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The effect of 8 weeks of aerobic training on serum lipoproteins in non-athletic girls

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ABSTRACT

The purpose of the present study was to investigate the effect of 8 weeks of aerobic training on triglycerides, cholesterol, LDL, and HDL levels in non-athletic girls. The subjects were 20 volunteer girls with the 22.35±2.27 age, 158.50±3.84 height, 73.80±4.59 weight and 29.2 8±2.17 BMI. The subjects performed aerobic training exercises with 60-65 percent heartbeat. Blood samples were collected before and after 12 weeks of training. Statistical analysis was performed using paired t-test and significance level of the test was considered P<0.05.The results showed that aerobic exercises resulted in a significant decrease in triglyceride levels, cholesterol, LDL and a significant increase in HDL(p=0.001, p=0.001, p=0.001 and p=0.001, respectively).Aerobic training causes changes in serum lipoproteins by activating the lipase enzyme. The results showed that aerobic training had significant effects on blood serum lipoproteins.

Key words: Triglycerides, Cholesterol, LDL, HDL, Aerobic Training.

INTRODUCTION

Increased cardiovascular disease and premature death is one of the most important results of sedentary lifestyle in developed and developing countries [1].One of the important cardiovascular diseases is atherosclerosis. Atherosclerosis is a progressive cardiovascular disease beginning in childhood and developing in old age, and is considered as one of the main causes of death in industrialized societies [2,3].It is directly related to high levels of total cholesterol and LDL and low levels of HDL in plasma [4].

Physical inactivity is as dangerous as high blood pressure and high plasma cholesterol, and is considered as a cardiovascular disease risk factor. Epidemiological studies have shown a strong inverse relationship between HDL levels and atherosclerotic disease. Increased HDL prevents cholesterol deposits inside the artery [5,6]. HDL prevents cardiovascular diseases by transferring excess cholesterol from peripheral cells and transporting it to the liver in a process called reverse cholesterol transport and bile production [7]. Regular aerobic exercises like walking, jogging, swimming and cycling have shown positive effects on lipid and lipoprotein levels, while non-aerobic exercises have not proven these effects [8]. Aerobic exercise leads to increased lipolysis by stimulating beta-adrenergic receptors [9].

Lipolysisis performed by various enzymes such astriglyceride lipase, triacylglycerol lipase, triacylglycerol lipase and monoacylglycerol lipase. These hormones have specific receptors on fat cells locating on specific receptors of enzymes and leading to lipolysis. Also the use of fat as energy varies with exercise intensity and even low intensity activities stimulate lipolysis from peripheral adipocytes [10].

On the other hand, studies show that hepatic lipase enzyme is reduced and finally inhibited after regular aerobic exercises [11]. Based on the mentioned information the purpose of the present study was to investigate the effect of 8 weeks of aerobic training on serum lipoproteinsin non-athletic girls.

MATERIALS AND METHODS

This is a quasi-experimental study. 20 non-athlete girls voluntarily participated in the study. They participated in aerobic exercises for eight weeks, three sessions a week, 35 minutes per session and 60-65% of maximum heart rate intensity. Blood samples were collected before and after exercises in fasting state and 24 hours after the training program. Statistical analysis was performed using SPSS version 18. Data normality was determined by Kolmogorov-Smirnov test. Then paired t-test was used for within-group comparison of measured variables. The significance level of the test was also considered $p \leq 0.05$.

RESULTS

Comparison of within-group differences of research variables is presented in Table 1. Research findings indicate a significant reduction in triglyceride, cholesterol, LDL levels and a significant increase in HDL levels at post-test compared to pre-test (p=0.001, p=0.001, p=0.001 and p=0.001, respectively).

Table 1-The results of paired t-test in case group before and after the intervention

Variable / Phase	Per-test	Post-test	t	p-value
Triglycerides (mg/dl)	175.85±4.28	151.75±4.86	38.90	0.001
TC (mg/dl)	187.35±3.40	180.55±3.70	15.93	0.001
LDL (mg/dl)	138.00±2.77	120.25±3.29	24.73	0.001
HDL (mg/dl)	37.55±1.82	39.10±2.02	-8.39	0.001

DISCUSSION

Physical inactivity and obesity are the main factors causing cardiovascular diseases [12]. Cardiovascular disease is a major cause of mortality in different societies [13]. The most important cardiovascular disease risk factors include increased LDL, total triglyceride, triglyceride, and decreased HDL [14]. Physical activity is generally associated with a healthy lifestyle. Also increasing physical activity in sedentary individuals improves cardiovascular disease risk factors [15].

Altena et al (2006) showed that aerobic exercises for 4 weeks, 5 sessions per week with 75 percent maximum heart rate leads to a significant decrease in triglycerides and LDL and a significant increase in HDL levels in blood plasma [16]. Hinkleman et al (1993) in a study investigated the effects of 15 weeks of aerobic exercise, five times a week and with an intensity of 62% maximal oxygen consumption on serum lipid levels of women. Results showed that low-density lipoprotein and cholesterol levels were not significantly different in groups but high density lipoproteins increased significantly [17].

Aerobic exercise can reduce body fat percent, body mass index and waist circumference measurements and as a result can have an impact on reducing and maintaining body weight [18]. Aerobic exercise increases the rate of body metabolism by increasing energy expenditure during exercise and energy consumption at the rest after exercising [19]. Physical activity for ten minutes with moderate-intensity can increase energy consumption up to 5 to 15% for 24 to 48 hours while resting. So one of the most important benefits of exercise and physical activity is the active person's increased energy consumption during the rest time [20].

Exercising causes the rapid activation of sympathetic nervous system, the result of which is released epinephrine and norepinephrine hormones which leads to lipolysis ultimately. Exercising will also lead to a reduction in serum

insulin concentrations with regard to lipolysis inhibiting function of the insulin hormone. Physical activity exerts limitations on those activities which lead to insulin increase and glucose destruction. On the other hand exercising stimulus the growth hormone, which is another important factor for lipolysis process [21,22]. Lipoprotein lipase is one of those enzymes which regulate lipoproteins, and triglycerides break down in triglyceride-rich lipoproteins. Therefore the changes in serum lipoproteins such as triglyceride can be attributed to exercise[11].

CONCLUSION

According to the results of this study, aerobic training resulted in a significant decrease in triglyceride, cholesterol and LDL, and a significant increase in HDL. So aerobic exercise is recommended to prevent cardiovascular disease staying healthy.

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