

# The Effect of Ramadan Fasting on Body Composition of Overweight and Obese Male Staff in Hazm Mebaireek General Hospital, State of Qatar

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## Abstract

**Background:** Fasting during the holy month of Ramadan causes Muslims to change their lifestyle as well as food habits. Muslims who observe fasting consume 2 meals per day, Iftar at sunset which is a relatively big meal, and Sohor before dawn. The aim of this study is to investigate the effects of Ramadan fasting on body weight and body composition. **Method:** The body weight and composition were measured and analyzed 4 days prior to the month of Ramadan (prefasting) and 4 days before the completion of Ramadan (fasting). Height was measured by using a weighing scale, the waist circumference was measured with a non-stretchable tape, whereas body weight, body mass index (BMI), basal metabolic rate (BMR), biological age, and body composition parameter (water, fat percentage, fat-free mass, and muscle mass) was estimated by using body composition analyzer based on bio-electrical impedance. **Result:** 107 subjects were involved in this study, the comparison between the prefasting and fasting measurements shows that body weight ( $89.112 \pm 14.7651$ ) vs ( $87.033 \pm 14.5363$ ) kg, BMI ( $29.453 \pm 3.8516$ ) vs ( $28.759 \pm 3.8289$ ) kg/m<sup>2</sup>, waist circumference ( $101.338 \pm 9.6535$ ) vs ( $97.869 \pm 9.4920$ ) cm  $P < 0.05$  was significantly decreased, while the body fat percentage ( $27.771 \pm 4.6771$ ) vs ( $27.021 \pm 4.8103$ ), fat mass ( $25.290 \pm 8.6062$ ) vs ( $24.035 \pm 8.4310$ ) kg, muscle mass ( $60.731 \pm 7.4130$ ) vs ( $59.916 \pm 7.3193$ ) illustrated a significant decrease, however fat-free mass decrease insignificantly ( $63.527 \pm 7.5559$ ) vs ( $63.022 \pm 7.6758$ ) kg. Additionally, metabolic age ( $50.308 \pm 8.4143$ ) vs ( $49.290 \pm 8.7997$ ) years, basal metabolic rate ( $1897.935 \pm 247.8362$ ) vs ( $1872.140 \pm 253.8423$ ) kcal showed significant decrease, more so, total body water was significantly increase ( $52.798$  SD  $3.3674$ ) vs ( $53.215$  SD  $3.4511$ ) kg. **Conclusion:** According to the result, Ramadan fasting provides an opportunity to lose weight among overweight and obese individuals. Further studies are required to investigate whether these changes can be a result of the restriction in meal frequencies, and total energy intake or if it is related to other factors.

**Keywords:** Ramadan fasting, body composition, biological age, bio-electrical impedance.

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## Introduction:

Ramadan is the ninth month in the lunar calendar and is one among five pillars of Islam, Muslims fast daily between 12-19 hours depending on the geographic location of the country and the season in which Ramadan falls. Fasting trigger Muslims to change their lifestyle as well as food habits. Eating and drinking is only allowed before sunrise and after sunset during the month. Usually Muslims who observe fasting have 2 meals per day, Iftar at sunset which is a relatively big meal and Sohor before dawn (1).

Different theories could be assumed for Ramadan fasting result, a scheduled consumption of meal could bring weight gain, weight loss or no weight change (2). For example, a reduction in the total intake of calories could be a reason for weight loss and sometime no weight change. This depend on the degree of homeostatic mechanisms that regulates hunger and food intake. On the other hand, Ramadan fasting could induce weight gain if excessive nutrients and calories intake by over enough food supply can lead to over-compensatory food intake once the day fast is broken. In general, during Ramadan meals are often eaten in a social context, and mostly include foods rich sugar, fat, and protein. Having data about this schedule can influence the direction of body weight and to provide health and nutritional advice to the Muslims community during the month (2,3).

The study of the effects of Ramadan fasting on body anthropometric measurement and its composition particularly fat percentage, water percentage and skeletal muscle percentage, is mostly important among overweight and obese Muslim as it might influence their physical activity. A systematic review involving nine studies has shown mixed findings, some studies showed increase while others showed decrease physical performance during Ramadan fasting. Differences in individual coping skill and adaptability can lead to mix findings and these differences depend on their adjustments of their daily schedule and lifestyle in accommodating Ramadan fasting (3).

A different study among overweight and obese Muslims showed no significant decreased in body fat

percentage during Ramadan. While a prospective study among 240 Muslims in the general population using bioelectric impedance and another study among 23 subjects using skin fold techniques showed that, fat mass was significantly reduced during Ramadan (4). Whereas other studies showed a significant reduction in high density lipoprotein (HDL) level after Ramadan fasting (5). Some studies that investigate the effect of Ramadan fasting on body mass index (BMI) reported that Ramadan fasting may cause reduction in BMI (6).

Some studies showed that Ramadan fasting leads to a reduction in energy intake and body (7). While others show increase (8), whereas some studies showed no changes in body weight or composition (9). The differences may be related to the different characteristics of the participants in terms of age, sex, dietary intake, and physical activity, and as well as the number of hours of fasting. Ramadan fasting is also associated with improved biochemical parameters and reduced risk of many metabolic diseases and disorders, such as hypertension, hypercholesterolemia obesity, metabolic syndrome, diabetes type 2, and chronic kidney disease (9,10).

Food consumption patterns and dietary habits in the Arabian Gulf has been changing recently due to increasing wealth and westernization. Qatar is a part of Muslim community, and as per our knowledge there are no previous studies that shows the effect of Ramadan fasting on the Qatari community. Conducting this study will help to better understand how Ramadan fasting affects both body weight and composition of the global Muslims community, while also taking in consideration the epidemic of obesity and overweight which affects all countries around the world including most Muslims countries (11). Furthermore, the result of this study can help us to understand the impact of fasting on Qatari population, taking in our consideration the influence of food customs, traditions, and practices during this month on Qatari community.

Intermittent fasting already has been proven as a good and effective practice in weight reduction and weight maintenance, we are conducting this study to know if Ramadan fasting have the same effect on body weight similar to intermittent fasting or no effect by observing the expected changes in the body weight, waist circumference (WC), body mass index (BMI), basal metabolic rate (BMR), biological age and body composition (water, fat, muscle and fat free mass percentage) that might happen during fasting in Ramadan among the participants of this study due to the change in food customs, traditions and practices including (the social gathering for meals, variety and availability of different choices of food) in the month of Ramadan on Qatari community. Based on the outcome of this study, if we find that Ramadan fasting has the same effect of intermittent fasting on body weight and body composition, then we can recommend it as a weight reduction tool outside Ramadan month for a specific period of time, furthermore, the probability of making researches in future to include both gender and more participants to represent Qatari society can support the outcome of our study. On the other hand if we find that RF cause an increase in body weight and the percentage of body fat then we can formulate our dietary recommendations regarding (serving size, type of food items, cooking method, number of meals with respect to sleeping hours, physical activity with respect to worship during this month) to make fasting which is a compulsory worship more healthy with positive outcomes.

In this prospective study, body composition analyzer (Tanita MC-980 MA-Japan) based on bio-electrical impedance, weighing scale (Health O Meter-600 KL-China) and a non-stretchable tape with an insertion buckle at one end, will be used to detect the expected changes in anthropometric parameter and body compositions during the two times of taking measurement. The selection of this instruments was due to convenience, accuracy, and its ability to analyze full body composition with the use of sensing technology.

### **Methodology:**

This prospective study will be conducted in the month of Ramadan (April 2022) on a sample of male Muslims staff, to investigate the effects of fasting on weight and body composition. The study will be conducted on male staff of Hazm Mebareek General hospital (HMGH) state of Qatar, after the study is approved by the Medical Research Center Hamad Medical Corporation. The inclusion criteria will be, adult male Muslims who are overweight and obese (BMI  $\geq$  25), who intend to fast Ramadan during this year 2022 were included, those who will not be able to fast were excluded from this study.

The body composition and anthropometric parameters will be measured and analyzed 4 days prior to the month of Ramadan (prefasting) and 4 days before the completion of Ramadan (fasting), participants will be asked to be fasting for the first measurement while the second measurement they will be already fasting because it will fall during Ramadan.

The anthropometric measurements included height will estimated by using weighing scale (Health O Meter-600 KL-China) while the waist circumference will be measured by a non-stretchable tape with an insertion buckle at one end. Whereas body weight, body mass index (BMI), basal metabolic rate (BMR), biological age, and body composition parameter (water, fat, fat free fat and muscle mass) will be estimated by using body composition analyzer (Tanita MC-980 MA-Japan) based on bio-electrical impedance. Written informed consent will be obtained from all subject that will be distributed through HMGH mail group before participating in the study, participant will take the print out of the attached consent form in the email, read & sign if agreeing to participate and then handover the signed consents personally to the principal investigator or to any other study team members

during the first session of measurement.

**Statistical analyses:**

Descriptive statistics will be used to summarize and determine the sample characteristics and distribution of various considered parameters related to demographic, body composition and anthropometric parameters, clinical and other related features of this cohort of participants. The normally distributed data and results will be reported with mean and standard deviation (SD) with corresponding 95% CI; the remaining results will be reported with median and interquartile range (IQR). Categorical data will be summarized using frequencies and percentages. Associations between two or more qualitative variables will be examined and assessed using Pearson Chi-square and Fisher Exact tests as appropriate. Quantitative outcome (body composition and anthropometric parameters) measured between the two time points will be analyzed using paired t test or Wilcoxon signed ranked test as appropriate. Relationship between two quantitative variables will be examined using Pearson’s or Spearman’s correlation coefficients. Linear or non-linear regression will be performed to explore and assess impact of potential factors and predictors effecting body composition and anthropometric parameters with adjusting potential predictors and confounders. Repeated measure analysis of variance (ANOVA) will be used to analyze quantitative outcome measures recorded at various time points. Pictorial presentations of the key results (body composition and anthropometric parameters) will be made using statistical graph Box plots. All P values presented will be two-tailed, and P values <0.05 will be considered as statistically significant. All Statistical analyses will be done using statistical packages SPSS version 27.0 (Armonk, NY: IBM Corp).

**Result:**

A total of 107 fasting Muslim male participants were involved and completed the study. The study was conducted during the holy month of Ramadan 2022, which is one of the five pillars of Islam. Muslims are fasting for more than 14 hours per day in Qatar according to the geographical area during Ramadan. The participants were composed of Qatari nationals 9 (8.4%) compared to 98 (91.6%) of non-Qatari, the age of the participant fluctuated between 26 to 61 years old while the range was 35 years.

Table 1: Weight, BMI, and Waist Circumference before and after fasting.

		Weight pre	Weight post	BMI pre	BMI post**	Waist Circumference pre	Waist Circumference post
N	Valid	107	107	107	107	107	107
	Missing	0	0	0	0	0	0
Mean		89.112	87.033	29.453	28.759	101.338	97.869
Median		86.700	85.000	28.900	28.400	100.100	97.400
Std. Deviation		14.7651	14.5363	3.8516	3.8289	9.6535	9.4920
Range		98.4	96.2	25.7	26.0	57.1	59.0
Minimum		65.3	64.3	25.0	23.7	83.1	80.0
Maximum		163.7	160.5	50.7	49.7	140.2	139.0
Percentiles	25	80.000	77.800	26.700	26.100	95.200	91.200
	50	86.700	85.000	28.900	28.400	100.100	97.400
	75	96.400	94.300	31.300	30.600	105.000	102.000

\*p<(0.05)

Figure 1: BMI % change from baseline.

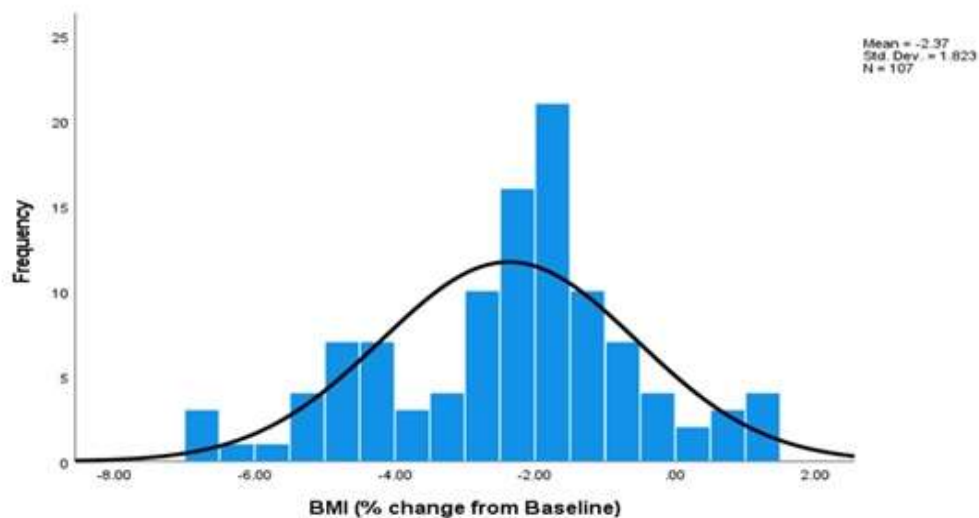
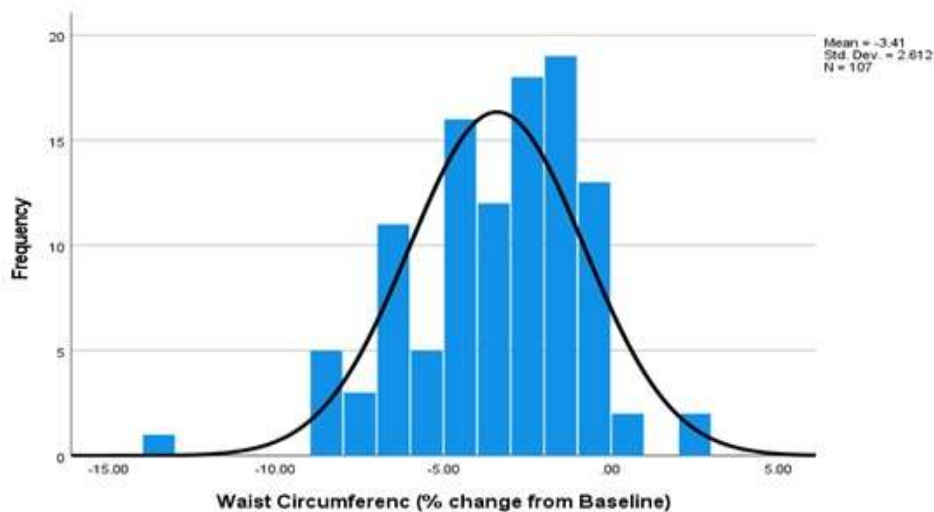


Table 1. shows pre-fasting mean for weight was 89.112 (SD 14.7651) with a range of 98.4 while after was 87.033 (SD14.5363) with a range of 96.2, while the mean BMI pre-fasting was 29.453 (SD 3.8516) with range 25.7 and after 28.759 (SD 3.8289) with range 26.0, while the average reduction in BMI was 2.37kg/m<sup>2</sup> as shown in figure 1. Both results illustrate that there was a reduction in weight and a decrease in the BMI of the subjects.

Figure 2: Waist Circumference % change from baseline.



Furthermore, table 1 also demonstrates a reduction in the waist circumference of participants, as the mean for WC pre-fasting was 101.338 (SD 9.6535) with a range of 57.1 while the mean for WC post was 97.869 (SD 9.4920) with a range of 59.0, while the average reduction of waist circumference was 3.41cm as shown in Figure 2. Body composition results from table 2 illustrate a significant difference between the initial fat percentage, fat mass, fat-free mass, muscle mass, metabolic age, basal metabolic rate, and total body water was observed during the study.

Table 2: Body composition (fat %, fat-free mass, muscle mass, metabolic age, BMR, and TBW)

Pairs	Mean	Std. Deviation	Std. Error Mean
Fat percentage pre	27.771	4.6771	0.4522
Fat percentage post	27.021	4.8103	0.4650
Fat Mass pre	25.290	8.6062	0.8320
Fat Mass post	24.035	8.4310	0.8151
Fat-Free Mass pre	63.527	7.5559	0.7305
Fat-Free Mass post	63.022	7.6758	0.7420
Muscle Mass pre	60.731	7.4130	0.7166
Muscle Mass post	59.916	7.3193	0.7076
Metabolic Age pre	50.308	8.4143	0.8134
Metabolic Age post	49.290	8.7997	0.8507
Basal Metabolic Rate pre	1897.935	247.8362	23.9592
Basal Metabolic Rate post	1872.140	253.8423	24.5399
Total Body Water pre	52.798	3.3674	0.3255
Total Body Water post	53.215	3.4511	0.3336

\*p< (0.05)

Before and after fasting comparison between fat percentage, fat mass, and fat-free mass showed a reduction in all three parameters. Fat percentage pre-fasting was 27.771 (SD 4.6771) and decreased to 27.021(SD 4.8103) post-fasting, while fat mass pre-fasting was 25.290 (SD 8.6062) and reduced to 24.035(SD 8.4310) post-fasting, and lastly, fat-free mass pre-fasting mean 63.527 (SD 7.5559) was lessened to 63.022(SD 7.6758) post-fasting.

Muscle mass pre-fasting mean of 60.731 (SD 7.4130) was reduced to a mean of 59.916 (SD 7.3193) post-fasting. Additionally, metabolic age illustrated a difference of mean pre-fasting 50.308 (SD 8.4143) versus a post-fasting mean of 49.290 (SD 8.7997). More so, basal metabolic rate comparison exhibits a decrease with the pre-fasting mean of 1897.935 (SD 247.8362) versus a post-fasting mean of 1872.140 (SD 253.8423). Meanwhile, an increase in the total body water was observed with a post-fasting mean of 53.215 (SD 3.4511) against the pre-fasting mean of 52.798 (SD 3.3674).

### Discussion:

This study was conducted prospectively on a group of Muslim male staff working in Hazm Mebareek General hospital (HMGH) who observe fasting during the holy month of Ramadan 2022. The aim of this study is to assess the effect of Ramadan fasting on body weight, waist circumference (WC), body mass index (BMI), basal metabolic rate (BMR), biological age, and body composition (water, fat, muscle and fat-free mass) of overweight and obese male staffs. Different theories could be assumed for Ramadan fasting results, a scheduled consumption of meals could bring weight gain, weight loss, or no weight change (2).

Results from this study showed a significant decrease in body weight among the samples when compared to pre & post-fasting values with a mean of 89.112 versus 87.033 respectively. These results coincide with the outcome of the study conducted by Urooj et al. (9) which demonstrated that fasting during Ramadan did bring in some changes in body composition and mean weight loss ranging from 0.81-1.4 kg in most of the subjects. Another study done by Sadiya et al. (10) in UAE approved that there was a reduction in weight observed from 103.9 to 102.1.

A systematic review and meta-analysis done by Fernando et al. (11), showed that there is a statistically significant reduction in weight during Ramadan fasting. Furthermore, the reduction in weight can be attributed to the decrease in the total calorie intake, while no weight change can depend on the degree of homeostatic mechanisms that regulate hunger and food intake (2). Meanwhile, a study from Jakarta, Indonesia by Sham et al. (14) found that body weight, BMI, and body fat had significantly decreased. Interestingly, a study by Bakhotma (15), reported weight gain in a month of fasting during Ramadan among a cohort of Saudi families, while a meta-analysis study about fasting during Ramadan by Sadeghirad et al. (16) stated that a significant weight loss in both genders at the end of Ramadan was observed.

Comparing the pre and post-fasting waist circumference, there was a significant reduction in subjects from the pre-fasting mean value of 101.338 versus 97.869 post-fasting, the result is similarly in line with the study conducted by Abdelfatah et al (1) which concluded that waist circumference as a reflection of abdominal adiposity was decreased significantly from 94.68 versus 92.00 respectively. Moreover, a significant reduction in BMI was also noted with a mean difference of 28.759 from 29.453 pre-fasting. This observation agreed with the study of Shamsuddin et al. (3) which shows that there is a significant reduction in weight and a decrease in BMI. According to Osman et al. (7), fasting during Ramadan provided only limited benefits to body composition through reductions in body mass in healthy and obese individuals.

Our study observed an insignificant reduction of fat-free mass from the pre-fasting mean value of 63.527

versus 63.022 post-fasting. However, this is in contrast with the study by Norouzy et al. (4) which noted a significant reduction in fat-free mass from 56.5 to 55.3 respectively. When comparing fat mass mean values in our study, it was noted that a significant decrease was observed during the pre-fasting with a mean value of 25.290 versus a post-fasting mean of 24.035. A similar result was noticed in a study by Al-Barha and Aljaloud (8) and in a systemic review conducted by Aloui et al. (6) which illustrated a reduction in fat mass at the end of Ramadan.

Meanwhile, our study shows that fat percentage significantly decreased from a pre-fasting mean value of 27.771 versus a post-fasting mean value of 27.021. This result is consistent with the study by Shamsuddin et al (3). which stated that body fat, subcutaneous fat percentages, and visceral fat level were all reduced during Ramadan. As a result of starvation during fasting, the reserve fat in the body could be used as energy and may result in the reduction of the body fat percentage in this study.

Total Body Water mean was significantly increased from 52.798 to 53.215 post-fasting, this depends on the degree of homeostatic mechanisms that regulate hunger and food intake (2). A study conducted by Aloui et al. (6) showed unchanged total body water during Ramadan compared to before Ramadan. A significant reduction was observed in muscle mass with a pre-fasting mean value of 60.731 compared to 59.916 post-fasting. However, this is contrary to the result of a study conducted by Syam et al. (14) which stated that protein body mass and calorie intake did not significantly change during Ramadan.

The basal metabolic rate significantly decreased from a pre-fasting mean value of 1897.935 to 1872.140 post-fasting. A similar result was observed in the study conducted by Sadiya et al. (10) regarding the effect of Ramadan fasting on metabolic markers, body composition, and dietary intake in UAE shows that there is a reduction in BMR from 1,400 post-fasting versus the pre-fasting BMR of 1,500. Our study suggests that there is significant reduction in metabolic age, from a pre-fasting mean value of 50.308 to 49.290 post-fasting. Moreover, the study of Shamsuddin et al. (3) stated that body age (biological age) is a measurement of age based on one's health and fitness level while chronological age is based on the date of birth. Additionally, Shamsuddin et al. (3) in their study found that mean body age for the group of respondents was 54.92 before Ramadan and reduced to 54.00 after Ramadan.

#### **Conclusion:**

This study showed that fasting during Ramadan provides an opportunity to lose weight among overweight and obese individuals. Further studies are required to investigate whether these changes are long-lasting or temporary, because of the restriction in meal frequencies or total energy intake or it is related to a combination of different factors such as change in dietary habits, customs and sleeping hours during Ramadan fasting.

#### **Recommendation:**

- More investigations are needed to explore the effect of Ramadan fasting on different populations especially people with special conditions and comorbidity, such as hypertensive, renal, hepatic coronary, and diabetic patients.
- Comparative studies can be conducted between males and females in the Qatar population and to make a blood investigation for the nutritional parameters.
- Increase the number of Qatari populations in the study to reflect the socioeconomic lifestyle during Ramadan fasting among the Qatari population.

#### **Limitations:**

- This study was conducted in one facility of Hamad medical corporation (HMC).
- The samples included only male obese and overweight participants.

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