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INAPPROPRIATE NUTRITIONAL INTAKES DURING RAMADAN IN OBESE WOMEN PATIENTS WITH FATTY LIVER PRECLUDE ITS BENEFICIAL EFFECT

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ABSTRACT: Introduction: Ramadan is a lunar month in the Islamic calendar. During this month, individuals who desire to keep a strict fast from dawn to sunset prevent stop eating and drinking. We evaluated the dietary intakes of patients with fatty liver during this month. **Material and Methods:** Sixty eligible overweight and obese women with fatty liver diagnosed *via* ultrasonography who had referred to the maternal and child obesity research center were included in this prospective study. Demographic, nutritional, clinical and laboratory data for each patient were extracted and analyzed. Dietary intake was evaluated by a 24 h dietary recall questionnaire and specific validated food frequency questionnaire. **Results:** The mean age in this population group was 41.4 ± 7.79 years, mean participant weight was 78.90 ± 12.33 kg, and mean BMI was 32.08 ± 4.62 . Mean daily energy, carbohydrate, protein, and fat intake, and mean daily intake from different food groups were evaluated and extracted as mean \pm SD. Mean daily energy intakes during Ramadan and mean requirement were 2527.41 ± 1509.58 and 1862.51 ± 1518.86 Kcal/day respectively. The analysis for comparing the patients' non-Ramadan requirement and Ramadan intakes in this study group showed no significant differences for the two comparable parallel variables. **Conclusion:** This study showed that the daily intakes from different dietary food groups in this population during Ramadan were not appropriate and well-balanced, so this can preclude the beneficial effects of such dieting.

INTRODUCTION: Ramadan is a lunar month in the Islamic calendar ¹. About 18% of the World's populations take this fasting regimen ². During this month, individuals who desire to keep a strict fast from dawn to sunset, eating and drinking ³. Fasting is a way of abstaining, partially or entirely, from food and drink.

During Ramadan, Muslims fast everyday from dawn to sunset and refrain from drinking and eating in this period; however, there are no restrictions on food or fluid intake between sunset and dawn ⁴.

During Ramadan, the frequency and quantity of food and daily physical activity will change. Eating habits, as well as food quality, differ during Ramadan compared with other months. There is tendency to consume foods that are richer in carbohydrates during this month ⁵. Eating habits change during Ramadan because Muslims have two meals a day ^{6, 7, 8}. Substantially, the total daily amount of food taken during Ramadan should be decreased ^{9, 10}.

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This means that Ramadan fasting is similar to a diet program. It is possible that these changes in meals and sleep rhythm could lead to changes in metabolism^{2, 11}; therefore, evaluating dietary intakes during this month will be important and valuable for studying their composition and consequences¹². During this month, some people consume less but healthier food based on their beliefs related to this month. However, the majority follows an unhealthy diet, consuming more fat, sweets and starchy staples in their meals and refusing dairy, vegetables and fruits^{3, 4, 13}. They do not consume these items because they believe that these food groups are cold and less sustainable in this period.

Fatty liver patients are peoples who are sensitive to their daily dietary intakes. In certain cases fasting may aggravate fatty liver and fat accumulation; on the other hand, reducing the total amount of daily intake can result in weight loss^{14, 15}. During Ramadan there may be increased consumption of specially prepared foods that are rich in fat, protein or carbohydrates. This can result in weight gain in some individuals in Ramadan^{3, 4, 16}. Nevertheless, the reduction in energy and macronutrient intakes can result in body weight and fat mass loss in others^{7, 17, 18, 19}. A number of studies have indicated that Ramadan fasting is a good opportunity for individuals to take part in a group dieting program. Therefore, we evaluated the dietary intakes of patients with fatty liver during this month.

MATERIAL AND METHODS:

Participants: Overweight and obese women referred to the Maternal and Child Obesity Research Center and diagnosed with fatty liver by ultrasonography were included in this prospective study. Food questionnaires were then filled and laboratory examinations of serum triglycerides, HDL, LDL, glucose, liver enzymes, and HOMA-IR were conducted in Shahid Motahari University Educational Hospital laboratory. Sampling was continued until 60 fatty liver overweight or obese patients were included. The fatty liver grades established by ultrasonography.

The inclusion criterion was being a woman with BMI more than 25 kg/m². Written consent forms were filled for all of them. The exclusion criteria were having a history of heart disease, history of

drug-induced fatty liver caused by amiodarone, diltiazem, methotrexate and tamoxifen, seropositive hepatitis C and B, pregnancy, type I diabetes, insulin therapy, menopause, use of oral contraceptives and steroids, as well as suffering from metabolic syndrome or being unsuitable for follow and study accompaniment. People who had been fasting for at least 20 consecutive or intermittent days during Ramadan were eligible for inclusion. This study has approved by the ethics committee of Urmia University of Medical Sciences with IR-UMSU.REC.1393.256 ethical registration number.

Demographic and Anthropometric Measures:

Body weight and height were measured by the same staff using an electronic balance with a stadiometer. Weight and height were recorded to the nearest 0.1 kg and 0.1 cm respectively. The body mass index (BMI) was then estimated.

Nutritional Assessment: Dietary intake was evaluated by a 24 h dietary recall questionnaire and specific validated food frequency questionnaire.

Statistical Analysis: Demographic, nutritional information, clinical and laboratory data for each patient were extracted and analyzed by SPSS V20. The results are reported as mean values and standard deviations.

RESULTS AND DISCUSSION: Results from sixty patients with various grades of fatty liver showed that mean age in this population group was 41.4 ± 7.79 years, mean weight was 78.90 ± 12.33 kg, and mean BMI was 32.08 ± 4.62. **Table 1** shows the patients' demographic and anthropometric data.

TABLE 1: DEMOGRAPHIC AND ANTHROPOMETRIC DATA ON THE FATTY LIVER POPULATION GROUP DURING RAMADAN

Variable	Start of Ramadan fasting	End of Ramadan fasting
	Mean ± SD	Mean ± SD
Age (Year)	41.4 ± 7.79	
Weight (Kg)	78.90 ± 11.57	79.69 ± 12.33
Body Mass Index (BMI)	32.08 ± 4.62	32.83 ± 9.15
Waist Circumference (WC)	101.13 ± 10.64	101.39 ± 10.36
Waist to Hip Ratio (WHR)	0.87 ± 0.07	0.9 ± 0.05

Mean daily energy, carbohydrate, protein and fat intake in this group was evaluated and expressed as mean \pm SD. Percentage of daily calorie provided from each macronutrient was also calculated, that has presented in **Table 2**.

TABLE 2: MEAN MACRONUTRIENT INTAKE IN FATTY LIVER POPULATION GROUP DURING RAMADAN

Variable	Mean \pm SD	% of daily calorie intake
Energy (Kcal/day)	2527.41 \pm 1509.58	---
Carbohydrate (gr/day)	383.38 \pm 257.59	% 60.69
Protein (gr/day)	104.80 \pm 59.39	% 16.59
Fat (gr/day)	63.84 \pm 41.27	% 22.73
Simple Sugars (gr/day)	79.09 \pm 133.18	% 12.5

In the last analysis on the extracted data, daily macronutrient and dietary food group intakes in patients with different grades of fatty liver were compared. The analysis showed no significant difference between intakes in patients with different grades of fatty liver.

TABLE 4: DATA ON DAILY MACRONUTRIENT AND FOOD INTAKES IN PATIENTS WITH DIFFERENT GRADES OF FATTY LIVER

Severity of fatty liver	N	Mean \pm SD			
		Energy	Carbohydrate	Protein	Fat
Grade I	17	2877.1 \pm 2018.63	463.11 \pm 352.61	169.7 \pm 73.03	61.86 \pm 48.19
Grade II	25	2562.2 \pm 1312.21	376.99 \pm 216.09	108.51 \pm 51.39	68.9 \pm 39.6
Grade III	18	2126.6 \pm 1140.40	313.07 \pm 184.59	87.17 \pm 54.60	58.39 \pm 37.75
P Value		0.352	0.237	0.321	0.708

There have been various studies with different results on nutrition during Ramadan. Some of these studies indicated an increase in energy intake, some others concluded a decrease, and yet others showed no changes. These different results might be due to different cultures in Islamic countries or the significantly increased consumption of simple carbohydrates and sweet foods during this month^{9, 11, 13, 16, 20, 21}.

In a study by Al-Hourani *et al.*, in Jordan on female students, intakes of sweets and simple sugars have shown an increase during Ramadan⁷. Mean daily energy intake in that study has been 1171 Kcal/day. Also in other studies in Morocco and Saudi Arabia increased energy intakes have been reported during Ramadan^{7, 22, 23}. In most instances, calorie and macronutrient intakes have shown increases during Ramadan. Part of this increase is related to the increase in the intake of food and beverages that are rich in carbohydrate and simple sugars.

The analysis for comparing the patients' requirement and intakes during this month showed significant differences between these two variables. Mean energy requirement was 1862.51 \pm 1518.86 Kcal/day, whereas mean intake was 2527.41 \pm 1509.58 Kcal/day. In 13.6% of patients, intakes were in the range of \pm 10% of their requirements (normal intakes). In 27.3% of patients, intakes were below this range, and 59.1% of participants had intakes more than their requirement.

TABLE 3: MEAN DAILY INTAKES FROM VARIOUS DIETARY GROUPS IN PATIENTS WITH FATTY LIVER DURING RAMADAN

Variable	Mean \pm SD	% of daily calorie intake
Dairy (Serving/day)	1.24 \pm 1.36	4.98%
Vegetables (Serving/day)	3.11 \pm 2.58	2.6%
Fruits (Serving/day)	1.38 \pm 3.09	2.77%
Sweets (Serving/day)	5.45 \pm 8.97	10.94%
Cereals (Serving/day)	22.55 \pm 15.27	56.6%
Meats (Serving/day)	4.8 \pm 4.03	12.05%
Oil and Fats (Serving / day)	6.67 \pm 5.96	10.05%

For example, in a study by Meckel *et al.*, energy intake during Ramadan has been more than its pre-Ramadan state⁸.

Mean energy intakes has reported to be 3240 Kcal/day, and participant intakes have been more than the present study, 3240 Kcal/day vs. 2527.41 \pm 1509.58 Kcal/day.

One of the important issue during this month is the level of intakes. Concomitant with reduced meal frequency, total daily intakes should also be reduced if we want to see the beneficial effects of fasting during this month. Unfortunately, in most studies, intakes have been more than the requirements¹³. In this study, we compared the patients' requirement and intakes, whereas in other studies less had been done in comparing these two variables. They had compared just intakes in Ramadan with their non-Ramadan state. In one study from the United Arab Emirates (UAE) on 29

men and women with average age of about 37 years, despite the reduced meal frequency, total daily energy intake remained high and unchanged, so no significant differences have been reported between intakes and meal frequencies in Ramadan and non-Ramadan state³.

Unfortunately, there are conflicting data on the effect of Ramadan fasting on weight status, total daily energy intake, and its health benefit^{3, 24}. Some of these variations are related to the lack of significant difference between intakes in Ramadan and non-fasting state; some others are because of increased fat and simple sugar intake, and others are attributable to confounding variables such as ethnicity, duration of fasting, climatic conditions, cultural influences, and physical activity³. We believe that alongside with comparison of intakes between fasting and non-fasting states, comparing actual daily intakes and requirements will be valuable.

In a study by Sadiya *et al.*,³ in UAE during Ramadan, an increased intake of fat and oils has been reported. Results of their study indicated an increased fat as much as 34.65% of total daily calorie intake. In the present study, the percentage of calorie provided by fat was about 22.73%. One of the possible reasons for this difference may be attributed to our patients' knowledge and attitude toward the fat intake.

Our study population consisted of patients with fatty liver, while their study participants have been patients with metabolic syndrome. Fatty liver patients have strong motivations for reducing the percentage of daily calorie provided by fat in their diet. Another similar study has been conducted by Alhurani *et al.*,⁷ in Singapore, where the mean daily energy intake during Ramadan has been 1171 Kcal/day.

In the present study, this amount was 2527 Kcal/day. In a number of studies such as the study by Alhurani *et al.*, total daily calorie intake during Ramadan has been reported to be low, while in some others a high calorie intake during Ramadan has been reported. In addition, some studies have reported that total energy intake during Ramadan has not changed in comparison with its non-Ramadan state³.

Another debatable and important issue in regard the Ramadan dieting is diet macronutrient composition. In the study by Alhurani *et al.*,⁷ diet composition for macronutrients was 56.2% for carbohydrate, 12% for protein, and 34.2% for fat, whereas in our study these percentages were 60.69%, 16.56% and 22.7% for carbohydrate, protein, and fat, respectively. In our studied population, 12.5% (equal to 79.09 gr/day) of total daily calorie intake was derived from simple sugars; this amount was reported to be 52.4 gr/day by Alhurani *et al.*, In the study by Sadiya *et al.*,³ there have been a decrease in protein and an increase in fat intake during Ramadan. There has been a non-significant trend towards reducing carbohydrate intake.

In this study, we also compared the patients' intake with their requirement. Mean daily patient requirement was 1862 Kcal/day, while this amount had been 2000 Kcal/day in the study by Alhurani *et al.*,⁷ considering that the diet in their study provided 43.5%, 12% and 40.5% of the patients' daily energy intakes from carbohydrate, protein and fat, respectively. Other studies conducted in other areas have shown different results. For example, according to Poh and Suriani *et al.*,²⁵ the mean daily energy intakes for Malaysian adolescent boys and girls have been 1230 and 1034 Kcal/day respectively, while their mean daily requirements have been 2600 and 2350 Kcal/day, respectively.

In the present study, intakes were more than requirements, in contrast with the abovementioned study in which intakes have reported less than requirements. In a review study by Trepanowski *et al.*,¹ heterogeneous design and findings have observed in different studies. The implication from various studies have indicated increased intake during Ramadan in comparison with its non-Ramadan state. In some instances, increased amounts of macronutrient intakes have been reported.

Average daily intakes from different dietary groups can be representative of the level of adequacy, balance and relevance in the diet. In the present study, mean daily serving intakes from dairy products, cereals and fruits were inappropriate and inadequate, with more daily servings of cereals and few servings of dairy products and fruits. Similar to our study, in the study conducted by Sadiya *et al.*,³

in the UAE, daily intakes from different dietary groups have been inappropriate, with high daily intakes from cereals. Cereals were the predominant group, providing about 31.7% of total daily calorie intakes. In the present study, cereals provided about 56.6% of total daily calorie intake (22 servings/day). In their study, mean dairy product intakes have reported 1.2 servings/ day; this amount was about 1.24 servings/day in our study. Mean daily intakes from fruits and vegetables in their study have been 2.2 and 1.2 servings/day respectively, different from the amounts reported by us. In our study, mean daily intakes for fruits and vegetables were 3.1 and 1.38 servings/day respectively.

CONCLUSION: It can be concluded from this study that to see the positive effects of Ramadan dieting, while reducing meal frequencies and prolonging the fasting period, it is necessary to reduce total daily calorie intake to the safe range and appropriate amount. Moreover, daily intakes from different dietary groups should be in balance with and appropriate for the daily prescribed servings according to personal requirements.

Therefore, any deviations from normal, well-balanced, and scientifically defined intakes can be confounding for benefiting from the positive effects of Ramadan dieting. As a result, to prove the benefits of Ramadan fasting, it is essential to conduct well-designed trials.

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CONFLICT OF INTEREST: None to be declared.

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