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RESEARCH ARTICLE

IMPACT OF RESISTED TRAINING AND NATURAL EXTRACT ON (TNF-α) AND LIPID PROFILE IN WOMEN WITH INSULIN RESISTANCE SYNDROME

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ABSTRACT

Background and Objective: Resisted Training and Natural Extract (green tea) for women with insulin resistance syndrome improved the level of TNF (α), lipid profile, exercise capacity, prevent cardiovascular complication and decrease morbidity. The effects of three months resisted training and natural extract on TNF (α) and lipid profile in women with insulin resistance syndrome were investigated in this study.

Material and methods: Sixty insulin resistance syndrome untrained obese women with age of 40-50 years were included in the present study. Their body mass index (BMI) was ranged from (30 to 39.9 kg/ m²). They were randomly divided into three equal groups. Group (A) who participated in a program of resisted training (40-50 min, resisted exercises, 3 times/week) and drank 5 cups of the water extract of the dried green tea leaves daily, group (B) who participated in the same program of resisted exercise only as group (A), and group (C) who drank the same green tea extract in the same manner as group (A) but without application of any resisted exercise at all. The study was conducted from Feb 2017 till May 2018, at Physical Therapy Department of Elmonira hospital, the biochemical changes in lipid profile (TC, LDL, and HDL)) and Tnf (α) were measured at the beginning of the study and after twelve weeks for all groups.

Results: revealed a significant decrease in the Tnf (α), total blood cholesterol and LDL-C, and a significant increase in the HDL-C, The higher percentage of improvement in the Tnf (α), LDL-C, TC and HDL-C were found in group (A) when compared with group(B) and group (C).

Conclusion: we concluded that a program of resisted training combined with green tea Natural extract produce a significant improvement for women with insulin resistance syndrome rather than when any of both applied separately.

INTRODUCTION

Insulin resistance (IR) defined as a pathological condition in which cells fail to respond normally to insulin secretion. The body produces insulin hormone as soon as glucose starts to be released into the blood stream after the digestion of carbohydrates in diet. Under normal status of insulin reaction, this insulin response stimulates glucose absorption into body cells as a source of energy and inhibits the body from using fat for energy that leads to decrease the concentration of glucose in the blood, During insulin resistance, excess glucose is not sufficiently absorbed by cells even in the presence of insulin resulting an increase in the levels of blood sugar (Wang, Guanyu, 2014).

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Metabolic syndrome (MetS) is characterized by the presence of many cardiovascular risk factors like insulin resistance, dyslipidemia and hypertension. Dyslipidemia is another well-known risk factor for CVD as it is also associated with insulin resistance, as well as a component of MetS (Ryuichi Kawamoto *et al.,* 2011). Recently, Obesity in children and adolescents has increased significantly, resulting in the development of chronic diseases and metabolic syndrome during adulthood (InstitutoBrasileiro de Geografia e Estatística, 2010). Abdominal or central adiposity is a risk factor for diabetes and cardiovascular disease in adults considering the degree of obesity. In children and adolescents, the effect of body fat distribution in obesity complications is uncertain (Lawlor *et al.,* 2010). Fatty tissue considered as an endocrine organ releasing several substances such asleptin, adiponectin, and tumor necrosis factor alpha (TNF-α). These adipocyte-derived cytokines affect various physiological functions as energy homeostasis, glucose regulation, and insulin sensitivity (Fernandes and Zanesco, 2010). Body mass

index (BMI) is used for the diagnosis of obesity in adolescents, although it does not assess the distribution of body fat. Cardiovascular risk, metabolic and insulin resistance disorders can be evaluated in youth population through measurement of waist circumference (WC). However, there is a still great need for studying usefulness of central obesity indicators as tools for detecting cardio-metabolic risk factors in adolescents (Spolidoro *et al.,* 2013). Computed tomography (CT) and magnetic resonance imaging are the gold standard methods in assessing the distribution of abdominal fats but its high cost and radiation are limiting factors. Regional and total fat distribution can be assessed by dual-energy x-ray absorptiometry (DXA) which is considered a simple and low-risk method with very good relation with other radiological exams (Bell *et al.,* 2013). Lipids are insoluble in water that makes their transportation very difficult; they combine with another food component in the body to form lipoprotein which allows the transportation of lipids through blood. Lipoprotein can be easily classified into different groups according to their sizes and composition. the low density lipoprotein cholesterol (LDL-c) is a harmful cholesterol which transport cholesterol to body cells and deposit a lot of it in the arterial walls that increasing the risk of cardiac diseases while the high density lipoprotein cholesterol (HDL-C) is also called healthy cholesterol because it transfers the cholesterol from the blood and the artery walls to the liver helping its conversion to the bile to be used in digestion or get rid of it by the body. That assists in preventing or reversing heart disease. As a result total cholesterol level isdetermined by the amount of LDLs and HDLs in a measured sampled of blood. Tumor necrosis factor alpha (TNF-α) is an inflammatorycytokines thatinvolvedin systemic inflammation. It is created mainly by macrophages cells, also produced by several cells as lymphocytes, neutrophils, mast cells, and neurons (Swardfager *et al.,* 2010). The function of TNF is the regulation of immune cellsand responds to sepsis via IL1&IL6 producing cells (Dowlati *et al.,* 2010).

Lifestyle is considered healthy if it is associated with the practice of regular exercises, it is evidence based that individuals who are physically active live longer with decreased morbidity and mortality rates. Resisted exercise (RE) is accompanied with an increase in muscle strength, power, and rate of force development, improving performance in daily activities and quality of life (Xiao and Fu, 2015). Green tea is a type of tea that is made from Camellia sinensis leaves that have not submit to the same withering and oxidation process that is used to make black teas, Green tea leaves can be used through soaking them in an alcohol solution, Extracts are found in many forms such as powder, capsules, and tablets (Khan and Mukhtar, 2013). Sedentary lifestyle increases the risk of cardiovascular diseases, diabetes, hypertension and the diseases related to plasma concentration of inflammatory markers. Increasing the level of inflammatory markers is associated with many of chronic diseases such as ischemic cardiovascular diseases, type II diabetes, and Alzheimer, due to the prevalence and dangerous effects, Lifestyle behavioral interventions to decrease the inflammation including changes in food/dietary intake and physical activity is of extreme response for improving inflammation and to reduce morbidity and disability (Beavers *et al.,* 2010). There are few studies investigating the specific responses of lipid profile to resisted training and their possible effects on inflammatory cytokines. Thus, the aim of this study was to study the response of blood lipids, BMI, (TNF-α) in response to resisted training and natural extract (green tea) in women with insulin resistance syndrome.

MATERIALS AND METHODS

Sixty insulin resistance syndrome untrained obese women, who were encouraged to follow their habitual life style throughout the study period, They were selected randomly and referred by the physician from the clinic of internal medicine in Elmonira Hospital and they were operated in the department of Physical Therapy at Elmonira Hospital, one of the Egyptian Health Ministry Hospitals in Cairo, were participated in the study. Their weights and height allowed them to be considered obese according to their body mass index (BMI) equation, between (30-39.9 kg/ m²). The present study was performed from Feb 2017 till May 2018.provided informed consent forms giving agreement for participation and publications of the study results, Full evaluation of each participant was performed prior to and at the end of the study (including medical history and clinical examination), After selection of the patients an informed consent was taken from all patients who accepted to participate in the study. Before starting the study all patients were informed about the nature, benefits and procedure of the study, the sixty women were randomly divided into three equal groups; each group consisted of twenty patients. The first Group received a program of resisted exercise and drank green tea in specific manner (group A) and the second group (group B) that performed the same program only as (group A), while the third group drank only green tea without participation in any exercise at all (group C). All groups were under their medical treatment prescribed by the physician. All women were previously diagnosed as having metabolic syndrome and the same inclusion criteria as follow: age from 40-50years, body mass index from (30 to 39.9 kg/ m^2), the onset of the disease was more than 5 years, and received the same necessary required drugs, Any patient had hepatic disease; severe life limiting illness (cancer, renal failure), other endocrinal disorders, orthopedic limitation, severe hyper tension, chronic pulmonary disease was excluded from the study. A treadmill was used for warming up exercise (Tunturi original treadmill W1 electronics), Sphygmomanometer and stethoscope for measuring blood pressure before, during and after training sessions.

Anthropometric characteristics of the patients

The body weight was measured in light indoor clothes and the patient standing height without their shoes and was measured using calibrated Healthy scale 160 kg. Body mass index (BMI) was calculated as the weight (kg) divided by the height squared (m2).

Assessment TNF- α and lipid profile

Plasma or serum samples were obtained by venipuncture (arterial cannula used in Larsen's study) and stored on ice. In all studies, venipuncture collections were taken between 900, and 1200, at least 24 hours and not more than 5 days after the last exercise session, thus negating the effects of the intervention. Within one hour, samples were centrifuged at 4◦C, 1500–2000RPM for 10 minutes, and then separated into aliquots and stored at between −75◦C and −80◦C. Concentrations of tumor necrosis factor and interleukin 6 were measured by commercially available enzyme-linked immunosorbent assay kit called the Quantikine TNF-α

immunoassays which is a 3.5-4.5 hour solid phase ELISA designed to measure TNF-α in cell culture supernates, serum and plasma. (R&D Systems, Inc. 614 McKinley place NE, Minneapolis, MN 55413. United States of America). immunosorbent assays (ELISAs), high-sensitivity kits were used for (TNF-α), Samples were assayed in batches from the same lot such that the baseline and 3-month sample from each participant were assayed together and the number of samples from each intervention group was balanced within each batch. Laboratory personnel were blinded to intervention group. Samples were run in duplicate with coefficients of variation for all samples less than 10%. Blood sample of a lipid profile (the total blood cholesterol, LDL and HDL levels) was taken after overnight fast of 12hrs for lipid profile and estimated using standardized enzymatic methods (SumanBala *et al.,* 2015). The Plasma or serum samples of (TNF-α) and lipid profile (total blood cholesterol, LDL and HDL levels) were taken and measured before starting After finishing the 12 weeks program, and then the pre and post samples for the three groups were compared.

Intervention

Both groups (A and B) who received an exercises program adhered to their exercise regimens four times per week for twelve weeks as they referred by the physician from the clinic of internal medicine in Elmonira Hospital and they were operated in the department of Physical Therapy at Elmonira Hospital, one of the Egyptian Health Ministry Hospitals in Cairo

A) Resisted Training intervention (Program for group A & B): Each women in the (group A), and group (B) participated in the supervised resisted exercises program for 12 weeks, a typical workout should consisted of 8 exercises to cover the major muscle groups, which includes the chest, shoulders, arms, back, abdomen, thighs, and lower legsin the form of circuit weight training, with exercise intensity according to the 1RM method (I.e. maximum weight which can be lifted in one full range of motion), The resistance or weight lifted should be moderate, which is defined as 30% to 40% of 1 RM for upper body exercises and 50% to 60% of 1 RM for lower body exercises. And the Duration of session was 40-50 min divided to the first five to ten minutes of each session was dedicated to warming up exercise on a bicycle ergometer and the same for the cooling down phase. There was a thirty minute of resisted exercise, three times per week for three months, A Circuit weight training program for the Patients in group (A & B) was started by Warm up and cool down duration from 5-10minutes, circuit weight training graduated from 2-3circuits, each circuit 8 muscles, there was 1 minute rest between circuits, time was 2-3 sec. for lifting and 2 sec. for descending,theDuration of session was 40-50 min., the mode was resistance exercises training, begin with weight increased gradually until reach to the end weight and avoiding valsalva maneuver (Van Roie *et al.,* 2013; Thompson *et al.,* 2013).

B) Regimen of Natural Extract Drink For Group (A) & (C): Each women of the group (A) and those of the group (C) drank 5 cups of green tea every day for 3 months in specific manner as they drank without sugar and with the following procedure taking in consideration that extraction of the dried leaves with water through heating with a temperature exceeding 45°C may result in hydrolysis of the bioactive constituents included in the water extract as Use 2 grams (one tea spoon) of tea /cup (each cup bears about 150 ml of water), Fill a kettle with cold water and bring to a boil, After unplugging the kettle allow it to stand for up to fifteen minutes and Pour the heated water over the tea and allow it to steep for up to 10 minutes.

Data analysis

Descriptive statistics and ANOVA-test were conducted for comparison of subject characteristics between groups. Normal distribution of data was checked using the Shapiro-Wilk test for all variables. Levene's test for homogeneity of variances was conducted to test the homogeneity between groups. Mixed MANOVA-test was conducted for comparison of pre and post treatment mean values of TNFα, BMI, TC, LDL, HDL and BF treatment in each group as within group comparison and between groups. Post-hoc tests using the Bonferroni correction were carried out for subsequent multiple comparison. The level of significance for all statistical tests was set at $p < 0.05$. All statistical measures were performed through the statistical package for social studies (SPSS) version 19 for windows.

RESULTS

Subject characteristics: Table 1 showed the mean ± SD age of group A, B, and C. There was no significant difference between the three groups in the mean age ($p = 0.95$).

Table 1. Descriptive statistics and ANOVA test for the mean ageof group A, B, and C

	Group A	Group B	Group C	p-value
	$\bar{x}$ ± SD	$\bar{x}$ ± SD	$\bar{x}$ ± SD	
Age (years)	45.25 ± 2.57	45± 3.06	45.15 ± 2.36	0.95*

$\bar{x}$, Mean; SD, standard deviation; p-value, level of significance;
* Non-significant.

Effect of treatment on TNFα, BMI, TC, LDL, HDL and BF: Mixed MANOVA revealed that there was a significant interaction of treatment and time (Wilks' Lambda = 0.85; F (12,104) = 21.05, p = 0.001). There was a significant main effect of time (Wilks' Lambda = 0.009; F (6, 52) = 933.92, p = 0.001). There was a significant main effect of treatment (Wilks' Lambda = 0.56; F (12,104) = 2.86, p = 0.002).

Table 2. Mean TNF α, BMI, TC, LDL, HDL and BF pre and post treatment of group A, B and C

	Group A	Group B	Group C	p-value		
	$\bar{x}$ ± SD	$\bar{x}$ ± SD	$\bar{x}$ ± SD	A vs B	A vs C	B vs C
			TNFα (pg/ml)			
Pre	12.89 ± 1.29	12.75 ± 1.33	12.85 ± 1.05	1*	1*	1*
Post	9.37 ± 1	10.72 ± 0.93	10.55 ± 1.22	0.001**	0.003**	1*
	*p = 0.001***	*p=0.001***	*p = 0.001***			
			BMI (kg/m²)			
Pre	36.96± 2	36.52 ± 1.8	36.28 ± 1.89	1*	0.77*	1*
Post	33.45± 2.56	34.21±2.05	34.75 ± 2.19	0.89*	0.23*	1*
	*p = 0.001***	*p=0.001***	*p = 0.001***			
			TC (mg/dl)			
Pre	267.05±14.23	262.75±16.6	260.4 ± 17.9	1*	0.6*	1*
Post	235.6± 14.91	239.85±17.08	241.95±17.16	1*	0.67*	1*
	*p = 0.001***	*p = 0.001***	*p = 0.001***			
			LDL (mg/dl)			
Pre	195.25±23.74	189.2 ± 21.57	187.65±19.95	1*	0.82*	1*
Post	165.85± 21.04	168.65 ± 20.9	171.3 ± 20.81	1*	1*	1*
	*p = 0.001***	*p = 0.001***	*p = 0.001***			
			HDL (mg/dl)			
Pre	36.15 ± 2.9	36.6 ± 3.45	37.4 ± 3.31	1*	0.68*	1*
Post	46.2 ± 2.8	42.1 ± 2.93	44.25 ± 2.84	0.0001**	0.1*	0.06*
	*p = 0.001***	*p = 0.001***	*p = 0.001***			
			BF (%)			
Pre	47.28 ± 1.33	46.53 ± 1.66	46.76 ± 1.69	0.4*	0.88*	1*
Post	35.73 ± 1.3	40.4 ± 1.6	38.47 ± 1.86	0.001**	0.001**	0.001**
	*p = 0.001***	*p = 0.001***	*p = 0.001***			

$\bar{x}$, Mean; SD, standard deviation; p-value, level of significance; * Non-significant; **Significant.

Table 2 showed descriptive statistics of TNF α, BMI, TC, LDL, HDL and BF as well as the significant level of comparison between groups and significant level of comparison between pre and post treatment in each group. There was no significant difference between the three groups in all parameters pre-treatment ($p > 0.05$). Post treatment group A showed a significant decrease in the TNFα and BF compared with that of group B and C ($p < 0.01$) and a significant increase in HDL compared with that of group B ($p < 0.001$). Group C showed a significant decrease in BF compared with that of group B post treatment ($p < 0.001$). There was no significant difference between groups in BMI, TC and LDL ($p > 0.05$). Comparison between pre and post treatment in the three group revealed a significant decrease in TNF α, BMI, TC, LDL and BF and a significant increase in HDL post treatment compared with that pre treatment in ($p < 0.001$).

DISCUSSION

The purpose of the present study was to determine the response of lipid profile and (TNF-α) to resisted training combined with natural extract on women with resistance syndrome. Sixty non trained obese women with metabolic syndrome were allowed to follow their habitual life style during the period of the study, They were randomly selected and referred by the physician from the clinic of internal medicine and they were operated in the department of Physical Therapy at Elmonira Hospital one of the Egyptian Health Ministry Hospitals in Cairo.The sixty women with metabolic syndrome were randomly divided into three groups equal in number. The first group received a program of resisted exercise and drank green tea in specific manner (group A) and the second group (group B) that followed the same program like (group A), the third group drank only green tea without doing any exercise. A (TNF-α) and lipid profile for the total cholesterol, LDL-c and HDL-c was performed before and after 12 weeks from the beginning of the study for each women in the three groups. There was no significant difference between the three groups in all parameters pre-treatment ($p > 0.05$). Post treatment group A showed a significant decrease in the TNF(α) and BF compared with that of group B and C ($p < 0.01$) and a significant increase in HDL compared with that of group B ($p < 0.001$). Group C showed a significant decrease in BF compared with that of group B post treatment ($p < 0.001$). Regarding BMI, TC and LDL comparison, there was no significant difference between groups ($p > 0.05$). Comparison between pre and post treatment in the three group revealed a significant decrease in TNF α, BMI, TC, LDL and BF and a significant increase in HDL post treatment compared with that pre treatment in ($p < 0.001$). This also come in support with (Huttunen *et al.,* 2017) Who performed a controlled trial about the effects of mild-to-moderate physical resisted training on serum lipoproteins. After two baseline examinations were done, 100 a symptomatic middle-aged men were randomly assigned into two groups as exercise and control groups. The exercise group practiced an exercise program for 3-4 per week for 4- month. The control group was asked to follow their previous exercise habits. At the end of the study it was found that serum triglycerides decreased from 1.54 +/- 0.10 to 1.27 +/- 0.08 mmol /L (pless than 0.001) and high-density lipoprotein (HDL) cholesterol increased from 1.27 +/- 0.04 to 1.41 +/- 0.04 mmol /L /1 (p less than 0.01) in the exercise group during the trial. No change was seen in the control group. There was a decrease in the level of low-density lipoprotein (LDL) cholesterol noticed in both groups during the trial.

The changes of both serum triglycerides and HDL cholesterol didn't depend on weight reduction in the exercise group. Three different antibodies against CD40L were tested in clinical trials for potential therapies for autoimmune and inflammatory disease. However, thromboembolic complications were associated with all three antibodies, which led to a complete stop in clinical testing of these antibodies. Mechanism underlying anti-CD40L antibody induced thromboembolism remains to be elucidated. Increased risk of development of tuberculosis and lymphoma is also seen with anti-TNF therapies (Murtiq *et al.,* 2016). This is consistent with the important role of TNF in regulation of many cellular processes and in activation of macrophages which are key players in killing Mycobacterium tuberculosis. Several of the harmful effects of TNF and its superfamily members are thought to be mediated through the activation of NF-κB. As all TNF superfamily members have potential to activate NF-κB and induce large numbers of genes, it is not surprising that their products are implicated in a wide variety of toxicities. Thus the beneficial role of therapies targeting TNF-α family members and their potential immunosuppressive or toxic effects must be critically examined in both animal studies and in human trials. A lot of health complications are accompanied with resistance syndrome which may be of non-fatal debilitating nature such as osteoarthritis, to life threatening chronic disease such as coronary heart problems, and from impaired self-esteem to clinically diagnosed depression. Recent estimates suggest that between 2 to 8% of the total sick care costs in Western countries are attribute to obesity. This is also come in support with the results of (Kelly, 2015) who concluded that resisted exercise can greatly alter the blood lipids towards the better values. Kelly used the meta-analytic study to assess the aerobic exercise effects on both lipids and lipoproteins in females.

The inclusion of studies was limited to randomized controlled trials published in the English language literature between January 2002 and January 2015 in which aerobic and resisted exercise was used as the primary intervention procedure in adult females with age > or =18 years. Statistically significant improvements were recorded for all lipoproteins and lipids (TC, +/- SEM, -4.3 +/- 1.3 mg/dl, 95% CI -6.9 to -1.7 mg/dl; HDL-C, +/- SEM, 1.8 +/- 0.9 mg/dl, 95% CI 0.1 to 3.5 mg/dl; LDL-C, +/- SEM, -4.4 +/- 1.1 mg/dl, 95% CI -6.5 to -2.2 mg/dl; TG, +/- SEM, -4.2 +/- 2.1 mg/dl, 95% CI -8.4 to -0.1 mg/dl). Decrease of approximately 2%, 3%, and 5%, respectively, were observed for TC, LDL-C, and TG, while an increase of 3% was observed for HDL-C. Another study was performed by to find out whether resisted exercises with a low to medium intensity can effectively affect the blood lipids and aerobic capacity parameters. Aerobic capacity indicators at anaerobic threshold (VO2ANP) level and the levels of blood lipids were measured at the beginning and also at the end of the study period. In the control group A (n = 6, age 58 +/- 7 years, BMI 32 +/- 4) aerobic capacity indicators and blood lipids were evaluated after a 12-week period of following the usual habitual physical activity. Aerobic capacity parameters were significantly improved in group B after 12-week walking training at the level of the anaerobic threshold (ANP) with the total and LDL cholesterol was significantly decreased. In the control group no significant changes observed neither in the aerobic capacity nor values of the blood lipid. The results of the present study was coincided and supported by, who studied the influence of resisted exercise on TNF and lipid profile on resisted syndrome who have reported statistically significant results. Meta-analysis considered data from 14 studies,

reported a reduction of approximately 10% in TNF concentrations and lipid profile improvement with resisted exercise and their study agree with the present study (Qin *et al.,* 2015). Who published his study that showed the blood lipid and inflammatory markers response to green tea drinking with a moderate intensity resisted exercise training of 30 minutes duration five times weekly for 12 weeks period of time. The exercise induced change in TNF and HDL-c ranged from a decrease (from the normal range) of 5.8% to an increase of about 25%. The reductions in LDL-c , TG and TC with exercise training were observed less frequently than the increase in HDL as the exercise training in the presence of simultaneous green tea drinking interventions resulted in mean reductions in TG, LDL-c and TC of about 3.7% ($p<0.05$), 5%($p<o.o5$) and1% (p=NS) respectively. The result of the present study was supported by who approved that resisted exercise training- combined with drinking water extract of green tea leaves was associated with slightly reduction of (TNF-α). Twenty-one females with the mean age ± SD was 45.0 ± 4.5 years participated in 12 weeks of moderate intensity aerobic exercise training combined with green tea drinking Muscle thickness and circulating levels of interleukin-6 (IL-6) and (TNF-α) were measured before and after the program. The program induced significant reductions in (TNF-α).

In agreement with present study results of who approved that resisted exercise and green tea drinking had been shown to slightly lowers the levels of interleukin-6 and (TNF-α), the effect of 12 weeks of moderate-intensity resisted exercise was examined on (TNF-α) compared to no exercise in resistance syndrome individuals, in the other control group significant decrease of the (TNF-α) levels was recorded after week 12 when compared to baseline. Therefore, resisted exercise training when combined with green tea drinking may be physiologically relevant in decreasing the risk of developing metabolic syndrome. A randomized, controlled trial was done by (Josef, 2015) who documented the effects of resisted exercise training on inflammatory markers (TNF-α) in females with metabolic syndrome, Inflammatory mediators such as tumor necrosis factor-alpha, interleukin-6, and nitric oxide produce similar effects to the features of resistance syndrome, such as (but not limited to) obesity, inflammatory markers. The current study performed on 50 women with age ranged from 40 to 60 years old these women asked to perform 12 weeks of moderate intensity resisted training. tumor necrosis factor (TNF)-α, IL-6 were measured before and after finishing the exercise program, the result was reduction in (TNF)-α by 18%, CRP by 23% but the decrease of IL-6 was not statistically significantly. However, there are several randomized trials which unanimously documented that women's with metabolic syndrome opposed to acute bouts of--exercise does not only lead to a decrease of cytokines (interleukin-6, TNF-α) and oxidative stress, but also these females obviously benefit from the increase in maximal oxygen consumption, exercise capacity, quality of life, reduction in hospitalization, morbidity, and mortality. The results showed by 29, which came in contrast with results of the current study, who assessed the effects of resisted exercise training in the skeletal muscle of women with metabolic syndrome; Twenty male women with metabolic syndrome; mean age 54 ± 2 years) were randomized to a training group (n = 10) or a control group (n = 10). At baseline and after six months, Serum tumor necrosis factor (TNF)-alpha, interleukin (IL)-6, and IL-1 beta levels were measured. Serum levels of IL-6, and IL-1-beta remained unaffected by training, TNF-alpha increased significantly by 2%. On the other hand, investigated the effect of different resisted exercise modalities on high sensitivity-C reactive protein (CRP) and other inflammatory markers (IL-1, IL-4, IL-6, IL-10, (TNF)-α) in women with metabolic syndrome. Eighty-two women's were allocated into four groups: randomly group (A) or sedentary control; group (B) which followed a low-intensity physical activity program; group (C) performed a prescribed and supervised high-intensity resisted exercises; (D) performing low intensity resisted training, inflammatory biomarkers were performed at baseline and every 3 months. Levels of CRP and (TNF-α) were decreased in all three exercising groups, but the reduction was significant only in Groups C and D, and particularly in group D. On the contrary, determined the effect of resisted exercise training combined with watery extract of green tea in metabolic syndrome women on inflammatory cytokines and markers of damage of the endothelium. Measured tumor necrosis factor α (TNF-α), its soluble TNF-receptors 1 and 2, interleukin 6 (IL-6), in 18 women with CHF and 9 age-matched controls in a randomized cross-over study of exercise training over 8 weeks. At baseline, women had significantly elevated levels of (TNF-α) and TNF-R2; after a program of resisted exercises there was significant decrease in the levels of TNF-α, TNF-R 1 and 2 and IL-6 the training group. In contrast, who assessed the relation between resisted training with green tea regular drinking according to specific program and TNF-alpha and IL-6 levels in metabolic syndrome females. Blood sampling was taken to measure the concentrations of interleukin-6, tumor necrosis factor-alpha, soluble TNF receptor-1(sTNFR1), 2 (sTNFR2) and (ELISA) in the plasma and also the cardiopulmonary exercise testing were done at the baseline and also repeated again after 4 months. Training induced no significant decrease in sTNFR1, sTNFR2 concentrations and (TNF-α) level were no significantly altered. Cytokine concentrations remained unchanged in an untrained age- and sex-matched control group due to the small sample of the study. Several possible mechanisms can explain why resisted exercise training reduced chronic inflammation. First, Long-term exercise may protect against chronic systemic low grade inflammation via IL6 independent pathways, IL-6 has main contribution to the anti-inflammatory activities such as reduced (TNF-α) production, because (TNF-α) stimulates the production of IL-6. Also, IL-6 inhibits (TNF-α) transcription and stimulates the anti-inflammatory cytokines production and TNF receptors shedding which has high affinity to bind with (TNF-α). Second, resisted exercise training can protect against chronic systemic low-grade inflammation through improve blood pressure, insulin resistance, and muscle mass.

Conclusion

The results of this study support the good effect of resisted exercise and green tea water extract on the (TNF-α) andlipid profilelevel. Both resisted exercise and green tea when combined showed a significant decrease in the total blood cholesterol, LDL (bad cholesterol) and a significant increase in the HDL (good cholesterol) and decrease in (TNF-α). This combination between resisted exercise and green tea can greatly lower the risk for coronary heart disease and resistance syndrome.

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Conflict of Interest Statement

The authors whose names are listed immediately below certify that they have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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Significant statement: The results of this study support the good effect of resisted exercise and green tea water extract on the (TNF-α) and lipid profile level. Both resisted exercise and green tea when combined showed a significant decrease in the total blood cholesterol, LDL (bad cholesterol) and a significant increase in the HDL (good cholesterol) and decrease in (TNF-α). This combination between resisted exercise and green tea can greatly lower the risk for coronary heart disease and resistance syndrome.

Abbreviations

ANOVA	: Analysis of variannce.
CRP	: C reactive Protein.
CT	: Computed tomography.
DXA	: dual-energy x-ray absorptiometry.
ELISAs	: enzyme-linked immunosorbent assays
HDL-C	: high density lipoprotein cholesterol.
HDLs	: high density lipoproteins.
IL	: Interleukin.
IR	: Insulin resistance.
KG	: Kilogram.
LDL-c	: low density lipoprotein cholesterol.
LDLs	: low density lipoproteins.
MANOVA	: Mixed Analysis of Variannce.
MetS	: Metabolic syndrome.
RE	: Resisted exercise.
RM	: Repetition maximum.
SD	: Standard Deviation.
SPSS	: Statistical Packaged For Social Science.
sTNFR1	: soluble TNF receptor-1.
TNF-α	: tumor necrosis factor alpha.
WC	: waist circumference.

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