

# **Body Composition Changes during Fasting among Female Youngsters**

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## **ABSTRACT**

The effects of fasting on body compositions are still inconclusive. Therefore the aim of the study is to determine the changes in body compositions particularly among female youngsters throughout fasting during the whole Ramadhan. Body weight, height, waist and hip circumference were measured and body mass index (BMI) and waist to hip ratio (WHR) were calculated while body fat percentage was determined using bioelectrical impedance analyzer. 67 female youngsters who strictly commit fasting, aged between 18 to 21 years old were recruited in this study. The study was carried out for six weeks, which started a week before Ramadan until a week after Ramadan ended. Results showed a significant decreased ( $P < 0.001$ ) in body weight, BMI and body fat percentage after the third week of fasting as compared to initial measurement before Ramadhan. However, a significant increase ( $P < 0.001$ ) in body weight, BMI, and body fat percentage was found a week after Ramadhan compared to the third week of Ramadhan. No significance difference observed on WHR throughout Ramadhan. Therefore Ramadhan fasting lead to body weight, BMI and body fat reduction among female youngsters which may enhance general human health.

**Keywords:** Body Composition, Female, Ramadhan Fasting, Youngsters

## **1. Introduction**

Ramadhan is the ninth month in Hijri calendar which obligates all eligible Muslims to fast. Ramadan fasting is simply defined as an ability of a healthy Muslim to self-curb wholly from food, drinks, and other prohibitions from dawn until sunset (Azizi, 2010; Rohin et al., 2013). Normally, Muslims fast for approximately 29 - 30 days, ranged from 6 -

18 hours per day depending on the geographical location of the county (Norouzy et al., 2013; Rohin et al., 2013). Previous studies indicated that eating habits, dietary intake, daily physical activity and sleep hours at night would change during Ramadhan (Bakhotmah, 2011; Chaouachi et al., 2008; Khaled et al., 2012; Norouzy et al., 2013; Ziaee et al., 2006). Moreover, body physiological is also altered due to Ramadhan fasting (Kul, Savas, Ozturk, & Karadag, 2014).

The effect of Ramadhan on body composition is still inconclusive. Likewise, several studies have resulted in mixed finding on body composition (Norouzy et al., 2013; Salehi & Neghab, 2007; Yucel, Degirmenci, Acar, Albayrak, & Haktanir, 2004). Norouzy et al (2013) suggested that age and sex were the factors that influenced body composition changes during Ramadhan fasting. Affiliated studies concede that during Ramadan fasting, the alteration in body composition can be seen especially in those who are free from any health problems (Mazidi, Karimi, Rezaee, Nematy, & Salehi, 2014). Other previous studies showed that there were no changes on the anthropometric component during the fasting in the holy month of Ramadan (Ramadan, 2002). Furthermore, most studies were conducted in males (Al-Hourani & Atoum, 2007) and males were more pronounce to get benefits from Ramadhan fasting compared to females (Saleh, Elsharouni, Cherian, & Mourou, 2005).

Thus, the present study aimed to determine the effects, if any, of Ramadhan fasting on body composition (body weight, body mass index, waist circumference, hip circumference, waist to hip ratio and percentage of body fat) in female youngsters.

## **2. Materials and Methods**

This cross-sectional study was conducted for six consecutive weeks. The measurements were collected at four non-consecutive times throughout the holy month of Ramadhan.

### **2.1 Participants**

A total of 67 female youngsters were recruited and voluntarily responded to the invitation to participate in the study. Information sheet and consent forms were given to the participants prior to the study. The participants were aged between 18 to 21 years old. The participants were selected based on purposive sampling method due to particular characteristic

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needed for this study, which required the participants to commit fasting during the holy month of Ramadan. Inclusion criteria were: adults age  $\geq$  18 years old, female, not suffering from any medical diseases, not consuming any medication and supplement throughout the study period and last but not least, willingness to be part of the study and well throughout the study.

### **2.2 Body Composition Measurement**

Body composition components being measured in this study were body weight, height, waist and hip circumference. Height was measured using a portable stadiometer (SECA 217) to the nearest 0.5 cm with subjects barefooted. The subject stands erect with arms at sides, feet together, and heels and back in contact with a stadiometer. Meanwhile, body weight and body mass index (BMI) as well as the percentage of body fat were measured using a bioelectrical impedance scale (BIA), HBF-352 body fat monitor (Omron Healthcare Co, Kyoto, Japan) to the nearest 0.1 kg with subjects being weighted in light clothing without footwear. Besides, waist and hip circumferences were measured using measuring tape (SECA 201) to the nearest 0.1 cm. Waist measurement or abdominal girth was measured horizontally at the navel's level. While the hip measurement was measured as the largest circumference of the buttocks – hip region and measured horizontally. The circumferences of waist and hip were taken while the subject stands with arms hanging loosely at the sides. Meanwhile, the waist to hip ratio (WHR) was calculated by dividing the waist to hip measurements.

### **2.3 Procedure**

Body composition components were measured at four intervals throughout this study. Measurements recorded at T1 (a week before Ramadhan), T2 (first week of Ramadhan), T3 (third week of Ramadhan) and T4 (first week after Ramadhan). All four measurements were carried out at the same place and the same time from 1700 hours to 1900 hours. Each measurement was repeated three times for consistency purpose.

### **2.4 Statistical Analysis**

Data were processed using the Statistical Package for Social Sciences (version 20.0 for Windows, SPSS Inc., Chicago, IL, USA). A descriptive

statistic was used to describe the demographic data of the subjects. The differences in body composition measurement that occur during Ramadan fasting at four interval time were measured using one-way repeated measure ANOVA test. A post hoc Bonferroni analysis was used to determine the mean difference from each other. The significant value was reported when the P-value was less than 0.05 ( $P < 0.05$ ).

### **3. Results and Discussion**

All participants ( $n = 67$ ) successfully completed the study. The mean age of the participant was 18.4 years old. Table 1 shows the descriptive data and the levels of significance for the body composition measurements during Ramadhan fast.

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**Table 1**  
The effect of Ramadhan fasting on body composition

Parameters	Pre-Ramadhan (T1)	1 <sup>st</sup> week of Ramadhan (T2)	3 <sup>rd</sup> week of Ramadhan (T2)	Post-Ramadhan (T4)	P-value
Weight (kg)	52.5 (14.60)	51.9 (14.54) <sup>a</sup>	51.4 (14.35) <sup>ab</sup>	52.1 (14.32)	P < 0.001
Waist circumference (cm)	73.1 (12.82)	72.9 (12.77)	72.3 (12.88) <sup>ab</sup>	72.8 (12.63)	P < 0.001
Hip circumference (cm)	91.4 (10.35)	91.1 (10.38)	90.5 (10.57)	91.2 (10.25)	P > 0.05
Body fat (%)	26.5 (6.51)	26.1 (6.65) <sup>a</sup>	25.8 (6.57) <sup>a</sup>	25.8 (6.46) <sup>a</sup>	P < 0.001
BMI (kg/m <sup>2</sup> )	21.8 (5.61)	21.6 (5.59) <sup>a</sup>	21.4 (5.51) <sup>ab</sup>	21.7 (5.48)	P < 0.001
Waist to hip ratio	0.8 (0.06)	0.8 (0.06)	0.8 (0.06)	0.8 (0.06)	P > 0.05

<sup>a</sup> as compare with T1

<sup>b</sup> as compare with T4

The study revealed that participants' body weight changed significantly throughout Ramadhan fasting, Wilks' Lambda = 0.301,  $F(3, 64) = 49.57$ ,  $P < 0.001$ . A post hoc Bonferroni analysis indicated a significant reduction in body weight at T2 and T3 compared with T1 and a sudden increase in body weight a week after Ramadhan (T4) compared with 3<sup>rd</sup> week of Ramadhan (T3). Parallel to body weight reduction, a significant change in BMI was observed, Wilks' Lambda = 0.303,  $F(3, 64) = 49.02$ ,  $P < 0.001$ .

On the other hand, waist to hip ratio (WHR) was not altered throughout Ramadhan although a significant change in waist circumference (Wilks' Lambda = 0.676,  $F(3, 64) = 10.25$ ,  $P < 0.001$ ) was observed at T3 as compared to T1 and T4. No significant change was also observed in hip circumference throughout the study.

The percentage of body fat had reduced significantly throughout Ramadhan fasting, Wilks' Lambda = 0.479,  $F(3, 64) = 23.18$ ,  $P < 0.001$ . Consistent reductions in the percentage of body weight were observed at T2, T3 and T4 as compared to T1.

The current finding is consistent with Poh, Zawiah, Ismail, and Henry (1996) which found that body weight could be reduced during Ramadhan fasting and regained after Ramadhan. Instead, Kul et al. (2014) revealed that body weight reduction during Ramadhan fasting in females was not significant compared to males. However, previous studies only focused on before and after Ramadhan fasting except for Al-Hourani and Atoum (2007) and Poh et al. (1996) which monitored body weight in four intervals (Kul et al., 2014; Ziaee et al., 2006). Therefore the changes in body weight might occur due to the alteration in food consumptions during Ramadhan fasting.

Any changes in body weight would directly affect body mass index (BMI). Therefore, a reduction in body weight throughout Ramadhan lead to a reduction in BMI. Body mass index is an important measure of general adiposity and has an association with cardiovascular disease risk (Wormser et al., 2011). Hence, fasting might be beneficial to be suggested as health promotion activity. Though BMI reduction is found in this study, several other studies did not indicate any changes in body weight or BMI starting from the early month of holy Ramadan until the end of Ramadan fasting (Ramadan, 2002; Yucel et al., 2004).

This study supported previous studies which reported a reduction in waist circumference throughout Ramadhan (Rohin et al., 2013; Sadiya, Ahmed, Siddieg, Babas, & Carlsson, 2011; Saleh et al., 2005). Furthermore, previous studies also found no significant changes in WHR

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in fasting females (Vardarli, Hammes, & Vardarli, 2014; Yucel et al., 2004). In contrast, Kareem et al. (2013) found an improvement in WHR after Ramadhan fasting. However, gender of the participants who involved in Kareem et al. (2013) study was not mentioned. No significant changes also found in WHR of healthy young males (Gnanou et al., 2015).

Many studies reported a reduction in body fat percentage throughout Ramadhan (Saedeghi, Omar-Fauzee, Jahromi, Abdullah, & Rosli, 2012; Suriani, Shamsuddin, Khalib, Hazizi, & Fadlan, 2015; Yucel et al., 2004; Ziaee et al., 2006). Despite the decrease in body fat percentage during Ramadhan fasting reported in previous studies, there were also conflicting result which showed an inclined increase in body fat percentage during Ramadhan (Hosseini, Sardar, Hejazi, & Farahati, 2013; Rohin et al., 2013). The alteration in body fuel utilization which leads to fat as the primary energy source during fasting may serve as a contributing factor in body fat percentage reduction (Mazidi et al., 2014; Saedeghi et al., 2012).

### **4. Conclusion**

Ramadhan fasting contributes to the beneficial effect in body composition via lowering body weight, BMI, waist circumference and body fat percentage among female youngsters. However, there was no improvement seen in the waist to hip ratio in this study. In conclusion, Ramadhan fasting may serve as an alternative in reducing body weight and provide an improvement to general health. Further study is required to investigate the effect of Ramadhan fasting on nutritional intake and biochemical characteristics. It is because the changes in body composition are closely related to food intake. These will lead to alteration in biochemical characteristics in human such as blood glucose level, lipoproteins, and free fatty acids.

### **5. Acknowledgement**

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