

Effects of Fasting and Detraining on Body Composition, Lipid Profile and Maximum Oxygen Uptake of Active Postmenopausal Women

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ABSTRACT

Introduction: During Ramadan, type and amount of energy intake dramatically change in Muslims and fasting individuals often reduce the duration and intensity of physical activities or avoid exercise during this month. However, one of the major issues of trainers and athletes is lack of training, which could have adverse effects on some cardiovascular parameters.

Methods: This research was conducted on 19 healthy menopausal women, selected via convenience and purposive sampling. Two study groups consisted of inactive menopausal women with fasting (n=9) and fasting women with a detraining period (n=10), who regularly exercised before Ramadan, but avoided physical activity during this month. Anthropometric indices, maximum oxygen uptake and lipid profile indicators of the samples were measured before and after Ramadan. Data analysis was performed using Student's t-test.

Results: In this study, no significant changes were observed in the body composition indicators: body mass index, body fat percentage and waist-to-hip ratio of the study groups. According to our findings, while the maximum oxygen uptake decreased in both groups, this reduction was not statistically significant. In addition, while high-density lipoprotein levels significantly decreased and low-density lipoprotein levels significantly increased, no significant changes were observed in the levels of total cholesterol and triglyceride in the fasting with a detraining period group.

Conclusion: According to the results of this study, while fasting for one month led to no significant improvement in the cardiovascular risk factors of inactive postmenopausal women, it had no adverse effect on lipid profile indicators.

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Introduction

Fasting during Ramadan is the religious duty of all healthy adult Muslims. For 30 days, Muslims abstain from eating and drinking and normally consume two meals as "Suhur" or "pre-dawn meal" and "Iftar" or "evening meal" (1, 2). During Ramadan, energy intake, sleep habits and daily physical activity of Muslims change dramatically. Most fasting individuals are concerned about the complications caused by training in a fasting state, such as weakness and lethargy due to reduced energy intake. Therefore, some Muslims tend to decrease the duration and intensity of physical activities during Ramadan, whereas others completely

avoid exercise during this period (2, 3). Lack of sufficient training has been one of the major concerns of trainers and athletes due to its significant effect on some cardiovascular factors.

Extensive research has focused on the effects of detraining, concluding that a week of strict bed rest is associated with a significant decrease (6-7%) in maximum oxygen uptake, physical work capacity, blood volume and hemoglobin mass in elite athletes. In addition, fitness benefits are completely lost after 4-8 weeks of detraining (4).

On this theme, Pihle et al. (2003) conducted a study on 25 non-athletic middle-aged individuals

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and former athletes, who had no regular physical activity at the time of research. According to the results, lipid profile levels had a more significant reduction in former athletes, compared to those with no history of physical activity (5). Ramadan fasting leads to changes in body composition and cardiovascular risk factors (6). Nevertheless, conflicting results have been reported regarding the effects of fasting with a detraining period on individuals with a history of physical activity.

Some studies have demonstrated a significant reduction in the level of high-density lipoprotein (HDL) after fasting during Ramadan (7, 8); whereas other findings have revealed an increase or no change in this regard at the end of Ramadan (9, 10). In a study conducted in Isfahan Cardiovascular Research Center (ICRC), ratio of HDL/LDL (low-density lipoprotein) significantly decreased during Ramadan. However, no changes were observed in total cholesterol (TC), triglyceride (TG), fasting blood sugar, LDL-C and HDL-C (11). This discrepancy could be due to the variable lifestyle of the samples, including their diet and daily activities (12).

According to the literature, reduced physical activity during Ramadan might be a contributing factor for the reduction of HDL-C level. In addition, dietary changes of fasting individuals might be potentially involved in this regard (13, 14). In terms of aerobic capacity, current findings indicate that although fasting has no significant impact on the aerobic power of inactive fasting individuals, but in regard to people trained different results are obtained (15).

In a study by Kirkendall (2008), it was demonstrated that Ramadan fasting was associated with decreased maximum oxygen uptake, aerobic capacity, endurance and ability to exercise in soccer players (75% maximum oxygen consumption) (16). Meanwhile, it was marked in another study that fasting had no significant effect on the aerobic power of the subjects (17).

Given the high prevalence of cardiovascular diseases during menopause and role of lipid profile indicators as the risk factors for these diseases, and regarding to the limited number of studies in this area, this research was conducted to evaluate the effects of 30-day fasting with a detraining period on maximum oxygen uptake and lipid profile indicators of active menopausal women.

Material and methods

This quasi-experimental research (with a pretest-posttest design) was conducted on 19 healthy menopausal women with mean age of 53.3 years and mean body mass index (BMI) of 29.78 kg/m² with urban residence at the time of the study. Participants were selected through purposive and convenience sampling and divided into two groups of intervention and control.

The intervention group (fasting with a detraining period) consisted of 10 active menopausal women, who regularly exercised before Ramadan, but avoided physical activity during this month. Control group (fasting only) included nine inactive menopausal women with no history of physical activity over the past three years.

Firstly, overall health of the samples was confirmed by a physician based on the demographic characteristics. All subjects were none-smokers and had no history of respiratory, metabolic, cardiovascular, renal and liver diseases. Moreover, all participants experienced natural menopause with no history of menopause caused by the removal of the uterus and ovaries, chemotherapy or radiotherapy. It is noteworthy that all the participants had a minimum amenorrhea period of one year.

Written informed consent was obtained from the participants, and they were allowed to withdraw from the research at any time. Exclusion criteria were use of medications (e.g., statins, ezetimibe and other lipid-lowering agents) and no fasting for more than 10 days (18). Before intervention, subjects were referred to a medical laboratory, and initial blood samples were collected after 12 h of fasting and 24 h of no intense physical activity. Obtained samples were used to determine the levels of TG, TC, HDL-C and LDL-C. On the second day, anthropometric indices were measured through the electrical impedance method using Body Composition Analyzer (Biospace, InBody720, Seoul, Korea) and tested to estimate the maximum oxygen uptake using the Naughton protocol on a treadmill (Technogym, Spazio, Italy) at physiology laboratory of Ferdowsi University of Mashhad, Mashhad, Iran.

At the end of Ramadan, all measurements were repeated, just as they had been provided a week before the start of Ramadan. For the current study, the first blood samples were taken

three days before the beginning of Ramadan and blood sampling was repeated for the second time at the end of the fasting month.

Data analysis was carried out using SPSS V.16, and after checking the normal distribution of data and homogeneity of variance by the Levene's test, and were student's t-test performed in order to compare the means of inter -groups. A P value of ≤ 0.05 was considered as significant.

Results

Changes in body composition, lipid profile indicators and maximum oxygen uptake of the women in the intervention (n=10) and control groups (n=9) are presented in Table 1.

According to the results presented in Table 1, no significant changes were observed in the body composition indicators: body mass index, body fat percentage and waist-to-hip ratio of the study groups. While fasting with a detraining period led to an elevation in the BMI, body fat percentage and WHR of the participants, significant changes were observed in none of the evaluated variables at the end of Ramadan.

In addition, while high-density lipoprotein levels significantly decreased and low-density lipoprotein levels significantly increased, no significant changes were observed in the levels of total cholesterol and triglyceride in the fasting with a detraining period group.

According to our findings, while the maximum oxygen uptake decreased in both groups, this reduction was not statistically significant.

Maximum oxygen consumption was reported to be 28.88 ml/kg/min in the fasting with a detraining period group before the study, which decreased to 26.88 ml/kg/min after the intervention.

Discussion

In the present study, no significant differences were observed between the control (one month of fasting) and intervention groups (one month of fasting with a detraining period) regarding the changes in BMI, body fat percentage and waist-to-hip ratio (WHR). In this regard, Ramadan (2002), Furuncuoglu et al. (2007) and Karli et al. (2007) have reported no significant change in the weight of the subjects after Ramadan, which is in congruence with the findings of the present study (19-21). On the other hand, findings of Yousef Boobes et al. (2009) were indicative of weight gain in the participants during Ramadan, whereas Haghdoost et al. (2009) and Tayebi et al. (2010) reported weight loss during this month. These findings are inconsistent with the results of the current research (23, 24).

Moreover, Saada et al. (2010) marked that fasting during Ramadan was associated with no significant change in the BMI of fasting and non-fasting participants (25). Fasting during Ramadan could result in increased calorie intake and weight gain in some cases, which might be due to the consumption of high-calorie foods after sundown (approximately 65% of total daily calorie). This leads to excessive energy intake through fats and proteins rather than carbohydrates (26).

Table 1. Changes in Body Composition, lipid profile and maximum oxygen uptake of fasting with a detraining period group (N=10) and fasting group (n=9) during different stages/ Changes in the Means of Inter-groups

Variable	Group	*Phases		t	**P-value
		Pretest Mean \pm SD	Posttest Mean \pm SD		
Body mass index (kg/m ²)	Fasting and detraining	29.64 \pm 3.71	29.98 \pm 3.53	-0.222	0.830
	Fasting	30.58 \pm 3.60	29.18 \pm 4.13	1.696	0.151
Body fat percentage	Fasting and detraining	42.11 \pm 5.24	42.63 \pm 4.47	-1.170	0.276
	Fasting	42.82 \pm 4.47	44.30 \pm 5.14	-1.743	0.142
Waist-to-hip ratio	Fasting and detraining	0.97 \pm 0.05	0.98 \pm 0.04	-0.902	0.393
	Fasting	0.98 \pm 0.07	0.98 \pm 0.08	-1.659	0.158
High-density lipoprotein (mg/dL)	Fasting and detraining	61.33 \pm 11.09	61.22 \pm 7.56	0.040	0.969
	Fasting	56.25 \pm 9.46	58.37 \pm 11.50	-0.808	0.445
Low-density lipoprotein (mg/dL)	Fasting and detraining	121.66 \pm 26.25	121.77 \pm 29.33	-0.011	0.992
	Fasting	128.37 \pm 20.25	126.50 \pm 19.31	0.318	0.760
Triglyceride (mg/dL)	Fasting and detraining	158.77 \pm 79.60	180.77 \pm 90.92	-1.736	0.121
	Fasting	150.87 \pm 53.39	159.37 \pm 63.59	-0.832	0.433
Total cholesterol (mg/dL)	Fasting and detraining	209.11 \pm 36.12	218.55 \pm 42.88	-0.639	0.540
	Fasting	218.37 \pm 23.62	218.25 \pm 21.00	0.018	0.986
Maximum oxygen uptake (ml/kg/min)	Fasting and detraining	28.88 \pm 3.48	26.88 \pm 4.83	2.309	0.050
	Fasting	21.85 \pm 2.91	20.85 \pm 2.54	1.323	0.234

*Data are presented as mean \pm standard deviation. **P-value: < 0.05 .

Moreover, detraining during this month could be associated with a slight increase in body fat percentage and weight, which affect the biological motion factors of individuals (27). Body fat percentage has a significant impact on athletic performance; as such, there is a reverse correlation between fat percentage and sports skills, as well as a direct relationship between lean body mass and physical performance (28).

In the present research, slight and insignificant increase of the body fat percentage in the intervention group could be attributed to improper diet and insufficient physical activity during Ramadan. Consumption of adequately nutritious meals instead of three medium-sized meals during Ramadan contributes to the mentioned mechanisms (27).

According to the results of the current research, there were no significant changes in the serum lipid levels of the women in the intervention and control groups, which is in line with the results obtained by Hosseini Kakhk et al. (2011) and Lemura et al. (2000) (29, 30).

In this regard, Zia'ee et al. (2006) conducted a study on 81 students to evaluate the effects of fasting for one month on body weight and lipid profile. Findings of the mentioned study were indicative of a significant reduction in the BMI, body weight, HDL-C, and glucose level of the participants. While LDL-C levels significantly increased, no significant decrease was observed in the levels of TC, TG and very-low-density lipoprotein of the subjects. It was concluded that while TG significantly increased in students with normal weight, a significant reduction was observed in TG level of overweight participants. However, these conflicting changes in lipoproteins might be due to the reduced number of daily meals and increased calorie intake at each meal. In addition, physical response of individuals to the biochemical changes induced by starvation might be involved in this regard (7).

Some experts have denoted that the positive impact of exercise or diet on blood lipids mainly depends on weight loss (i.e., reduced body fat) (29, 31). It is noteworthy that diet has no significant effect on lipid profile indicators (especially HDL-C) in individuals with normal TG levels. In other words, exercise affects the lipid profile indicators of individuals with higher and lower TG and HDL-C levels, respectively (31).

According to our findings, while the maximum

oxygen uptake decreased in the control group, this reduction was not statistically significant. On the other hand, maximum oxygen uptake significantly diminished in the intervention group. On this theme, Me'mari et al. (2011) evaluated the effects of fasting for one month on physical performance and body composition indices of female athletes. Their findings indicated a significant reduction in the BMI of the participants at the end of Ramadan, whereas no significant change was observed in the physical performance of the participants (32). Moreover, Lotfi et al. (2010) conducted a study on nine male athletes and concluded that fasting had no significant impact on the physical performance of fasting individuals (33). In contrast, Mikel et al. (2008) evaluated the effect of fasting for one month on the physical performance of young soccer players. According to the results, while there was a slight but significant increase in the body fat mass of the participants, no significant change was observed in the weight of the samples. As reported in the mentioned study, fasting was associated with a significant decrease in aerobic capacity, endurance, explosive power of legs and physical performance of the individuals (34).

Conclusion

It was concluded that one month of fasting could improve cardiovascular risk factors in menopausal women. It is recommended that further studies be conducted to determine the effects of Ramadan fasting with a detraining period on conventional and new cardiovascular risk factors in order to obtain accurate results. The exact reason for the inconsistencies in the results of the present research remains unclear. However, different diets of various populations during Ramadan and some demographic characteristics (e.g., age, gender, physical fitness and body composition) might have affected findings of the present study.

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