Effects of Eight Weeks Aerobic Training on Blood Pressure and Serum Lipids of Men Suffering From Hypertension

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Abstract: The goal of this study was to evaluate the effects of eight weeks aerobic exercises on the reduction of hypertension and serum lipids in men suffering from hypertension. Twenty patients suffering from hypertension with over 140/90 mm/Hg and weight mean of 80±20 participated in the present study. Subjects were divided into two control and experimental groups randomly. Experimental group attended in an eight-week aerobic exercise, 45 minutes daily, three days a week with submaximal heart beat of 60-79. Rate of systolic and diastolic pressure and blood lipids in both groups were measured both before and after initiating exercises. Results indicated that systolic and diastolic blood pressure showed a significant reduction (p=0.000) in experimental group after eight weeks of exercise while the reduction was not significant in control one (p=0.875). LDL/TC and TG were significantly reduced after eight weeks of exercise (p=0.05). Decrease of HDL as a useful lipid was not significant (p>0.05). No significant changes were seen in above-mentioned variables of control group (p>0.05).

Key words: aerobic exercises, hypertension, blood pressure, serum lipid.

INTRODUCTION

Arterial hypertension is the most important health problem of our modern lifestyle. This disease, while fatal is very common, symptomless and could easily be treated. The prevalence of hypertension is reported to be from 10 to 60% in various countries. Hypertension has been a health issue since 1954. It is widely known that medicinal and non medicinal treatments could reduce hypertension. These methods have been effective to prevent or treat Hypertension and its complications (Harrison, 1998). If left untreated blood capillaries thicken and harden and would lead to heart attack. Hypertension causes kidney and also clinical disorders. All such risks will get aggravated by Hypertension. Factors effective on Hypertension are as following (Azizi, 2001.; Taghavi, 1995.; Harrison, 1998): (1) over weight; (2) high cholesterol; (3) high TG; (4) stress; and (5) smoking. Hypertension in such patients will be controlled by monitoring such factors during cardiovascular rehabilitation (Collins, PetoR and Herbert, 1990.; Griffin, 2000). These studies showed that mild aerobic exercise had led to a significant reduction of Hypertension within16-24 weeks. Similar study in Tehran (Azizi, 2001) showed that hypertension amongst urban population of Tehran reached 22.9% (22.9 and 23.7% in men and women; respectively). Kelly (2000) and Nicollet (1998) reported that mild to middle exercises had been more effective on hypertension reduction than severe ones.

Resistance aerobic exercises with low to middle severity involve large muscle therefore exercises 3-5 times weekly and with 60-79% of maximal heart rate can have a significant effect on hypertension reduction. Sectional and linear studies (Kokinos and papademetrious, 2000) indicated that there are more risk factors for increasing hypertension in those who reduced their physical activities from 35 to 50 percent compared with those who were less active from the very beginning.

According to other findings regular exercises of 70 minutes (4 times a week) will reduce hypertension significantly during 21 weeks. Significant reduction of systolic and diastolic hypertension has been reported using aerobics ith low to middle severity (Paoliso, 2000).

Obesity is known as the risk factor for cardiovascular diseases. Fat people have some additional harmful fat such as LDL, TC and TG which could deposit in vein and lead to obstruction of arteries narrowing the wall of veins and consequent hypertension. The risk of cardiovascular disease is high in overweight and mature adults; and usually physical activity is recommended as obesity treatment program. The main aim of physical activity is to make weight reduction continuous in long term (Harrison,1998). This study showed that cardiopulmonary resistance exercises are known as an effective factor on lipids and plasma lipoproteins metabolism. Athletes
who participated in cardiopulmonary resistance activities, such as field skiing and long-distance running demonstrated a very clear pattern of plasma lipid change (Pulack, Wilmore, 2000).

Cross-sectional studies on resistant athletes as well as permanent studies before and after a course of resistant exercise showed that aerobic exercise could lead to a partial reduction of overall cholesterol rate and VLDL, a little reduction of LDL but significant increase of HDL. Furthermore, density of plasma TG decreased significantly. As a unique clinical sign ratio of total cholesterol to HDL reduced significantly, as well.

Vassilius (1997) discovered that some specific medicinal considerations were effective in hypertension prevention. Prevention is the best way of obesity control. Findings have shown that preschool age is the most effective period to initiate the necessary care for successful prevention of elderly obesity. Obesity is one of the factors that causes hypertension while weight watch can lead to a remarkable reduction of it. Stampler (1993) revealed that there was a close relationship between hyper tension and fat increase in body. For instance, abdominal fat increase is associated with hypertension, diabetes and incidence of cardiovascular diseases. In this respect, the ratio between the size of waist and hips (WHR), more than 85% in males and 98% in females, were introduced as a risk factor of cardiovascular diseases (Azizi, Fereydoon, 2001). Findings showed that if cardiovascular risk factors are not controlled, youths are also susceptible to diseases, Particularly Coronary ones, Because arteriosclerosis platelets are started from the youth and improve from 86% to 1% speed annually in a manner that approximately 60% of inner surface of veins are Covered by these platelets in a 60-year-old person.

Remarkable over weight and incidence obesity associated with blood lipids disorders in children and adolescents can setup for vein obstruction and incidence of hypertension in the future (Azizi, Fereydoon, 2001). On the other hand the role of exercises and physical activities have a special importance. Researchers have focused on the effect of aerobic exercises on cardiovascular risk factors in recent decades (Fakelman KA, 1989). It is not exactly recognized so far that what level of exercise will have more effect on the reduction of cardiovascular risk factors. Generally, studies have shown desirable changes of lipids lipoproteins due to physical activities with low and middle severity (Huttunen, J.R. et al., 1998; Kokinos F, 2000; Powell, K.E. et al., 2000).

Factors, such as, full fat dairy, yolk, Cookies red meat, bother, full fat milk consumption, lock of sufficient physical activities, stress and mental pressure may lead to includes health condition evaluation, physical activities conduction band on exercise schedule, diet and mental condition control and mental and medical support. No such care is available for there patients meets in our country and each individual cares himself / herself based on personal knowledge mostly unscientific. No established and regular exercises associated with desirable diet in such programs is conducted for hypertension and blood fat reduction treatment. This study was carried out on patients suffering from hypertension whom were advised to enter in an aerobic exercise program due to the need of support because of lack of control by specialist physicians. Regarding high percentage of hypertension among aged and middle aged people in the community and also the essence of aerobic exercises to control or reduce by pretension or blood fat in such patients, this study was conducted to evaluate the function of such exercise. Finally, the results showed the same effects as other studies.

**MATERIALS AND METHOD**

In this study, 20 male patients suffering From over 140/90 mm/Hg hypertension with the age range of 15-65 year were studied.

The patients had no history of heart attack, infarction, angina pectoral, diabetes and kidney diabetes and were introduced for rehabilitation program by cardiologist. The patients were randomly divided in to two experimental and Control groups. The Control group was not intervened and was only under the common health care by specialist physician. Experimental group attended the selected aerobic exercise for eight weeks. Initially, pretest and posttest were conducted for blood pressure, TC,TC,HDL and LDL before aerobic exercise program in both groups. Then, both groups attended in a six- session exercise program- one hour each. Later, Emanuel limitation and clinical signs determinant was carried out which determines the neediness of one a attend exercise activities and probability of coronary disorder improvement, by which a program can be design far exercises. Data collecting included evaluation of medical history analysis of CAD risk factors and finally physical headness.

Evaluation of physical neediness contained cardio- Pulmonary test, Physical condition, muscular resistance and flexibility. In this study, cardiopulmonary and blood fat of patients were evaluated in order to schedule exercise program.

The fist data included Medical examination or consolidation with family physician or both, response to medical history list, interpretation the letter of content and exercise test if applicable. Exercise test is a maximal aerobic activity which is and to diagnose the practical capacity and continual control of electro cardiogram, blood pressure and other intolerability of exercise (Yukihisa, 1998).
Patients were asked not to use any drug 24 hours before test to avoid the effect of drug on test results. Blood pressure and ECG of each patient were evaluated before that and then began to exercise. Each activity included four courses three minutes each in which the speed increase in each three minutes. No pause was between courses. Ten electrodes were attached to the body of subject out of which four were attached to hand and foot and other six ones were attached to chest. The electric activity of head was observed by monitor. Test was stopped as arrhythmia or disorder was observed in electrocardiogram or if angina pectoris were felt. Otherwise, the test was continued for 12 minutes. Immediately, electrocardiogram, blood pressure and heart rate were checked. This heart rate was considered as the maximal heart rate of patient. In order to measure blood pressure manometer model Yamaso was used. This is an audio method. For this purpose, first, the cuff pressure was completely higher than arterial systolic pressure to close the artery entirely and blood cannot reach the lower part of artery during pulse, so the Korotkof sounds were not heard. Then, the cuff pressure was gradually reduced and as the cuff pressure was the systolic pressure and lower than that, blood passes through the narrow slash of vein and a shot and anticipate sound was heard which was he repeated by each heart beat. The pressure, which was shown by attached manometer to cuff bag, is approximately equal with systolic pressure. At his sound is cut after a while and the pressure showed by manometer will be diastolic one kit(TQ Method- Paos Azemoon licensed by German Bosch) was used to measure TG and lipoproteins and cholesterol were measured using kit (TC-HDL-LDL Method-Pars Azemoon - Licensed by German Bosch).

**Exercise Program:**

Experimental group attended in a sub maximal aerobic exercise program for eight weeks. This program contained aerobic activities with 60-79% of maximal heart rate in three sessions, 45 minutes each. Maximal heart rate was recognized using exercise test (in the cause of time and place limitation, age +220 method was used which is not enough valid) patients were advised to stop exercise if they feel pain in jaw, neck, shoulder and chest they were asked to report the severity of physical activity to control the exercise severity. Data were analyzed using SPSS software and uni variable. All statistical operations were considered significant in 45% confidence interval and a <5%.

**Findings:**

Table 1, shows mean, standard deviation, systole and diastole blood pressure in Control and experimental groups. As shown pre and post test systolic and diastolic blood pressures in experimental group have been 182.20 ± 5.813, 92. 500 ± 2.344, 144.40 ± 5.813 and 78.200 ± 2.344, respectively, 85.800 ± 2.344, 143.600 ± 5.813 and 84.900 ± 2.344 in control group.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Height</th>
<th>Age</th>
<th>Test</th>
<th>Mean (mmHg)</th>
<th>SD (mmHg)</th>
<th>Min. (mmHg)</th>
<th>Max. (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>165 ± 5</td>
<td>45 ± 20</td>
<td>pretest</td>
<td>42.50</td>
<td>83.70</td>
<td>84.4</td>
<td>179.31</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>42.50</td>
<td>83.70</td>
<td>84.4</td>
<td>179.31</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>78.20</td>
<td>153.20</td>
<td>84.3</td>
<td>139.81</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>42.50</td>
<td>83.70</td>
<td>84.4</td>
<td>179.31</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>78.20</td>
<td>153.20</td>
<td>84.3</td>
<td>139.81</td>
</tr>
<tr>
<td>control</td>
<td>165 ± 5</td>
<td>45 ± 20</td>
<td>pretest</td>
<td>85.80</td>
<td>153.20</td>
<td>81.2</td>
<td>139.81</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td>85.80</td>
<td>153.20</td>
<td>81.2</td>
<td>139.81</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>84.90</td>
<td>143.60</td>
<td>81.9</td>
<td>134.16</td>
</tr>
</tbody>
</table>

*Significant difference p<0.05*
Aerobic exercise program led to a significant reduction of systolic and diastolic blood pressure in experimental group, where as no significant reduction was in control group(Table 2).

Table 2: shows the mean of systolic and diastolic blood pressure and the rate of t and p in control and experimental groups before and after selected exercise program.

<table>
<thead>
<tr>
<th>No</th>
<th>groups</th>
<th>Test</th>
<th>Mean (mm/Hg)</th>
<th>T rate</th>
<th>P rate</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Dia.</td>
<td>Sys.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Experimental</td>
<td>pretest</td>
<td>92.500</td>
<td>182.200</td>
<td>0.684</td>
<td>0.000 significant (a&lt;0.05)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>post test</td>
<td>78.200</td>
<td>144.400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>control</td>
<td>pretest</td>
<td>85.800</td>
<td>153.200</td>
<td>0.010</td>
<td>0.857 No significant (a&gt;0.05)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>post test</td>
<td>84.900</td>
<td>143.600</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 2: comparison between the rate of systolic blood pressure in Control and experimental groups before and after exercise program.

*Significant difference P<0.05.

selected aerobic exercise program led to a significant reduction of systolic and diastolic blood pressure in experimental group, where as no significant reduction was seen in control group.

Table 3: A comparison between systolic blood pressure of control and experimental groups before and after selected exercise program.

<table>
<thead>
<tr>
<th></th>
<th>Control group</th>
<th>Experimental group</th>
<th>Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD(mm/Hg)</td>
<td>Mean (mm/Hg)</td>
<td>SD(mm/Hg)</td>
<td>Mean (mm/Hg)</td>
</tr>
<tr>
<td>5.813</td>
<td>2.344</td>
<td>152.200</td>
<td>85.800</td>
</tr>
<tr>
<td>5.813</td>
<td>2.344</td>
<td>143.600</td>
<td>84.900</td>
</tr>
</tbody>
</table>

*Significant difference P<0.05

Table 4 shows mean, standard deviation, the rate of TC,TG, HDL and LDL in both groups. The mean of TC, TG, HDL and LDL before and after exercise program in experimental group were 215.200 ± (13.340), 325.800 ± (57.427), 247.900 ± (57.427), 54.3 ± (69.594), 48 ± (69.595), 100 ± (12.502), and 78.5 ± (12.502) mg/dl, respectively, where as they were 217.700 ± (13.240), 148.800 ± (13.390), 367.500 ± (57.427), 282.700 ± (57.427), 42.8 ± (69.595), 38.1 ± (64.595), 103.800 ± (12.501) and 97.400 ± (12.502) in control group , respectively.

Cholesterol:

The rate of blood cholesterol of experimental group significantly reduced after eight weeks of aerobic exercise program. The mean of cholesterol of experimental group was 215.200 ± (13.340) mg/dl before exercise program, where as it reached 176.100 ± (13.340) mg/dl after exercise program. The mean of cholesterol of Control group changed from 217.700 ± (13.240) to 148.800 ± (13.340) mg/dl. No significant difference was mean in control group before and after exercise program. A significant difference was seen between experimental and control groups in the end of the course.
Table 4: shows the mean, standard deviation, the rate of, TC, TG, HDL and LDL in Control and experimental groups before and after exercise program.

<table>
<thead>
<tr>
<th>Group</th>
<th>Height</th>
<th>Age</th>
<th>Test</th>
<th>Mean(mg/dl)</th>
<th>SD (mg/dl)</th>
<th>Min</th>
<th>Max (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>165±5</td>
<td>45±20</td>
<td>Pretest</td>
<td>21</td>
<td>5</td>
<td>5</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Posttest</td>
<td>17</td>
<td>6</td>
<td>1</td>
<td>48</td>
</tr>
<tr>
<td>Experimental</td>
<td>165±5</td>
<td>45±20</td>
<td>Pretest</td>
<td>21</td>
<td>7</td>
<td>7</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Posttest</td>
<td>14</td>
<td>8</td>
<td>8</td>
<td>28</td>
</tr>
</tbody>
</table>

Table 5: Comparison between control and experimental groups cholesterol before and after exercise program.

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean(mg/dl)</th>
<th>SD (mg/dl)</th>
<th>P</th>
<th>Mean(mg/dl)</th>
<th>SD (mg/dl)</th>
<th>P</th>
<th>Mean difference (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td>215.200</td>
<td>13.340</td>
<td>.04</td>
<td>217.700</td>
<td>13.240</td>
<td>0.083</td>
<td>+.2.50</td>
</tr>
<tr>
<td>Posttest</td>
<td>176.100</td>
<td>13.340</td>
<td>.4</td>
<td>148.800</td>
<td>13.240</td>
<td></td>
<td>+.22.7</td>
</tr>
</tbody>
</table>

Fig. 3: Rate of cholesterol in control and experimental groups before and after exercise program.  
*significant difference P<.05

**Triglyceride:**

Triglyceride showed a significant reduction in experimental group compared with before exercise. No significant difference was observed in control group before and after exercise program.

The means of TG in experimental group were 325.800± (57.427) and 247.900± (57.427) in exercise program before and after 100mg/d/ before and after in exercise programme. The mean of TG changed from 367.500± (57.427) to 282.700± (57.427) in control group in the end of exercises program. No significant difference was seen between control and experimental groups after exercise program.

Table 6: shows comparison the rate of TG between control and experimental groups before and after exercise program.

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean(mg/dl)</th>
<th>SD (mg/dl)</th>
<th>P</th>
<th>Mean(mg/dl)</th>
<th>SD (mg/dl)</th>
<th>P</th>
<th>Mean difference (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before program</td>
<td>325.800</td>
<td>57.427</td>
<td>.04</td>
<td>364.500</td>
<td>57.427</td>
<td>.023</td>
<td>±14.7</td>
</tr>
<tr>
<td>After program</td>
<td>247.900</td>
<td>57.427</td>
<td></td>
<td>282.700</td>
<td>57.427</td>
<td></td>
<td>±84.80</td>
</tr>
</tbody>
</table>
Fig. 4: shows the rate of TG in control and experimental groups before and after exercise program.

**LDL:**
A significant difference was observed in experimental group, but no significant difference was shown in control group before and after exercise program. Also, no significant difference was seen between control and experimental groups before and after exercise program. The means in experimental group before and after exercise were 100 ± (12.502) and 78.5 ± (12.502) Mg/dl, respectively the mean of LDL changed from 103.800 ± (12.502) to 97.400 ± (12.502) in control group.

Table 7: Shows comparison of LDL between control and experimental groups before and after exercise program.

<table>
<thead>
<tr>
<th>Test</th>
<th>Experimental group</th>
<th>Control group</th>
<th>P</th>
<th>Mean Difference (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before program</td>
<td>100 ± 12.502</td>
<td>103.800 ± 12.502</td>
<td>0.03</td>
<td>± 3.80</td>
</tr>
<tr>
<td>After program</td>
<td>78.5 ± 12.502</td>
<td>97.400 ± 12.502</td>
<td>.083</td>
<td>± 18-90</td>
</tr>
</tbody>
</table>

* Significant difference p<0.05

Fig 5: Shows LDL in control and experimental groups before and after exercise program.

**HDL:**
No significant difference was seen in experimental and control groups before and after exercise program. No significant difference was observed between control and experimental groups after exercise program. The means F HDL were 54.3 ± (69.595) and 48 ± (69.595) in experimental group before and after exercise.
program, respectively. The mean of HDL were $42.8 \pm (69.595)$ and $38.1 \pm (69.595)$ in control group before and after exercise program, respectively.

Table 8: shows comparison of HDL between control and experimental groups before and after exercise program.

<table>
<thead>
<tr>
<th>Test</th>
<th>Experimental group</th>
<th>Control group</th>
<th>P</th>
<th>Mean Difference (mg/dl/)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (mg/dl)</td>
<td>SD (mg/dl)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>before program</td>
<td>44.300</td>
<td>69.595</td>
<td>0.033</td>
<td></td>
</tr>
<tr>
<td>after program</td>
<td>48</td>
<td>69.595</td>
<td>38.10</td>
<td>69.595</td>
</tr>
</tbody>
</table>

Fig. 6: shows HDL in control and experimental groups before and after exercise program.

Discussion:
This study indicated that non medicinal treatments are effective to reduce hypertension. Evaluation of obtained mean of results showed that diastolic blood pressure reduced to $78.2 \pm 2.34$ From $92.5 \pm 2.34$ mm/Hg in experimental group at the end of exercise program. The results of this study correspond the results of Nicollatis (1998) study on hypertension treatment (regular aerobic programs 3-5 times a week for 30-45 minutes). Regarding the adaptation derived from exercise program aerobic nature to balance the secretion of adrenal glands hormones, such as E and NE and consequently veins resistance and adjustment of Renin – Angiotensin function and Aldosterone secretion caused by aerobic exercise . The reduction of diastole blood pressure can be related to above mentioned issues. In this respect, with regards to the reduction of blood lipids as mentioned earlier and reduction of blood lipids and arterial pressure mean, based on studies, it is probable to relate the reduction of blood lipids to the effective factors of diastole blood pressure reduction . Diastolic blood pressure reduced in control group at the end of study which was not significant. The mean of blood pressure reduced from $85.5 \pm 2.34$ mm/Hg to $84.900 \pm 2.34$ mm/Hg .Diastolic blood pressure reduced in 60% of control group, whereas, diastolic blood pressure increased in 30% and no change was seen in 10% else. These insignificant fluctuations could be related to full fat and salt diet and mental changes in Control group at the time of blood pressure measuring or unreduced blood lipids (Harrison, M.D, 1998) The findings of this study have also been approved by Kanne (1998), Grundy (1993) and paoliso (2000) in their researches. Focusing on an 8-12 exercise programme, 3-5 times a week they also reported a reduction and control in blood pressure.

More evaluation on conducted studies using resistant exercise program shows contradictory results. For example, no reduction was seen in arterial blood pressure mean in another study (Leutholtz, BC, 1998) using a 12 week resistant exercise program, whereas, a reduction was reported in another study on obese and hypertensive patients after an eight- week resistance exercise program in systolic and diastolic blood pressure (five times a week for 45 minutes) (Mac Donald J.R, 1999). The effect of lowering and controlling hypertension will be approved using the results of this study and adaptation of present one. The same results were obtained on systolic blood pressure. The mean of systolic blood pressure reduced from $153.300 \pm 5.813$ mm/Hg to $143.600 \pm 5.83$ mm/Hg in experimental group in the end of study. This reduction was significantly seen in 90% of the subjects of control group which also agrees with the studies of McDonald (1999) and McAlister (1999). They have reported that reduction of ADH hormone secretion rate from the posterior part of hypophysis gland (Adeno hypophysis) is one of the factors of blood pressure reduction regarding the adaption of this study and the present
one, probably this factor may be considered as one of the factors of systolic blood pressure reduction in the subjects of this study. No significant change was seen in systolic blood pressure in 10% of remained subjects of experimental group in this relation, perhaps, the factors, such as, insufficient of exercise severity, full salt and also mental mood of subjects at the time of blood pressure measuring are effective. Based on a 12-week aerobic exercise on subjects suffering from heart attack with veins generating to reduce blood pressure, pressure, this factor will probably be one of the factors of blood pressure reduction in such individuals with regards to the agreement with the present study. Increasing veins generating will lead to arterial blood pressure reduction due to the effect of general resistance against blood circulation and increase of veins capacity (Arnold. J. R. Chard, 1987). Systolic blood pressure were also evaluated and seen as 153.30 ± 5.813: mm/Hg and 143.600 ± 5.813mm/Hg in the subjects of control group before and after rehabilitation program. Such insignificant reduction in control group agrees with the results of Grifin (2000), McAlister (1999) and McDonads (1999 ) results. Slight significant reduction of blood pressure of the subjects in Control group in these studies has been related to the factors, such as mental mood of individuals during test and the effects of diet. Particularly meals of 24 hours prior to tests, which may be related to slight reduction (of course, insignificant) of blood pressure , in subjects of control group of the present study regarding the agreement of results.

**Blood Serum Lipids (HDL, LDL, TG, TC):**

The selected t- week exercise program led to a significant reduction of cholesterol in experimental group which adapts to the results of Falkeman (Fakelman KA, 1989). He showed that regular exercise, 70 minutes a day, four times a week for 21 weeks results a significant reduction of cholesterol.

Cholesterol was reduced in nine individuals of experimental group, where as one showed increase that was due to un observation of deniable diet and consumption of full fat and salt food. Regarding HMG/COA enzyme in cholestrol production as an important and key compound mediator and since increase of insulin hormone will have a remarkable effect on increase of such enzyme and also reduction of insulin following adaptation of it with aerobic exercise, reduction of cholesterol in blood could be related to this sector in experimental group. Beta cells in pancreas will some now be inactive and less to the limitation of insulin secretion in blood following increase of cholesterol can be related to the lack of selected physical activity. Reduction of HDL can also cause increase of cholesterol in blood. LDL, as a heavy Phospholipid can prevent cholesterol sedimentation in vein with the maximum rate of fat and move this harmful fat in vein and discharge it from the vein. Increase of the rate of LDL and VLDL, doe to the height rate of cholesterol, can lead to the increase of blood cholesterol (Mc Ardel, whilliam, 2000). Cholesterol was reduced insignificantly in control group after 8 weeks. Cholesterol reduced in 8 subjects, where as increased in2 ones. Reduction of blood cholesterol in control group (regarding no participation in aerobic activities) can be related to low fat diet (egg, full of fat milk and red meat) and low sugar, (artificial sweets and height sugar fruits) and consumption of cholesterol reducing agents such as cholestramine (Mc Ardel, whilliam, 2000). Triglyceride was significantly reduced in experiment group during 8 week exercise program. Triglyceride was reduced in 40% subjects of experimental group after program and increased in only one individual.

The results of Superko (1991) about blood fat and the effect of exercise were the same as the results of the present study. Triglyceride can be an important energy source for aerobic activities undesirable severity and duration of exercise can lead to metabolism of carbohydrates instead of fats. This happens when the severity of activity is higher than selected one. If the severity and duration of activity is low, the sources of energy providing will be Phosphagen organs. Although fats and sugars play role, fats metabolism is not enough to lead to a significant reduction of triglyceride in blood (fat metabolism need slight severity and a long time). Consumption of some fats, such as, olive oil, almond oil, corn oil, sunflower oil and soya oil in diet may lead to increase Triglyceride in blood. If one consumes much sugar ingredients but not enough physical activities, will change sugars to Triglyceride, then accumulating in fat tissue and releasing of fat acids in blood.

Untimely was of medicine prescribed by a physician, such as Anton, also leads to a significant increase of blood Triglyceride (Mc Ardel, whilliam, 2000).

No significant reduction of blood Triglyceride was seen in control group before and after exercise program. Blood Triglyceride was reduced in 9% of the subjects of control group after exercise program and an increase, was seen only in one subject. Lack of reduction or insignificance of the rate of blood triglyceride can be considered as lack of participating in selected aerobic program and disobedience from medicinal and diet prescriptions. A significant difference was observed in LDL in experimental group before and after exercise program. Minly and Ralf (1987) in their studies, showed that aerobic activity for mix miles, three times a week will lead to LDL reduction after eight weeks. It is recognized that arterial wall injury and full fat diet increase plasma LDL concentration (Rauramaa. R. et al., 2000).

Brown (2007) in, his study, showed that LDL is influenced by highly sensitive receptors of LDL. while a great number of such receptors are available in cell, the low con concentration of LDL will be stabilized, vice versa. Meanwhile, factors, such as full of cholesterol reached diet is effective in reduction of the receptors of
LDL. Due to sufficient of exercise, LDL significantly reduced in eight subjects of experimental group and increased in two other ones. Insufficient severity of exercise associated with deniable medicinal and food diet have been the reason of LDC increase.

Increase of LPL enzyme activity, which is neon more in aerobic exercises and less production of Actyle COA in liver, restricts the process of LDL synthesis, on the other hand, continual control of diet and no consumption of full fat food may probably just if a part of LDL reduction. Mental severe stresses and problems can also be effective in blood LDL increase (Leon, A, S .et al, 1979). LDL significantly reduced in control group after exercise program.

A significant reduction of LDL was seen in seven subjects of control group, while three of them should increase in the end of eight weeks. An insignificant reduction of HDL was observed in experimental group after eight weeks of cardiovascular exercise program.

HDL reduced in nine individuals of experimental group, but increased only in one person.

Minly and Ralf (1987), in their study, showed that aerobic activity of six miles, there times a week leads to LDL reduction and HDL increase after eight weeks. Martin (1991), in another study, found out that aerobic exercise increase HDL and also, the ratio of HDL to cholesterol will be absolute. The results of this study disagree with the present one.

Since HDL controls the lowest rate of cholesterol and harmful fat acid, the acceptable amount of it, is not disadvantageous. Consumption of low fat and conducting regular aerobic exercises with mild severity caves increase of HDL. If diet contains much saturated fat, liver will synthesis more cholesterol which leads to increased LDL and consequently, reduction of HDL synthesis. If HDL increasing agent is not consumed or not consumed at the right time, such as, nicotinic acid also leads to reduction the rate of HDL and consequently increases the ratio of LDL and cholesterol to HDL which is an important index of fore seeing cardiovascular diseases(Mc Ardel, whilliam, 2000). An insignificant reduction of HDL was seen in control group after exercise program. HDL reduced in seven subjects of control group, but increased in two persons and no change was observed in one individual.

Since control group did not participate in selected aerobic activity, the reduction of such fat can be related to the increase of full fat food consumption and lack of consumption of nicotinic acid.

**Conclusion:**

The results of study showed that systolic and diastolic blood pressure reduced significantly in experimental group after eight week sub maximal aerobic exercise for 30-45 minutes, three times a week (P=0.000), bat not significant in control group (P=0.85 5, P=0.245) (sub maximal aerobic exercises are those in which one can speak comfortably, his (her) speech is not interrupted and choppy and does not feel pain or discomfort during exercise).

Reduction of LDL, TC and TG was significantly occurred after eight weeks of exercise (P<0.05), but not only significant increase was shown in HDL, but increased (P>0.05). No significant change was seen in above-mentioned variables in control group (P>0.07). so, eight- week aerobic exercises with low severity and sub maximal leads to significant reduction in blood pressure, LDL, TC and TG. no increasing of HDL, as a usual fat, may be related to the severity and duration of exercise which requires more study.

**REFERENCES**

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