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Blood Lipid and Lipoprotein Profile of Female Athletes with Respect to Their Jobs and Nutrients Intake

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Abstract: There is general believe that exercise may results in changes that likely reduce the risk of developing cardiovascular disease and may slow the progression of established coronary artery disease. Chronic cardiovascular training results in changes in lipoproteins and apolipoproteins that reflect adaptation to the increased metabolic demands imposed by frequent, vigorous exercise. Moreover, the alterations in lipoproteins vary according to level of physical conditioning and intensity of exercise. One hundred three pre-menopausal physically active women ages 20-50 years old which have been exercising for at least 6 months involve in this study. Upon entering the study subjects were asked to complete questionnaire, regarding personal health and diet history (24 h recall plus 7 days food frequency list). Total calorie intake, level of carbohydrate, protein and fat in the subjects' diet were analyzed. In addition the concentration of women's plasma triglycerides, total cholesterol, LDL-C and HDL-C were also measured and compared with normal value. The results of the present study showed that, the mean total caloric intake of women were 1812.54 kilocalories, where their carbohydrate, protein and fat intake were 67.28, 12.83 and 19.89% of their total calories, respectively. The average age, weight, height and Body Mass Index (BMI) of the women involved in the study were, 30.81±8.87 years, 57.85±7.79 kg, 160.32±5.36 cm and 22.53±2.82 kg m^{-2}, respectively. Plasma lipid and lipoprotein concentration of women were also in normal range with the lowest in those who exercise for more than one year and physical education teacher.

Key words: Blood lipid, physically active, nutrient intake

INTRODUCTION

The recent interest concerning physical activity and its relation to health stems so much on the physiologic and biochemical events that occur during exercise (Powell *et al*., 1987). Research has shown that lack of physical activity is an important risk factor in the pathogenesis of atherosclerosis (Niebauer, 1997). On the other hand regular cardiovascular training improves circulation, making the heart a more efficient pump that maintaining the elasticity of arteries and tones the respiratory system (Kentor *et al*., 1978).

Endurance training increases the potential of the body to mobilize and to oxidize fatty acids (Nikkila *et al*., 1978). This adaptation may also influence the serum lipid and lipoprotein concentrations (Leon *et al*., 2002). Well trained men have a lower level of total triglycerides, very low density lipoprotein (VLDL), low density lipoprotein (LDL) and a high level of high density lipoprotein cholesterol (Durstine *et al*., 1994). With regular strenuous aerobic training and after exercise lipoprotein lipase (LPL) activity increases which enhances catabolism of VLDL remnants (Johansson *et al*., 1991). Similar data are also available in rats regular exercise is accompanied by several fold increases in lipoprotein lipase activity, suggesting that the utilization of serum triglycerides is improved with physical training (Austin *et al*., 1988). The aim of the present study is to determine the blood lipid and lipoprotein concentration of Shiraz physically active women with respect to their job and nutrients intake.

MATERIALS AND METHODS

One hundred three pre-menopausal women ages 20-50 years old which have been exercising for at least 6 months were served as subjects. A medical history was obtained and a physical examination was carried out by an independent physician at the beginning of the study. Participants then asked to complete questioner, regarding diet history (24 h dietary recall plus 3 day food frequency list). Total caloric intake, level of carbohydrate, protein and fat in subjects diet were also analyzed, using PDF

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soft ware. In addition fasting plasma triglycerides, total cholesterol, LDL-C and HDL-C concentration were also measured. Samples were proceeding in central laboratory of Motahari clinic.

Statistical analyses: ANOVA was performed to identify a significant differences, among the mean value of a variables measured. When ANOVA was significant, comparisons of the mean values were made by unpaired student t-test with Fisher's exact test correction.

RESULTS

The average age, weight, height and Body Mass Index (BMI) of the physically active women were 30.81±8.87 years, 57.85±7.79 kg, 160.32±5.36 cm and 22.53±2.82 kg m^{-2}, (Table 1). The results of the present study showed that, the mean caloric intake of physically active women were 1812.54 kilocalories, where their carbohydrate, protein and fat intake were 67.28, 12.83 and 19.89% of the total calories, respectively (Table 2). The concentration of total cholesterol, triglyceride and the major lipoprotein fractions, LDL-C and HDL-C are shown in Table 3. All blood indices were within normal range. The mean ratio of total cholesterol to HDL-C and LDL-C to HDL-C were 3.40 and 2.00, respectively (Table 3).

In professional office workers the mean lipid and lipoprotein level were similar to that of homemaker, on other hand the concentration of triglycerides and total cholesterol in physical education teachers were lower than in other two groups ($p<0.05$) (Table 4).

Highest value of HDL-C was observed in physical education teachers and the two lowest values were recorded in female professional office workers and home makers. Physical education teachers had the lowest LDL-C level where compared to the other groups ($p<0.05$).

Table 1: Mean of age, weigh, height and BMI of 103 female athletes

Variables	Mean	SD
Age (year)	30.81	8.87
Weight (kg)	57.85	7.79
Height (cm)	160.32	5.36
BMI (kg m^{-2})	22.53	2.82

Table 2: Nutrient intake of female athletes

Variables	Mean	SD	Percent	SD
Carbohydrate (gram)	304.80	73	67.28	3.14
Fat (gram)	40.60	21	19.89	2.20
Protein (gram)	58.20	30	12.83	1.70
Energy (kcal)	1812.54	446	100.00	---

Table 3: The lipid and lipoprotein profile of 103 female athletes

Variables	Mean	SD	Normal value
TG	105.14	46.86	40-200
Total chol. (mg dL^{-1})	153.15	41.91	125-250
HDl-C (mg dL^{-1})	55.83	10.15	29-80
LDL-C (mg dL^{-1})	106.01	38.56	65-175
Chol./HDL-C	3.40	1.05	---
LDL/HDL-C	2.00	0.90	---

Table 4: Blood indices of female athletes with respect to their jobs

Jobs variables	Home maker	Physical ED teacher	Office worker	p-value
	Mean±SD			
TG (mg dL^{-1})	117.00±53	91.00±37	98.00±23	0.094*
Chol. (mg dL^{-1})	198.00±45	158.00±27	160.00±32	0.007*
HDL (mg dL^{-1})	54.00±9	60.00±10	51.00±5	0.000*
LDL (mg dL^{-1})	119.28±40	89.70±26	90.35±35	0.007*
LDL/HDL	2.27±0.89	1.58±0.67	1.82±0.81	0.004*

*Significant with t-test

DISCUSSION

Chronic exposure to endurance activity are reported to be associated with increased plasma concentration of High Density Lipoprotein (HDL) cholesterol and decreased concentration of low density and very low density lipoprotein (Griffin *et al*., 1988; Kentor *et al*., 1987; Davis *et al*., 1992).

The present investigation demonstrates a normal plasma lipid and lipoprotein concentration in physically active women. Others have noted endurance athletes have elevated serum levels of high density lipoprotein cholesterol and lower level of triglycerides, total cholesterol and low density lipoprotein (Skinner *et al*., 1987). The subjects' total fat intake in this study was low which may have a relation with their serum lipid profile. A few researches, have suggested that lipoprotein lipase (LPL) may play a key role in acutely regulating lipid and lipoprotein metabolism during strenuous physical activity (Skinner *et al*., 1987; Tran *et al*., 1983; Wood *et al*., 1983). Lithell *et al*. (1984), suggested that muscle LPL activity is increased for at least 12 h after exercise. Kentor and his collogue reported that even an isolated prolonged exercise session may elevate post heparin plasma LPL activity (Kentor *et al*., 1987).

Elevated tissue LPL activity presumably adopts endurance athletes for the rapid and efficient utilization of lipid for energy during exercise and may also contribute to their increase in HDL-C and decreased triglyceride concentration (Kentor *et al*., 1984).

Although many studies have demonstrated an increase in HDL-C with an acute bout of exercise, thresholds of energy expenditure (Davis *et al*., 1992) and duration (Siegel *et al*., 1970) may also have a role too. Niebauer and his colleague, observed an improvement in total cholesterol, HDL-cholesterol and significant reduction in LDL-C concentration with 6 years regular physical activity. In the present study, serum lipid concentration of physically trained individual was within

the normal range. Present observation is in congruent with other studies that have shown the base line level of serum triglycerides (Williams *et al*., 1986) and LDL cholesterol are lower in physically active women.

In summary, this study demonstrates that regular physical training is capable of inducing retardation of the progression of coronary artery disease by reducing the serum lipid and lipoprotein concentration.

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