

Effects of Combined Exercise on Blood Lipids and Obesity-related Hormones in Postmenopausal Women

Do-Jin Kim¹, Jong-Hyuck Kim*²

¹ Professor, Dept. of Rehabilitation Sports, Bucheon University, 25 Sinheung-ro 56 beon-gil, Bucheon-si Gyeonggi-do, 14632, Republic of Korea

² Professor, Dept. of Medical Beauty care, Jungwon University, 85 Munmu-ro, Goesan-eup, Goesan-gun Chungbuk, 367-700, Republic of Korea

taehab@hanmail.net¹, jhkim4170@hanmail.net^{2*}

Abstract

Background/Objectives: The purpose of this study was to investigate the effects of 8 weeks of combined exercise on blood lipid and obesity-related hormones in postmenopausal women and to provide basic data in regard to exercise prescription for effective postmenopausal women's health management.

Methods/Statistical analysis: The subjects of this study were postmenopausal women living in Seoul, Korea. The combined exercise of the experimental group consisted of treadmill walking and weight training using weight. The exercise intensity was able to maintain the exercise intensity of 60%-70% or more based on RPE and 1RM. Exercise intensity was adjusted in units of 4 weeks. 60 minutes four times a week for 8 weeks. Warm-up and cool down were conducted for 10 minutes each. The exercise was conducted for 20 minutes of aerobic exercise and 20 minutes of resistance exercise. In the data processing, descriptive statistics were presented for each measurement item and a 2-way RGRM ANOVA was conducted to examine the interaction effects between groups.

Findings: The results have shown significant interaction effects in the blood lipids(TG, TC, HLD-C, LDL-C) and the obesity-related hormones(Leptin, adiponectin).

Improvements/Applications: The purpose of this study was to investigate the effects of resistance exercise using treadmill and weight on blood lipid and obesity-related hormone in postmenopausal women. The results suggest that combined exercise has a positive effect on blood lipid and obesity-related hormones. Therefore, the 8-week combined exercise program proved that obesity and cardiovascular disease can be prevented and improved by effectively improving blood lipid and obesity-related hormones. Considering these aspects, it is necessary to develop various combined exercise programs for postmenopausal women.

Keywords: Combined Exercise, Blood Lipids, Obesity-related Hormones, Postmenopausal women, TG, TC, LDL-C, HDL-C, Leptin, Adiponectin

1. INTRODUCTION

The average life expectancy of women in Korea continues to increase from 79.0 years in 2000 to 85.7 years in 2018[1], leading to more interest in middle-aged and older adults for a better life[2].

The proportion of middle-aged women ranged from 40s to 60s was about 19.5% in 1990, but it increased by 13.1% to 32.6% in 2018, which mean that the proportion of middle-aged women in the total population is large and continuously increasing[3]. Middle-aged women ranged from 40s to 60s are exposed to rapidly accumulate fat in the abdominal cavity when menopause begins. In fact, excessive abdominal obesity increases the risk of chronic diseases such as cardiovascular disease, metabolic syndrome and dyslipidemia. Active therapeutic intervention to prevent these negative effects is necessary[4].

Menopause is an inevitable change in the body by accelerating the aging process, typically causing obesity, metabolic syndrome, osteoporosis, type 2 diabetes mellitus, cardiovascular disease, changes in physical fitness, and an increase in various diseases[5,6]. In addition, the prevalence of chronic diseases such as obesity, prehypertension, hypercholesterolemia, hypertriglyceridemia, etc. in postmenopausal women is high, and the importance of disease prevention is further emphasized[7].

Lack of physical activity caused by sedentary behaviors is highly likely to increase the chronic disease, so it is recommended that the most effective strategy for preventing chronic disease is physical activity[8]. Regular physical activity not only helps people promote health and improve health, but prevent chronic diseases, cardiovascular disease, type 2 diabetes, and obesity[9].

Middle-aged women required healthcare to prevent various postmenopausal diseases have a rapid decrease in immunity, muscle strength, and cardiopulmonary function after 40s. Therefore, a combination exercise of aerobic and resistance exercise is necessary[10].

The use of blood lipids during exercise can consequently help prevent or delay cardiovascular diseases such as coronary artery disease[11]. Also, regular exercise can reduce blood leptin levels in overweight and obese people, and reduce blood leptin levels by aerobic exercise and resistance exercise[12,13]. In addition, the fact that the concentration of adiponectin in the blood increased through exercise was reported[14]. Therefore, the purpose of this study was to investigate the effects of 8 weeks of combined exercise on blood lipid and obesity-related hormones in postmenopausal women and to provide basic data in regard to exercise prescription for effective postmenopausal women's health management.

2. MATERIALS AND METHODS

2.1. Subject of study

20 postmenopausal women were divided into 10 groups each for experimental group(EG) and control group(CG). The experimental group performed aerobic exercise and resistance exercise in parallel, and the control group maintained daily life as usual <Table 1>.

Table 1: Physical Characteristic of Subjects (M±SD)

Group	N	Age (yr)	Height (cm)	Weight (kg)	Fat (%)
EG	10	53.70±2.67	161.88±2.60	63.96±3.98	32.17±4.54
CG	10	54.15±2.73	160.86±2.36	62.43±3.66	33.28±4.89

2.2. Exercise program

The combined exercise of the experimental group consisted of treadmill walking and weight training using weight. The exercise intensity was able to maintain the exercise intensity of 60%-70% or more based on RPE and 1RM. Exercise intensity was adjusted in units of 4 weeks. 60 minutes four times a week for 8 weeks. Warm-up and cool down were conducted for 10 minutes each. The exercise was conducted for 20 minutes of aerobic exercise and 20 minutes of resistance exercise. The combined exercise program is shown in <Table 2 >

Table 2: Combined Exercise Program

Division	Exercise Program	Intensity	Time(min)
Warm Up	Body Stretching/walking		10
Combined Exercise	Treadmill exercise: walking(20min)	HRmax 60-70% / RPE≤12	20
	Resistance exercise: Leg curl, dumbbell on legged toe raise, overhead press, triceps curl, chest fly (10rep./3set)	1RM 60%	20
Cool Down	Body Stretching/walking		10

2.3. Measurement method

The experimental and control groups performed blood lipid and hormone tests before and after the eight-week treatment program. The fasting time was maintained for 24 hours before blood test, and blood was collected and referred to a medical corporation for analysis.

2.4. Data analysis

The statistical program of this study used SPSS 21.0. Descriptive statistics for each measurement variable were presented to verify the treatment effects of the experimental and control groups. In addition, 2-way ANOVA was conducted to verify the effect on experimental treatment. The significance level was verified at .05.

3. RESULTS

3.1. Blood Lipids

Significant differences were found in TC(p=.041), HDL(p=.035), LDL(p=.010), and TG(p=.045) in the experimental and control groups (p<.05).<Table 3>.

Table 3: Blood Lipids

Factor	Group	Pre	Post	P
TC(mg/dL)	EG	195.47±51.89	187.80±55.61	Group*period:.041 Group:.684 Period:.009
	CG	202.44±59.81	201.17±58.09	
HDL(mg/dL)	EG	45.10±9.54	56.27±8.56	Group*period:.035 Group:.765 Period:.023
	CG	47.22±8.90	46.39±10.70	
LDL(mg/dL)	EG	132.45±24.24	98.68±19.73	Group*period:.010 Group:.583 Period:.008
	CG	131.72±22.25	132.36±23.88	
TG(mg/dL)	EG	121.99±29.00	90.05±19.09	Group*period:.045 Group:.422 Period:.012
	CG	124.31±27.64	123.80±26.96	

3.2. Obesity-related Hormones

Leptin(p=.032) and adiponectin(p=.020) showed significant differences in experimental and control groups (p<.05)<Table 4>.

Table 4: Obesity-related Hormones

factor	group	Pre	Post	P
Leptin (ng/mL)	EG	12.73±3.68	6.68±2.93	Group*period:.032 Group: .586 Period: .007
	CG	13.88±4.80	13.90±3.11	
Adiponectin (ug/mL)	EG	5.93±2.12	8.99±2.24	Group*period: .020 Group: .677 Period: .014
	CG	5.03±3.54	5.21±2.77	

4. DISCUSSION

The purpose of this study was to present the basic data of effective exercise program for the improvement of health and prevention of cardiovascular disease in the postmenopausal middle-aged women by comparing and analyzing the differences in blood lipid and obesity-related hormones for 8 weeks. This study performed a comparative analysis of the results of this study and previous studies as below.

Increased blood lipid concentrations are a major cause of cardiovascular diseases such as atherosclerosis, stroke, hypertension, and myocardial infarction, resulting in imbalances in skeletal muscle energy metabolism, and increasing the amount of storage fat in major organs and peripheral tissues of the body, resulting in obesity and insulin resistance, leading to a direct cause of metabolic diseases[15].

According to previous studies on changes in blood lipids through combined exercise in postmenopausal middle-aged women, Kim & Yang[16] performed 16 weeks of combined exercise in postmenopausal middle-aged women. They revealed that it significantly reduced total cholesterol(TC) and high density lipoprotein cholesterol(HDL-C). Also, Kim[17] showed that weight loss, TC, and TG were decreased after 12 weeks of moderate intensity exercise in postmenopausal middle-aged women and supported our results.

According to previous studies on changes in the blood mass through exercise in the middle of menopause, Choi & Cheon[18] found that the decreased TC and LDL-C in the 12-weeks circuit training of the menopause and Choi & Jang[19] reported that a 16-weeks Aquarobic exercise in obese women significantly reduced TC, LDL-C, and TG, though the type of exercise differs from this study.

Diniz et al[20] reported significant differences in LDL-C after 8-weeks of aerobic exercise in postmenopausal women. Kemmler et al[21] also showed that the concentration of total cholesterol and neutral fat decreased significantly as a result of fast walking, running and jumping rope exercises for women in menopause. Whereas, Elliott et al[22] reported that resistance for eight weeks did not have a significant effect on the lipid concentration of the blood, showing the contrasting results from this study.

In this study, the 8-weeks combined exercise showed significant differences in blood lipids among postmenopausal women. It is considered as an exercise program that can prevent health promotion and cardiovascular disease, as previous studies have also suggested the effects of motion on blood lipid changes in menopause women, and, as reported, reducing LDL-C or increasing HDL-C reduces coronary diseases[23]. In addition, it is expected that aerobic and resistance exercise during the 8-weeks combined exercise conducted in this study will increase energy consumption, increase muscle mass to maintain health[24], and that combined exercise will help maintain the health of menopause women[25].

Leptin is a representative substance of adipocaine secreted from adipose tissue that affects energy intake related to obesity and controls weight and satiety[26], showing higher blood concentrations in obese people than in normal weight people[27].

In addition, adiponectin is secreted only in adipocytes, abundantly present in blood, and negatively correlated with visceral fat mass, so that adiponectin levels in obese people are lower than those in normal people[28]. It is related to insulin resistance and affects glucose metabolism and lipid oxidation[29,30].

According to previous studies on changes in the leptin and adiponectin through exercise in postmenopausal middle-aged women, Ryan et al[31] reported a reduction in Leptin after 16 weeks of resistance

training for obese women and Lee & Kim[32] reported that leptin was significantly decreased after 16 weeks of Hatha Yoga exercise in postmenopausal obese women. Also, Park et al[33] reported that 12 weeks of resistance exercise in postmenopausal obese women significantly decreased leptin and adiponectin significantly increased. These supported our results.

Although there are different subjects and types of exercise, previous studies on the changes of leptin and adiponectin supported our results. Botero et al[34] reported a decrease in leptin as a result of 12 weeks of resistance exercise postmenopausal elderly women, and a 7-month aerobic exercise for young obese women reported improvements in leptin and adiponectin[35]. After 12 weeks of walking exercise in middle-aged women, adiponectin levels were significantly increased[36], and Esposito et al[37] reported that the concentration of adiponectin increased significantly as a result of two years of both aerobic exercise and dietary control for middle-age women. In contrast, five months of combined exercise in obese young men showed no significant increase in adiponectin[38].

In this study, the combined exercise for 8 weeks showed significant difference between leptin and adiponectin in postmenopausal middle-aged women. This study also suggests the effect of exercise on obesity-related hormone changes in postmenopausal women, and this result suggests that adipocaine secretion by exercise promotes lipid oxidation[39]. Therefore, eight weeks of combined exercise conducted in this study are considered as an exercise program that can help improve obesity-related hormones in women during menopause and prevent health promotion and cardiovascular diseases.

5. CONCLUSION

The purpose of this study was to investigate the effects of resistance exercise using treadmill and weight on blood lipid and obesity-related hormone in postmenopausal women. The results suggest that combined exercise has a positive effect on blood lipid and obesity-related hormones. Therefore, the 8-week combined exercise program proved that obesity and cardiovascular disease can be prevented and improved by effectively improving blood lipid and obesity-related hormones. Considering these aspects, it is necessary to develop various combined exercise programs for postmenopausal women.

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