

Research Article

The effect of 8-week aerobic training and green tea consumption on adropin and lipid profiles of overweight-obese women

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Abstract

Background: Aerobic training and green tea consumption affect fat metabolism via a change in several elements. Adropin is a unique hormone, which is related to fat metabolism. This study was carried out to evaluate the effect of eight weeks of aerobic training and green tea consumption on adropin and lipid profiles of overweight-obese women.

Materials and Methods: 32 overweight-obese non-athletes (age: 20-40 years) were included in this study and divided into four groups ($n=8$ each group): 1) green tea and exercise, 2) green tea, 3) exercise, and 4) control. The exercise training program was three days a week, 60% to 70% of the maximum heart rate each session, for 8 weeks. The green tea supplement dose was one 500 mg capsule of green tea, consumed three days a week for 8 weeks. BMI as well as serum levels of adropin, total cholesterol, HDL, and LDL, were determined before and after the interventions. The collected data were analyzed via covariance test at a significance level of $P<0.05$.

Results: 8 weeks of aerobic training and tea consumption had no significant effect on adropine, cholesterol, and triglyceride levels in overweight-obese women ($p>0.05$). However, 8 weeks of aerobic training and green tea supplementation had a significant beneficial effect on the LDL, HDL, BMI, and weight of overweight-obese women ($p<0.05$).

Conclusion: 8 weeks of aerobic training and consumption of green tea significantly improved the weight, BMI, HDL, and LDL of the participants.

Keywords:

Adropin, Aerobic training, Lipid profile, Green tea

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1. Introduction

Obesity is the main risk factor for many common diseases in the world, including diabetes, cardiovascular diseases, high blood pressure, metabolic disorders, and various types of cancers(1, 2). In fact, inactivity may be a more effective factor in the development of obesity than overeating. To lose weight, a negative balance of energy is needed, which is obtained by reducing the intake of calories and increasing the intake of calories. In this regard, some researchers consider inactivity to be more important than the intake of calories and characterize laxity and neglect of physical activities. First, fat people know(3). The more activity a person does, the more energy he spends daily, and the faster obesity will disappear (4). Therefore, forced muscle activity is often considered a necessary part of the treatment of obesity, and due to the high risk of obesity, interventions that help to reduce or maintain weight are of particular importance (5). Sports activity leads to weight loss and improvement of subjects' health and blood factors related to obesity(6, 7).

Regular aerobic exercises such as walking, jogging, swimming, and bicycling can have a positive effect on the amount of fat and lipoproteins (8-10). Green tea has received much attention due to its beneficial effects on health. Green tea is an important source of flavonoids. Green tea contains a group of polyphenolic flavonoid compounds called catechins, and among catechins, epigallocatechin gallate (EGCG) is a strong antioxidant in laboratory conditions and the most common and abundant polyphenol in tea. is green EGCG prevents the activity of the catechol methyltransferase (COMT) enzyme, which reduces noradrenaline, and by regulating sympathetic activity and lipolysis, it increases energy consumption, fat oxidation, and decreases body fat mass(11).

In addition to its effects on fat metabolism, green tea causes an increase in adropin and as a result can have effects on glucose action and insulin resistance (11). Due to the close relationship between obesity and the components of metabolic syndrome with the functions of some peptides, many researchers tried to understand their functions and investigate the effect of various interventions on these mediators that regulate energy homeostasis. One of these peptide hormones is adropin (12) Regulating the metabolism of carbohydrates, lipids and fats are one of the effects of adropin. Increasing the amount of circulating adropin reduces insulin resistance and glucose intolerance, which occurs in response to metabolic stress (13). Research results show that exercise stimulates the increase of adropin levels, which may be related to the effect of exercise on arterial stiffness and obesity in obese adults (14) according to the background of research conducted in the field of obesity and overweight. Effective indicators on lipid profile including adropin, therefore, in this study, the effect of eight weeks of aerobic exercise and green tea consumption on adropin and lipid profile of overweight-obese women was investigated.

2. Materials and Methods

In this research, the statistical population consists of 32 overweight-obese non-athletic women (age: 20-40 years) who, after completing the consent form, were randomly divided into four groups of 8 people, including the first group of green tea consumption and exercise, the second group was green tea consumption, the third was the exercise group and the fourth was the control group. It is worth mentioning that all the people used in the study entered the research by filling out the personal information questionnaire, medical records, and physical activity evaluation questionnaire. The main criteria considered for people to enter the research were: 1) having perfect health and no history of illness 2) body mass index between 25 and 35 3) not using drugs and supplements effective in the research results 4) not performing regular exercises Sports or having a training history. Before starting the exercise program, the subjects' anthropometric indices were measured. Measurement of anthropometric indicators included weight, height, and BMI, which was done with minimal clothes and no shoes. The height and weight of people were measured while standing, respectively, using a wall-mounted height gauge (with an accuracy of 5.5 cm) and a digital scale (with an accuracy of 1.5 cm). BMI is calculated by dividing body weight (kilograms) by the square of height (square meters). The ethical considerations considered in this research were to fully explain the objectives of the research to the participants, to assure them of the confidentiality of the information, and to leave the research for personal reasons.

Blood sampling

To check the biochemical variables, blood was taken in two stages, 48 hours before the start of training (first week), and the eighth week (48 hours after the last training session). Subjects were advised to refrain from sports activities 24 hours before blood sampling and eat a light diet the night before blood sampling. To measure LDL, HDL, and triglyceride, was done using the quantitative detection kit of Pars Azmoun Iran and the photometric method. Total cholesterol was measured by the enzymatic method and Pars Azmoun kit. To measure the amount of adropin, it was calculated using the sandwich ELISA method and using the adropin ELISA kit (Cat No: E3231Hu) with an assay range of 5 to 100 ng/L and a sensitivity of 2.49 ng/L.

Exercise protocol

A week before the start of the research, the subjects first participate in a familiarization session and get acquainted with the correct way to perform the exercise. The training program was three days a week for 8 weeks. The schedule of each session includes 10 minutes of warm-up, 20 minutes of aerobic exercise (running and local movements), and 5 minutes of cooling down, which continued with an intensity of 60% to 70% of the maximum heart rate (15).

Consumption of green tea

In this research, to increase the accuracy of the work and ensure the consumption of the determined dose, instead of brewing green tea, herbal tablets with a certain amount of catechin were used. Each 500 mg tablet of green tea contained 300 mg of catechin. These tablets were obtained. The green tea supplement dose was one 500 mg capsule of green tea for three days a week. And one form was given to the subjects, which had to be consumed by the subjects three days a week, after having lunch (16).

Statistical Analysis

To analyze the data, the normality of the data was checked using the Kolmogorov-Smirnov statistical test. After the normality of the data was confirmed by the test, analysis of covariance and Tukey's post hoc test were used to compare the average variables between the research groups. All statistical information was analyzed by SPSS version 24 statistical software at a significant level ($P < 0.05$).

3. Results

According to Table 1. The results of the analysis of covariance did not show significant differences in the levels of adropin ($p=0.48$), cholesterol ($p=0.43$), and triglyceride ($p=0.77$) in the four research groups. But the results of covariance analysis showed a significant difference in the levels of HDL ($p=0.002$), LDL ($p=0.006$), BMI ($p=0.02$), and weight ($p=0.02$) of the participants.

Table 1: Comparison of variables in four groups.

Variable	Review time	Control		Green tea		Aerobic		Aerobic + Green tea		Sig
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Adropin	pretest	103.37	18.83	109	32.51	116	50.21	117.50	29.15	0.48
	post-test	101.62	16.32	109.25	31.21	119.75	47.30	121.12	29.36	
Cholesterol	pretest	195.87	6.95	195.75	9.05	191.75	13.85	191.87	9.28	0.43
	post-test	195.12	4.58	193	7.70	191.12	13.44	187.75	9.48	
TG	pretest	121.75	27.47	117.25	31.20	123.87	28.11	123.87	25.04	0.77
	post-test	119.25	25.67	111.12	29.80	123	28.20	122.25	23.34	
BMI	pretest	30.30	2.88	30.10	3.36	29.49	3.19	30.15	3.71	0.02
	post-test	30.19	2.83	29.41*	3.47	28.58*	3.34	28.62*	4.15	
HDL	pretest	39.25	7.02	37.875	4.48	36.12	4.38	34.87	4.99	0.002
	post-test	38.25	6.62	39.75*	5.06	39.75*	5.14	38*	5.04	
LDL	pretest	121.37	19.61	118.50	20.07	125.87	20.82	130.62	19.41	0.006
	post-test	119.37	15.46	116.50*	20.12	119.37*	21.13	121.62*	24.51	
Weight	pretest	78.75	7.95	77.62	9.06	77.50	7.07	77.75	7.04	0.02
	post-test	79.50	8.29	75.68*	9.19	74.75*	7.68	72.98*	7.61	

4. Discussion

The results of the present study showed that eight weeks of aerobic exercise and consumption of green tea had no significant effect on the levels of adipon, cholesterol, and triglycerides in overweight-obese women, however, eight weeks of aerobic exercise and consumption of green tea supplements had a significant beneficial effect on the LDL, HDL, BMI and the weight of overweight-obese women.

In a study conducted by Fujie et al. (2017) to investigate the relationship between the level of adipon and the effect of aerobic exercise on arterial stiffness and obesity in adults (14), serum adipon levels in healthy, overweight, and obese adults had a negative relationship with arterial stiffness and He had abdominal visceral fat. After an 8-week exercise program, serum adipon levels increased in obese adults, which was inconsistent with the results of this study. On the other hand, in the study of Alizadeh et al. (2018), aerobic activity with an intensity proportional to the maximum fat oxidation had a significant effect on adipon and insulin resistance in overweight women in insulin factors and insulin resistance, but no significant changes were observed for glucose and adipon (17). It is possible that due to the effect of the fasting state on the increase of adipon or insufficient duration and intensity of exercise training, no significant changes in the level of adipon were observed in this study.

In the research of Amir Hossein Haghghi et al., eight weeks of aerobic exercise and consumption of green tea in medium and high doses caused a significant decrease in body weight, body mass index, body fat percentage, waist circumference, and a significant increase in maximum oxygen consumption, but between two doses No significant difference was observed in consumption (18). which is consistent with the present study. Probably, the combination of exercise training and consumption of green tea leads to weight loss and body mass index. Due to the caffeine present in it, green tea can increase epinephrine, and along with exercise, it has a greater effect on fat burning, which leads to weight loss (19). Also, green tea can increase a person's basic metabolism, which leads to losing more weight. In the research of Fathei et al. (2016), the mean total cholesterol levels in the green tea group, aerobic and combined exercise, the average triglyceride in the green tea and aerobic exercise group, the mean low-density lipoprotein in the green tea and combined group, and the mean high-density lipoprotein Above, there were significant changes only in the aerobic exercise group in the post-test phase compared to the pre-test (20). In the present study, consumption of green tea along with aerobic exercise resulted in no change in total cholesterol level, a decrease in LDL, and an increase in HDL.

In the research of Cardoso et al. (2013), it was found that compared to other groups (exercise, control, and green tea), consumption of green tea along with resistance training increases resting metabolism, increases net body weight, increases strength and decreases body fat percentage. waist circumference and triglyceride reserves (21).

In the present study, aerobic exercise along with the use of green tea was not associated with a decrease in triglyceride levels. The reason for this discrepancy could be the different exercise protocols in the two studies. In the research of Ichinose et al. (2011), the effect of aerobic exercise and consumption of green tea extract on substrate metabolism during exercise in healthy male subjects decreased the ratio of respiratory exchange and increased the use of fats during exercise (22). In the research of Maki et al. (2009), it was found that a drink containing catechin caused a significant decrease in the concentration of free fatty acids and serum TG (23).

In the study of Baharloo et al. (2014), after 12 weeks of aerobic training in the experimental group, weight, body mass index, waist circumference, the ratio of waist circumference to hip circumference and cholesterol, LDL cholesterol, C-reactive protein, and thyroid stimulating hormone levels were significantly reduced. No significant change was observed in triglyceride levels (24). The longer follow-up period in this study compared to the current study could be one of the reasons for some discrepancies.

Δ. Conclusion

In summary, the results of the present study showed that eight weeks of aerobic exercise and consumption of green tea significantly improved the weight, BMI, HDL, and LDL of overweight-obese women compared to other groups. Based on this, eight weeks of exercise and consumption of green tea seem to be an effective strategy for weight loss.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval the research was conducted concerning ethical principles.

Informed consent was obtained from all participants

Informed consent Informed consent was obtained from all participants.

Author contributions

Conceptualization: B.G., S.R.; Methodology: A.A., S.R.; Software: B.G.; Validation: S.S.E., S.R.; Formal analysis: A.A., B.G.; Investigation: A.A., S.S.E.; Resources: S.S.E., S.R., A.A.; Data curation: A.A., B.G.; Writing - original draft: S.S.E., S.R.; Writing - review & editing: A.A., B.G.; Visualization: S.S.E., S.R.; Supervision: A.A.; Project administration: S.R.; Funding acquisition: A.A., S.R.

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