

# Misconceptions and Negative Attitudes towards the Metabolic Effects of Ramadan Fasting, Resulting in Fasting Avoidance

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## ABSTRACT

The aim of this study was to assess public knowledge about the effects of Ramadan fasting on various aspects of health and its association with fasting decision-making. This cross-sectional study was conducted on 600 subjects. The association between fasting and participants' knowledge and attitudes toward Ramadan fasting, anthropometric measurements, physical activity, depression, anxiety, stress, dietary intake, and prior history of diseases was evaluated. The results indicated an adverse correlation between negative attitudes towards the effects of Ramadan fasting and adherence to fasting ( $P < 0.0001$ ). The prevalence of gastrointestinal disorders was higher in the non-fasting group ( $P = 0.002$ ). No significant association was found between other investigated variables and fasting adherence. It seems that negative thinking about the effects of Ramadan fasting may be inversely associated with fasting decision-making. Therefore, evidence-based educational programs may improve public knowledge and encourage fasting among eligible people.

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## Introduction

Ramadan is the month during which Muslims must refrain from eating and drinking from sunrise to sunset. However, there are some exemptions to fasting including travelling, menstruation, illness, older age, and pregnancy. Therefore, informing people about the effects of Ramadan fasting on various aspects of health is of great importance.

Considerable research has been conducted regarding the effects of Ramadan fasting on various aspects of health. These studies have evaluated the effects of fasting on anthropometric indices (1-3), sleep quality (4-6), irritability and psychological status (7-9), blood pressure (10), lipid profile (11, 12), blood cells (13-15), immune system (16-19), headache (20, 21), myopia and eye pain (22, 23), kidney stones (24, 25), and stroke (26, 27).

Islam exempts individuals from fasting if it adversely affects their health status or worsens

their condition. Therefore, knowledge about these study results may influence people's decision for fasting. On the other hand, in addition to religious beliefs and convictions, positive or negative impressions about the effects of Ramadan fasting on health, even without considering the actual impact, may be a strong determinant of decision-making regarding fasting.

The aim of this study was to assess public knowledge about the effects of Ramadan fasting on various aspects of health. Moreover, the associations between Ramadan fasting and positive or negative thinking about fasting, anthropometric measurements, dietary intake, physical activity, and psychological status were evaluated.

## Materials and methods

This cross-sectional study, approved by the Ethics Committee of Endocrinology and

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Metabolism Research Centre (EC-00180), was conducted during July (a month before Ramadan) and August (Ramadan) 2012 in Tehran, Iran. Through cluster sampling, 300 individuals who intended to fast and 300 individuals with no intentions of fasting (aged 18-65 years) were entered to the study.

Fasting duration was considered to be 25 days in men and 20 days in women. The exclusion criteria were as follows: 1) acute and chronic diseases such as cancer and cardiovascular, renal, hepatic, and thyroid diseases, and 2) body mass index (BMI) lower than 18.5 kg/m<sup>2</sup> or more than 40 kg/m<sup>2</sup>. The two groups were matched in terms of age, sex, and BMI.

### **Anthropometric measurements**

The participants' height was measured to the nearest 0.1 cm, using a wall-mounted stadiometer in a standing position against a wall with bare feet and shoulders touching the wall. The subjects' weight was determined to the nearest 0.1 kg on the same calibrated electronic digital scale after voiding (barefoot, with minimal clothing). The two measurements were calculated and averaged; a third measurement was performed if the first two differed by 0.1kg. BMI was estimated as the ratio of body weight to the square of height (kg/m<sup>2</sup>).

Waist circumference (WC) was determined by placing an inflexible measuring tape in the horizontal plane around the abdomen just above the right iliac crest; WC was measured at the end of normal expiration without depressing the skin. The three measurements were performed to the nearest 0.1cm and averaged. Obese subjects for whom it was difficult to apply the tape at the narrowest circumference, the measurements were taken just under the last rib.

### **Physical activity, depression, anxiety, and stress**

Physical activity level was assessed by a validated questionnaire in which nine different metabolic equivalent (MET) levels were graded on a scale from sleep/rest (0.9 METs) to high-intensity physical activities (> 6 METs) (28). During 24 hours, for each activity level, the MET value was multiplied by the time spent on that particular level. The sum of MET time at each

level and the average (divided by 24) were calculated. Moreover, Depression, Anxiety and Stress Scale (DASS-21), which is a validated self-report, was used to measure depression, anxiety and tension/stress (29).

### **Dietary data**

To estimate the calorie intake, a seven-day food record was used. For this purpose, the participants were instructed to record their dietary intake. To estimate the portion sizes, a set of pictures and in some cases three-dimensional food models were used. The amounts were documented in household units (e.g., tea spoons, cups, and ounces). Data related to the total intake of calorie, carbohydrate, protein, and saturated/unsaturated fatty acids, were analysed, using adjusted N4 software (Nutritionist: version 4.0; Tinuviel Software, Warrington, United Kingdom).

### **Knowledge about Ramadan fasting**

The participants' knowledge and attitudes towards the impacts of Ramadan fasting on health were evaluated using a self-made questionnaire, based on the results of articles related to Ramadan fasting (30). Multiple-choice questions were designed for each section. Incorrect choices were determined based on the results of previous studies.

In addition, 8 specialists were asked to evaluate the questionnaire and state their opinions on the accuracy of options; also, they were asked to check if a single question includes multiple correct answers. Furthermore, 5 specialists and 10 healthy individuals were asked to evaluate the questionnaire in terms of clarity of the questions, answers, and generalizability of the desired subject, in addition to answering the questions; then, the questionnaire was revised based on the given comments.

In a pilot study, the revised questionnaire was completed by 25 individuals, who were selected via simple sampling. The reliability of the questionnaire was tested by Cronbach's alpha coefficient (alpha=0.86). The final version of the questionnaire contained 13 questions.

To estimate the prevalence of misconceptions and negative thoughts about the effects of Ramadan fasting, each incorrect answer was scored one point and other answers

**Table 1.** The characteristics of study population and their association with adherence to Ramadan fasting by logistic regression model

Variables	Fasting group	Non-fasting group	B±SE*	Odds ratio	P-value (CI)**
Age (yrs)	34±13	36±14	0.01±0.007	1.01	0.12 (0.99-1.02)
Weight (kg)	70.7±14.5	68.8±14.6	-0.008±0.006	0.20	0.99 (0.98-1.00)
BMI (kg/m <sup>2</sup> )	25±5	24±4	-0.02±0.01	0.97	0.11 (0.93-1.00)
WC (cm)	84±11	83±12	-0.008±0.007	0.99	0.29 (0.97-1.00)
Kcal	2125±805	2144±846	0.000±0.000	1.00	0.80 (1.00-1.00)
Kcal/kg	31±12	32±14	0.007±0.007	1.00	0.29 (0.99-1.02)
PAL (MET)	1.47±0.2	1.47±0.2	0.12±0.40	1.13	0.75 (0.51-2.50)
Depression	8.25±1.11	9.12±1.01	0.004±0.008	1.00	0.58 (0.98-1.02)
Anxiety	4.02±2.01	4.25±1.87	0.003±0.005	1.00	0.66 (0.99-1.05)
Stress	11.32±3.52	11.33±3.91	0.004±0.006	1.00	0.75 (0.98-1.09)

BMI: body mass index, WC: waist circumference, Kcal: kilocalorie intake in 24 hours, Kcal/Kg: kilocalorie intake per body weight, PAL (MET): physical activity level (metabolic equivalence), DASS: Depression, Anxiety and Stress Scales

\* B±SE regression coefficient ± standard error of mean for logistic regression

\*\*CI presented for expected beta

**Table 2.** The distribution of diseases and disorders in groups

Disorders	Fasting group	Non-fasting group	K2-P-value
Diabetes (%)	2.7	1.9	0.53
Cardiovascular diseases (%)	1	2.3	0.29*
Hypertension (%)	2.7	3.7	0.51
Celiac disease (%)	0	0.5	0.42*
Kidney stone (%)	0.3	1.4	0.31*
Gastrointestinal disorders (%)	1.7	6.9	0.002*
Hypothyroidism (%)	2.3	2.3	0.98
Hyperlipidemia (%)	2	1.4	0.74*
Anemia (%)	1	3.2	0.10*
Hemorrhoid (%)	0	0.5	0.42*
Migraine (%)	0.7	0.5	1.00*

\*Fisher's test for expected count less than 5

were scored zero. The total score was calculated by summing the scores of all sections. To evaluate positive thoughts, each positive answer was scored one and other answers were scored zero.

### Statistical analysis

To examine the association between each independent quantitative variable and fasting adherence, the odds ratio and 95% confidence interval were calculated using logistic regression models. Chi-square test was used to compare qualitative variables in fasting and non-fasting groups.

### Results

The subjects' characteristics and the association between these features and fasting adherence in Ramadan are shown in Table 1. Logistic regression showed no association between Ramadan fasting adherence and these variables (Table 1).

In this study, 61% of female and 50% of male subjects fasted during Ramadan. There were no

associations between fasting adherence and marital status ( $P=0.72$ ), educational level ( $P=0.62$ ), or the partner's educational status ( $P=0.81$ ). The distribution of diseases and disorders in fasting and non-fasting groups is presented in Table 2.

Table 3 shows the participants' knowledge about the effects of Ramadan fasting on health and diseases.

Logistic regression showed a negative association between negative thinking about the effects of Ramadan fasting and fasting adherence ( $B\pm SE: -0.17\pm 0.03, P<0.0001$ ), with an odds ratio of 0.84 (CI: 0.78-0.89). Furthermore, a positive association was found between positive thinking and fasting adherence ( $B\pm SE: 0.20\pm 0.04, P<0.0001$ ), with an odds ratio of 1.22 (CI: 1.11-1.33).

### Discussion

Comparison of fasting and non-fasting groups showed no significant differences in terms of age or anthropometric measurements. Also, the mean calorie intake, physical activity level, and depression-stress-anxiety score were not significantly different between the two groups. In addition, no significant differences were observed regarding marital status, educational level, or partner's educational level between the two groups. It seems that none of these characteristics can determine fasting decision-making during Ramadan.

Regarding the association between disease history (listed in table 2) and fasting adherence, data showed that the number of patients with cardiovascular diseases, hypertension, celiac disease, kidney stones, anaemia, and haemorrhoid was relatively higher in non-

**Table 3.** The knowledge of fasting and non-fasting groups regarding the effects of Ramadan fasting on health and diseases\*

Items	Increase (%)	Decrease (%)	No change (%)	Do not know (%)
In your opinion, what changes occur in sleep duration during Ramadan?	51.7 54.2	34.6 33.8	5.0 2.8	8.7 9.3
In your opinion, what changes occur in sleep quality during Ramadan?	27.9 18.1	59.4 63.0	5.0 4.6	7.7 14.4
In your opinion, what changes occur in alertness and concentration by Ramadan fasting?	11.7 7.4	69.1 80.1	6.0 4.2	13.1 8.3
In your opinion, what changes occur in headache by Ramadan fasting?	67.8 80.6	11.7 6.5	4.0 1.9	16.4 11.1
In your opinion, what changes occur in irritability by Ramadan fasting?	61.4 70.4	24.5 17.1	4.7 2.3	9.4 10.2
In your opinion, what changes occur in depression by Ramadan fasting?	23.5 31.5	36.6 31.0	7.4 6.5	32.6 31.0
In your opinion, what changes occur in body weight by Ramadan fasting?	20.1 35.6	57.4 40.7	10.7 6.9	11.7 16.7
In your opinion, what changes occur in eye pain by Ramadan fasting?	28.5 35.2	10.1 3.7	9.7 8.4	51.7 52.8
In your opinion, what changes occur in myopia by Ramadan fasting?	39.6 43.1	7.0 6.5	6.4 6.0	47.0 44.4
In your opinion, what changes occur in kidney stone by Ramadan fasting?	48.3 54.6	7.7 4.6	4.7 3.7	39.3 37.0
In your opinion, what changes occur in anaemia by Ramadan fasting?	37.2 43.1	6.7 6.5	7.4 4.6	48.7 45.8
In your opinion, what changes occur in stroke by Ramadan fasting?	8.4 14.8	17.1 15.7	5.0 5.1	69.5 64.4
In your opinion, what changes occur in blood pressure by Ramadan fasting?	9.7 14.4	47.3 43.5	2.3 2.8	40.6 39.4
In your opinion, what changes occur in lipid profile by Ramadan fasting?	7.7 18.1	52.7 39.8	3.4 1.9	36.2 40.3
In your opinion, what changes occur in immune system activity by Ramadan fasting?	32.9 18.5	27.9 44.9	3.4 3.2	35.9 33.3

\*In each case, the first row of numbers is related to the fasting group and the second to the non-fasting group

fasting subjects, although the difference was not significant. However, the prevalence of gastrointestinal disorders including peptic ulcers and inflammatory bowel disease (IBD) was significantly higher in non-fasting subjects, compared to fasting individuals ( $P=0.002$ ).

The reason behind obtaining such results may be the nature of disease symptoms. For instance, the symptoms of peptic ulcers and IBD may occur without delay and be severe, affecting the individual's quality of life. While statistically non-significant, higher prevalence of diabetes and hyperlipidemia in the fasting group may be related to the subjects' beliefs about the beneficial effects of Ramadan fasting on weight and consequently serum glucose and lipid profile.

Assessment of subjects' knowledge about the effects of Ramadan fasting showed that approximately more than half of subjects in both

groups believed in the increment of sleep duration and decrement in sleep quality during Ramadan. Also, they mentioned decreased daytime alertness and increased irritability. The obtained results were consistent with previously reported findings (4-6, 8, 31).

Based on previous research, the incidence of headache might increase in Ramadan (20). In fact, a high percentage of participants (67.8% of the fasting group and 80.6% of the non-fasting group) confirmed this effect. These headaches have been often associated with factors such as hypoglycemia, caffeine withdrawal, changes in sleep patterns and starvation-induced stress (21).

Furthermore, Ramadan fasting is often associated with restriction in food intake and weight loss, depending on the degree of dietary restriction (1-3, 11, 12, 32-34). Overall, 57.4% and 40.7% of fasting and non-fasting subjects

mentioned a decrement in body weight. However, a high proportion of the second group (35.6%) believed in weight increment caused by fasting.

Although the results regarding the subjects' knowledge about the mentioned possible effects of fasting were similar to previous reports, the outcomes may be mainly subjective. Moreover, in some cases such as those with diseases and metabolic disorders (e.g. eye pain, myopia, kidney stones, anaemia, stroke, and immune system dysfunction), it seems that a large number of subjects provided wrong answers or left no comments. Thus, they need to be informed about the effects of Ramadan fasting, especially when negative thinking about the effects of Ramadan fasting may be associated with fasting decision-making ( $P < 0.0001$ ).

Indeed, public educational programs are essential for improving knowledge, attitude, and practice in those who are unaware of the actual effects of Ramadan fasting. These educational programs should focus on the following points:

- 1) Ramadan fasting has no deteriorating effects on myopia (22, 23), although it may cause preventable eye pain due to dehydration (35);
- 2) Considering the increase in the occurrence of kidney stones in warm seasons due to dehydration, Ramadan coinciding with summer may increase the risk of these stones; however, Ramadan fasting alone has no such effects (24, 25);
- 3) Ramadan fasting does not significantly affect immune system in healthy subjects (16-18, 36);
- 4) Ramadan fasting results in no significant changes in serum hemoglobin, red or white blood cell counts, or immune system (13, 15-18, 37, 38);
- 5) The incidence of stroke does not increase during Ramadan; however, a significant shift in the circadian pattern of stroke is seen which is not only due to fasting (26, 27);
- 6) Ramadan fasting leads to a decrease in daytime blood pressure (10, 39). This reduction often depends on dehydration, although it is preventable by consuming a sufficient amount of fluids and fluid-containing foods (39); and
- 7) The effect of Ramadan fasting on lipid profile may depend on changes in dietary intake,

physical activity, and body weight. For instance, the high intake of foods containing saturated fatty acids may lead to an increase in total serum cholesterol and low-density lipoprotein cholesterol. Also, increased dietary carbohydrate intake during Ramadan may lead to increased triglyceride level (11, 12).

## Conclusion

It seems that misconceptions and negative thinking about the effects of Ramadan fasting may be inversely associated with fasting decision. Therefore, evidence-based educational programs may improve public knowledge and subsequently the number of eligible people who decide to fast during Ramadan.

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