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## Effects of Fasting and a Medium Calorie Balanced Diet During the Holy Month Ramadan on Weight, BMI and Some Blood Parameters of Overweight Males

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**Abstract:** Fasting during holy month, Ramadan, is a religious obligation for all adult healthy Muslims. During this month Muslims are allowed to eat and drink between sunset and dawn. However, they are not allowed to eat and drink after dawn. To assess the effects of fasting on weight, BMI (Body Mass Index) and some blood indices, we recruited 28 overweight male volunteers aged 20-26 years. They were on a balanced diet of 2000 calories, containing 70 g protein, 350 g carbohydrate and 35.5 g lipid during Ramadan, while they were on a free diet before Ramadan. Subjects were requested to drink more than 6 glasses (about 1.5 L) of water or fruit juice every night between sunset to dawn during Ramadan. Serum levels of glucose, cholesterol, triglyceride as well as weight and BMI were measured in all subjects one day before and after Ramadan. Fasting resulted in significant ( $p < 0.05$ ) decreases in the mean values of both, weight and the BMI. Similarly, the mean values of glucose and cholesterol were significantly decreased in subjects after Ramadan, although none of these decreases reached to a level with pathological significance. Conversely, no significant changes in serum levels of triglyceride were noted.

**Key words:** Fasting, balanced diet, cholesterol, T.G.

### INTRODUCTION

During Ramadan, Muslims fast the daylight hours for a month. The duration of restricted food and beverage intake is approximately 12 h/day which makes Ramadan a unique model of intermittent fasting. Many physiological and psychological changes are observed during Ramadan that are probably due to the changes in eating and sleeping patterns (Aksungar *et al.*, 2005; Roky *et al.*, 2004). The experience of fasting is intended to teach Muslims self-discipline and self-restraint and remind them of the plight of the impoverished. Muslims are required to abstain not only from eating and drinking, but also from consuming oral medications and intravenous nutritional fluids during fasting (Roky *et al.*, 2004).

Physiological changes occurring during Islamic fasting have received considerable attention (Shokry, 1986; Dowod, 2004; Maislos *et al.*, 1993; Iraki *et al.*, 1997).

It is known that reduced intake of dietary Saturated Fatty Acids (SFA) and cholesterol lower total and LDL cholesterol concentrations as well as the risk of cardiovascular diseases (Law, 2000; Shahar *et al.*, 2001). Fasting has also been shown to have a small, but statistically significant, impact on fasters' BMI at the end of the fasting periods that was not sustained in non-fasting periods. Similarly, Haddad *et al.* (1999) have

reported significantly lower BMI levels in the vegetarian groups. Moreover, vegetarians have been shown to have lower BMI than meat eaters (Key *et al.*, 1996, 1999). A Mediterranean-style diet has also been proven to be beneficial to weight loss (Azizi and Siahkollah, 2003).

Although in some studies (De Lorenzo *et al.* 1999), fasting has been reported to reduce the serum lipids and blood sugar, no unanimous agreement exists in this regard.

To the best of authors' knowledge, the effect of Islamic fasting on the weight, BMI, serum cholesterol, glucose and triglyceride levels of overweight individuals have not been extensively studied. Additionally, controversy exists in this regard. The current study was, therefore, conducted in Shiraz, south of Iran, during Ramadan 2002, to better address these issues.

### MATERIALS AND METHODS

Twenty eight healthy males aged 20 to 26 years (mean age 23.4), voluntarily participated in this study which was performed during Ramadan in Shiraz.

They fasted each day from dawn to sunset for 29 days. The length of each day of fasting was approximately 13 h. Subjects had two main meals. One after sunset (Iftar) and the other just before dawn (Sahar)

and they were allowed to eat and drink in the interim. They were on a diet of 2000 calories containing 70 g Protein and 350 g Carbohydrate and 35.5 g fat during Ramadan. However, they were on a free diet before Ramadan.

Abstinence from water is known to cause a slight dehydration during Ramadan (Athar and Habib, 1994). To minimize the likely confounding effects of dehydration on serum cholesterol, glucose and triglyceride, subjects were encouraged to drink at least 6 glasses (1.5 L) of water or natural fruit juice from sunset to dawn.

Blood samples were taken just one day before and one day after Ramadan, after an average fasting time of 13 h. Venous blood was collected in clean glass tubes and allowed to clot at zero degree of centigrade. All specimens were centrifuged and serum was transferred to plastic tubes. Serum glucose, cholesterol and triglyceride were determined by Technical Auto Analyzer.

The weight and height of subjects were measured just one day before and one day after Ramadan.

Body weight was measured to the nearest 0.5 kg. Similarly, body height was measured to the nearest 0.5 cm. BMI was also calculated, using subjects' weight and height data.

**Data analysis and statistical procedures:** The data were analyzed using student's paired t-test, or Welch's alternate t-test (when the standard deviations of two comparable variables with the F-test were significantly different) with a preset probability of  $p < 0.05$ .

## RESULTS AND DISCUSSION

As shown, fasting resulted in significant decreases ( $p < 0.5$ ) in the mean value of both, weight and the BMI (Table 1).

The mean values of glucose and cholesterol were significantly decreased in subjects after Ramadan. However, no significant changes in serum levels of triglyceride were noted (Table 2).

Many studies have reported weight loss during the month of Ramadan fasting (Takruri, 1989; Nomani *et al.*, 1990, 1992). As shown in Table 1, our overweight subjects also experienced a 6% reduction in their weight and BMI during Ramadan. This finding is qualitatively similar to the findings of other studies in which 1.7 kg (Azizi, 1978) 1.8 kg (Sajid *et al.*, 1999), 2 kg (Takruri, 1989) and 3.8 kg (Sulimani, 1988) weight loss have been reported among normal weight individuals during Ramadan.

Similarly, total cholesterol showed a 38% decrease. This statistically significant reduction in serum cholesterol level is also in accord with other studies

Table 1: Anthropometric characteristics of subjects

| Parameter                | One day before Ramadan | One day after Ramadan | P-value |
|--------------------------|------------------------|-----------------------|---------|
|                          | Mean±SD                | Mean±SD               |         |
| Age (years)              | 23.4±1.3               | 23.5±1.3              | N/A     |
| Weight (kg)              | 84.1±8.3               | 79.03±6.7*            | <0.001  |
| Height (cm.)             | 172.46±3.64            | 172.46±3.64           | N/A     |
| BMI (kg/m <sup>2</sup> ) | 28.27±2.59             | 26.71±2.08*           | <0.0001 |

N/A: Not Applicable, \*: significantly different from its corresponding before Ramadan value (paired t-test)

Table 2: Serum glucose, cholesterol and T.G levels in subjects before and after Ramadan

| Blood constituent (mg%) | One day before Ramadan | One day after Ramadan | p-value |
|-------------------------|------------------------|-----------------------|---------|
| Glucose                 | 81±23                  | 69±8*                 | 0.01    |
| Cholesterol             | 233±29                 | 145±11*               | 0.0001  |
| Triglyceride            | 195±31                 | 197±19                | NS      |

NS: Non Significant, \* significantly different from its corresponding before Ramadan value (paired t-test)

(Katerina *et al.*, 2003) in which fasters presented 12.5% lower-end-total cholesterol value compared to their control counterparts.

Increase in total cholesterol levels during Ramadan seldom occurs (Laajam, 1990) and few studies have reported increases in high-density-lipoprotein (Adlouni *et al.*, 1998; Maislos *et al.*, 1998).

Compared to other studies (Azizi, 1978; Sajid *et al.*, 1999; Takruri, 1989; Sulimani, 1988; Katerina *et al.*, 2003) a combination of sufficient fluid intake in conjunction with a medium calorie balanced diet, as practiced in our study, more efficiently reduced the BMI, weight and serum cholesterol levels. This could be explained, at least in part, by the fact that drinking relatively large amounts of fluids reduces the normal appetite, thereby restricts food consumption.

Our data also showed a non significant slight increase in serum TG levels in fasting overweight individuals. This non significant increase is also consistent with the observations of other authors who found non significant elevations in end-fasting serum TG and VLDL that could be attributed to the lipolytic effects of prolonged fasting (De Lorenzo *et al.*, 1999; Nagra *et al.*, 1998).

Few studies have investigated the effects of Ramadan fasting on serum glucose levels (Haouri *et al.*, 1997; Azizi and Rasouli, 1987). Some have shown a mild increase (Scot, 1981) or variation in serum glucose concentration (Davidson, 1979; Khogheer *et al.*, 1981).

Fasting is known to be associated with psychological effects. There is a peace and tranquility for those who fast during the month of Ramadan. Personal hostility is at a minimum and the crime rate decreases. This psychological improvement could be related to better stabilization of blood glucose during fasting as hyperglycemia after eating, aggravates behavior changes.

(Athar and Habib, 1994). As illustrated in Table 2, serum glucose level in this study also showed a 15% decrease in overweight subjects. Qualitatively similar findings have been reported by authors in a previous study (Ravanshad *et al.*, 1999) in healthy adult male aged 16-67 years.

In conclusion, our findings demonstrate that consumption of a medium calorie balanced diet in conjunction with sufficient fluid intake during Ramadan and fasting may significantly decrease serum levels of glucose, cholesterol, as well as weight and BMI. Although none of these decreases reaches pathological level.

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