Effect of aerobic exercise versus resistive exercise accompany with aerobic on early post menopause abdominal obesity

Dina H. Hamed[1], Sohier M. Elkosery[2], Hanaa Abd el moneam younis[3],

[1]Department for Women's Health , Faculty of Physical Therapy, Cairo University
[2]Department for Women's Health, Faculty of Physical Therapy, Cairo University
[3]Department Gynecology & Obstetrics , Faculty of Medicine (Girls), Al –Azhar University

Abstract:

Background: postmenopausal abdominal obesity is a common problem, which affects the majority of women after menopause. Purpose: The aim of this study is to investigate whether 12 weeks of moderate-intensity aerobic, or combined exercise training would induce and sustain improvements in lipid profile which reduce cardiovascular risk, weight and fat loss in overweight in postmenopausal abdominal obese women .**Subjects and Methods:** Thirty postmenopausal women, suffering from abdominal obesity , participated in this study; their age ranged from 47 to 53 years, and body mass index was was>30 kg/m2.Patients were randomly divided into 2 groups; group **(A)** walk on treadmill for 30 min in moderate intensity; group **(B)** walk on treadmill for 30 min in moderate intensity in addition to resistive exercise. Both groups exercising for 3 days/week for 12 weeks. Examining the effects of different exercise regimes on fasting measures of lipids, changes in body weight, BMI and WHR . **Results:**It showed Group (A) significant decrease and group(B) highly significant decrease (P=0.0001) in BMI. However, group A showed significant decrease in waist hip ratio (WHR) (P=0.0001) and significant increase in HDL (P=0.0001) , significant decrease in LDL (P=0.0001) , significant decrease in FTG(P=0.000) and significant decrease in TC (P=0.0001) . In comparing between GroupA and Group B there is significant difference in improvement Compared to group A, group B showed highly significant decrease in BMI (P=0.0001) highly significant decrease in WHR (P=0.0001), and highly significant increase (P=0.0001) in HDL , and highly significant improvement difference in LDL (P=0.0001) and highly significant decrease in FTG in Group B in compare to Group A with (P=0.0001) and highly significant decrease in TC in Group B in compare to Group A with (P=0.001) .**Conclusion:** Therefore, combination exercise training should be recommended for overweight and abdominal obese postmenopausal women in National Physical Activity Guidelines.

Keywords: Menopause , abdominal obesity , aerobic exercise , resistive exercise.

Introduction

Obesity is identified as an important modifier of reproductive hormones. In mid-life women, obesity is associated with menstrual cycle alterations, anovulatory cycles ending with bleeding, menopausal symptoms including hot flashes, poor sleep, aches and joint pain, urinary symptoms and quality of life. Many women experience weight gain, increases in central adiposity and other changes in body composition around menopause, but the extent to which these changes are specific to levels or changes in reproductive hormones or to other behavioral and disease factors are complex and not clearly identified. **(Santoro et al., 2014)**

The incidence of excess body weight among women is increasing worldwide to epidemic proportions. The arrival of the menopause in middle age is associated with a tendency to gain weight. It is estimated that the prevalence of obesity among women aged 40–59 years in the United States is approximately 38.2%, while the prevalence of overweight and obesity is 66.3% . In Brazil, data from the Family Budget Study revealed that 58.0% and 63.0% of women aged 45–54 and 55–64 years of age, respectively, were overweight, and, of these, 21.5% and 26.0%, respectively, were obese .There are strong indications that in middle age, obesity is associated with increased mortality (**Pischon et al., 2015)**.

Several alterations in fat deposits occur with the advent of the menopause, leading to a change in the distribution of body fat. Hypoestrogenism has a negative effect on fat metabolism, favoring the appearance of central-body obesity .**(Cuadros et al., 2014)**

Central obesity is associated with a statistically higher risk of heart disease, hypertension, insulin resistance, and Diabetes Mellitus Type 2 With an increase in the waist to hip ratio and overall waist circumference the risk of death increases as well. Metabolic syndrome is associated with abdominal obesity, blood lipid disorders, inflammation, insulin resistance, full-blown diabetes, and increased risk of developing cardiovascular disease. It is now generally believed that intra-abdominal fat is the depot that conveys the biggest health risk. **(Cameron et al ., 2013)**

Regular exercise is known to reduce risk for cardiovascular disease and type 2 diabetes through numerous mechanisms. It reliably and robustly improves insulin sensitivity and cardiovascular fitness , reduces blood pressure , improves dyslipidemia , reduce abdominal obesity, visceral fat, and health-related metabolic risk variables. In addition to the important role of upper body obesity and both individual and combined factors of metabolic syndrome score . Regular exercise has modest effects on reducing body weight with substantially greater effects on improving body composition. Conversely, it is becoming increasingly clear that a continued sedentary lifestyle in overweight or obese individuals—particularly those who already have some metabolic abnormalities—comes at a high metabolic cost, as numerous health-related variables worsen over relatively short time periods **.(Hamilton et al.,2015)**

Aerobic exercise comprises innumerable forms. In general, it is performed at a moderate level of intensity over a relatively long period of time. For example, running a long distance at a moderate pace is an aerobic exercise, but sprinting is not. Playing singles tennis, with near-continuous motion, is generally considered aerobic activity, while golf or two person team tennis, with brief bursts of activity punctuated by more frequent breaks, may not be predominantly aerobic. Some sports are thus inherently "aerobic", while other aerobic exercises, such

as fartlek training or aerobic dance classes, are designed specifically to improve aerobic capacity and fitness. It is most common for aerobic exercises to involve the leg muscles, primarily or exclusively. There are some exceptions. For example, rowing to distances of 2,000 m or more is an aerobic sport that exercises several major muscle groups, including those of the legs, abdominals, chest, and arms. Common kettlebell exercises combine aerobic and anaerobic aspects. (**Kenneth ., 2016)**

Resisting exercise (Strength training) is a type of physical exercise specializing in the use of resistance to induce muscular contraction which builds the strength, anaerobic endurance, and size of skeletal muscles. When properly performed, strength training can provide significant functional benefits and improvement in overall health and well-being, including increased bone, muscle, tendon, and ligament strength and toughness, improved joint function, reduced potential for injury, increased bone density, increased metabolism, increased fitness, improved cardiac function, and improved lipoprotein lipid profiles, including elevated HDL ("good") cholesterol. Training commonly uses the technique of progressively increasing the force output of the muscle through incremental weight increases and uses a variety of exercises and types of equipment to target specific muscle groups. Strength training is primarily an anaerobic activity, although some proponents have adapted it to provide the benefits of aerobic exercise through circuit training. (**Shaw et al ., 2014)**

Strength training is typically associated with the production of lactate, which is a limiting factor of exercise performance. Regular endurance exercise leads to adaptations in skeletal muscle which can prevent lactate levels from rising during strength training. This is mediated via activation of PGC-1alpha which alters the LDH (lactate dehydrogenase) iso enzyme complex composition and decreases the activity of the lactate generating enzyme LDHA, while increasing the activity of the lactate metabolizing enzyme LDHB. (**Shaw et al., 2015)**

Sports where strength training is central are bodybuilding, weightlifting, powerlifting, strongman, Highland games, shot put, discus throw, and javelin throw. Many other sports use strength training as part of their training regimen, notably tennis, American football , wrestling , track and field , rowing , lacrosse , basketball , pole dancing , hockey, professional wrestling , rugby union , rugby league , and soccer . Strength training for other sports and physical activities is becoming increasingly popular.(Shaw et al ., 2013)

More research is needed to determine the most effective treatment that can decrease central obesity posmenopausal. So, this study was conducted to determine clinical evidence of the effectiveness of moderate intensity aerobic exercercise versus combination between aerobic and resistive exercise on postmenopausal abdominal obesity , which constituted a great problem if not controlled and it may associated with cardiovascular risk**.** It is hypothesized that both affecting.

Material and methods

Subjects

- Thirty females suffering from postmenopausal abdominal obesity participated in this study. They were selected from Central Qaluob Hospital, refered outpatient clinic to physical therapy department . Their age ranged from 47-

53 years and their body mass index(BMI) was >30 kg/m^2 and < 35 kg/m^2 and Their waist circumference (W.C) > 90 cm and Their waist hip ratio (WHR) > 0.8 and All participants were medically stable.

They were randomly distributed into two equal groups, group (A) and (B) . Group (A) performed high intensity aerobic exercise in form of walking on treadmill for 30 min, training for three time per week for 12 weeks with 70 % of HRR ±10 beats/min intensity in addition to the diet control Group (B) performed a Combination of high intensity aerobic exercise in form of walking on treadmill for 15min with 70% HRR ±10 beats/min intensity and 15-min of resistive exercise training for three time per week for 12 weeks in addition to diet control. Full instructions about assessment and treatment procedures were given to each patient, who signed an informed consent form at starting of this study. The Research Ethical Committee, Faculty of Physical Therapy, Cairo University approved the study protocol.

Measures:

1-Weight-Height scale:

It was used to measure height and weight for each patient in all groups(A&B) at starting of the study to calculate BMI by dividing weight by height squared (kg/m^2).

2- Tape measurement:

It used to measure hip and waist circumference to calculate waist-hip ratio.

3-Electronic Treadmills .

It used for detection of exercise intensity and training protocol for both group, and for making 6-min run test that used for testing aerobic endurance fitness (the ability of the body to use oxygen as an energy source) .

4-*Weight Resistance Dumbbells* :

They used for detection of resistive exercise intensity and training protocol for combined group

Interventions:

1-Diet Control

All subjects in both groups (A&B) subjects were informed personally about the detail of the study , They were have the last meal at least two hours before each training , They were committed with diet control in form of low caloric diet..

2-Aerobic Training in Moderate intensity

This group consisted of fifteen obese early postmenopausal women. They performed moderate intensity aerobic exercise in the form of walking on treadmill for 30 min of training for three time per week for 12 weeks with 70% of HRR ±10 beats/min intensity in addition to the diet control . (Park **et al., 2014)**.

3-Combination Between Resistive Training And Aerobic Training.

This group consisted of fifteen obese early postmenopausal women. They performed moderate intensity aerobic exercise in form of walking on treadmill for with 70% of HRR ±10 beats/min intensity15 min in combination with resistance exercise inform of two sets of each following exercise : squat exercises, Plank with

Alternating Leg Lift, squat exercises in form of (Wood Chop with dumbbells, Dumbbell Squat and Overhead Press, Romanian Deadlift, Dynamic Lunge, Bent over Row), Bench Press, Triceps Extension and Biceps Curls.

Started workload levels for dumbbell's weights were tested by participants and if more than 10 repetitions would achieve, the weight increased and after a short rest participants were try again. Likewise, if less than 8 repetitions achieved, the weight were be decreased and after a short rest participants were try again. Dumbbells (adjustable weight 1.5-6 kg) .Training for three time per week for 12 weeks in addition to diet control .

Each set of 12-15 repetitions at 10-RM, with each set completed in approximately 30-sec with 1-min rest) . **(Williams et al ., 2015)**

Statistical analysis:

Results are expressed as mean±standard deviation. Test of normality, Shapiro-Wilk test, was used to study the distribution of data. Accordingly, 3X2 mixed design multivariate analysis of variance (ANOVA) was used to compare the tested variables at different tested groups and measuring periods. Statistical analysis was performed using SPSS computer program (version 18 windows). P-value<0.05 was considered significant.

Results

In group (A),the mean values of age, weight, height, and BMI were49.93±1.79 years and 49.93±1.79kg/m^2 respectively. While group (B) mean values of age and BMI were years50.33±1.72 and 32.95±1.64 kg/m^2 respectively. As indicated by the ANOVA, there were non-significant differences (p>0.05) in the mean values of age, and BMI among the three tested groups (Table 1).

Table(1): Descriptive statistics and ANOVA of the demographic data for the three groups.

	Group A (N=20)	Group B (N=20)	T-value	P-value
Age (years)	49.93±1.79	50.33±1.72	0.62	0.0538 NS
BMI (kg/m2)	32.28±1.6	32.95±1.64	1.14	0.264^{NS}

***Significant at P<0.05; NS: non-significant; BMI: body mass index**

In group (A),the mean values of age, weight, height, and BMI were49.93±1.79 years and 49.93±1.79kg/m^2 respectively. While group (B) mean values of age and BMI were years50.33±1.72 and 32.95±1.64 kg/m^2 respectively. As indicated by the ANOVA, there were non-significant differences (p>0.05) in the mean values of age, and BMI among the three tested groups (Table 1).

Table(2):Descriptive statistics and ANOVA of the tested variables for the three groups.

Group A significant decrease and group B highly significant decrease (P=0.0001) in BMI. However, group A showed non significant decrease in waist hip ratio (WHR) (P=0.0001) and significant increase in HDL (P=0.0001) , significant decrease in LDL

(P=0.0001) , significant decrease in FTG(P=0.0001) and significant decrease in TC (P=0.0001). In comparing between GroupA and Group B there is significant difference in improvement Compared to group A, group B showed significant decrease in BMI (P=0.0001) highly significant decrease in WHR (P=0.0001), and highly significant increase (P=0.0001) in HDL , and significant improvement difference in LDL (P=0.0001) and significant decrease in FTG in Group B in compare to Group A with (P=0.0001) and significant decrease in TC in Group B in compare to Group A with (P=0.0001) .

Variables		Group (A)	Group (B)
BMI (kg/m2	**Pre-treatment**	32.28±1.6	32.95 ±1.64
	Post-treatment	28.24±1.49	26.49 ±1.13
	P-value	0.0001*	0.0001*
Waist hip ratio (WHR)	**Pre-treatment**	0.76±0.03	0.78 ±0.04
	Post-treatment	0.74 ±0.03	0.7 ±0.03
	P-value	0.0001	0.0001
High density lipoprotein (HDL)(mg/dl)	**Pre-treatment**	43.07 ±4.03	47.2 ±4.5
	Post-treatment	46.97 ±3.6	53.53 ±4.36
	P-value	0.0001	0.0001*
Low density lipoprotein (LDL)(mg/dl)	**Pre-treatment**	168.8 ± 5.53	169 ± 5.53
	Post-treatment	150.33 ± 6.96	142.93 ± 8.06
	P-value	0.0001*	0.0001*
Fasting triglycerides (FTG)(mg/dl)	**Pre-treatment**	215.53 ±4.88	215.47 ±4.9
	Post-treatment	184.2 ±5.02	179.6 ±3.16
	P-value	0.0001*	0.0001*
Total cholesterol (TC)(mg/dl)	**Pre-treatment**	246.67 ±3.94	248.13 ± 3.78
	Post-treatment	229.4 ± 4.05	223.6 ±6.41
	P-value	0.0001*	0.0001*

Discussion

Cohort studies of healthy women moving through the menopausal transition have shown an increase in abdominal obesity, an increase in triglycerides, total cholesterol and LDL cholesterol, a decrease in HDL cholesterol, increased fasting glucose and other measures of insulin resistance , increased BMI and increased blood pressure **(Matthews et al., 2013).**

The results of this study came in agreement with **Slentz et al**. who reported that low-amount/moderate-intensity and low-amount/vigorous-intensity endurance training (i.e., activity equivalent to ~12 miles·week^{-1} of walking or jogging) were equally effective in reducing % body fat, fat mass, waist circumference, and abdominal circumference in previously sedentary, overweight, middle-aged adults. They also reported that high-amount/vigorous intensity endurance training (activity equivalent to ~20 miles·week^{-1} of jogging) was more effective in reducing % body fat and fat mass compared to the two low-amount training groups.

The results of the current study were supported by **Tremblay et al.** who reported that high-intensity intermittent exercise training induced greater subcutaneous fat loss compared to moderate-intensity exercise training under isocaloric training conditions. Similarly, **Tremblay et al**. , also reported results from the Canadian Fitness Survey that indicated that vigorous-physical activity was associated with lower subcutaneous skinfold thickness, which continued to remain significant after adjusting for total

energy expenditure. It should be realized that HIET was likely associated with slightly greater exercise energy expenditure and total energy expenditure than LIET. The kcal per training session was based on total energy expenditure (e.g. 300, 350 or 400 kcal per session) and resting metabolism was part of the total. Therefore on the high intensity exercise days where duration was ~ 6 min shorter , resting metabolism would contribute to a lower fraction of the total energy expenditure. This resulted in an ~ 400 kcal difference in exercise energy expenditure between the high and low intensity groups over the 16 week time frame(~ 25 kcal/week). In addition, it is likely that post-exercise oxygen consumption was higher on the HIET days.**(Dumortier et al., 2013)**

Physical activity is a major modifiable determinant of chronic disease and postmenopausal changes. The Australian National Physical Activity Guidelines for Adults recommend that for good health, adults should "put together at least 30 min of moderate-intensity physical activity on most, preferably all, days." However, it is not known if this recommendation is adequate for improvement in cardiovascular disease (CVD) risk factors in overweight and obese individuals. Despite the acknowledged role of 30 minutes of daily physical activity on general health improvements in an otherwise healthy but sedentary population, less is known of the adequacy of this level of exercise for health improvements in those who are overweight or obese. In addition, as many people have difficulty finding time to exercise, it is important to better understand which mode(s) of exercise is the most effective.**(Slentz et al., 2014)**

Numerous studies have investigated the effects of exercise training, demonstrating significant improvements to CVD risk factors of postmenopausal women after aerobic exercise training. However, it is unclear whether health benefits are limited to aerobic training or if other exercise modalities such as resistance training or a combination are as effective or more effective in the overweight and obese.**(Johnson et al., 2015)**

Sigal et al. investigated the effects of aerobic, resistance and combined aerobic and resistance training in adults with Type 2 diabetes. However, the combined intervention used both aerobic (45-min walking/cycling) plus resistance training (2–3 sets of 7 exercises with 7–9 repetitions), that is, participants completed a double dose of exercise. They observed significant decreases in body weight, body mass index (BMI) and abdominal subcutaneous fat in the aerobic and resistance groups compared to control.**(Sigal et al.,2017)**

Davidson et al. also examined different exercise modalities in older adults. Calorie intake was strictly controlled and results were due solely to the energy deficit of the exercise interventions. They observed significant improvements to total, abdominal and visceral fat and cardio-respiratory fitness in the aerobic and combination exercise groups. It was concluded that the combination of the resistance and aerobic exercise was the optimal exercise strategy for improvements to insulin resistance and functional limitations .**(Davidson et al., 2013)**

A recent study by **Church et al.** compared equivalent time durations (140 min/week) of aerobic, resistance and combination exercise. They observed significant improvements in $HbA_{1c}$and maximum oxygen consumption in the combination group compared to control as well as decreases in weight and fat mass in the resistance and combination groups compared to control.**(Church et al., 2014)**

Tremblay et al. who reported that high-intensity intermittent exercise training induced greater subcutaneous fat loss compared to moderate-intensity exercise training under isocaloric training conditions.

All these findings confirmed that, moderate aerobic exercise on treadmill combined with resistance exercise programme with low caloric diet control is much better than using moderate intensity aerobic exercise individually with low caloric diet program with in treating obese postmenopausal abdominal obese women with hyperlipidemia . Thus, combination of moderate aerobic exercises with resistance exercise have a great and beneficial effect on primary hyperlipidemia in postmenopausal abdominal obese women, they give marvelous results and noticeable changes.**(Tremblay et al., 2015)**

Conclusion

On the basis of the present data, it is possible to conclude that moderate aerobic exercise combined with resistance has a great effect on hyper-dyslipidemia in abdominal obese postmenopausal women; they gave marvelous results and noticeable changes. So we can say that, hyper-dyslipidemia required formal medical treatment and moderate aerobic exercises combined with resistance exercise can complement treatment plan.

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