

## Changes in Dietary Intake during Ramadan in North East of Iran Population

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### ABSTRACT

**Introduction:** Ramadan is the holiest month in Islamic calendar and Muslims abstain from eating, drinking, and smoking from dawn to sunset, in which there are changes in quality of food and eating patterns. The purpose of this study was to know whether these changes provide nutritional needs, and supply all of necessary macronutrients for individuals in the month.

**Method:** A prospective observational study was performed during Ramadan of 1429 AH (September, 2008) in Mashhad, Iran. Among 335 subjects enrolled for the study, 266 subjects met inclusion criteria. We used a semi-quantitative 302-item food frequency questionnaire (FFQ) that was self-administered and assessed the subject's energy, macronutrient, and fiber intake over the previous three days. Dietary intake assessment was carried out one week before or after Ramadan and during the month.

**Results:** Data showed that the amount of energy intake and macronutrients increased significantly in women and men less than 35 years during Ramadan, and also we found a significant difference in protein intake between males and females less than 35 years old out of Ramadan time,.

**Conclusion:** This study revealed that there was a significant increase in intake of energy and macronutrients in men and women less than 35 years that was mainly due to high consumption of carbohydrate during this month. In this study there was no change in energy intake of participants over 35 years old.

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### Introduction

Ramadan is the holiest month in the Islamic calendar and Muslims abstain from eating, drinking, and smoking from dawn to sunset. (1)

Ramadan fasting is partial, because the intake of food and water is permissible from sunset to

dawn. There are changes in the quality of food and eating patterns. (2) It might be due to the consumption of more carbohydrates and sweet foods. (1) Fasting during Ramadan causes a drastic change in lifestyle for the period of one lunar month. (3) The quality of ingested nutrients

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can also differ during Ramadan compared to the rest of the year. The fasting period per day may vary depending on the geographical location of the country and the season of the year, and can be as long as 18 hours/day in the summer. Furthermore, a decrease in meal frequency (4) and sleep duration, (5) together with a reduction in daily physical activities during Ramadan (6) have been reported.

One research determining energy intake was performed on healthy Iranian population in Ramadan. The result of research showed that the total energy intake was reduced during Ramadan in all participants. (7)

There are many researches about Ramadan with different results. Some of these studies concluded an increase in energy intake, (8-10) some concluded a decrease, (4, 5, 7) and some others showed no changes. (3, 11) These different results might be due to different cultures in Islamic countries. In most of these researches, consumption of simple carbohydrates and sweet foods increased significantly. (8, 9)

It is important to provide energy and calorie with necessary macronutrients for body. Not providing sufficient energy can cause eating disorders.

This study was done in order to assess whether or not changes in eating habits could provide nutritional needs in Ramadan, and that these changes could supply all necessary macronutrients for individuals in this month.

## Material and Methods

A prospective observational study was performed during Ramadan of 1429 AH (September, 2008) in Mashhad, Iran. A random sample of Muslims who indicated their intention to fast during Ramadan was recruited from all six districts of Mashhad by cluster sampling.

Inclusion criteria were healthy adults aged  $\geq 15$  years old, who were planning to fast for at least 20 days of the Ramadan, and who consented to their participation. Fasting is not obligatory for the sick or anyone whose health might be negatively affected by fasting as well as for menstruating, pregnant, and lactating women, and travelers. Participants who reported implausible energy intakes ( $< 800$  or  $> 6,000$  kcal/day,  $n = 69$ ) (12) were excluded from the analyses. The study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Research Ethics Committee of Mashhad University of Medical Sciences (approval number 87224). Written informed consent was obtained from all subjects before participation.

## Dietary intake assessment

Dietary intake assessment was carried out one week before or after Ramadan and during this month to assess their intake in non-fasting days and during fasting period, respectively. A semi-quantitative 302-item food frequency questionnaire (FFQ) was designed based on two FFQs previously validated in the Iranian population. (13, 14) The FFQ was self-administered that assessed subject's energy, macronutrient, and fiber intake over the previous three days. Consumption of foods was broken down into seven frequencies: the highest was 5 times a day and the lowest was never. Pictures of standard portion sizes were used to estimate usual portion consumed for foods such as rice and pasta. For each food item, the frequency consumed per day was multiplied by the amount consumed based on portion size to compute the total amount consumed per day. Iranian food composition tables were used to calculate the daily energy, macronutrient, and fiber intake. (15)

## Statistical Analysis

Statistical analyses were performed using the SPSS 15.0 software (IBM Company, Chicago, USA). Data were checked for normality before analysis by the Kolmogorov-Smirnov test and by examining normality plots. A paired t-test was used for comparison between two sets of data for normally distributed data, and the Wilcoxon Signed Ranks test was used for non-parametric data. Calorie and macronutrients intake in males and females were compared using an independent t-test for normally distributed data or Mann-Whitney U test for not-normally distributed data. A p-value  $\leq 0.05$  was considered to indicate a statistically significant difference. Data are expressed as mean and standard deviation (SD).

## Results

Among 335 subjects recruited into the study, 266 subjects met inclusion criteria (119 males: mean age 34.1 y; 147 females: mean age 25.3 y). Subjects were categorized by age and sex, and the intake of energy and macronutrients in each group was analyzed. (Table 1)

Data showed that the daily intake of energy, macronutrients, and fiber increased significantly in men less than 35 years in Ramadan, but in men over 35 years the intake of energy, macronutrients, and fiber decreased insignificantly during this month.

The amount of energy intake and macronutrients increased significantly in women less than 35 years in Ramadan, but in women

**Table 1.** Dietary energy, macronutrient, and fiber intakes pre- and during Ramadan according to gender (n= 266).

		Age <= 35 years old					Age > 35 years old				
		Pre Ramadan		During Ramadan		P value <sup>†</sup>	Pre Ramadan		During Ramadan		P value <sup>†</sup>
		Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Energy intake (kcal/day)	Males (n=119)	2476	1164	2866	1262	0.019	2507	1173	2277	993	0.131
	Females (n=147)	2191	1040	2719	1180	0.000	2503	1301	2604	1229	0.654
Carbohydrate (g/day)	Males	319.2	157.1	382.9	174.2	0.008	318.0	151.8	289.3	141.9	0.161
	Females	277.9	133.9	356.9	155.3	0.000	327.0	154.1	354.0	195.7	0.627
% ‡ carbohydrate	Males	51.3	6.9	53.3	7.0	0.049	50.8	6.5	50.1	7.0	0.587
	Females	50.8	6.7	52.9	7.0	0.007	52.9	7.2	53.6	9.0	0.694
Protein (g/day)	Males	88.6	41.3	98.7	46.8	0.110	95.3	48.9	83.5	42.3	0.101
	Females	76.8	39.7	92.2	46.1	0.002	91.5	55.5	86.4	47.7	0.709
% ‡ protein	Males	14.8	3.8	13.9	3.0	0.117	15.2	3.2	14.5	3.3	0.321
	Females	14.1	3.0	13.5	2.6	0.077	14.3	3.1	12.8	2.7	0.044
Fat (g/day)	Males	94.3	49.5	106.2	51.6	0.073	96.0	49.2	87.9	35.0	0.348
	Females	86.3	44.4	103.9	54.1	0.001	95.0	58.9	95.8	46.2	0.737
% ‡ fat	Males	33.9	6.5	32.8	6.2	0.256	34.1	5.3	35.4	5.8	0.253
	Females	35.2	6.1	33.6	5.9	0.022	32.8	6.0	33.5	7.4	0.662
Fiber (g/day)	Males	19.5	13.5	22.8	11.2	0.010	20.8	10.9	18.5	9.2	0.219
	Females	19.1	9.7	22.1	10.3	0.004	23.9	13.0	22.0	13.0	0.681

† Comparing pre- and during Ramadan variables done by paired samples t-test for normally distributed data, and by Wilcoxon test for non-normally distributed data

‡ % of daily energy

over 35 years these differences were not statistically significant.

There was no significant difference in energy, macronutrients, and fiber intake among males and females in each age group during Ramadan and out of Ramadan, except in the protein intake which was significantly different between males and females less than 35 years old out of Ramadan time .

## Discussion

In this study, statistical analysis was done based on two age groups:

### Less than 35 years old

Our study findings indicated Ramadan fasting affected energy and macronutrients intake in both males and females in this age group. Energy intake in Ramadan was significantly higher than that out of this month and it was mainly due to high consumption of carbohydrate during this month. There are some studies that show increase in energy intake during this month. (8-10, 16-18) Frost and Pirani reported a significant increase in energy and macronutrients intake in a sample group of 15 young Saudis'. (16) Some of studies reported carbohydrate consumption was higher during this month (8,9,16) but some of other studies reported no change in consumption

of carbohydrates (17,18) or decrease in carbohydrates intake. (10)

### Over 35 years old

In the present study, the amount of energy and macronutrient intake in men and women over age 35 were not significantly different in Ramadan. There are some studies showing the same result, (3,11,19) one of them is Al-Hourani's study on 57 female subjects recruited from the Hashemite University in Jordan. The study showed that the mean energy and nutrients intake before and during Ramadan was not significantly changed. (11) In another study on Tunisian Muslim women, total daily energy intake remained unchanged during Ramadan. (3)

### Decrease in energy intake during Ramadan

Findings of this study indicated two sets of results based on different age groups:

1. Increase in energy intake during Ramadan in males and females younger than 35 years old.
2. No change in energy intake in over 35 years of age participants.

But some of other studies reported decrease in energy intake during Ramadan. (4, 5, 7, and 20) In Larijani's study, (7) dietary intake was recorded using a semi-quantitative FFQ. One hundred and fifteen healthy Iranian volunteers participated in this study and results showed a

significant decrease in energy intake during Ramadan. Intake of macronutrients was not assessed in this study.

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### References

1. Sarraf-Zadegan N, Atashi M, Naderi GA, Baghai AM, Asgary S, Fatehifar MR, et al. The effect of fasting in Ramadan on the values and interrelations between biochemical, coagulation and hematological factors. *Annals of Saudi medicine* 2000;20(5/6):377-81.
2. Cohn C, Joseph D. Role of rate of ingestion of diet on regulation of intermediary metabolism" meal eating" vs." nibbling". *Metabolism* 1960;9:492-500.
3. el Ati J, Beji C, Danguir J. Increased fat oxidation during Ramadan fasting in healthy women: an adaptative mechanism for body-weight maintenance. *The American journal of clinical nutrition* 1995;62(2):302-7.
4. Angel JF, Schwartz NE. Metabolic changes resulting from decreased meal frequency in adult male Muslims during the Ramadan fast. *Nutr Rep Int* 1975;11:29-38.
5. Husain R, Duncan MT, Cheah SH, Ch'Ng SL. Effects of fasting in Ramadan on tropical Asiatic Moslems. *British Journal of Nutrition* 1987;58(01):41-8.
6. Sulimani RA, Famuyiwa FO, Laajam MA. Diabetes mellitus and Ramadan fasting: the need for a critical appraisal. *Diabetic medicine* 2009;5(6):589-91.
7. Larijani B, Zahedi F, Sanjari M, Amini MR, Jalili RB, Adibi H, et al. The effect of Ramadan fasting on fasting serum glucose in healthy adults. *Medical Journal of Malaysia* 2003;58(5):678-80.
8. Lamri-Senhadj MY, El Kebir B, Belleville J, Bouchenak M. Assessment of dietary consumption and time-course of changes in serum lipids and lipoproteins before, during and after Ramadan in young Algerian adults. *Singapore medical journal* 2009;50(3):288.
9. Adlouni A, Ghalim N, Benslimane A, Lecerf JM, Saile R. Fasting during Ramadan induces a marked increase in high-density lipoprotein cholesterol and decrease in low-density lipoprotein cholesterol. *Annals of nutrition and metabolism* 1997;41(4):242-9.
10. Oliveras López MJ, Agudo Aponte E, Nieto Guindo P, Martínez Martínez F, López García de la Serrana, & López Martínez MC. Nutritional assessment in a Moroccan university population during Ramadan. *Nutricion hospitalaria : organo oficial de la Sociedad Espanola de Nutricion Parenteral y Enteral* 2006;21(3):313-6.
11. Al-Hourani HM, Atoum MF. Body composition, nutrient intake and physical activity patterns in young women during Ramadan. *Singapore medical journal* 2007;48.906:(10)
12. Epstein LH, Carr KA, Lin H, Fletcher KD, Roemmich JN. Usual energy intake mediates the relationship between food reinforcement and BMI. *Obesity* 2012;20(9):1815-9.
13. Malekshah AF, Kimiagar M, Saadatian-Elahi M, Pourshams A, Nouraie M, Gogiani G, et al. Validity and reliability of a new food frequency questionnaire compared to 24 h recalls and biochemical measurements: pilot phase of Golestan cohort study of esophageal cancer. *European journal of clinical nutrition* 2006;60(8):971-7.
14. Mirmiran P, Hosseini Esfahani F, Mehrabi Y, Hedayati M, Azizi F. Reliability and relative validity of an FFQ for nutrients in the Tehran Lipid and Glucose Study. *Public health nutrition* 2010;13(05):654-62.
15. Dorosty Motlagh AR, Tabatabaei M. *Food Composition Tables*. 1st ed ed. Tehran, Iran: Doniaie Taghzie; 2007.
16. Frost G, Pirani S. Meal frequency and nutritional intake during Ramadan: a pilot study. *Human nutrition Applied nutrition* 1987;41(1):47.
17. Gharbi M, Akrouf M, Zouari B. Food intake during and outside Ramadan. *East Mediterr Health J* 2003;9(1-2):131-40.
18. Lamine F, Bouguerra R, Jabrane J, Marrakchi Z, Rayana MCB, Slama CB, et al. Food intake and high density lipoprotein cholesterol levels changes during ramadan fasting in healthy young subjects. *Tunis Med*. 2006;84(10):647-50.
19. Fedail SS, Murphy D, Salih SY, Bolton CH, Harvey RF. Changes in certain blood constituents during Ramadan. *The American journal of clinical nutrition* 1982;36(2):350-3.
20. Poh BK, Zawiah H, Ismail MN, Henry CJK. Changes in body weight, dietary intake and activity pattern of adolescents during Ramadan. *Malaysian Journal of Nutrition* 1996;2(1):1-10.