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The effect of Pilates training on cardiovascular risk factors in overweight teachers

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***Abstract*— the aim of this study was to investigate the effect of a Pilates training course on cardiovascular risk factors in overweight teachers. Therefore, 20 overweight teachers (body mass index 25 and above 25) with an age range of 30 to 40 years were purposefully selected and randomly assigned to two Pilates training and control groups (10 people in each group). The Pilates training group participated in 8 weeks of Pilates training (three sessions per week). The control group did not participate in any regular physical activity program during this period. Relevant measurements were taken before and after the intervention. Weight, body mass index, and serum levels of triglycerides, cholesterol, LDL, and HDL were measured in two groups. The statistical method of mixed analysis of variance was used to compare and examine the changes of variables between two groups at the level of P≤0.05. Weight, body mass index, cholesterol, triglyceride and LDL in the Pilates group were significantly reduced compared to the control group (P<0.05), but HDL in the Pilates group did not change significantly compared to the control group (P>0.05). It seems that Pilates exercise can reduce the risk factors of heart diseases in overweight teachers.**

***Keywords*— Pilates, cardiovascular risk factors, lipid profile, HDL, overweight**

Introduction

Studies conducted in recent years show that Pilates exercise plays an important role in improving physical fitness, body composition, metabolic disorders and depression (1, 2). These advantages are obtained while Pilates exercises are a low-cost, healthy, safe method without side effects, and it is easy to learn and can be applied even by patients, elderly and disabled people (3). However, while the effects of Pilates exercise on the metabolic and hormonal status of several diseases have been investigated in limited studies (1-4), the effect of this type of exercise on cardiovascular risk factors has been less investigated. Today, cardiovascular diseases are one of the most important causes of death, especially in developed countries, and account for nearly 40% of deaths in the world every year. Due to the inactive lifestyle, cardiovascular diseases have increased in the last few decades (5). Several risk factors such as increased levels of triglycerides (TG), low-density lipoprotein (LDL) and very low (VLDL), cholesterol, and a decrease in high-density lipoprotein (HDL), weight gain and high blood pressure increase the prevalence of heart diseases (5). Research results on the effect of exercise on plasma lipid levels in obese individuals are contradictory (6-11). There is no clear mechanism of the effect of exercise on lipoproteins. It seems that regular aerobic exercise with a relatively high intensity can significantly improve overall lipoprotein profile (12). Fat tissues have numerous capillaries and autonomic nerves. Therefore, all their metabolic actions are controlled by thyroid, sexual and nervous hormone factors. Many of them are affected by obesity, which can be one of the reasons for the increase in cholesterol levels in obesity (13). TG levels are inversely related to HDL levels. Elevated TG and LDL levels are a major risk factor for cardiovascular disease. An overview of research on the effect of exercise on lipid profiles shows that, according to some researchers, exercise rarely affects TC and LDL levels, unless it is associated with weight loss (13). Various studies have investigated the effect of physical activities and exercises on cardiac risk factors. Various findings indicate a significant favorable effect on these factors by physical exercises (14, 15). However, there are also findings that reported no significant effect of physical exercises on cardiac risk factors (16-19). However, previous research has paid less attention to Pilates exercise. These exercises, which focus on and strengthen the mind and body, have recently attracted the attention of many people, and considering that it is done with mild intensity, the researcher thinks that it may have the same effects as aerobic exercises, especially when the training duration is long (for example, 40 minutes or more). The research results show that we need medium intensity and long duration exercises for the desired changes in the lipid profile and these risk factors (20). On the other hand, previous results show that intense exercises do not have a significant favorable effect on lipid profile (21). Therefore, Pilates exercise may be effective in this field.

In this regard, the aim of the present study was to investigate the effect of a Pilates training course on cardiovascular risk factors in overweight teachers.

Materials and methods

20 overweight teachers (body mass index 25 and above 25) with an age range of 30 to 40 years were purposefully selected and randomly assigned to two Pilates training and control groups (10 people in each group). Before starting the research, the nature, goals and risks of this study were explained to the subjects in a face-to-face meeting, and written consent was obtained from them to participate in this study.

After that, all pre-test variables, including blood biochemical factors and general characteristics, were measured. For each blood sample, C-reactive protein was measured by ELISA method using a commercial ELISA kit, Ontario Canada Company with a sensitivity of 10 ng / ml. Cholesterol, triglyceride, LDL and HDL were measured by colorimetric method using Biorox kit. Then the volunteers were randomly assigned to one of the control and Pilates groups. The Pilates training group participated in 8 weeks of Pilates training. During this period, the control group did not participate in any regular

physical activity program and only did their normal daily activities. After the end of the intervention period, the subjects were again measured before the exercises. In order to control the subjects' nutrition, they were given a written recommendation.

Subjects in the exercise group participated in 24 Pilates training sessions (for 45 to 60 minutes) for 8 weeks. In the first session, the basic principles of Pilates exercise were explained and general information about Pilates was provided to them. These basic principles were observed in all sessions. At the beginning of each session, after preparing the preparations for the training session, including: breathing control and how to stand correctly in Pilates class (about 5 minutes), it started with Pilates breathing and stretching exercises that were accompanied by the instructor's explanations (about 10 minutes). The continuation of the session was continued by performing specific moderated exercises (about 40 minutes). At the end of the class, cooling down and returning to the initial state was done (about 5 minutes). The exercises started from a low level and progressed gradually. The protocol used in this research was the selected exercises that were collected by the researcher from different texts and according to the capabilities of the people and were approved by the Pilates instructors. The exercise protocol included six components: warming up, strengthening the abdominal muscles, control and excitability of the spine, lateral stabilization, shoulder stabilization, back strengthening, hip stabilization, and thigh endurance. The intensity of exercises for each subject was controlled based on the tolerance threshold of exercise and pain. As the exercises continued, people did the exercises with more repetitions without feeling pain or fatigue. In this way, the exercises started with 8 repetitions and ended with 16 repetitions.

The statistical method of mixed analysis of variance was used to compare and examine the changes of variables between two groups at the level of $P \leq 0.05$. Also, SPSS version 16 statistical software was used to perform statistical calculations.

Results

The statistical method of mixed analysis of variance was used to compare and examine the changes of variables between two groups at the level of $P \leq 0.05$. Weight, body mass index, cholesterol, triglyceride and LDL in the Pilates group were significantly reduced compared to the control group ($P<0.05$), but HDL in the Pilates group did not change significantly compared to the control group ($P>0.05$).

Table1. The results of the mixed analysis of variance test

Variables	Groups	Pre	post	F	P
Weight (kg)	Pilates	72.30 ± 2.98	71.40 ± 3.02	10.80	0.004 *
	Control	69.80 ± 5.30	70.10 ± 5.50		
BMI (kg/m^2)	Pilates	25.98 ± 0.18	25.64 ± 0.27	7.05	0.016 *
	Control	25.68 ± 0.41	25.81 ± 0.53		
Cholesterol (mg/dl)	Pilates	200.33 ± 20.94	189.45 ± 20.76	12.004	0.003 *
	Control	194.31 ± 26.46	196.81 ± 25.59		
Triglycerides (mg/dl)	Pilates	154.84 ± 30.69	136.06 ± 29.81	9.69	0.006 *
	Control	146.78 ± 19.50	152.81 ± 26.79		
LDL (mg/dL)	Pilates	136.15 ± 20.38	125.72 ± 22.34	10.40	0.005 *
	Control	141.09 ± 15.04	142.34 ± 14.04		
HDL (mg/dL)	Pilates	121.91 ± 17.79	123.49 ± 17.20	0.075	0.78
	Control	144.54 ± 10.79	143.90 ± 11.11		

* Significant at the level of $P \leq 0.05$

Discussion

According to the findings of the present study, weight, body mass index, cholesterol, triglycerides and LDL in the Pilates group were significantly reduced compared to the control group, but HDL in the Pilates group did not change significantly compared to the control group. Many researchers have shown

that all types of exercise and sports activities have an effect on blood fats. Skumas et al. (2003) and Kin Isler et al. (2001) reported a decrease in triglyceride, cholesterol, and LDL, as well as an increase in HDL following physical training (23, 22). Kraus (2002) after some studies stated that high intensity and long distance have the greatest effect on the change of lipids and lipoproteins in blood serum (13). HDL has long been considered as the strongest predictor of coronary artery disease in all ages. It has been shown that its reduced levels are an independent and important risk factor for coronary disease (24). The effect of aerobic exercise on HDL levels has been reported in some researches, especially researches whose intensity is between 70% and 90% of the maximum heart rate (25). Probably, the lack of significant change in HDL in the present study is due to the low intensity of physical activity in Pilates. However, Linder et al. (1983) showed that HDL increases at any intensity of exercise (26). However, a threshold of physical activity intensity is probably required for HDL changes. Various other factors affect the changes in the amount of HDL in the blood of people that among them can mention the sex of the subjects, diet, drug use, and hereditary characteristics of the people. Physiologically, the cause of HDL increase can be attributed to factors such as the increase of lecithin cholesterol acyltransferase (LCAT, LPL) and the decrease of HTGL (hepatic lipase) activity (27). HDL is the main carrier of cholesterol ester hydroperoxide and when oxidized, it has a great capacity to reduce the total amount of lipo peroxide produced in LDL. In other words, the reverse transfer of cholesterol reduces the incidence of cardiovascular diseases. Therefore, increasing it has a great value (28). Different researches have presented different results of the effects of exercises. Donavan and colleagues (2005) have acknowledged the beneficial effects of moderate-intensity and long-distance exercise on reducing LDL and VLDL (28). William and colleagues (2002) have pointed out that LDL is more effective in intense aerobic exercise (29). Considering the consumption of fat as fuel during activity and during the return to the initial state, it seems to be one of the factors of reducing LDL and VLDL. Performing sports activity (exercises) increases the amount of lipoprotein type A and causes an increase in LPL enzyme. LPL also causes the catabolism of the lipid part of LDL. Therefore, LDL in the blood is expected to decrease (30). One of the factors of TG reduction may be the activity of LPL as a result of sports training (30). Total cholesterol has also been mentioned as one of the main cardiovascular risk factors in most researches. The reduction of triglycerides following exercise can be attributed to the response of lipoprotein lipase (LPL) to exercise.

Conclusion

In general, the results of the researches show that sports exercises, if they are within the threshold intensity and duration, can cause favorable changes in the lipid profile and cardiovascular risk factors, and probably Pilates exercise in the present study also has the threshold intensity and duration for teachers with extra The weight has been Therefore, overweight teachers can use this type of exercise to reduce their heart risk factors.

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