

Effects of Treadmill Training on Serum Low and High Density Lipoprotein, Total Cholesterol and Blood Pressure in Postmenopausal Women

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ABSTRACT

The purpose of this study was to investigate the effect of exercise on blood pressure, low and high density lipoprotein and cholesterol levels on women during menopause. Thirty patients with essential hypertension were involved in the study. Their ages between 55-65 years. They underwent clinical and laboratory investigations including estimation of serum blood cholesterol and blood pressure. They were exercised by treadmill for 30 minutes every other day for 12 weeks and diet plan. The obtained data indicated that there was statistically significant reduction of systolic and diastolic blood pressure, also there was a reduction in total cholesterol level and low density lipoprotein (LDL). And there was an increase in high density lipoprotein (HDL) after the exercise and the followed diet plan. From these results it could be concluded that exercise is effective for reducing elevated blood pressure, total cholesterol as well as LDL and increase HDL.

Key words: Tread mill exercise, Blood pressure, Cholesterol and Menopause.

INTRODUCTION

High blood pressure is a major risk factor for stroke, coronary heart disease, congestive heart failure and renal disease^{1,16}.

Clinical trials have demonstrated that lowering blood pressure reduces incidence of death from cardiovascular diseases. These studies also indicate that a decrease of a little as 2mm Hg in mean diastolic blood pressure could substantially reduce the risk for disease associated with elevated blood pressure¹⁹.

Cholesterol when present in excessive amount, it can injure blood vessels and cause heart attacks and stroke^{2,21}.

The body needs cholesterol for digesting a dietary fat, making hormones, building cell wall and other important processes. Too much of cholesterol can injure the arteries,

especially the coronary ones that supply the heart leading to chest pain (angina). If a blood clot obstructs the coronary artery, a heart attack (myocardial infarction) or death occurs³.

There are two types of cholesterol, low density lipoprotein (LDL) which is bad as, it is the main cause of harmful fatty buildup in arteries, high density lipoprotein (HDL) which is good as, it carries blood cholesterol back to liver, where it can be eliminated and it helps a cholesterol build up in blood vessels. Low HDL levels increase heart disease risk and high LDL increase also heart disease¹⁸.

Physical inactivity is a major risk factor for developing coronary artery disease. Coronary artery disease is characterized by deposits of fatty substances, cholesterol, calcium and other substances in the inner lining of arteries that supply blood to the heart muscle. It also contributes to other risk factors.

Including obesity, high blood pressure, high triglycerides, a low level of HDL (good)⁷.

Moderately intense physical activity such as brisk walking is beneficial when done regularly for a total of 30 minutes or longer on most days⁵.

Regular aerobic physical activity increases your capacity of exercise. It also plays a role in both primary and secondary prevention of cardiovascular disease. Physical inactivity is a major risk factor for heart disease and stroke and is linked to cardiovascular mortality. Exercise can help control blood lipid abnormalities, diabetes and obesity. Aerobic exercise also has an independent, modest blood-pressure-lowering effect for certain groups of people with high blood pressure¹⁷.

Several studies have shown that people who modify their behavior & start regular exercise after suffering a heart attack have better rates of survival and a higher quality of life. Healthy people, as well as many patients with cardiovascular disease, can improve their exercise performance with routine training⁴.

Physical activity reduce triglyceride levels. High triglycerides are linked to developing coronary artery disease in some people. Low levels of HDL cholesterol (less than 40 mg/dL) have been linked to a higher risk of coronary artery disease. Recent studies show that regular physical activity significantly increases HDL cholesterol levels and thus reduces risk^{3,21}.

This study was designed to determine the influence of treadmill exercise on blood pressure and serum cholesterol in women during menopause.

SUBJECTS AND PROCEDURES

Subjects

Thirty women with essential

hypertension, selected from Kasr EL-Aini University hospital, out patient clinic of gynecology department. Their ages ranged from 55 to 65 years complaining of prolapse.

They underwent clinical investigations to exclude any associated disorders such as chest diseases, cardiac diseases, diabetes mellitus or musculoskeletal disorders.

Informed consent form were signed by each subject before starting the treatment.

Procedures

A) *Evaluative Procedures*

- 1) Blood Pressure: Blood pressure was measured before starting the treatment and after the end of the 12 weeks. Systolic and diastolic blood pressure were measured on the dominate arm using sphygmomanometer. Three manual blood pressure were made at one minute intervals with patient reclining in a chair with feet rest. The mean of these three reading was considered the blood pressure data point.
- 2) Blood cholesterol level was assessed in the laboratory department before and after the treatment to determine the level of total cholesterol, low density lipoprotein (LDL) and high density lipoprotein (HDL) through a venous sample of 5 cc. patients were fasted for 12 hours before the examination.

B) *Treatment procedures*

Patients shared into electric treadmill programs, which was done for 30 minutes, with 5 minutes warming up, 20 minutes main exercise and 5 minutes cooling down, with a rate of 3 sessions per week and continued for 12 weeks.

Creating a diet plan: avoidance of food known to boost cholesterol, such as fatty red meat, butter, whole milk and replace animal fat with vegetable oils or olive oil and eating

low fat foods such as fresh vegetables and fruits, fish, chicken and fat free youghort.

Statistical analysis

All variables were analyzed before and after 12 weeks, after the end of the study. Statistical analysis included the arithmetic mean, standard deviation and student's test.

RESULTS

As shown in table (1) and Fig. (1): There was significant reduction of mean systolic pressure ($P < 0.05$) between the first session which was 190.28 ± 32.12 mmHg and after the last session, which was 156.02 ± 27.72 mmHg.

Also, there was significant reduction of mean diastolic blood pressure ($P < 0.05$) between the mean of the first session which was 100.32 ± 20.01 mmHg and after the last session which was 90.83 ± 15.51 mmHg.

Table (1): Change in mean systolic and diastolic blood pressure between the first and last session.

Variables	1st session	Last session	P. Value
Syst B.P	190.28 ± 32.12	156.02 ± 27.72	<0.05
Diast B.P	100.32 ± 20.01	90.83 ± 15.51	<0.05

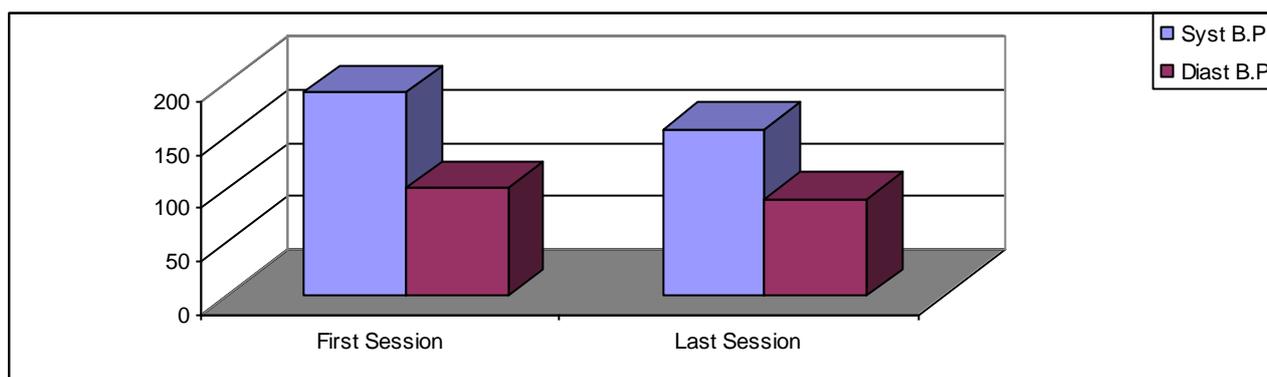


Fig. (1): Change in mean systolic and diastolic blood pressure between the first and last session.

As shown in table (2) Fig. (2), there was a significant difference of LDL and HDL before and after training program. The mean of LDL before treatment was 170.32 ± 10.05 mg/dl, after treatment it reduced and become 100.01 ± 3.031 mg/dl. The mean of HDL was

40.4 ± 8.11 mg/dl before treatment and after the end of treatment it increased and become 59.63 ± 14.01 mg/dl. Also, total cholesterol before treatment it was 210.36 ± 18.16 mg/dl and after treatment it become 159.64 ± 17.04 mg/dl.

Table (2): Change in mean total cholesterol, LDL and HDL between the first and last session.

Variables	Before Treatment	After treatment	P. Value
Total cholesterol	210.36 ± 18.16	159.64 ± 17.04	<0.05
LDL	170.32 ± 10.05	100.01 ± 3.03	<0.05
HDL	40.4 ± 8.11	59.63 ± 14.01	<0.05

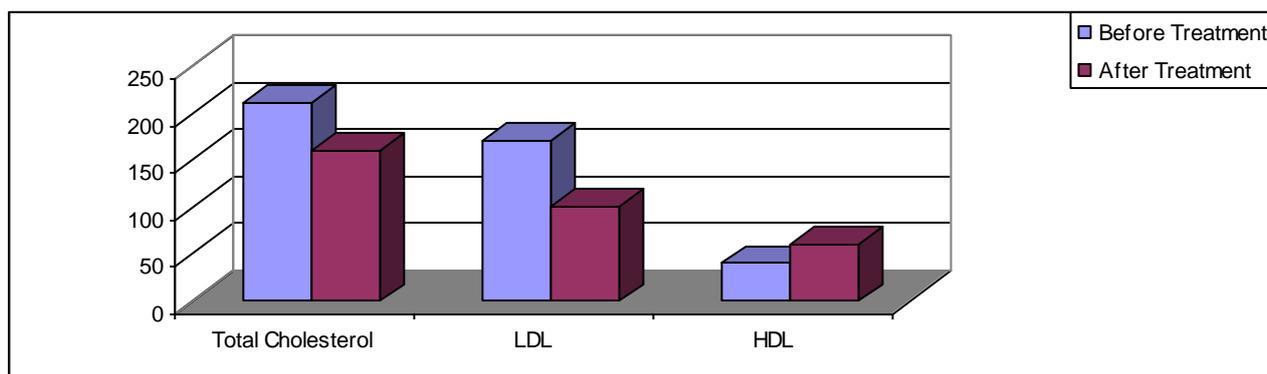


Fig. (2): Change in mean total cholesterol, LDL and HDL between the first and last session.

DISCUSSION

A sedentary lifestyle is a major risk factor for heart and blood vessel (cardiovascular) disease. For example, people who are less active and less physically fit have a 30 to 50 percent greater incidence of hypertension. Physical activity may reduce blood pressure hypertensive individuals^{1,12}.

The association between high serum cholesterol and the incidence of coronary heart disease (CHD) is so pronounced in epidemiological studies. Recent overviews have indicated that a 1% reduction in total serum cholesterol level yields a 2 to 3% reduction in the risk coronary heart disease^{11,13,14}.

Aerobic exercise such as walking, jogging and aerobics reduce total cholesterol, low density lipoprotein (LDL) and triglycerides while elevating the "good" high density lipoprotein (HDL)¹⁰.

This results agreed with Staessen et. al. (2001) who studied the effect of exercise on high blood pressure.

The study revealed a significant reduction in systolic and diastolic blood pressure after 12 weeks of exercise.

Also, studies done by Oberman et. al. (2001) found that aerobic exercise is a suitable

treatment and can even play a role in the prevention of hypertension.

Additionally Blumenthal et. al. (2000) stated that, even without changes in body weight, aerobic exercise reduce resting blood pressure, the blood pressure reduction did not seem to depend on the frequency or intensity of exercise or on type of exercise.

From puberty until menopause women generally have lower total cholesterol and LDL values than men. After menopause, their values equal or exceed those of men. This may be partially explained by the relatively higher lipoprotein lipase activity in women⁷.

Also, estrogen seems to have a major role in lowering the risk of coronary heart disease⁸.

The present study revealed a significant decrease in total cholesterol as well as LDL and increase in HDL after 12 weeks of exercise.

This result agree with those of Boyden et. al. (1998) who stated that total cholesterol levels are lower in persons with high aerobic fitness compared to low aerobic fitness, he stated that activity as dynamic and vigorous exercise, such as running lower LDL.

Also, study by Haskell (2000) found that decrease in triglyceride concentration in the blood have been attributed to increase in

skeletal muscle and adipose tissue lipoprotein lipase activity resulting from aerobic training.

Also, study by Martin et. al. (2001) reported that the majority of studies comparing endurance athletes to sedentary controls or the general population, reported that the athletes have lower LDL levels and higher HDL. This explained that increase in HDL is due to increase in lipoprotein lipase activity in response to exercise which, accelerate the break down of triglycerides, resulting in a transfer of cholesterol and other substances to the HDL.

Conclusion

It was concluded that life style modifications can have an important role in the treatment and prevention of hypertension, and can slow the progression of CHD.

So, we can add regular exercise to the list of life style modification that includes dietary changes, reduction in salt intake, low fat diet and avoid diet rich in cholesterol compliance with prescribed medications when they needed.

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الملخص العربي

تأثير تمارينات السير على ضغط الدم ومستوى الكوليسترول الضار والحميد لدى السيدات بعد انقطاع الدورة الشهرية

أجريت هذه الدراسة لمعرفة تأثير تمارينات سير الجري و النظام الغذائي علي ضغط الدم ومستوى الكوليسترول في الدم لدى السيدات بعد انقطاع الدورة الشهرية . وقد أجريت هذه الدراسة علي 30 سيدة تتراوح أعمارهن بين 55-65 سنة من المصابين بارتفاع في ضغط الدم ونسبة الكوليسترول . وقد قامت السيدات بعمل التمارينات المطلوبة لمدة 12 أسبوع بمعدل 3 مرات أسبوعياً . وتم تقييم ضغط الدم ومستوى الكوليسترول بالدم قبل وبعد البرنامج العلاجي . وأوضحت النتائج والتحليل الإحصائي أنه يوجد نقص ذو دلالة إحصائية في كل من ضغط الدم ومستوي الكوليسترول بالدم قبل وبعد البرنامج مما يؤكد أهمية التمارينات في علاج السيدات بعد انقطاع الدورة الشهرية من ضغط الدم المرتفع وتقليل الكوليسترول الضار وزيادة نسبة الكوليسترول الحميد بالدم .

الكلمات الدالة : تمارينات السير ، الكوليسترول ، فترة انقطاع الطمث ، ضغط الدم .