normal and healthy students aging between 12-25 years, residing in the Islamic dormitory, voluntarily to participated in the study. Blood samples were obtained from the volunteers on the 1st and 26th day of Ramadan and analyzed for the aforementioned biochemical parameters. A non-significant effect of Ramadan fasting was observed on most of the parameters studied. However, serum urea, triglycerides, total cholesterol and LDL-cholesterol were reduced significantly ($p<0.05$) but remained within the physiological limits. Decrease in blood urea has been attributed to the effect of at least protein and triglycerides intake to increase lipolytic effect. The reduction in serum cholesterol and LDL is a beneficial effect of Ramadan fasting. The results of the study indicated that Ramadan fasting is quite safe for normal healthy adults.*

Most of the world's great, recognized and accepted religions recommend a period of fasting or abstinence from certain foods (Azizi and Benham, 2003). Muslims throughout the world fast during Ramadan to fulfill a religious obligation. Fasting muslims abstain from eating and drinking between dawn and sunset for the whole month of Ramadan, which is the 9th month of lunar calendar. The span of fasting time varies with seasons in which the month of Ramadan falls. The geographical position of the country is yet another determinant factor for the length of the fast. Depending upon these two factors, the length of the fast may vary from 12 to 19 hours a day. Ramadan fasting differs with total fasting as refeeding is essential twice in 24 hours and no restriction exists on the nature of food to be consumed for refeeding. Apart from religious and spiritual considerations, it is often a subject of discussion whether or not Ramadan fasting confers any harmful effects on the body. Changes in eating pattern and infrequent meals lead to reduced food intake which may alter important enzymatic and metabolic responses.

Studies pertaining to Ramadan fasting have been carried out in males (Angel and Schwartz, 1975; Mustafa *et al.*, 1978; Muazzam and Khalique, 1999; Nizal *et al.*, 2000; Azizi and Benham, 2003), pregnant and lactating women (Suleman *et al.*, 1982 and Nomani *et al.*, 1989) and patients (Prentice *et al.*, 1984 and Malhotra *et al.*, 1989). However, no such study has been reported in normal and healthy women. The aim of the study was to evaluate the impact of Ramadan fasting on different blood parameters. The present study deals with the changes in body weight, blood glucose, urea, uric acid, proteins, cholesterol and triglycerides in unmarried adult females.

MATERIALS AND METHODS

Subjects

The study was conducted in female school and undergraduate students of the Ar Rohmah Islamic dormitory of Malang Indonesia. A total of nineteen normal and apparently healthy students, as number of the students residing in this dormitory, age between 12-25 years, voluntarily asked to participate in the study. The study was conducted in the month of November-December, 2005. Average duration of the fast was about 14 hours.

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Meal plan

All the volunteers resided in the Ar Rohmah Islamic dormitory where a fixed menu was served to each volunteer at *Sahri* (a predawn meal) and *Iftar* (dinner). The average daily consumption of protein and calories was worked out from a readily available list of food composition tables, which turned out as 55 g and 2042 calories respectively, and this did not include the allowance for left over food. It was therefore expected that actual consumption of protein and calories was slightly less than those figures. There was no special change in the dormitory's food menu before or after the onset of Ramadan except that *paratha* (*Chapatis* - flat bread, fried in excess of vegetable oil) were served instead of plain *chapatis* at *Sahri*. It was difficult to estimate the exact amount of fat intake; however, it was certain that fat intake was at least 10-15 percent higher than that of normal days and mainly comprised of hydrogenated oils. Since there is no restriction on eating between *Iftar* and *Sahri*, therefore, volunteers were allowed to consume whatever they wanted. Ramadan fasting does not impose any restriction on the quantity or quality of food intake between *Iftar* and *Sahri*. Whatever are *Halal* (permitted by Islam) for a Muslim in ordinary days they can be consumed.

Blood sampling

Five mililiters of venous blood was drawn from each subject after 11 hours of fasting on the 1st and 26th day of Ramadan and serum was obtained for examination of biochemistry parameters.

Reagents and procedures

Serum glucose, urea, uric acid, total cholesterol, LDL, HDL and triglycerides were determined by enzymatic methods using diagnostic kits obtained from Exel "Diagnostic", Italia, whereas serum total proteins and albumin were determined by biuret and dye-binding method, respectively (Barber *et al.*, 1979). Each sample was analyzed in duplicate.

Statistical procedures

The Student-T test was used (Duke and Yar, 1977) to compare the values of different parameters obtained in the 1st and 26th day of Ramadan fasting by employing the SPSS version 11 software.

RESULTS

The results of the study were summarized in Table 1 and Figure 1. Blood glucose level at the 1st day of fasting (91±7.49 mg/dl) showed no significant decrease with that at 26th day (79±5.19 mg/dl) Ramadan fasting.

Table 1. Effect of Ramadan fasting on various blood parameters

Parameter	1st day of Ramadan Fasting	26th day of Ramadan Fasting	Sig.	Normal Values
Glucose	91 ± 7.49	79 ± 5.19	0.135	60 – 110 mg/dl
Protein Total	7 ± 0.55	6.9 ± 0.39	0.237	6,3 – 8,4 mg/dl
Cholesterol	144 ± 29.33	140 ± 43.04	0.003*	< 200 mg/dl
HDL-cholesterol	47 ± 4.28	44 ± 15.17	0.758	> 35 mg/dl
LDL-cholesterol	107 ± 30.41	74 ± 43.33	0.007*	< 150 mg/dl
Triglyceride	114 ± 15.65	108 ± 38.99	0.035*	< 150 mg/dl
Urea	17 ± 3.50	15 ± 4.34	0.024*	10 – 50 mg/dl
Uric acid	5 ± 1.85	4 ± 1.11	0.802	3,4 – 7,0 mg/dl

* Significant difference between two means at $p<0.05$ level

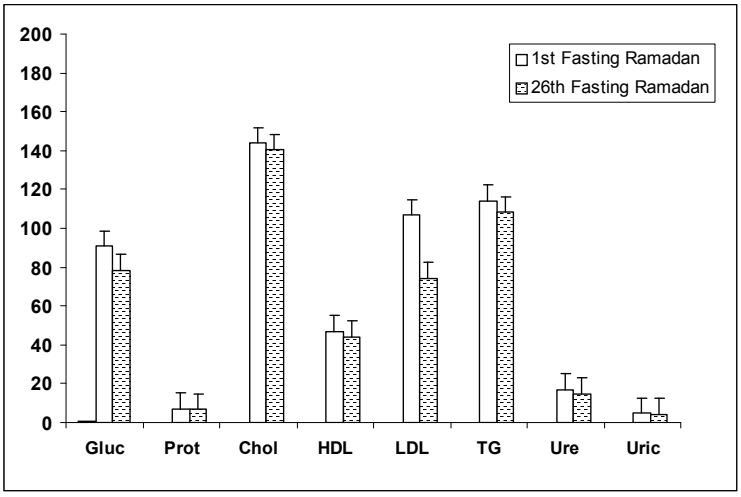

Figure1. Serum concentration of glucose, protein, cholesterol, HDL-cholesterol, LDL-cholesterol, triglyceride, urea and uric acid on 1st and 26th day Ramadan fasting. Bar represented means ± SD for 19 young men each groups.

Total serum proteins level decreased at the end of the study. Despite statistically non significant, total serum proteins level decreased at the 26th day of fasting (6.9±0.39 mg/dl) compared to that at the 1st day of fasting (7±0.55 mg/dl).

Total serum cholesterol, LDL-cholesterol and TG levels decreased significantly (p<0.05) towards the end of the study despite the fact that tendency to consume fried foods and "*kari ayam*" increased during Ramadan. HDL-cholesterol level was unchanged. As seen in this study, cholesterol, triglyceride and LDL-cholesterol levels were lower in the serum subject at the 1st day of Ramadan compared to that at the 26th day of Ramadan fasting.

The blood urea levels at the 26th day of fasting (15±4.34 mg/dl) showed significant decrease compared to that at the 1st day of fasting (17±3.50 mg/dl) (p<*0.05*). Similarly, the uric acid levels at the 26th day of Ramadan fasting (4±1.11 mg/dl) was lower than that at the 1st day of fasting (5±1.85 mg/dl). However, this decrease was statistically not significant.

DISCUSSION

No significant difference between the blood glucose levels at the 1st and 26th day indicated that the homeostatic mechanism for blood glucose level was working during Ramadan fasting period. These results were in line with those of Angel & Schwartz (1975), Iraki *et al.* (1997) and Muazzam & Khalique (1999). Prentice *et al*. (1984) carried out glucose tolerance tests along with before and after fasting and did not observe any difference. However, our results disagree with those of Malhotra *et al.* (1989) and Nomani *et al.* (1989) who reported a significant (p<0.05) decrease in blood glucose towards the end of the month of Ramadan. These differences may be attributed to the fact that they gave a hypo caloric diet to the volunteers, whereas in our case volunteers were free to consume any thing they wanted; no gross variation from their routine diet resulted.

No significant differences in blood glucose level at the 1st and 26th day of fasting suggest that blood glucose level is a critical factor during the last days of Ramadan fasting. In the early stage of the post-absorptive period, the fall in glucose level is associated with depletion of glycogen stores of the liver. There are only 1200 calories stores as carbohydrate in the liver and skeleton muscle cells. Eventually, after about 24 hours of starvation, the glycogen stores become depleted and the only source of glucose remain to be gluconeogenesis (Leonie *et al.*, 2005 and Azizi, 2002).

Other possible explanations may be the gender differences of volunteers and environmental/ climatic factors. We could not find any study conducted on unmarried adult females regarding the effect of Ramadan fasting. Nagra and Gilani (1991) have reported a 10 per cent increase in glucose level towards the end of Ramadan in adult males and it has been attributed to gluconeogenesis.

No significant decrease in total serum protein levels indicated that Ramadan fasting did not lead to a state of malnutrition. Significant decrease in total serum cholesterol, LDL-cholesterol and TG levels showed that consumption of increased fried foods and "*kari ayam*" suggest a higher intake of fats

as compared to non-Ramadan days. Ramadan fasting appears to be one way to achieve a marked reduction in LDL-C levels in their subjects (Azizi and Benham, 2003). It appeared as if the quality and quantity of fat intake in Ramadan govern blood cholesterol level (Gowenlock and Varley, 1988).

Uric acid is a waste product of purine metabolism. The serum uric acid values remained almost constant and a non-significant difference was observed in its values before and at the end of the study (Iraki *et al.,* 1997). Our results partially agree with those of Mustafa *et al.* (1978) who observed no change in serum uric acid until the 15th day of Ramadan. However, beyond this period they observed an elevation in serum uric acid. Our results do not agree with those of Suleman *et al*. (1982) who reported a significant increase in serum uric acid and has attributed this to prolonged fasting and reduction in glomerular filtration rate, decrease in uric acid clearance and alterations in renal transport of uric acid. Nomani *et al*. (1997) has recently reported that uric acid is negatively associated with changes in body weight; that is, blood uric acid level increases with weight loss. Results of present study can be explained in the light of his findings. No significant body weight change is perhaps the reason for no change in blood uric acid level.

From these studies, one may assume that during fasting day in which a rather large meal is taken before dawn (*Sahur*), the stores of glycogen, along with some degrees of gluconeogenesis, will maintain serum glucose within normal limits. However, slight changes in serum glucose may occur individually according to food habits and individual differences in mechanisms involved in metabolism and energy regulation.

Decreased serum triglycerides observed during Ramadan at the end of the study may be attributed to lipolytic effect of prolonged fasting. The results of the study indicated that Ramadan fasting is quite safe for normal healthy adults and perhaps very useful for reducing cholesterol and triglycerides in relation with dislipidemia. It may also provide one means of preventing progression of atherosclerosis and possibly for reversing existing atherosclerotic lesions (Maislos *et al*., 1993; Adlouni *et al*., 1997; Guyton and John, 2000; Wilson *et al.,* 2000 and Durdi *et al*., 2002).

Different studies conducted on the effect of fasting on the blood urea revealed conflicting results, mainly due to the difference in experimental methodology. Yegin *et al.* (2002) measured the blood urea before the onset and during the 4th week of Ramadan fasting in male and female belonging to different social background and age. They observed no change in this parameter. Our results disagree with those of Nomani *et al.* (1997) who had reported a significant increase in the blood urea towards the end of Ramadan fasting.

Ammonia is toxic in nervous system and its accumulation rapidly causes death. Therefore it must be detoxified to a form which can be readily removed from the body. Ammonia is converted to urea, which is water soluble and is readily excreted via the kidneys in urine. Blood urea is also associated with protein intake and fasting. Decreasing of protein intake and fasting can stimulate growth hormone secretion. These stimulation decreases catabolism of protein and amino acid so decrease in urea production (Guyton and John, 2000; Wilson *et al.,* 2000 and Yegin *et al.,* 2002). Ramadan fasting does not inflict any restriction on the amount and nature of *Halal* fluids. Moreover Ramadan lasts for one month. This temporary elevation in urea is unlikely to cause any problem.

CONCLUSIONS

A non-significant effect of Ramadan fasting was observed on most of the parameters studied. Serum urea, triglycerides, total cholesterol and LDL-cholesterol were reduced significantly ($p<0.05$) but remained within the physiological limit. The serum uric acid, blood glucose, HDL cholesterol and total serum protein values remained almost constant and a non-significant difference was observed. The results of the study indicated that Ramadan fasting is quite safe for normal healthy adults.

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