LIFESTYLE INTERVENTION IMPROVES CARDIO VASCULAR DISEASE MARKERS IN OBESE WOMEN

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ABSTRACT

This study aimed to investigate the comparison of effects Aerobic activity and Caloric restriction on cellular and vascular adhesion molecules in obese women. 40 sedentary Obese woman with mean±SD age: 20/4±1/26 years, %BF: 26/6± 3/95 and BMI: 30/6±2/81 m/kg2 were selected and randomly allocated to EXP1 (Aerobic activity), EXP2 (Caloric restriction), EXP3 (concurrent intervention) and control groups. 8 week Training program in EXP1 included running on treadmill in 50-60 min, 5 day/week, EXP2 use a caloric restriction diet with equal energy to EXP1 and EXP3 use a diet and aerobic activity with energy restriction equal EXP1. Fasting blood sample analyzed for VCAM-1 and ICAM-1 levels before and after 48 h at the end of study. Resulting data were analyzed by ANOVA and bonferroni post hoc, pair t test and person correlation coefficient (a=0.05). Data Analyzing show that weight, BMI and %BF in the experimental groups were significantly decrease. The higher changes seen in EXP2 equal 6/4%, 6/4%and 1/9% (p<0.05). Result show that the decreases of ICAM-1 in EXP1, EXP2 and EXP3 equal %9.3, %19.7 and %23.1. The decrease of ICAM-1 significant in EXP2 (Aerobic activity) (p=0.05). The levels of VCAM-1 in Experimental groups were decrease but there were not significant (p>0.05). A low correlation were seen between Baseline and changes adhesion molecules levels and %BF, weight (p>0.05).

Keywords: Physical Activity, Caloric Restriction, Vascular & intracellular Adhesion molecules, Obese Women.

INTRODUCTION

It is established that lifestyle therapies that combine energy restriction and physical activity improve a number of cardiovascular disease risk factors. Lake of Adequate Physical activity and obesity are of the main cardiovascular risk factors. Improvement in cardiovascular function by physical activity has been attributed to exercise induced positive changes in metabolic abnormalities and risk factors that are associated with atherosclerosis. The role of Inter cellular adhesion molecules and vascular adhesion molecules in the occurrence of Arthroscleroses has been verified. Adherence of blood cells to the surface of the vessel is one of the first events noticed in the Arthroscleroses [Cybulsky et al. 2001, Blake and Ridker 2001, and Roberts et al. 2006]. Based on this, inflammatory markers like ICAM-1 and VCAM-1 are considered as one of the powerful markers of cardiovascular diseases. VCAM-1 and ICAM-1 are endothelial adhesion molecules of the Ig gene superfamily that may participate in atherogenesis by promoting monocyte accumulation in the arterial intima. Plasma concentrations of this adhesion molecules are elevated in patients with endothelial dysfunction.

Several researches have emphasized on the role of the role of exercise and diet on the inflammatory markers especially on the changes in the level of adhesive molecules [Donnelly et al 2004, Hyder et al 2002, and Pate et al. 1995]. In deed the beneficial effects of physical activity could be mediated by improved markers of endothelial dysfunction, including adhesion molecules. In relation to this, Zoppini et al. (2006) after a period of strength practices at moderate intensity, two sessions per week for six months in Diabetic oboes men has reported significant decrease in the level of P-selection and ICAM and also no change in the level of Lipid profiles [Zoppini et al. 2006]. On the other hand, Sakton et al. (2008) in inspecting the effects of cycling with foot and hand on low ratio or 24 weeks has observed the %25 decrease in the level of the vascular adhesion molecules [Saxton et al. 2008]. Sabatira et al. (2008) in a study on a long term of aerobic activity of 50 minutes on a moderate intensity reported a significant change in the level of VCAM-1 and ICAM-1 [Sabatier et al. 2008]. Rankovic et al. (2009), in a study on patients suffering from a heart disease, after a period of a six-week heart rehabilitation plan with a low intensity, reported no significance change in

the number of leucocytes and Inter cellular adhesion molecules [Rankovicet al. 2009]. In this research, studies after some practices related to strength training, increase [Nemet 2004, Nemet 2004, and Nielsen and Lyberg 2004], no change [Christopher et al. 2006, and Yannakoulia et al. 2005] and decrease [Ding et al. 2005, Maeda et al. 2004, and Wannamethee et al. 2000] in the Inter cellular adhesion molecules levels have been reported. But some other researches have reported the requirement for the level of inflammatory markers to be changed is applying a composed program of physical activity and diet [Ziccardi et al. 2002, Mello et al. 2008, and Christian et al. 2006] and some others has reported the effect of dieting to be more significant [Keogh et al. 2008]. Koch et al. (2008) in a study of the effect of weight loose through caloric restriction by changing the rate of carbohydrate to fat in fat middle aged men and women has reported the significance loss of weight. Based on ICAM-1،E-Selection،P-Selection and BMI in this study, the decrease in the serum level of adhesive molecules following the diet was mostly due to the loss of weight [Keogh et al. 2008]. Mello et al. (2008) in a research has reported the effect of long-term losing weight in 34 over weight men in the level of ICAM-1 of

the plasma to be significant [Mello et al. 2008]. Ziccardi et al. (2002) studied the effect of losing weight and changing lifestyle (physical activity and diet) on inflammatory markers in 56 healthy obese women inflammatory markers (25 to 44) and 40 women with natural weight in a year. In weighty women the inflammatory markers level of ICAM-1 and VCAM-1 of the serum was higher, comparing to slim women. After one year of a multi-purpose weight-losing program, composed of dieting, behavioral counseling and physical activities including one hour jogging per day, three days a week and significant decrease in the serum level of adhesive molecules [Ziccardi et al. 2002]. A change in the markers of Coroner cardio diseases was also reported after non-medicine intrusions in short time. Christian et al. (2006) studied the effect of dieting (using foods with high fiber and low fat) and aerobic physical activities for three weeks on the level of ICAM-1 and VCAM-1 of the plasma in 31 weighty men and 15 weighty women, suffering from metabolic syndrome. The results of the research showed significant decrease in the level of ICAM-1 and VCAM-1 in these people after three weeks [Christian et al. 2006]. Generally, during the researches in which the decrease in the level of adhesive

molecules has been observed, dieting has been applied alongside with physical exercises without considering the rate of its effect [Ziccardi et al. 2002, Mello et al. 2008, and Christian et al. 2006]. Ultimately, few researches have studied the direct effect of physical exercises, dieting and a combination of both on the level of equal calorie consumed and it is still unclear whether calorie restriction, together with aerobic exercise, is more effective than calorie restriction alone for the reduction of risk factors. Based on this, this study aims to answer this question: is there a significant difference between the effect of physical activity, dieting and physical activity plus dieting on the level of equal calorie?

2. Research method

2.1. Subjects

The study is Practical and the method used is semi-empirical with four groups. The statistic population consists of women with little physical motion within the ages of 35 to 58 in the 22nd area of Tehran, without any background of physical activity, lunge diseases, diabetes and high blood pressure, who were chosen from among volunteers informed by brochures which were distributed in different parts of 22nd area of Tehran. 40

subjects were randomly divided into 4 groups (n=10).

At the beginning of the research and all conditions of the research including advantages, probable rare disadvantages and main advices were described for subjects, and finally a form was filled and signed by each subjects to prove their willingness for entering the test. Before beginning physical activities an initial height, weight and fat percentage of the body measuring was done under experimental Condition. After 12 hours of hunger, blood samples were also taken for measuring the level of VCAM-1 and ICAM-1 of the plasma, and same measurements were carried out at the end of the training program.

2.2. Protocols

The intrusions program, which was executed during 8 weeks, is described in Table no.1. For each training session 10 minutes were considered for warming up (jogging: 2-4 minutes, joints warm up: 2 minutes and tensile movements: 4 minutes) and 5 minutes for cooling down.

Subjects practiced on a treadmill (Techno gym, manufactured in Italy) with a practice ratio based on metabolism equality (MET=7). Consumed energy during this activity was calculated based on the following formula, which was in average 535 calories:

Consumed energy (kcal/min) = (MET×3.5×body max)/200

The energy needed by subjects was calculated regardless of training plan, based on Herish Bendick formula. Regarding the fact that subjects were having little motion their activity module was chosen as 1.3 and their needed calorie was chosen to be 1900 calories.

Basal Metabolism Rate= (weight*13.7) + (height*5) -(age*8.6)

After receiving the reminder form of received energy from the subjects, who received 2500 calories per day, giving them a variable diet, they were asked to receive 1900 calories per day, (regardless of the activity done), and they were predicted to lose 1kilograms per month (450 grams per each 3500 consumed calorie).

Table 1: Programs in experimental and control groups

groups	Independent variable
Exp 1: physical activity	Jogging or walking on treadmill (50-60 minutes) (5days a week, 8 weeks)
Expl 2: calorie restriction	Calorie restriction equal to the physical activity in experimental group no.1 for 8 weeks
Exp 3: Physical activity and calorie restriction	Jogging or walking on treadmill (25-30 minutes) and Calorie restriction equal to this physical activity
Control group	No intrusion

Subjects practiced on a treadmill (Techno gym, manufactured in Italy) with a practice ratio based on metabolism equality (MET=7). Consumed energy during this activity was calculated based on the following formula, which was in average 535 calories:

Consumed energy (kcal/min) = (MET×3.5×body max)/200

The energy needed by subjects was calculated regardless of training plan, based on Herish Bendick formula. Regarding the fact that subjects were having little motion their activity module was chosen as 1.3 and their needed calorie was chosen to be 1900 calories.

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Subjects in group two received 2580 calorie a day on average, which based on the estimates it should have been 1945 on average. Based on this, they followed a fair diet and calorie restriction equal to the activity of experimental group no. 1 (380 calories daily), without physical activity, in order to lose

weight. Based on Basal Metabolism Rate for the subjects, their midday meal was varying. The average calorie estimated for the subjects was considered as 1500 kilocalorie. The experimental group no.3 followed a composed program including a diet with calorie restriction equal to 1/2 for the group 1(190 kilocalorie) and the physical training as mentioned in Table 1.

Blood Sampling an Evaluating the amount of Adhesive molecules

before beginning the study (at the beginning) after 12 hours of hunger, and at the end of the study (48hours after the last session of the program), under laboratorial conditions, 10 cc of vein Blood was taken from the left hand of the subjects after 5 minutes of complete rest, using sterile Venojack needles containing EDTA, and then samples were put into ice. The serum was gained using a 1500g centrifuge for 15 minutes, and then was stored in the temperature of -70 for the next analyses.

ICAM-1 and VCAM-1 were measured using the Immunosorbent method by Elisa Stat Fax2100, using BMS232 and BMS232TEN kits, manufactured by Elisa Co. in Poland.

2.3. Measuring body fat percentage

Anthropometric measuring including height, weight and body fat percentage was done using a body composition auto analyzer (made by Biospace Co.) both before and after the test. The amount of BMI for each subjects was calculated by dividing weight (kg) to the square of the height (m).

2.4. Statistic method

The Clomogrov-Smiernov statistic was used to check the data to be natural. In order to inspect the effect of intrusions on dependant variables, Dependant T test was used. Mono-direction variance analysis was applied to inspect the difference between the average of changes before and after the study, between the groups, and if the results were significant, the follow Ben Frany Test was applied. In order to inspect the correlations, Pierson Correlation Test was applied. In all test, the amount of mistake was calculated as $P<0.05$.

2.5. Result

Findings of the research show the level of ICAM-1 to be reduced 9.3%, 19.7% and 22.1% for the experimental groups 1, 2 and 3 respectively. Based on dependant T test, only for the experimental group no.2 (physical activity) a significant reduction was observed ($p=0.01$, $t=27.3$). based on Mono-Direction Variance analysis test, no significant difference in the variances of the Inter cellular adhesion molecules was observed among the groups ($P=0.12$, $F3.35=2.08$).

About vascular adhesion molecules, after 8 weeks of experimental intrusion protocol these reductions in the restive level of VCAM-1 (p>0.05): group 1: 24%, group2: 23%, and group 3: 8%. Mono-Direction Variance analysis test reported no significant difference for the change in VCAM-1 between the groups (p=0.19, F3.35=1.67).

Based on the results in the Table 3, after 8 weeks of applying the intrusions of the study, in experimental groups 1, 2 and 3, the variable of weight reduced 1.8%, 4.6% and 2.4% respectively, and the variable of BMI

reduced 1.0%, 4.6% and 2.4% respectively. Body fat percentage also reduced 5.1%, 9.1% and 7.7% respectively (P<0.05). Mono-Direction Variance analysis test showed significant difference between experimental groups and the control group in the changes before and after the test (P<0.05).

The Pierson Correlation Test showed weak correlation between the initial levels and changed levels of Inter cellular adhesion molecules and vascular adhesion molecules, and the amounts of weight, fat percentage and Body Mass Indicator (p>0.05).
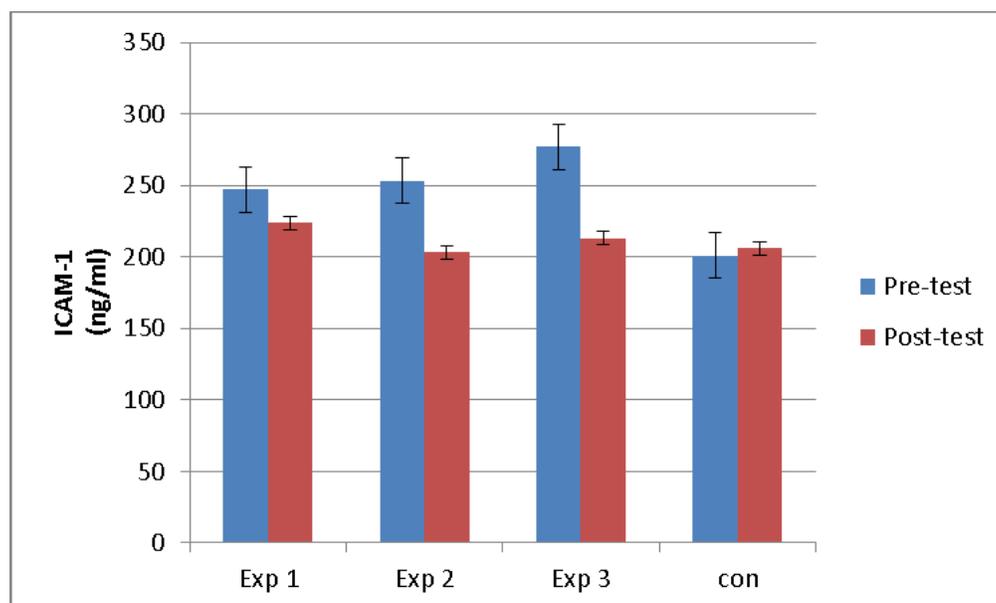

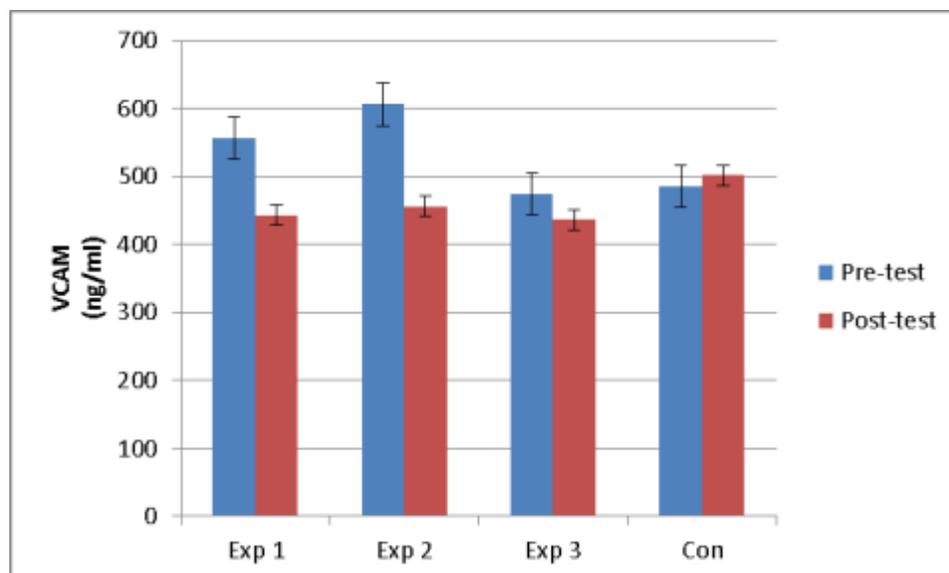**Figure 1: ICAM-1 before and after the trainings in groups.**

Figure 2: VCAM-1 before and after the trainings in groups

Table 2: The average ± standard deviation in the ICAM-1 and VCAM-1 level, before and after the trainings; Significance at the level of P<0.05

Variables	Groups	Pre-test	Post-test	P value
ICAM-1 (ng/ml)	Exp 1	247.4± 73.8	224.5± 76.8	0.20
	Exp 2	253.3±46.0	203.1± 42.2	0.01*
	Exp 3	277.0± 88.3	213.3± 82.1	0.07
	Con	201.3± 44.6	206.2± 51.3	0.70
VCAM-1 (ng/ml)	Exp 1	557.1± 106.1	443.7± 134.3	0.05
	Exp 2	606.7± 152.0	456.6± 145.6	0.09
	Exp 3	474.1± 81.0	436.2± 129.9	0.20
	Con	486.2± 170.0	502.2± 143.7	0.07

DISCUSSION

Based on recent studies, evaluating the cardio health and giving responses to health intrusions using modern inflammation markers such as levels of adhesive molecules are of more sensibility. Today, most of nutrition experts emphasize on the role of dieting on the reduction of the cardiovascular risk factors, and sometimes it is reported to be more important than any other health intrusion [Keogh et al. 2008]. In contrast with this idea, the findings of this research showed that the reduction in the level of Serum ICAM-1 for all experimental groups (physical activity: 19.7%, diet, 9.3%, composite intrusion 23.1%) is significant (table no.2), (P=0.01). the VCAM-1 level of the experimental groups 1, 2, and 3, 48 hours after the end of the trainings, reduces 24%, 23% and 8% respectively.

The inter-group and between-groups changes of this variable was not significant for the

experimental groups (p>0.05). Different researches about the effects of health intrusions on the level of adhesive molecules show different findings, so that some of the researches has reported the effect of changing the combination of the diet [Ziccardi et al. 2002, and Mello et al. 2008] on the level of adhesive molecules, and others has reported the effect of changing the consumption of calorie [Christian et al. 2006]. Sabatira, et al. (2008), in a study done on a group similar to that of this study, after 14 weeks of aerobic practices (2 sessions a week, medium ratio, 20-30 minutes) reported no significant decrease in the levels of serum VCAM-1, but in their subjects, vascular resistance against blood flow was reduced 28%, and the diameter of the leg vessel increased 12% [Sabatier et al. 2008]. Apparently, these results are against our knowledge about the changes in the elasticity of the vessels and the endothelial construction. Because increasing the shear stress causes the increase in the occurrence of adhesive molecules and detaching them from endothelial surface [Sabatier et al. 2008]. Based on this research, regardless of the level of adhesive molecules, the clinical effects of the trainings on the changes in the size of the vessels also can be reported. Most of the researches which have applied diet alone, or alongside with physical exercises, have emphasized on the effect of losing weight on the level of adhesive molecules [Ziccardi et al. 2002, Keogh et al. 2008, Mello et al. 2008, and Christian et al. 2006]. For example, Robert et al. (2007), in a research studying the effects of consuming large amounts of fiber in the diet, and daily activity (2-2.5 hours) for 2 weeks, in over weighted people between the ages of 7 to 18, has reported a reduction in the amount of the lipids of the serum, ICAM-1 and CPR. In this research the average of the weight showed significant reduction [Roberts et al. 2007]. The human's hemostat response to a physical activity depends on the ratio, duration and the type of the exercise program. Pontiroli, et al. (2004), after executing a program of daily running for 30 minutes, for a year, reported significant decrease in the level of the adhesive molecules [Pontiroli et al. 2004].

Goldhammer et al. (2005) after 12 weeks aerobic activity at a high ratio, 3 sessions a week, 45 minutes a session, has reported the increase of IL-10 and the decrease of inflammatory markers cytokine. Interleukin 10 is introduced to be the blocking factor against pre inflammatory cytokines. Although decreasing other factors such as IL-1β and TNF-α, results in increasing occurrence and

detachment of adhesive molecules [Roberts et al. 2006]. Zoppinie et al. (2006) after 6months of physical activity, 2 sessions a week on a medium ratio reported a significant decrease in the level of adhesive molecules. The interesting point is that the level of CRP, which is a more common, inflammatory indicator, did not show a significant change [Zoppini et al. 2006].

It seems that the change in the level of adhesive molecules does not match the initial level, which this research also approves of. Because Christopher et all (2006), after 12 weeks aerobic exercises for smoking men, which the level of adhesive molecules in them was higher, showed that although the physical inclination was increased, no significant change occurred in the level of VCAM-1 [Christopher et al. 2006]. Other different mechanisms also were reported to be the factor in increasing the level of adhesive molecules after long-term trainings, which regarding the little correlation of these variables with the weight and fat percentage, these factors also probably contribute to decreasing the level of adhesive molecules.

In this research, the serum level of adhesive molecules did not show a high level of correlation with weight and fat percentage ($p > 0.05$). Although the correlation between

fatness, increase in the level of body fat percentage and increase in the level if serum VCAM-1 in the childhood is been proved [Pontiroli et al. 2004]. But one of the reasons described for the lack of correlation between fat percentage and weight or lipid profiles, and adhesive molecules is that the correlation between the adhesive molecules and its detached type is not that much to result in the correlation between fat percentage and HDL of the serum with the adhesive molecules [Pontiroli et al. 2004].

Inconclusion, physical training and calorie restriction led to a normalization of increased ICAM-1, VCAM-1. Most researches emphasize on the role of dieting and physical activities, as two main factors affecting the cardiovascular risk factors. Based on this research, the combination of two factors of physical activities and dieting, or merely physical activities on the level of adhesive molecules is emphasized. However, if able to carry out physical activities, consuming energy via physical activities is more advisable.

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