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The effect of short –term aerobic training on liver enzyme, serum lipid and lipoprotein levels in sedentary men

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ABSTRACT

Cardiovascular diseases are the most significant factors leading to death. This study was done to determine the effectShort-term aerobic training on markers of liver, serum lipid and lipoprotein levels in sedentary men. This quasi-experimental study was carried out on 20 non athletic men. Subjects were divided into2 groups: 15 minutes of sit-ups +30 minutes walking group and 30 minutes of sit-ups +15 minutes walking group. High-density lipoprotein (HDL) its sub fractionsHDL2 and HDL3 cholesterol, Total cholesterol (TC),Triglyceride(TG), Aspartate aminotransferase (AST) and Alanine amino transferees(ALT)were evaluated prior and after training for 16 sessions follow: three session in each weeks with one hour aerobic training in each session. Data analyzed using SPSS-18 and independent and dependent T student tests. The differences were not significant of TC, ALT, AST and HDL2 cholesterol observed in 15 minutes of sit-ups +30 minutes walking group and 30 minutes of sit-ups +15 minutes group after training in comparison with prier phase. Significant increase of TG were observed in 30 minutes of sit-ups +15 minutes walking group comparison with prior phase (P<0.01). Significant increase of HDL cholesterol were observed in15 minutes of sit-ups +30 minutes walking group comparison with prier phase (P<0.003). Significant increase of HDL3 cholesterol were observed in 15 minutes of sit-ups +30 minutes walking group and significant reduction 30 minutes of sit-ups +15 minutes walking group after training in comparison with priorphase (P<0.001 and P<0.01).This study showed thatShort-term aerobic training on levels of markers of liver without affecting but positive effects have on the lipid profile changes in non athletic men.

Keywords: Short-term aerobic exercise, Lipid profile, Lipoprotein, sedentary men.

INTRODUCTION

One of the known causes of obesity, cardiovascular disease is the leading cause an increase in blood cholesterol and high Blood pressure.Overweight and obesity is multi factorial phenomenon that is genetic and environmental factors and lifestyle. In fact, in developed countries and appropriate physical inactivity and poor diet is the cause of obesity and cardiovascular disease [1]. Aerobic exercises such as walking, running, swimming and cycling can have a positive effect on the lipid and lipoprotein and although anaerobic exercise cannot have effects like aerobic exercise [2].Human studies indicate a significant inverse relationship between HDL-C levels and indeed the major protein

apolipoproteinA-I (APOA-I) and heart-coronary disease is atherosclerosis[3-5]. The role of HDL-C in the prevention of cardiovascular disease through the transfer of excess cholesterol from peripheral cells and carry it to the liver in a process called cholesterol reverse transport of bile (Reverse cholesterol transport) [5] .On the other hand, HDL-C, total amount of different subgroups are formed, so that the concentration of HDL-C effectively dependent is HDL2-C. Therefore, if an increase in serum HDL- C not by increasing HDL 2-C but by HDL3-C can increase total HDL-C to be followed [6]. Because the role of HDL-C in (RCT) is more related to the HDL2-C group [7].

Formation of HDL-C and its transformation (conversion HDL3-C toHDL2-C) by plasma factors are a complex process and require several factors. Including hepatic lipase (HL), lipoprotein lipase (LPL), lecithin cholesterol acyltransferase (LCAT), cholesterol sterile transporter protein (CETP), phospholipidtransporter protein (PLTP) and tape carrier groupsattached to the ATP (ABC) is especially ABCA 1 [1,3,4]. It has been reported that exercise altered subtypes of HDL-Can increases HDL2-C / HDL3-CinserumHDL-C [3].On the other hand, Narayani et al (2010) showed that moderate-intensity exercise can prolong may alter the metabolism of lipids and lipoproteins and the answer may be different in Persons trained and untrained[8]. Given the important role of the liver in the interaction of hormonal and metabolic and using different enzymes during rest, exercise and recovery phase of the reconstruction of the energy resources in sport activities, investigate and study the limb during exercise are undeniable importance[9]. The exercise is associated with fatigue; liveracute damage is increased aspartate aminotransferase (AST) andalanine aminotransferase (ALT). The results indicate that the enzyme AST in heart, liver, skeletal muscle, kidney, brain, pancreas, lung, leukocytes and erythrocytes and also enzyme ALT found of fewer complexes in liver, kidney, skeletal muscle, heart [10].

Given the evidence, the optimal level of physical activity in different agegroups has not been clearly identified. Thissuggests that people withintensity and volume of training with aerobic activity to beneficial changes in lipid and lipoprotein levels and reduce the risk factors for cardiovascular (as well as control nonsmoking factors, control blood pressure, weight, and the regime good food) be observed, is unclear. Methodological differences in the training methods, characteristics of participants, controlling feeding and blood sampling time after the activity, may be a factor in the variability of research results in practice [11-12]. Therefore, the study of the effectShort-term aerobic training on markers of liver, serum lipid and lipoprotein levels insedentary men.

MATERIALS AND METHODS

Subjects

This quasi-experimental study, 18 male volunteers that Cleans 100 participants randomly with a mean age of 21.6 ± 1.41 years, height 172.66 ± 4.63 cm, weight 80.25 ± 11.77 kg and body mass index 3.460 ± 26.744 kg / m2 constituted. The participants of the purpose, benefits and risks of the study and informed consent prior to the completion of this study Protocolsobserving the principles of medical ethics measures in Babol University of Medical Sciences. After selection participants, firstly the tests were conducted to evaluate the anthropometric variables. Anthropometric characteristics of subjects including height, weight, waist circumference, hip circumference, waist, twin muscle circumference, calf circumference, hip circumference, width, shoulder and arm circumference was measured in two stages. First group performed thetraining protocol performedfor each session 30 minutes walking program +15 minutes Sit-upand secondgroup in the 15 minutes walking program + 30 minutes Sit-up. Training will continue for 16 sessions. A sit-up exercise in this study consists of 25 exercises for abdominal muscles.

Sample collection

For the measurement of serum lipids, the testsubjects between 8 to 10 am, 10 ml venous blood samples Were collectedduringsecond phaseconsists of 24hoursbefore the start of the first session and 24 hours after the end of the training 16 session. Thus the Total cholesterol (TC), Triglyceride (TG) and High-density lipoprotein (HDL) colorimetric -enzymatic method (GPO-PAP) and were measured the biochemical autoanalyzer, Classic α Iranian version, measuring Equipment Co. To measure TC and HDL of Cholesterol esterase enzymes and Cholesterol oxidase, TG ofGlycerol kinas enzymes and protein Lipoprotein lipase was used of Pars azmon company kits/ Iran. After this phase, the subjects participated in the 16the session of aerobic exercise [13].

Data analysis

The data obtained from the Study were analyzed by using the SPSS software Version 18. The degree of normality was measured by Kolmogrov-smirnov. For significances differences between data, were used the ANOVA test, as well as the post-hoc test of Tukey test (α =0.05) for comparison between means.

RESULTS AND DISCUSSION

Change some of the variables studied subjects such as weight and body mass index are presented in Table1. The results of the statistical analysis is performed both exercise program led to a significant reduction in body weight, although body mass index showed a significant reduction of the only15 minutes walking+30 minutes of sit-ups group(Table1).

Table1. The mean ± SE of physiological parameters pre-test and post-test

Variable	Groups	Before Exercise	After Exercise	P Value
Weight (kg)	30 minutes walking+15 minutes sit-ups	80.25±11.78	78.55±11.87	0.005
	15 minutes walking+30 minutes sit-ups	81.79±8.25	80.22±8.32	0.000
BMI (kg / m2)	30 minutes walking+15 minutes sit-ups	26.74±3.47	26.64±3.94	0.77
	15 minutes walking+30 minutes sit-ups	26.82±1.92	26.3±1.97	0.02

Concentrations measured variables are shown in Table 2. Inter group study shows that the TG level in 15 minutes walking+30 minutes of sit-ups group, HDL-C Level in the 30 minutes walking+15 minutes of sit-ups group, HDL3-C level in the 15 minutes walking+30 minutes of sit-ups group and 30 minutes walking+15 minutes of sit-ups group were significant with pre-test. (P-value of the order is equal 0.019, 0.003, 0.001 0.011) and also between groups, There was no significant difference. The results of the study showed on Results one-way ANOVA, after training, the levels, ALT, AST, TG, TC, HDL-C, HDL2-C and HDL3-C in two training group there was no significant difference (Table2).

Table2. The mean ± SE of serum concentration in experimental in pre-test and post-test

Variable	Groups (walking+ sit-ups)	Before Exercise Mean ± SD	After Exercise Mean ± SD
TG(mg/dl)	30 minutes walking+15 minutes sit-ups	143.67±75.56	149.45±51.07
	15 minutes walking+30 minutes sit-ups	127.11±49.00	157.78±57.09*
AST(IU/L)	30 minutes walking+15 minutes sit-ups	24.16±16.87	19.23±8.46
	15 minutes walking+30 minutes sit-ups	20.28±10.53	14.07±10.73
ALT(IU/L)	30 minutes walking+15 minutes sit-ups	36.19±29.95	35.95±20.52
	15 minutes walking+30 minutes sit-ups	20.12±8.99	16.12±8.57
TC (mg/dl)	30 minutes walking+15 minutes sit-ups	179.12±26.9	170.56±26.98
	15 minutes walking+30 minutes sit-ups	172±28.1	178.1±21.4
HDL-C(mg/dl)	30 minutes walking+15 minutes sit-ups	29.42±5.93	40.44±9.8*
	15 minutes walking+30 minutes sit-ups	35.83±7.19	41.77±6.69
HDL2-C(mg/dl)	30 minutes walking+15 minutes sit-ups	12.09±2.57	9.66±4.29
	15 minutes walking+30 minutes sit-ups	12.52±3.87	12.27±3.65
HDL3-C(mg/dl)	30 minutes walking+15 minutes sit-ups	18.74±5.15	30.7±6.69*
	15 minutes walking+30 minutes sit-ups	23.31±4.71	29.51±4.66*

** Significant different between pre-and post-test (P≤0.05)*
TG: Triglyceride, TC: Total Cholesterol, ALT: Alanine aminotransferase, AST: Aspartateaminotransferase, ALP: alkaline phosphatase, HDL: High-density lipoprotein cholesterol, HDL2 and HDL3 cholesterol.

The above data provide some support for the proposal that physical activity and exercise can be utilized to improve Cholesterol levels. Regular physical activity has been shown to increase HDL cholesterol, HDL3-C and triglycerides but not decrees significant on markers of liver, HDL2-C and Total Cholesterol.

Total HDL-C level was observed in30 minutes walking+15 minutes of sit-ups group significant increase and in 15 minutes walking+30 minutes of sit-ups group reduced significantly after the training .The results of this study in HDL-C serum with several studies past increases in HDL-C serum after exercise showed a line [3,5,13]. Another studyalsoresistance training to increase the amount of HDL-C and TG levels in serum hepatic but HDL-C, LDL-C levels and TC did not change significantly in the middle-aged female rats [14].

This study showed that HDL 2-C level in30 minutes walking+15 minutes of sit-ups groupno significant increase and in 15 minutes walking+30 minutes of sit-ups group no significant decrease was observed with before training. Research results Khabazian et al on rats after 12 weeks of exercise treadmill was observed that in theexercisegroupcompared with thecontrol, HDL-C, HDL2-C levels, the ratio of TC / HDL-C and LDL-C / HDL-C were significantly higher level. While the rest of lipoprotein levels remained unchanged [4].

HDL 3-C levels in30 minutes walking+15 minutes of sit-ups group a significant increase and in 15 minutes walking+30 minutes of sit-ups group with before training was a significant reduction (p = 0.01).

Increased levels of HDL-C and HDL3-C in aerobic exercise are compatible with some studies [15,16], but the others were non-aligned [17]. On the factors that can influence the changes in HDL levelIncludingthetrainingmethods, characteristics of participants, controlling feeding and blood sampling time after the activity, may be a factor in the variability of research results in practice [11-12].

Aadahl et al. [18] reported significant associations between physical activity and improvements in total cholesterol, LDL cholesterol, triglycerides and HDL cholesterol among participants aged 30–60 years, although significant improvements in HDL cholesterol levels were found only in men.While the mechanisms underlying the effect of exercise on the lipid profile are unclear, exercise appears to enhance the ability of skeletal muscles to utilize lipids as opposed to glycogen, thus level of plasma lipid will be reduced [19]. The mechanisms may include increases in lecithin-cholesterol acyltrans (LCAT)-the enzyme responsible for ester transfer to HDL cholesterol [20], which has been shown to increase following exercise training [21] -and increases in lipoprotein lipase activity, although the data in this specimen are inconsistent [22] and may depend upon the energy expenditure that is elicited. Fergusonet al. [23] reported that 1,100 kcal of energy expenditure is required to elicit increases in HDL cholesterol that coincide with significant increases in lipoprotein lipase activity. The process of cholesterol removal is known as 'reverse cholesterol transport'. This process removes cholesterol from circulation for disposal as a result of increases in LCAT and reductions in cholesterol ester transfer protein (CETP)-the enzyme responsible for transfer of HDL cholesterol to other lipoproteins-following acute and chronic exercise [24]. This increased enzymatic activity increases the ability of muscle fibres to oxidize fatty acids originating from plasma, VLDL cholesterol or triglycerides [25].One of the issues affecting the levels of the variables of research which is one of the reasons resulting in inconsistent with other researches includes duration, intensity, duration and also type of training.

TG levels in 30 minutes walking+15 minutes of sit-ups group non-significant reduction and in15 minutes walking+30 minutes of sit-ups group showed a significant increase. Research results LeMura et al showed that aerobic exercise for 16 weeks and 70 to 75% heart rate is reduced TG levels [26].Furthermore, studies Vatani et al have shown that moderate-intensity resistance training reduces the decrease amount of TG and TG levels increase with high intensity [27].Changes related to triglyceride can be made to answer for lipoprotein lipase (LPL) attributed to exercise. Lipoprotein lipase including lipoproteins regulating enzymeswhichthebreakdownof triglycerides. Furthermore, studies show that regular aerobic exercise reduced hepatic lipase enzymes and inhibited [22].Thus making available triglyceride is reduced in the LDL and VLDL.

In this study, total cholesterol decreased significantly, but the difference was not compatible with some studies [28]. Nybo et al reported that aerobic activity for 12 weeks, with 65% VO_{2max} in total cholesterol wasreduced but not significant that is compatible with the present study [29].Yang et al in his research focused on the effects of aerobic and resistance training and 3 times a week for 12 weeks showed that total cholesterol decreased, but no significant difference [30]. Longitudinal studies have shown that when subjects maintained body weight, cholesterol levels are not altered by a program of aerobic exercise [31].

The research on liver enzymes (ALT and AST) showed no significant difference. Devries et al (2008) also found that12 weeks of endurance training does not create significant change in ALT levels [32].In a survey by Kawanishi et al (2012) was conducted on rats, with 16 weeks of treadmill exercise and diet high in fat and sugar (HFF = High-fat diet and high-fructose water), NAFLD and plasma ALT activity indicating liver damage in HFF rats increased in the control group, but decreased in the exercise group [33].

In another study, to investigate the effects of aerobic exercise, resistance training on visceral adiposity and liver, liver enzymes and insulin resistance in overweight adults in 3 groups include RT = Resistance training, AT = Aerobic training and combined training (AT / RT) was performed. The effect of aerobic exercise, a significant reduction in liver fat, visceral fat, ALT and insulin resistance were observed, but the effect of resistance exercise, only a decrease in abdominal subcutaneous fat was obtained. The general conclusion was that to reduce visceral fat and reduce the development of fatty liver and insulin resistance improved, moderate amounts of aerobic exercise, exercise is the most efficient and effective method [34].Also ajaminezhad et al in relation to the impact of a single Session of aerobic exercise with different intensities on indicators of liver function and hemoglobin levels in healthy men non-athletes reached the conclusion that after 30 min of exercise of light, medium, and high intensity (60, 70 and 85% of maximum heart rate (in the fasting state and without any previous physical activity, ALP levels decreased in the control group [35].

CONCLUSION

According to our study, short-term aerobic exercise training on levels of liver enzymes without affecting the positive effects on the lipid profile changes.

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