

# Effect of ramadan fasting on body weight and percent of body fat among student from program nutrition study of UPN “Veteran” Jakarta, Indonesia

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**Abstract.** Background: Overweight is a state of unbalanced body health caused by excess fat accumulation and can interfere with health. The prevalence of overweight year 2013 in Indonesia at the age of more than 18 years, namely 13.3%, increased in 2018 to 13.6%. This study aims to see the effect of Ramadan fasting on body weight and percent body fat in college students. The research design used was a quasy experimental design with one group pretest and posttest. The number of subjects was 137 UPN "Veteran" Jakarta nutrition students with ages over 18 years. Data collection was carried out 3 times, namely before fasting, the second week of fasting and after one month of fasting ended. The instruments used are BIA (Bioelectrical Impedance Analysis), a 24-hour food record and PAL (Physical Activity Level). Data analysis used the Wilcoxon test and paired t test. The results obtained include: (1) there was difference between body weight before fasting and body weight during fasting in p value = 0.000 ( $p < 0.05$ ). Likewise, there was a difference between body weight before fasting and body weight one month after the end of the Ramadan fast in p value = 0.048 ( $p < 0.05$ ). (2) there was difference between percent of body fat before fasting and percent of body fat during fasting in p value = 0.000 ( $p < 0.05$ ). Likewise, there was difference between percent of body fat before fasting and percent of body fat one month after the end of the Ramadan fast in p value = 0.048 ( $p < 0.05$ ). In conclusion, Ramadan fasting can affect body weight and percent of body fat.

## 1 Introduction

Students are in a period of entering early adulthood with an age range of 18-25 years. This period is usually a transition from adolescence to adulthood. In addition, students are a population at risk of gaining weight due to changes in the environment and behavior related to a decrease in the quality of food consumption and physical activity [1]. The behavior and

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lifestyle of students shows behavior that does not consume healthy food and causes individuals not to control the food they consumed. This can have an impact on the risk of being overweight [2].

Overweight is a state of unbalanced body health caused by excessive intake of nutrients such as carbohydrates, protein, and fat. Therefore, all nutrients intake accumulates in the body [3]. According to WHO, overweight is defined as irregular or intemperate fat accumulation that can harm health [4]. Based on Basic Health Research in 2013 in Indonesia, the prevalence of overnutrition among those aged over 18 years was 13.3% [5]. Meanwhile in 2018 it increased to 13.6% [6]. Based on previous research in 2020 of nutrition students at UPN Veteran Jakarta, it was found that 30% of students had over-nutrition status [7]. Apart from that, research by Lisnawati (2023) shows that 37% of students in West Java who are over 18 years old are in the overweight percent body fat category [8].

Body weight is the result of an increment or diminish in all tissues within the body, counting bones, muscles, fat, body liquids and others [9]. Body fat percentage is the total percentage of fat mass throughout the body. Body fat percentage shows the proportion of body composition. If a person's body fat percentage is higher than usual or a normal figure, then that person's body fat mass is excessive. The holiest month of Ramadan for Muslims around the world. Muslims fasting for 29 or 30 days in the month of Ramadan. Ramadan fasting start from dawn to sunset. Fasting in the month of Ramadan causes weight loss and a decrease in calorie intake which accumulates with a decrease in eating frequency [10].

During fasting, the usual main meals 3 times a day change to 2 times a day and no eating during the day [1]. During fasting blood glucose decreases due to lack of food intake and depletion of glycogen in the liver which has been used. Therefore, the body produces less insulin hormone and produces more anti-insulin hormones (glucagon and epinephrine). The anti-insulin hormone works by using fat and glycogen to convert it into energy. Hence, weight loss can occur due to more efficient fat utilization during Ramadan fasting. This can also reduce the percent of body fat caused by the use of fat to convert it into energy [11]. Previous research conducted by Illahika *et. al.* (2022) explains that there was an effect of Ramadan fasting on percent of body fat, but there was no explanation regarding other factors that cause a decrease in percent of body fat, such as nutrient intake and physical activity. Therefore, this research aims to determine the effect of Ramadan fasting on body weight and percent of body fat in students of the UPN "Veteran" Jakarta Nutrition Study Program.

## 2 Materials and methods

The design of this research is quasi experiment method with one group pre test-post-test design. The one group pre-test-post-test design in this research was carried out by measurements body weight and percent of body fat before the Ramadan fast as the pre-test. Meanwhile, data on body weight measurements and percent of body fat during the Ramadan fast and one month after the Ramadan fast ended as the post-test. The research was conducted before the Ramadan fast, the second week of the Ramadan fast and one month after the end of the Ramadan fast at the UPN "Veteran" Jakarta Nutrition Laboratory. Researchers calculated the sample manually using the Slovin formula because the population size was already known. The result of the minimum sample calculation is 124 subjects. Researchers added 10% to avoid the risk of subjects dropping out. The total sample in this research was 137 students of nutrition science of UPN "Veteran" Jakarta. Subject inclusion criteria were aged over 18 years, in good health, Muslim, and fasting during Ramadan.

The data used in this research were measurements of body weight, percent of body fat, nutrient intake, and physical activity. All data were taken three times, before the Ramadan fast, during the Ramadan fast and after one month of the Ramadan fast ended. The instruments used in this research are BIA (Bioelectrical Impedance Analysis) to measure

body weight and percent of body fat, 24-hour food record to determine food intake for 24 hours, PAL (Physical Activity Level) to determine all activities during 24 hours. All information data collection was carried out by measuring body weight and body fat percentage using BIA (Bioelectrical Impedance Analysis) after that, providing a 24-hour food record form to fill in food intake for 24 hours, and providing a PAL (Physical Activity Level) form to fill in all activities for 24 hours. The next day, the 24-hour Food Record Form and PAL (Physical Activity Level) that had been filled in were collected by the researcher. This research was conducted using univariate analysis, normality test and bivariate analysis were conducted. Univariate analysis for subject characteristics data, average data on nutrient intake and physical activity. Normality test in this research used Kolmogorov-Sminorv test, If the results of the normality test indicate  $p < 0.05$ , the Wilcoxon test should be employed for bivariate analysis because the data is not normally distributed. Otherwise, If the results of the normality test indicate  $p > 0.05$ , bivariate analysis can be conducted using parametric methods paired sample T test because the data is normally distributed. The research was conducted based on the existence of an ethical approval letter from the Health Research Ethics Committee of Universitas Prima Indonesia Number: 045/KEPK/UNPRI/V/2023.

### 3 Results and discussion

**Table 1.** Subject characteristics

Characteristics	n (%)
<b>Total Subject</b>	<b>137 (100)</b>
<b>Age (Years)</b>	
19	45 (32.8)
20	62 (45.3)
21	27 (19.7)
22	3 (2.2)
<b>Gender</b>	
Female	129 (94.2)
Male	8 (5.8)

Based on Table 1, most subjects were 20 years old with a total of 62 subjects (45.3%). The smallest age characteristic of the subject is 19 years and the largest is 22 years. Gender in this study shows that most subjects were female with a total of 129 subjects (94.2%). Age and gender are among the factors that influence body weight and percent of body fat [12]. Gender can differentiate a person's body fat percent category. The percent of body fat in men and women is different. The normal value of percent fat in women is 20% - <30%, while in men it is 10% - <20% [13]. This is due to the estrogen hormone possessed by women which triggers the accumulation of fat in the area under the skin or subcutaneous fat, so that the percentage of body fat in women is higher than the normal value [14].

**Table 2.** Kolmogorov sminorv normality test

Variable	BW1 <sup>1</sup>	BW3 <sup>1</sup>	BW5 <sup>1</sup>	PF1 <sup>2</sup>	PF3 <sup>2</sup>	PF5 <sup>2</sup>
<b>p value</b>	0.000	0.000	0.000	0.200	0.200	0.200

<sup>1</sup>BW1 = Body weight before Ramadan fast, BW3 = Body weight during Ramadan fast, BW5 = Body weight one month after Ramadan fast ended

<sup>2</sup>PF1 = Percent of body fat before Ramadan fast, PF3 = Percent of body fat during Ramadan fast, PF5 = Percent of body fat one month after Ramadan fast ended

Based on the normality test in table 2, there are results of variable body weight data that are not normally distributed ( $p < 0.05$ ). While the results of variable percent of body fat data

are normally distributed ( $p>0.05$ ). Bivariate tests on body weight data use the Wilcoxon test because the data is not normally distributed. While the body fat percentage data uses the Paired sample T test

**Table 3.** Differences in mean values for body weight (kg) and percent of body fat (%)

Variable	Mean±SD <sup>1</sup>	p value
<b>Body weight (Before Ramadan - During Ramadan)<sup>2</sup></b>		
Before Ramadan	60.12±13.851	0.000
During Ramadan	58.90±13.751	
<b>Body weight (Before Ramadan - After Ramadan)<sup>2</sup></b>		
Before Ramadan	60.12±13.851	0.048
After Ramadan	60.03±14.130	
<b>Percent of Body Fat (Before Ramadan - During Ramadan)<sup>3</sup></b>		
Before Ramadan	30.69±5.559	0.001
During Ramadan	30.15±5.448	
<b>Percent of Body Fat (Before Ramadan - After Ramadan)<sup>3</sup></b>		
Before Ramadan	30.69±5.559	0.036
After Ramadan	30.34±5.772	

<sup>1</sup>Mean±Standard Deviation

<sup>2</sup>Wilcoxon test,  $p < 0.05$

<sup>3</sup>paired sample T-test,  $p < 0.05$

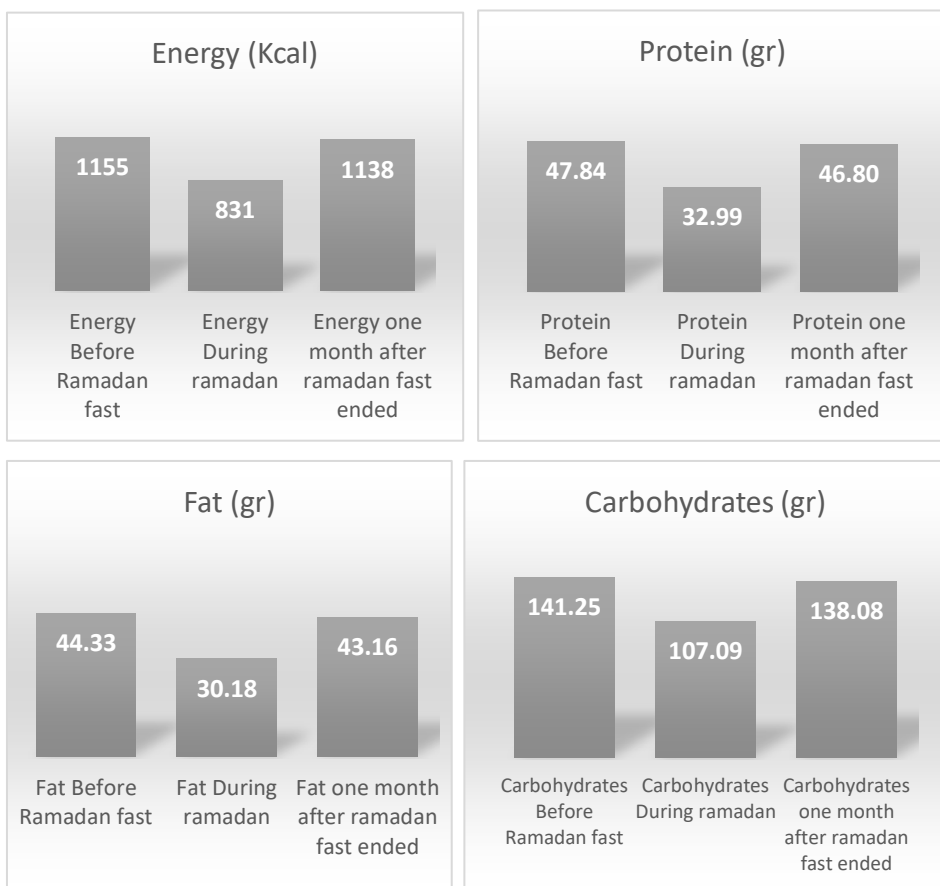
The results of the analysis on the variables of body weight before fasting and body weight during fasting shows that there was a significant difference between body weight before fasting and body weight during fasting ( $p < 0.05$ ). Likewise, there is a difference in the weight variable before fasting and after fasting ( $p < 0.05$ ). This is in line with research conducted by Majid et. al. (2023) which shows that there is a significant difference between body weight before fasting and body weight during fasting and there is also a difference between body weight before fasting and after fasting [15]. Based on table 2, it shows that there is a difference in weight body weight with an average difference of 1.2 kg in the variables of body weight before fasting and body weight during fasting. Meanwhile, there is a slight average difference between body weight before fasting and body weight after fasting, namely 0.09 kg.

Table 2 shows that there is a difference between the percent of body fat before fasting and the percent of body fat during fasting ( $p < 0.05$ ). Apart from that, there is also a difference between the percent of body fat before fasting and the percent of body fat after fasting ( $p < 0.05$ ). This is in line with research Correia et. al. (2021) which shows differences in the decrease in body fat percentage during fasting, so there are differences in body fat percentage before fasting, during fasting and after fasting [16]. The most significant difference in average value is 0.54% in the variable body fat percentage before fasting and body fat percentage during fasting. Meanwhile, the percent of body fat before fasting and the percent of body fat after fasting, there is only a slight difference in the average value, namely 0.35%.

Reducing body weight and body fat percentage during fasting is influenced by the body's metabolism. When fasting, glucose will decrease which results in the body producing less insulin hormone and producing more anti-insulin hormones (glucagon and epinephrine). After fasting for about 12 hours, glycogen stores are depleted causing the body to use energy stores from triglycerides in adipose tissue [17]. Triglycerides are separated into free fatty acids and glycerol through the lipolysis process. Fatty acids are converted into fatty acid CoA then converted into Acetyl CoA. Through the Krebs cycle, acetyl CoA turns into oxaloacetate

which will be converted into glucose through the process of gluconeogenesis. Meanwhile, glycerol undergoes phosphorylation to become glycerol-P which is then converted to dihydroxyacetone-P and then undergoes phosphorylation to become glyceraldehyde 3-P which will be converted into glucose through the process of gluconeogenesis [18]. This can reduce the amount of fat mass in the body which results in weight loss.

The weight gain that occurs after one month of Ramadan ends is because the body's metabolism returns to normal. During non-fasting periods, the body utilizes glucose derived from consumed food as its primary energy source through the metabolic process of glycolysis. When the body experiences excess glucose it will be stored in the form of glycogen in the liver and muscles. Apart from that, excess glucose can also be stored in the form of fat in adipose tissue. In a non-fasting state, when food intake, namely excessive intake of protein, fat and carbohydrates, can cause increased fat storage in the body. This can affect weight gain due to an increase in fat mass in the body [19].



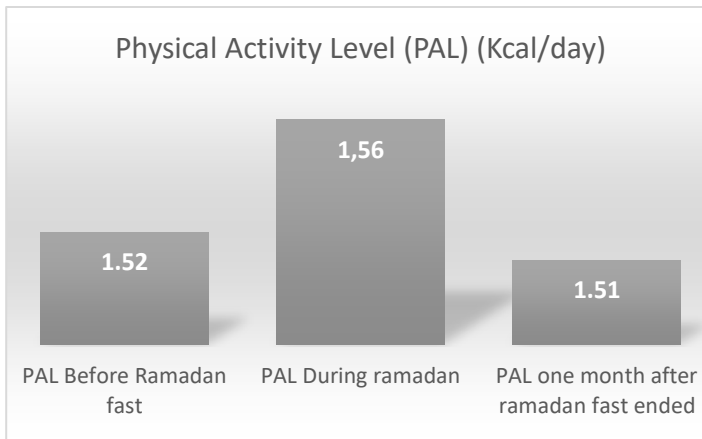
**Fig. 1** Differences in mean values for energy (kcal), protein (gr), fat (gr), and carbohydrates (gr)

Changes in body weight and body fat percentage during fasting can be caused by food intake and physical activity. When fasting, the eating pattern occurs twice a day, namely sahur and breaking the fast. Based on Figure 1. Energy, protein, fat and carbohydrates intake experienced significant changes in average. Changes in the average value of nutrient intake occurred during fasting because the amount of food consumed by the subject decreased compared to the nutrient intake data before fasting. Meanwhile, after one month of Ramadan fasting ended, the subject's eating frequency returned to normal, which was three times a day,

therefore the subject's nutrient intake increased again when compared to when fasting.

The difference in the average value of food intake that looks significant is before fasting and during fasting. The average value of food intake before fasting is energy intake 1,155 kcal, protein intake 47.84 gr, fat intake 44.33 gr and carbohydrate intake 141.25 gr. Meanwhile, the average value of food intake during fasting is energy intake 831 kcal, protein intake 32.99 gr, fat intake 30.18 gr and carbohydrate intake 107.09 gr. The average value of food intake after fasting is almost the same as the average value of food intake before fasting, because the eating pattern after returning to normal is three times a day. This is in line with research conducted by Lola *et. al.* (2018) which shows that there is an increase in food intake during the Eid al-Fitr holiday, 1 week, 2 weeks, 3 weeks after the Eid al-Fitr holiday compared to during the fasting month of Ramadan [20]

The sources of nutrients available during fasting are similar to those accessed during non-fasting periods, but the intake during fasting is only small. Sources of protein intake are chicken meat, chicken eggs, sausages, nuggets, chicken liver, tempeh and tofu. Sources of carbohydrate intake are rice, noodles, bread, vermicelli, rice cake, potatoes. Sources of fat intake are obtained from butter, margarine, oil, and coconut milk.



**Fig. 2** Differences in mean values for Physical Activity Level (PAL) (kcal/day)

Based on Figure 2, There was a very significant difference in the average value of physical activity during fasting. This is in line with Lestari (2017) which shows that there is a difference between physical activity before fasting and physical activity during fasting [21]. Within the table over, it is known that the normal esteem for physical activity before fasting is 1.52, while the average value for physical activity during fasting is 1.56. This is in line with Lestari's research which shows the average value for physical activity before fasting is 1.46 and the average value for physical activity during fasting is 1.51 [21].

The physical activity data before Ramadan fast and physical activity one month after Ramadan fast ended, there is no difference in the average value. This is because physical activity before fasting and after fasting are the same activities. Based on physical activity records carried out by respondents, physical activity during fasting has additional time for activities compared to when not fasting, for example time for cooking, driving motorbikes and cars, and praying every night of Ramadan.

## 4 Conclusion

Ramadan fasting can affect body weight and percent of body fat. The difference in body weight and percent of body fat is clearly visible before fasting and during Ramadan fasting.

Reducing body weight and percent of body fat is also influenced by food intake and physical activity. Intermittent fasting will be an alternative solution to reduce weight and percent of body fat by paying attention to food consumption according to balanced nutrition and regular physical activity like jogging for 10 minutes every day.

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