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Regular Aerobic Exercise Decreases Serum Resistin levels In Active Young Females

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Abstract

Objective: Resistin is an adipocyte-derived hormone, which plays a key role in energy homeostasis and metabolism regulation. The aim of this study was to assess the effects of regular aerobic training on serum resistin levels in active young females. Methods: Twenty **females were randomly divided into the control and the experimental groups. The experimental group performed aerobic training for 8 weeks, 4 sessions in a week, and with the intensity of 70-80 % of maximum heart rate. BMI, fat percentage, and serum resistin levels were measured respectively by ELISA before and after the 8 weeks of training period. Results: Paired t-test results revealed decrease of average BMI and fat percentage before and after training in the experimental group. Serum resistin levels decreased significantly after training in the experimental group (P<0.05). Conclusions: Regular 8 weeks aerobic training in addition to reducing weight, BMI, and fat percentage also reduces serum resistin levels in young Females (P<0.05), which exhibits the reduction of cardiovascular diseases and diabetes risks.**

Key Words: Aerobic Training, Serum Resistin, Active Young Female

Introduction

Adipose tissue is an important endocrine organ which produces several factors and affects food absorption, lipids and carbohydrates metabolism in human body. It also secretes some hormones and cytokines called adypocytokines (Liu et al., 2008; Bloomgarden, 2002). Which consists of leptin, interleukin 6, tumor necrosis factor-alpha or TNF-α, adiponectin and resistin (Kern et al., 2003; Sinorita, 2010). Resistin is a new hormone secreted from adipocytes and belongs to cysteine-rich proteins family (Liu et al., 2008). It is involved in insulin resistance, inflammation and atherosclerosis (Steppan et al., 2001) and increases the vulnerability of atherosclerotic plaques through stimulating pro-inflammatory cytokines (Wang et al., 2009). According to results of the study by Xu et al (2006), resistin causes lipids to accumulate and create foam cells in walls of vessels through increasing the expression of CD 36 (Cluster of Differentiation 36) gene. Physiological effect of resistin on obesity and insulin resistance is still unclear. However some studies have reported that there is a significant relationship between the level of resistin, obesity and insulin resistance (Fujinami et al., 2004). In contrast, some other reports show that high levels of resistin are not related to obesity and insulin resistance (Ukkola, 2001; Juan et al., 2001; Qin et al., 2003). Aerobic exercises are considered as the main strategy for management and treatment of obesity. Several studies have investigated the separate effects of high and low intensity exercises along with diet on fat hormones and the results have been contradictory (Lazzer et al., 2005). In human, aside from adipose tissue, the resistin is produced in blood mononuclear cells and leukocytes, too (Azuma, 2003; Jones, 2009). Therefore,

these cells may increase the expression of resistin gene in response to exercise stimulants (Qi et al., 2008). Jamurtas et al (2006), reported that one session of aerobic exercise with a VO_{2max} of %65 in healthy and overweight men does not cause any significant change in adiponectin and resistin levels up to 48 hours after the exercise. Kelly et al, (2007) in their study on professional athletes, found that the whole-body insulin sensitivity index (WBISI) and lipid oxidation have been increased; and resistin increased in middle distance and marathon runners. However there was no difference between sprinters and low-active individuals in terms of increase in resistin levels. The results show that serum resistin is increased in elite athletes.

In another study, a long-term exercise program and a diet led obese individuals to reduce significantly the level of resistin and leptin (Jung et al., 2008). A study by Perseghin et al (2010) on 23 elite athletes (sprinters, middle distance runners, Marathon runners) and 72 inactive thin and fat participants showed that endurance athletes but not speed runners, had higher levels of resistin compared to inactive individuals. Rashidlamir et al (2010), reported that, in addition to reducing weight and fat percent, regular aerobic exercise decreases fibrinogen and increases the resistin in healthy inactive men. Serum resistin levels however are not studied in young females enrolled in medium duration aerobic exercise training. The research question of this study is whether aerobic exercise will decrease serum resistin levels after 8 weeks aerobic training. Assessing serum resistin levels together with BMI and body fat percentage before and after 8 weeks of aerobic training in young females was the aim of this study.

Materials and Methods

Participants

Twenty young females participated this study. They were randomly divided into the control and the experimental groups. Participants were informed on the nature and demands of the study, completed a health questionnaire, and their written consent was obtained. The study was approved (date and number of approval) by the university's ethical advisory commission. The subjects were in good health, were not using medications known to affect immune function. All participants regularly took part in a variety of activities but were unfamiliar with the tests used in the current investigation. Subject were allocated to either the aerobic training (n = 10)), or the control groups (n = 10). Subjects' descriptive data is presented in Table 1.

Table 1: Descriptive Characteristics of Experimental Subjects

Variable	Placebo (n=10)	Aerobic (n=10)
Age (years)	22±2	22±2
Height (cm)	166.22±2.30	166.75±2.53
Body mass (kg)	58.53±4.10	58.76 ±3.15
BMI	21.13±1.099	21.17±1.24
BF (%)	24.8±3.71	22.79±3.29

*Values are expressed as means ± SEM.

Exercise Protocol

The study was conducted on two groups and there was a pre-test and pos-test. The study has a semi-experimental design. We selected 20 young Females and then they were randomly divided into two equal groups of 10. The experimental group performed aerobic exercises for 8 weeks and 4 sessions a week with a maximal heart rate intensity of 70-80 percent. However the control group did not exercise during these 8 weeks. We monitored the heart rate of participants using a Polar heart rate monitor. After medical examinations to make sure if they did not use any kind of drugs and if they were healthy, we asked participants to sign a written consent form. We explained the exercise protocol to all participants. None of the participants were in their menstrual cycle and 3 days before or

after that period. We evaluated the diet of participants using a 3-day diet questionnaire and through related scales. Then we suggested them a diet for the day prior to sampling which was a pre-prepared diet by the researchers. The anthropometric indices of participants were measured with the least wearing possible and without the shoes.

Blood sampling and Biochemical Analysis

We took 10 cc of blood from brachial artery of all participants 48 hours before performing the exercise protocol and after fasting for 10-12 hours and 48 hours after the last exercise session. Blood samples were taken from left brachial artery of the participants and it was poured into test tubes containing EDTA. Then the samples were sent to laboratory for analysis and were kept in minus 20 centigrade degrees there. Serum Resistin was measured by an enzyme-linked immunoassay kit (Ray- Biotech, Inc.). This biotin-labelled antibody sandwich assay measures homodimeric resistin. The intra- and inter-assay CV were 10 and 12%. The probable changes in the volume of serum after the training program was calculated and the measured amounts of the hormones were corrected based on it (Dill et al., 1974).

Statistical Analysis

Before any analysis, the assumption of normal distribution of the data related to the Body weight, BMI and Resistin level were confirmed using K-S test (P>0.05). We used paired T-test in order to compare the average Body weight, BMI and Resistin level before and after the aerobic exercise in groups. Independent t tests were used to assess differences between two group in Body weight, BMI and Resistin level before and after aerobic exercise. P values of less than 0.05 were considered to be statistically significant.

Results

Results showed a significant decrease in the level of body fats before and after the aerobic exercises (t (9) - 2.83, p= 0.02)(Table2 ,Figure.1) and there is a significant decrease in the level of BMI before and after aerobic exercises in aerobic group (t (9) - 6.93, p = 0.000)(Table2, Figure.1). Also there was a significant decrease between average resistin levels before and after aerobic exercises in aerobic group (t (9) = 6.47, p= 0.000) (Table 2, Figure 1).

Table 2: Paired T-test to compare body fat, BMI, and resistin level before and after the test

Group	Index	DF	Mean± SD	T	P value
Statistics	BF	9	0.882±0.98	2.831	0.020*
Earobic	BMI	9	0.729±0.33	6.935	0.000*
	Resistin	9	0.810±0.395	6.472	0.000*
	BF	9	-0.108±0.475	-0.718	0.491
control	BMI	9	0.268±0.309	2.739	0.358
	Resistin	9	-0.018±0.219	-0.259	0.801

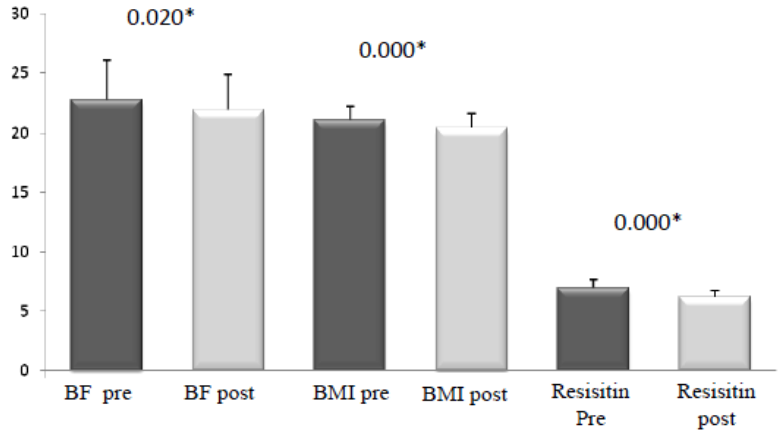

Fig.1. Average of pre and post test variables in the aerobic group($P<0.05$)

We used independent T-test to compare control and aerobic groups. Results showed that there is a significant difference between control and aerobic groups in terms of average resistin level after the test ($t(18) = -3.80$, $p = 0.01$) (Table 3).

Table 3: Independent T-test to compare body fat, BMI, and resistin level in both control and aerobic groups

Statistics		Levene Statistics	Independent T-test		
	Variable	P value	t	DF	P value
BF	pre	0.660	-1.281	18	0.216
BF	post	0.321	-1.997	18	0.061
BMI	pre	0.578	-.074	18	0.942
BMI	post	1.000	-.943	18	0.358
Resistin	pre	0.642	-.673	18	0.509
Resistin	post	0.162	-3.798	18	0.001*

Discussion and conclusion

In the present study there was a significant change in serum resistin levels following 8- week of aerobic exercise in young Females (Table 2, Figure. 1). Some previous studies have pointed out the effect of moderate diet and regular sports activity on decrease of blood resistin level and decrease of fat mass, due to weight loss in response to the diet or sports activity which leads to decrease of serum resistin (Jung et al., 2008). The 8-week exercises protocol of the present study helped participants in the aerobic group to decrease significantly BMI, body fat percentage, as well as the body weight (Table 1, Figure. 1). Resistin is recently known as an adipocyte hormone which has a positive relationship with body composition characteristics and insulin resistance (Elloumi et al., 2009).

The increase of resistin is followed by increased insulin resistance. However its exact mechanisms are not known, yet (Kopff et al., 2005). High transgenic expression of resistin disrupts skeletal muscles' glucose metabolism and increases the non-resistance of glucose (Pravenec et al., 2003). Therefore resistin may play an important role in insulin resistance or glucose homeostasis. However, physiological role of resistin on insulin resistance and obesity is still unclear (Fujinami et al., 2004).
A study reported that there is a significant relationship between resistin levels, obesity and insulin resistance (Silha et al., 2003), while another study failed to show such a significant relationship (Lee et al., 2003). Moreover, some scholars believe that resistin has a direct relationship with changes in BMI, body fat, glucose and insulin in fat individuals (Kopff et al., 2005; Pravenec, 2003).
there was no such a study on young Females, the results are congruent with results by Balducci et al (2010), Kadoglou et al (2007), Elloumi et al (2009), Jones et al (2009) and Zelber-Sagi et al (2008). Jones et al (2009) have studied the effect of 8-week aerobic exercise on lipid levels of serum, leptin, adiponectine, resistin, peptide YY, and ghreline in overweight adolescents and reported a significant decrease of resistin. Kadoglou et al (2007) studied the effect of 16-week regular aerobic exercises with a VO_{2max} of 50 to 85 percent on resistin levels in patients with type 2 diabetic and overweight ones. They reported a significant decrease of this hormone among the participants. Zelber-Sagi et al (2008), suggested that there is a significant and inverse relationship between resistance exercise (at least one session a week) and resistin levels, in patients with Nonalcoholic Fatty Liver Disease NAFLD. In the study by Elloumi et al (2009), two months of exercise with the weight loss, led to a significant decrease in resistin level among obese adolescents. Balducci et al (2010) reported that 12 months of regular physical activity can decrease the level of resistin in patients with diabetes and obesity.
However, the results of the present study was not congruent with results by Monzillo et al (2003), Kelly et al (2007), Camera et al (2010) and Perseghin et al (2006) . Monzillo et al (2003), showed that 6 months of physical activity with the average intensity increases resistin in participants with diabetes type 2 and healthy one. In the study by Kelly et al (2007), overweight children who participated in an exercise program including eight weeks of aerobic exercise with a VO2max of 50 to 60 percent, resistin increase was negligible and insignificant. Camera et al (2010) reported that 10-day exercise leads to increase of resistin gene expression among inactive young men. Perseghin et al (2010), found out that endurance athletes (and not speed runners) have higher levels of resistin, compared to inactive individuals. Although it can be presumed that regular aerobic exercise with weight loss and decrease of BMI was one of the major reasons behind the decrease of serum resistin in the present study, however none of the studies mentioned had similarity with the present study, in terms of design, intensity, exercise duration and participants.
Some researchers such as Yaturu et al (2006), showed that there is a strong relationship between serum levels of resistin and TNF-α and considering the fact that sports exercises, in addition to limiting the energy in individuals who have a significant improvement in physical fitness and body composition, it is considered as a stimulating factor for adipocytokines. It also impedes the pro-inflammatory products of cytokines and increases anti-inflammatory cytokines. Pro-inflammatory cytokines such as IL-6 and TNF-α have a cytotoxic function and it is safe to claim that regular exercise can prevent the damage of insulin-producing β- cells by reducing products of these pro-inflammatory cytokines (Camera et al., 2010).
The present study was a semi-experimental research, thus as a shortcoming of the study we could not fully control the disturbing variables. Considering the fact that there is a correlation between resistin and leptin and some inflammatory markers, and also having in mind that some cytokines have direct effect on resistin synthesis, the changes of these factors (leptin and inflammatory cytokines of TNF-α and IL-6) can affect the resistin levels .The amounts of these changes are not measured in the present study. Also considering the fact that there are several factors involved in insulin resistance and insulin sensitivity and with regard to the possible relationship between resistin and insulin resistance in human, changes in insulin sensitivity due to exercises can affect resistin levels (Elloumi et al., 2009). Nevertheless, more studies should be conducted to determine the relationship between insulin resistance and resistin in human and also to investigate the effect of different exercise programs on levels of this factor among athlete and non-athlete individuals. In general, the results of the present study shows that regular aerobic exercise, not only decreases weight and fat percentage, but also decreases resistin in young trained Females; this indicates that the risk of cardiovascular diseases have been decreased. However, there should be further research to investigate the effect of long-term sports activity on resistin levels.

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