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Energy and Fluid Intake among University Female Students During and after Holy Ramadan Month

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Abstract: Insufficient daily fluid and energy intake during holy Ramadan may have adverse effects on humans' health. In previous studies the importance of energy, macro and micro nutrients intake were emphasized whilst the importance of fluids intake were overlooked, so in this study, daily fluid, energy, fiber and Ca intake of female students during Ramadan and after Ramadan were investigated and compared. In this descriptive study, 60 volunteer female students who lived on campus were recruited. Information on food and fluids intake was collected by using a three day food and fluid intake weighed record method in Ramadan and after Ramadan. This study was conducted in School of Public Health and Nutrition of Tabriz University of Medical Sciences in, 2005. In comparison with Ramadan, daily energy intake and the percentage of energy from fat sources increased significantly after Ramadan. (1400±571 vs. 1629±589kcal and 23% vs 32%). The average daily intake of fluids during Ramadan was higher than that of after Ramadan (2392±800 vs 1685±802ml). However the mean daily intake of fluid both during and after Ramadan was lower than the recommended values. The most consumed beverages during Ramadan were tea, water, soft drinks, milk and others whilst after Ramadan were tea, water, milk and soft drinks and others, respectively. Adequate energy and fluid intake, particularly milk and water in students during holy Ramadan are strongly recommended.

Key words: Fluid intake, energy intake, Ramadan, fat

Introduction

Millions of healthy adult Muslims over the world observe the holly month of Ramadan each year by abstaining from fluid and food from sunrise to sunset (Ramadan *et al.*, 1999). Traditionally the practice is to eat two meals: 1 before dawn, Sahari and 1 just after sunset, iftari (Rahman *et al.*, 2004). Therefore, the month of Ramadan is associated with prolonged period of fluid and energy deprivation (Sakr, 1975). Fluid and food intakes become exclusively nocturnal, a large quantity of fluid and food enters the individual body essentially at two night meals (Hakku *et al.*, 1994). Fluid and electrolyte disturbances produce significant orthostatic hypotension and fainting during Ramadan in field laborers, particularly in warm climate (Ramadan *et al.*, 1999). Water is the most essential nutrient for life and it is the largest single component of the body (Kleiner, 1999). The volume, composition and distribution of body fluids have profound effects on cell function. The body has no provision for water storage, therefore the amount of water lost every 24 hours must be replaced to maintain health and body efficiency (Kathleen Mahan and Escott Stump, 2004). Insufficient and inappropriate daily fluid intake, as well as, daily energy intake, in one month may have adverse effects on humans' health. Although numerous studies have carried out investigating energy, macro, micro nutrients intake and

plasma lipid levels in Iran and other Muslim countries during Ramadan (Rahman *et al.*, 2004; Gharbi *et al.*, 2003; Adlouni *et al.*, 1998; Beltaifa *et al.*, 2002; Ati *et al.*, 1995; Rashidi *et al.*, 2001; Afrasiabi *et al.*, 2001 and Hassanzadeh Salmasi *et al.*, 2001) fluid intake and beverages consumption pattern are overlooked, so daily fluid, energy and nutrient intakes of female students during Ramadan and two months after Ramadan were investigated and compared.

Materials and Methods

In this descriptive study, 60 volunteer female students who lived on campus, with average age of 21.5±2 (y) and average weight of 54.5±6.5kg were recruited. Height of subjects was measured using a mounted tape with the subjects' arm hanging freely at their sides and recorded to the nearest 0.5cm. Body weight of subjects was measured with barefoot and light clothing to the nearest 0.1kg with a Seca scale mod. 220. The body mass index (BMI) was calculated as weight (kg) divided by height (m²). Information on food and fluids intake was collected by using a three day food and fluid intake weighed record (one weekend day included) in the middle of Ramadan (October, 2005) and two months after Ramadan (December, 2005) Dietary intake of subjects was analyzed by using Nutritionist III for windows software program which has been modified by adding

Iranian food composition tables (Movahedi and Roosta, 2001). The data of dietary intakes for 12 female students were not included in the statistical analysis, since 5 of the mentioned subjects, due to skipping down meal because of being on diet, were under-eating and 7 of them because of attending iftari ceremonies didn't follow their usual diet. The mean total fluid intake (drinking fluid values merged with data on the water content of foods) and also the rate of metabolic water during and after Ramadan were figured out. Daily fluid requirements of subjects were estimated by reasonable allowance based on recommended caloric intake, 1ml/kcal, (Kathleen Mahan and Escott Stump, 2004). It has been reported that, the oxidation of foods in the body produces metabolic water as an end product. The oxidation of 100gr fat, carbohydrate and protein yields 107, 55, 41gr of water, respectively for a total of approximately 200-300 ml/d (Kathleen Mahan and Escott Stump, 2004). So the rate of metabolic water in students was also figured out. Data were analyzed using students paired t-test by SSPS for windows software version 10. Values were considered to be significantly different if $P < 0.05$. All data were expressed as mean \pm SD. This study was conducted in School of Public Health and Nutrition of Tabriz University of Medical Sciences in, 2005.

Results

Table 1 shows the selected general characteristics of the students, their body weight and BMI variation during Ramadan and two months after Ramadan. The mean values of body weight and BMI during Ramadan were higher than after Ramadan but these changes were not significant. Data reported in Table 2 shows that total daily energy intake and fat intake increased significantly after Ramadan. The mean daily fiber intake did not change significantly during Ramadan. However, the mean intake of fiber during and after Ramadan was significantly lower than the recommended values. The mean daily intake of calcium during Ramadan decreased but it wasn't statistically significant (Table 2). As considered in Table 3, the total mean of fluid intake during Ramadan (2392 \pm 800ml) reflects the sum of drinking fluids (1512 \pm 620ml, 64%) and the water content of foods (800 \pm 35ml, 36%). The rate of metabolic water in subjects was 200 \pm 166ml. After Ramadan the total mean of fluid intake (1685 \pm 802ml) includes the sum of drinking fluids (1180 \pm 623ml, 70%) and the water content of foods (505 \pm 357ml, 30%). Metabolic water rate of subjects after Ramadan was 231 \pm 165ml. During and after Ramadan the total mean of beverages consumption (1512 \pm 620ml) and (1180 \pm 623ml) respectively, which were significantly lower than both reasonable allowance based on recommended caloric intake (1919 \pm 27ml). Mean daily intake of total fluid and water content of foods during Ramadan were significantly higher than those of post-Ramadan. Mean daily intake of various beverages during and after

Ramadan are shown in Table 4. As considered, the most consumed beverage during Ramadan and also after Ramadan was tea. In fact, tea accounted for 34% of total daily beverage intake during Ramadan and for 33% of that after Ramadan. Comparison of mean daily intake of various beverages during and after Ramadan indicated that the mean daily intake of tea was significantly higher than after Ramadan.

Discussion

We were interested in investigating fluids, energy and nutrients intake in a population of 60 Iranian female students during and after Ramadan. Analysis of the recorded food intake revealed that the mean daily energy intake during Ramadan reduced, which was due to significant decrease of fat intake but not to carbohydrate and protein intake which were increased only when expressed as percent (%) of total energy. In contrast, energy intake of the Tunisian (Gharbi *et al.*, 2003) during Ramadan (2432 \pm 590) was significantly higher than after Ramadan (2018 \pm 594) because of significant increases in carbohydrate, protein and also fat intake. In Moroccan men, energy intake during Ramadan (3210 \pm 101) was significantly higher than before Ramadan (2683.8 \pm 785) but it wasn't significantly higher than after Ramadan (2852.2 \pm 625). Carbohydrate intake and also, in slight proportion, protein intake were increased significantly during Ramadan compared with the values before Ramadan but there weren't any significant differences compared with after Ramadan (Aldouni *et al.*, 1998). In Bangladeshi men the mean energy intake during Ramadan and post Ramadan did not show significant difference. However fat intake after Ramadan compared with during Ramadan declined significantly (Rahman *et al.*, 2004). It seems that the results of previous studies and this study did not correspond because this study conducted among university students who lived on campus, so it is possible that residence had a great influence on low energy intake of students, particularly, during Ramadan. Moreover, the cause of less energy intake during Ramadan might be concerned with the number, time of meals, depressed appetite and the place of residence or it could be due to tendency for weight loss. Generally two meals are consumed between sunset and dawn and the appetite is probably depressed due to altered meal schedules and also it might be associated with the meals provided by canteen of the university. Fluids intake Comparison of total daily fluids intake during Ramadan with that of after Ramadan showed significant difference, that of total daily fluids intake during Ramadan were much more than after Ramadan. It is due to higher consumption of beverages and particularly increased water content of foods during Ramadan. It is interesting to note that although during Ramadan food intake of students decreased-which was conducive to less energy intake daily total fluid and water content of foods increased, that may imply on more

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Table 1: The demographic and anthropometric characteristics of the students

	During Ramadan	After Ramadan
Age(y)	21.5±2	21.6±2
Weight(kg)	54.5±6.5	53.5±7.5
Height(cm)	160.5±4.8	160.5±4.8
BMI (kg/ m ²)	21.26±1.4	21±1.5

Table 2: Daily mean intake of energy and the distribution of energy among the macronutrients, fiber and calcium intake

	During Ramadan	After Ramadan
Total energy intake (kcal)*:	1400±571	1629±589
- Energy from Carbohydrate (%)	62	55
- Energy form protein (%)	15	13
- Energy from fat* (%)	23	32
Fiber intake (gr)	9.5±5.7	12.28±2.7
Calcium intake (mg)	378.44±27.2	489±370

*p<0.05

consumption of watery foods like different kinds of soups during Ramadan. In current study, total daily fluid intake of females during Ramadan was 2392±800ml which was higher than that of Ghaem Maghami *et al.* report which was 1971ml per day (Ghaemmaghmi *et al.*, 2003). Total mean of beverages consumption in this study during Ramadan (1512±620ml) and after Ramadan (1180±623ml) which had insignificant difference, were similar to total mean per capita drinking fluid intake based on USDA, CSFII (USDA, 1995) data from, 1989-1991 (in females, 1074ml). Mean daily intake of nonalcoholic beverages from, 1995. National Nutrition Survey in Australia (Australian Bureau of Statistics, 1999) was in females 1917ml. As Considers, these values were greater than our reported values both in Ramadan and after Ramadan. Also in present study, the mean beverage consumption during and after Ramadan, according to the results of NHANES Data (NHANES III, 1988-1994) in, 1988-1994 (2838±41ml for females), CSFII (U.S., 1998) in, 1994-1996 and, 1998 (2367ml for females) and Canadian dietary intake data (Canadian Dietary intake data for adults from ten province, 1990-1999) in, 1990-1997 (2455±130ml in females) was remarkably low. Since current study was conducted in fall, it could be assumed that the low climatic temperature of the season contributed to low consumption of fluids. If a similar study was conducted in a summer, different result would be obtained. In this study, the most consumed beverages in female subjects during Ramadan were respectively tea (34%), water (31%), soft drinks (11%), milk (10.7%) and after Ramadan were respectively, water (32%), tea (33%), milk (19%) and soft drinks (10%), whilst in National Nutrition Surrey (Australian Bureau of Statistics, 1999) in Australia, 1995, the must consumed beverages in females were water (44.31%), tea (23.64%) and coffee (19.78%). In conclusion the average daily intake of fluids during Ramadan was higher than that of After Ramadan

Table 3: Daily mean intake of total fluids (including beverages and food water) and metabolic water

	During Ramadan	After Ramadan
Total fluids intake(ml)*:	2392±800	1685±802
- Beverages (ml)	1512±620	1180±623
- food water (ml)*	880±35	200±166
Metabolic water (ml)	505±357	231±165

*p<0.05

Table 4: Daily mean intake of total and various beverages (mean, SD, percent)

	During Ramadan	After Ramadan
Total beverages:(ml)	1512±620	1180±1623
- Water(ml)	(465±360, 31%)	(377.6±276, 32%)
- Tea*(ml)	(512±500, 34%)	(385.4±294, 33%)
- Milk(ml)	(162±130, 10.7%)	(229±110, 19%)
- Soft drinks(ml)	(165±30, 11%)	(118±26, 10%)
- Fruit juices(ml)	(104±60, 7%)	(35±19, 3%)
- Yoghurt drinks(ml)	(100±95, 6.3%)	(35±20, 3%)

*p<0.05

but the mean daily intake of fluid both during and after Ramadan was lower than the recommended values and pattern of fluids consumed was inappropriate. It is strongly suggested that the daily consumption of fluids, particularly, water and milk be enhanced.

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