THE EFFECT OF EIGHT WEEKS HIGH-INTENSITY INTERVAL AEROBIC TRAINING ON CHEMERIN AND VISFATIN IN OVERWEIGHT MEN

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ABSTRACT

Adipose tissue secretes some hormone-like combinations called adipokines; a better understanding of adipokines can help much in seeing the side effects of obesity. The aim of this study is to see the effect of 8 weeks of aerobic-interval training on serum levels of chemerin and visfatin in elderly men with overweight. In this semi-experimental study, 24 subjects were selected by available and targeted sampling and divided into two experimental group (12 people) and control group (12 people) with their ages ranging between 68 to 79. The subjects took aerobic-interval training for 8 weeks, three days each week and each session lasting 45 to 60 minutes. Blood samples were gathered before and after training intervention. By means of SPSS software, version 16, intra-group and between-group means were calculated by statistical methods of paired and independent sample t-test respectively and the results were analyzed at significance level of $p<0.05$. Eight weeks of aerobic-interval training decreased significantly the variables of weight, body mass index and body fat percentage ($p<0.5$). Also chemerin and visfatin levels decreased significantly. These results show that aerobic-interval training decreases chemerin and vistafin, and probably one of the reasons for physiological changes due to sports activities is the change in these hormones.

Keywords: High-intensity interval aerobic training, Chemerin, Visfatin, Overweight men

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INTRODUCTION

Obesity is one the most dangerous causes of common diseases in the world including: diabetes, cardiovascular disease, high blood pressure, metabolic disorders and different types of cancers [1]. The increasing trend of obesity has become of the biggest challenges of health in the world. It is predicted that in 2015, the frequency of obesity and overweight reaches 54 percent in men and 74 percent in women in Iran [2]. One side effect of inactivity is obesity which can lead to diseases such as cardiovascular diseases [3], blood pressure and life expectancy reduction [4]. Among the side effects of obesity, one can mention dyslipidemia and increase of low density triglycerides and lipoproteins [5]. Adipose tissue secretes some hormone-like combinations called adipokines [6]. Accordingly, better understanding adipokines can help much in seeing obesity side effects[7]. Different adipokines are secreted from adipose tissue, including resistin, chemerin adipokines and vistafin[8].

Chemerin adipokine is secreted from liver and visceral adipose tissue in the form of immature polypeptide. Then by help of lung serine protease enzyme, amino acid is separated from the end of targeted carboxyl polypeptide and becomes mature chemerin [6]. Due to the role of chemerin in differentiating fat cells, this protein is classified in the adipokines group [9]. It has been reported that chemerin serum level increases in obese and diabetic people [10]. Visfatin, is a protein which has been identified in visceral adipose tissue by Fokuha in 2005. This protein exists more in visceral adipose tissue compared to subcutaneous adipose tissue. In the past the molecular structure of visfatin, named PBEF, was known to be in skeletal muscle, liver, bone and lymphocytes, which was named vistafin after being known to secrete from adipose tissue [11].

Visfatin plasma density and the amount of visceral visfatin gene are related to obesity. Studies have shown that the increase of IBM, leads to the rise of visfatin levels and their decrease after losing weight [12]. Doing exercises is considered as a remedial and effective method in losing weight and side effects of obesity. Aerobic-interval exercises are the most common trainings which enhance cardio respiratory system performance, also by increasing specific tissues they can make a positive change in body combination. On this ground, Ghanbarzadeh et al (2016), by studying the effect of three parallel ways of training on plasma chemerin levels, investigated insulin resistance and physical performance of 10 women who were divided randomly into four groups: endurance-resistance training (10 people), resistance-endurance training (9 people), interval training (12 people) and control (9 people), they concluded that eight weeks of training didn't change significantly the amount of chemerin, insulin, fasting glucose, insulin resistance, body fat percentage and waist-to-hip ratio at the end of the period [13]. Seifi et al. (2016) by studying the effect of 12 weeks of aerobic training on chemerin and vistafin levels in 30 aged and obese women ranged between 45-60 years old, concluded that chemerin level increased significantly and visfatin and glucose levels decreased significantly [14]. Generally, it is believed that aerobic-interval exercises play a significant role in weight loss, however, it seems that the effect of these exercise on chemerin and visfatin, as factors related to obesity, have not been studied sufficiently. Therefore, the aim of this study is to see the effect of

aerobic-interval training on chemerin and blood serum visfatin in men with obesity.

METHOD

Subjects

This study is semi-experimental, with the plan of two experimental and control groups undergoing pretest and posttest. The statistical society of this study included 24 elderly men with obesity ranging between 68 to 79 years old, with body mass index of 25 to 30 kg per square meter and they were selected by targeted and available sampling. First the subjects were identified with the nature of the project and the method of the study. Being healthy according to health questionnaire, not taking drugs, smoking and not participating in any exercise for two months before the study training were among the criterion for this study. The subjects participated in the study voluntarily and filled out the consent form. Then the subjects were divided randomly into two groups of aerobic-interval training group (12 people) and control group (12 people).

Body Combination

In this study in order to estimate body combinations, respectively the subjects' heights with Seca height gauge (made in Germany) with 5 mm sensitivity, waist and hip environment with tape meter (Mabis-Japan) with 5 mm accuracy, their weight with 100 gram sensitivity and body fat percentage by implant bioelectrical system (model In-body-720 Korea) were measured. All measuring was done while the subjects hadn't eaten or drunk for four hours before the test and their bladder, stomach and bowels were emptied.

Blood Sample

Blood sampling was done by an experienced expert of laboratory sciences at two stages, blood samples were taken from the subjects' left-hand vein in sitting and rest mode 48 hours before the training and 48 hours after the last training session. In both sessions before and after training, 5 ml of blood was taken from brachial ante cubital vein and the samples were frozen -18 ° C. to determine the amount of chemerin and visfatin, Elisa method was used by means of Kazabayo kit made in Japan.

Training Program

In this study training included aerobic-interval exercises for eight weeks, three sessions per week and each session lasting 45-60 min. Severe interval training includes: warm-up with stretching movements for 10 minutes and then doing severe interval exercises with 10 minutes of rest between each set. The training program was done from simple to difficult and by considering overload principle as well as intensifying the training. Severe interval training pattern was in this way: in the first week, doing exercise for 4 minutes with an intensity of 90% heart rate reserve with a two-minute active recovery, the second week four stages of exercise for four minutes with an intensity of 90% heart rate reserve with a two-minute active recovery, the third week five stages of exercise for four minutes with an intensity of 90% heart rate reserve with a two-minute active recovery, the fourth week six stages of exercise for four minutes with an intensity of 90% heart rate reserve with a two-minute active recovery, the fifth week seven stages of exercise for four

minutes with an intensity of 90% heart rate reserve with a two-minute active recovery, the sixth week eight stages of exercise for four minutes with an intensity of 90% heart rate reserve with a two-minute active recovery, the seventh week six stages of exercise for four minutes with an intensity of 90% heart rate reserve with a two-minute active recovery and the eighth week five stages of exercise for four minutes with an intensity of 90% heart rate reserve with a two-minute active recovery, training severity was controlled by rate monitor (Polar made in Finland)[15]. The control group had no activity during the study period (inactive lifestyle).

Statistical Evaluation

At the end the data was gathered and were analyzed by SPSS software version 16. After confirming the normality of data theoretical distribution by Shapiro-Wilk statistical-exploratory test and variances homogeneity by Leven's test, to compare inter-group and between-group means, paired and independent sample t-test respectively was used. For results test, significance level was considered to be P<0.05.

RESULT

Table 1: Participant characteristics at baseline

Groups	Variations (M±SD)			
	Age (years)	Height (Cm)	Weight (kg)	Body Mass Index (kg/m2)
Experimental	68.00±3.43	165.92±4.90	78.16±4.80	28.43±2.05
Control	75.25±3.41	167.33±4.31	78.72±4.42	28.14±1.77

The subjects' characteristics in this study have been shown in table 1

Table 2: Comparison of within group variance and between group of some cardiovascular risk factors in Overweight men

Variables	Group(s)	Pre-test M±SD*	Post-test M±SD*	Variations	
				Within groups	Between groups
				P-value	*P*-value
Weight (Kg)	Exercise	78.16±4.80	77.67±4.50	‡0.03	0.02‡
	Control	78.72±4.42	78.88±4.73	0.40	
BMI (kg/m2)	Exercise	28.43±2..05	28.26±2.13	‡0.02	0.01‡
	Control	28.14±1.77	28.20±1.92	0.36	
Body fat percent (%)	Exercise	44.71±2.38	43.16±2.63	0.006‡	0.01‡
	Control	44.83±4.84	44.80±5.39	0.95	
Chemerin (pg/ml)	Exercise	133.16±5.82	127.91±6.27	0.001‡	0.03‡
	Control	127.27±5.42	125.81±6.64	0.25	
Visfatin (ng/ml)	Exercise	1.69±0.12	1.63±0.16	0.002‡	0.98
	Control	1.55±0.11	1.49±0.23	0.26	

*Data presented as mean ± standard deviation ‡The mean difference is significant at the 0.05 level

The results of table 2 show that intra-group means concerning the variables of body weight (p=0.03) body mass index (p=0.02), body fat percentage (p=0.006), chemerin (p=0.001) and visfatin (p=0.002) are statistically significant in aerobic-interval training group. Means difference concerning the variables of body weight (p=0.02), body mass index (p=0.01), body fat percentage (p=0.01), chemerin (p=0.003) are statistically significant.

DISCUSSION and CONCLUSION

The aim of the present study was to see the effect of eight weeks of aerobic-interval training on serum level of chemerin and visfatin in elderly men with overweight. According to the results of the study aerobic-interval training decreased significantly the serum density of chemerin. These results are in line with those of Lloyd et al. (2016) [16], however, they are in contradiction with those of Moradi et al. (2015) [17]. Lloyd et al. (2016) by studying the effect of severe aerobic training with 60 to 65 percent of used oxygen on chemerin surface, which was done on 11 mature and obese men, concluded that for two hours after training chemerin surface decreased up to 12 percent [16]. Moradi et al. (2015) by studying the effect of eight weeks of increasing aerobic training on plasma surfaces of omentin and chemerin in female Sprague Dawley mice (the training program included increasing aerobic exercises which was conducted for 8 weeks and 5 sessions per week) concluded that the serum surface of omentin and chemerin increased significantly compared to the control group [17].

Serum density decrease of chemerin shows that its changes compared to basic levels, are due to the decreasing trend of adipokines and this means that training has led to positive changes in the fat oxidation. Also among the mechanisms which can be mentioned is that chemerin can play an important role in motivating intracellular calcium release as well as in the process of phosphorylation of kinase type 1 and 2 set with extracellular signal, also chemerin can play the role of inhibitor of accumulation of cyclic adenosine monophosphate, and acts so by attaching to inhibitor protein G. On this ground chemerin increases the activity of hormone-sensitive lipase and activates the process of lipolysis in fat cells, also chemerin increases PKA dependent on cyclic adenosine monophosphate as the dominant way. It seems that chemerin can play roles in both fat cells differentiation and fat metabolism and also play an intermediary role among paracrine effects [18].

According to the results aerobic-interval training program decreased visfatin serum density significantly. These results are in line with those of Azimi et al. (2013) [19], however, they contradict those of Kim et al (2011) [20]. Azimi et al. (2013) by studying the effect of aerobic training for three days per week, 35 to 50 minutes per day, with 40-55 heart rate reserve on plasma visfatin in 36 men ranging about 45 years old and body mass index of 30 kilograms per square meter, concluded that plasma surface of visfatin, insulin, blood sugar, body mass index, glycosylated hemoglobin, waist to hip ratio and body fat percentage decreased significantly in the training group compared to the control group [19].

Kim et al (2011) by studying the effect of 12 weeks of aerobic training on visfatin surface and insulin resistance on obese men concluded that insulin resistance decreased significantly; however, there was no significant change in plasma visfatin surface [20]. Giti et al (2011) by study the effect of eight weeks of aerobic training on treadmill with the maximum of 55 to 65 percent of heart beat in 30 middle-aged women, concluded that there was no significant change in serum visfatin surface [21].

Visfatin biological characteristic is like some of cytokines and attaches to insulin receiver in a location other than that of insulin. Visfatin, in energy

metabolism and adipose tissue safety system, plays a key role in developing metabolic syndrome; it has the anti-apoptosis feature and increases cells proliferation[14]. The function of visfatin has not been fully known, however, visfatin may have a dual role; one is the autocarine/paracrine function which facilitates fat cells distinction in visceral adipose tissue and the other is its endocrine role of visfatin which modifies insulin sensitivity in environmental members. Therefore visfatin may facilitate glucose control and lead to obesity [22]. By comparing the means related to body fat percentage, body weight and body mass index in aerobic-interval group compared to control group, one can conclude that visfatin surface decrease leads to weight loss on the part of the subjects. Different studies show that the decrease in visfatin surface is due to weight loss [23-24].

Generally it can be said that eight weeks of aerobic-interval training leads to a decrease in chemerin and visfatin surfaces. So it is proposed that this type of training be used as an effective, economical and remedial method for controlling body fat in men with obesity. Therefore it is suggested that aerobic-interval training be used for avoiding the side effects of obesity in men.

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