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Lipid Profile in Elite Jordanian Athletes of Different Competitive Sports

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Abstract: One of the important effects of exercise on human body is on the metabolic system especially on lipids elevated lipids and lipoprotein are risk factors for coronary heart disease. This study was conducted to evaluate the lipid profile among Jordanian top athletes according to gender. The sample included top athletes (males and females) participated in different national teams. One hundred twenty eight Jordanian top athletes 67 males and 61 females, mean age 18.6±1 years with training experience at least 5 years and with a minimal training load of twenty training hours per week participated in competitive different sports (aerobic, anaerobic and aerobic-anaerobic) were included in this study. Group of healthy male and female (control group), matched for age and gender was also included (n = 90). No subject revealed evidences of cardiovascular disease, diabetes (fasting glucose <7 mmol L^{-1}) or hypertension (blood pressure <130/80 mm Hg) when tested by specialized physicians. The lipid pattern included cholesterol, triglycerides, HDL-cholesterol and LDL-cholesterol. The results showed n significant differences appeared between the males and females in control, aerobic and anaerobic groups over the lipid profile variables except for triglycerides but significant differences p>0.05 appeared between the males and females groups in the aerobic-anaerobic group over the HDL-C and LDL. Researchers concluded that the most abnormalities observed on routine biochemical screening in male and female athletes are no clinical significance.

Key words: Cholesterol, triglycerides, HDL-C and LDL-C, lipid, gender

INTRODUCTION

Hyperlipidemia contributes significantly in the manifestation and development of atherosclerosis and Coronary Heart Diseases (CHD). Cardiovascular diseases including atherosclerosis are the most common cause of mortality and morbidity worldwide (Yokozawa *et al*., 2003). Atherosclerosis which includes Coronary Heart Disease (CHD), heart failure, stroke and peripheral arterial disease is one of the leading causes of death worldwide, accounting for 17 million deaths annually (AHA, 2004). Coronary heart disease is an important contributor to this statistic resulting in approximately 20% of all deaths throughout the world. In 2001, there were 7.1 million deaths from CHD and this figure is expected to reach 11.1 million in 2020 (AHA, 2004). Although, several factors such as diet rich in saturated fats and cholesterol, age, family history, hypertension and life style play a significant role in causing heart failure, the high levels of cholesterol particularly LDL cholesterol are mainly responsible for the onset of CHDs (Farias *et al*., 1996). Regular physical exercise is an important component in the prevention of some of the diseases of affluence such as heart disease, cardiovascular disease, type 2 diabetes, obesity and hypercholesteremia (Swain and Franklin, 2006; Murtagh *et al*., 2005). Serum lipid levels may be associated with age, gender, dietary habits and some primary genetic defects. Low cholesterol levels characterize some rare hereditary disorders such as abetalipoproteinemia, familial hypobetalipoproteinemia and chylomicrone retention disease. Furthermore, low plasma levels of TC with or without hypertriglyceridemia-4 0-have been frequently described in a variety of disorders. The main metabolic benefits of regular physical activity are a rise in High Density Lipoprotein Cholesterol (HDL-C) levels, a lowering of Triglycerides (TG) and low density Lipoprotein Cholesterol (LDL-C) levels and higher insulin sensitivity to fasting glucose. In addition, exercise training increases plasma clearance of postprandial lipoproteins such as chylomicrons (Mankowitz *et al*., 1992). Chylomicrons transport dietary lipids from the intestine into the systemic venous system. Endurance exercise also increases fat oxidation, enhances dietary TG turnover and increases HDL-C concentrations

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(Pasman *et al*., 1999). However, several studies found (Herd *et al*., 1998) that after the acute metabolic effects of exercise, i.e., 60 h after the last training session, there was no further effect of training on postprandial lipidemia, insulin sensitivity and Pl-LPL activity. Therefore, frequent exercise is needed to maintain metabolic benefits of endurance training (Hardman *et al*., 1998). Metabolic effects of training and 4 raining have been studied in obese (Halbert *et al*., 1999) sedentary (Motoyama *et al*., 1995) lean (Hickner *et al*., 2000) and aerobically fit subjects (Ziogas *et al*., 1997). Most sports are anaerobic in nature. Only the long term endurance sports such as cycling, swimming and running are largely aerobic (Ainslie *et al*., 2003).

The clinical utility of biochemical screening using multiple parameters has often been assessed in the general non-athletic population. A number of researchers have suggested that widespread screening should be performed in an effort to produce a set of normal ranges for elite athletes (Halbert *et al*., 1999; Hickner *et al*., 2000). Others have suggested that screening of some biochemical variables when athletes are in the rest state may be useful as a baseline for biochemical monitoring of training (Julia and Anne, 2007). It has also suggested that such monitoring may be useful in the prediction of the onset of overtraining (Lippi *et al*., 2006). The objectives of this study were to analyze the associations between the type of physical activity serum lipids. To the best of the knowledge no similar studies were carried before among Jordanian athletes.

MATERIALS AND METHODS

Experimental subjects: One hundred twenty eight Jordanian top athletes 67 males and 61 females, mean age 18.6±1 years with training experience of at least 5 years and with a minimal training load of 18 training hours per week participated in competitive different sports (Aerobic, aerobic-anaerobic and anaerobic) were included in this study. A group of healthy male and female adolescents (control group), matched for age and gender was also included (n = 120). No subject revealed evidences of cardio vascular disease, diabetes (fasting glucose <7 mmol L^{-1}) or hypertension (blood pressure <130/80 mm Hg) when tested by specialized physicians. All subjects submitted their written consents to a single blood sampling. Athletes included in this study represented all types of sport metabolisms aerobic (long distance swimming, long distance running), aerobic-anaerobic (football) and anaerobic (basketball, taekwondo, volleyball and short distance running).

Blood collection: Blood samples were drawn from antecubital vein early in the morning after 15-18 h rest and 12 h of fasting. Samples were collected in plain tubes from the athletes and control group and were then allowed to clot and then serum was obtained by centrifuging at 4000 rpm (Cenformix).

Methods: Cholesterol, triglycerides, HDL-C and LDL-C were examined after 15-18 h rest using commercial analytical kits from Sigma (St. Louis, Mo, USA).

Statistical analyses: Data were treated using SPSS. Means, standard deviations, t-test, Mann Whitney U test, one way ANOVA and multiple comparisons utilizing Tukey HSD test were calculated and used to describe and test mean differences among groups. A significance level of 0.05 was used throughout the whole study.

RESULTS AND DISCUSSION

The aim of this study was to evaluate the lipid profile among competitive Jordanian athletes. The sample included first class athletes who participated in different national teams. For evaluation the lipid profile, researchers measured the total cholesterol, triglycerides, HDL-C and LDL-C. Anthropometrical characteristics as age, weight, height and BMI of athletes from different sport disciplines are shown in Table 1. The levels of total cholesterol, triglycerides, HDL-C and LDL-C in athletes in different groups were measured. All the lipid profile variables measured for the experimental and control groups are in Table 2. The results of Table 2 revealed that there is significant difference in cholesterol levels between experimental group and control group (4.56±0.87, 3.94±0.65, respectively). Moreover, significant difference

Table 1: Means and standard deviations for age, weight, height and BMI for each group

Variables	Groups	N	Mean	SD
Age (year)	exp	60	18.43	2.32
	cont	60	18.63	1.75
Weight (kg)	exp	60	75.54	12.97
	cont	60	68.42	13.49
Height	exp	60	1.82	0.17
	cont	60	1.64	0.13
BMI	exp	60	24.53	2.75
	cont	60	24.16	3.62

Table 2: Results of comparison for the study variables between the 2 groups

Factors	Experimental group	Control group	p-value*
Cholesterol	4.56±0.87	3.94±0.65	0.000*
Triglycerides	1.63±1.24	0.66±0.19	0.000*
HDL	1.45±0.62	1.43±0.54	0.741*
LDL	2.18±0.65	2.07±0.64	0.395*

($p<0.5$) in triglycerides levels between females in the experimental group (1.63±1.24) and the control group (0.66±0.19) was found. In contrast to triglycerides the results of HDL, presents in Table 2, revealed that there is slight difference between the experimental and control groups with means 1.45±0.62 and 1.43±0.54, respectively.

According to Tukey HSD multiple comparison procedure the results in among the experimental subgroups are shown in Table 3. The clinical utility of biochemical screening using multiple parameters has often been assessed in the general non-athletic population. Athletes are usually thought to be physically.

The results for lipid profile (Table 2) showed that significant increase ($p<0.05$) appeared between the control and experimental groups over the total cholesterol and triglycerides. On the other hand, no significant differences were observed in HDL and LDL between control and experimental groups (Table 2). Differences between subgroups were noted. The aerobic-anaerobic group showed lower levels of triglycerides than the anaerobic group but higher levels of HDL than the anaerobic and aerobic groups. Anaerobic group showed lower HDL levels than both groups (Table 3). Numerous studies documented the relation of increased physical activity with an improved cardiovascular risk factor profile in adults. In particular these studies have shown the overall benefit of physical activity in reducing the risk of developing coronary heart disease, especially due to the reduction of arterial blood pressure levels (Pitsavos *et al*., 2002).

Inflammation and coagulation markers (Maron *et al*., 1996; Hu *et al*., 2001). Evaluated the effect of several types of physical activity on lipids levels. Particularly, they observed that compared to sedentary physically active men had a reduction that varied from 3-11%, in all lipids measurements. In women they also observed a reduction starting from 5-18%, in all lipids with the most significant reduction in triglycerides 18%. However, the results revealed that the benefits from different competitive sports on total cholesterol, triglycerides and LDL cholesterol levels could be explained by the reduction in body mass index and the decreased unbalanced food habits among elite Jordanian athletes. The findings are in accordance with several other observational studies (McHugh, 2003) that reported a no significant effect of physical activity on lipids levels by the exception of HDL cholesterol and triglycerides. Regarding the intensity of physical activity that is needed for a considerable lowering on lipids levels several investigators report that positive changes in HDL cholesterol levels observed in those who were highly exercised (Nikolaidis *et al*., 2003). Although, it is difficult to compare results among studies because different methods were used to classify physical activity levels, it is widely accepted that exercise affects blood cholesterol and other lipids in a positive way by regulating the metabolism of all lipids in the blood. Several studies demonstrate that exercise raises HDL-cholesterol in the blood. The data analyzed in the present study reveal that exercise training did not significantly alter plasma lipids. Exercise training has been variably reported to improve several risk factors for cardiovascular disease such as hypercholesterolemia, obesity, glycemic control and hypertension, factors that are also associated with endothelial dysfunction. Some early studies of exercise training in humans suggested that the improvement in endothelial function observed was secondary to amelioration of these coincident risk factors (Jimenez *et al*., 1996).

Table 3: One way ANOVA table for the physiological variables according to subgroups

Factors	Sum of squares	df	Mean square	F-value	Sig.
Cholesterol					
Between groups	1.997	2	0.999	1.922	0.153
Within groups	39.999	77	0.519	-	-
Total	41.997	79	-	-	-
Triglycerides					
Between groups	14.076	2	7.038	5.034	0.009
Within groups	107.650	77	1.398	-	-
Total	121.726	79	-	-	-
HDL					
Between groups	2.888	2	1.444	7.728	0.001
Within groups	14.386	77	0.187	-	-
Total	17.274	79	-	-	-
LDL					
Between groups	2.766	2	1.383	1.661	0.197
Within groups	64.106	77	0.833	-	-
Total	66.873	79	-	-	-

CONCLUSION

Researchers conclude that different competitive sports affect blood cholesterol and other lipids in a positive way by regulating the metabolism of all lipids in the blood and increased fat oxidation during training results in an adaptive mechanism for body weight maintenance. Also, increasing HDL-C level in males and females gymnasts has protective value against cardiovascular diseases such as ischemic stroke and myocardial infarction by carrying cholesterol from the body's tissues and remove cholesterol from atheroma within arteries and transport it back to the liver for excretion or re-utilization which is the main reason why HDL-bound cholesterol. Cholesterol is insoluble in blood but is transported in the circulatory system bound to one of the varieties of lipoprotein (HDL) as spherical particles which have an exterior composed mainly of water-soluble proteins. The future research will be concentrate on the study of the effects of some aerobic sports on lipid profile.

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REFERENCES

AHA, 2004. International cardiovascular disease statistics. American Heart Association. http://www.sld.cu/galerias/pdf/servicios/hta/international_cardiovascular_disease_statistics.pdf.

Ainslie, P., T. Reilly and K. Westerterp, 2003. Estimating human energy expenditure: A review of techniques with particular reference to doubly labelled water. Sports Med., 33: 683-698.

Farias, R.A.F., M.F.O. Neto, G.S.B. Viana and V.S.N. Rao, 1996. Effects of *Croton cajucara* extract on serum lipids of rats fed a high fat diet. Phytother. Res., 10: 697-699.

Halbert, J.A., C.A. Silagy, P. Finucane, R.T. Withers and P.A. Hamdorf, 1999. Exercise training and blood lipids in hyperlipidemic and normolipidemic adults: A meta-analysis of randomized, controlled trials. Eur. J. Clin. Nutr., 53: 514-522.

Hardman, A.E., J.E. Lawrence and S.L. Herd, 1998. Postprandial lipemia in endurance-trained people during a short interruption to training. J. Applied Physiol., 84: 1895-1901.

Herd, S.L., A.E. Hardman, L.H. Boobis and C.J. Cairns, 1998. The effect of 13 weeks of running training followed by 9 d of detraining on postprandial lipaemia. Br. J. Nutr., 80: 57-66.

Hickner, R.C., S.B. Racette, E.F. Binder, J.S. Fisher and W.M. Kohrt, 2000. Effects of 10 days of endurance exercise training on the suppression of whole body and regional lipolysis by insulin. J.Clin. Endocrinol. Metab., 85: 1498-1504.

Hu, F.B., J.E. Manson, M.J. Stampfer, G. Colditz, S. Liu, C.G. Solomon and W.C. Willett, 2001. Diet, lifestyle and the risk of type 2 diabetes mellitus in women. N. Engl. J. Med., 345: 790-797.

Jimenez, C., E. Pacheco, A. Moreno and A. Carpenter, 1996. A soldier's neck and shoulder pain. Phys. Sports Med., 24: 81-82.

Julia, B. and B. Anne, 2007. Hillery: Amenorrhea. The Female Athlete Triad. University of Oregon, Department of Human Physiology, 08-14.

Lippi, G., F. Schena, G.L. Salvagno, M. Montagnana, F. Ballestrieri and G.C. Guidi, 2006. Comparison of the lipid profile and lipoprotein (a) between sedentary and highly trained subjects. Clin. Chem. Lab. Med., 44: 322-326.

Mankowitz, K., R. Seip, C.F. Semenkovich, A.Daugherty and G. Schonfeld, 1992. Short-term interruption of training affects both fasting and post-prandial lipoproteins. Atherosclerosis, 95: 181-189.

Maron, B.J., J. Shirani, L.C. Poliac, R. Mathenge, W.C. Roberts and F.O. Mueller, 1996. Sudden death in young competitive athletes: Clinical, demographic and pathological profiles. JAMA, 276: 199-204.

McHugh, M.P., 2003. Recent advances in the understanding of the repeated bout effect: The protective effect against muscle damage from a single bout of eccentric exercise. Scand J. Med. Sci. Sports, 13: 88-97.

Motoyama M., Y. Sunami, F. Kinoshita, T. Irie and J. Sasaki *et al*., 1995. The effects of long-term low intensity aerobic training and detraining on serum lipid and lipoprotein concentrations in elderly men and women. Eur. J. Appl. Physiol. Occup. Physiol., 70: 126-131.

Murtagh, E.M., C.A. Boreham, A. Nevill, L.G. Hare and M.H. Murphy, 2005. The effects of 60 minutes of brisk walking per week, accumulated in two different patterns, on cardiovascular risk. Prev. Med., 41: 92-97.

Nikolaidis, M.G., M.D. Protosygellou, A. Petridou, G. Tsalis, N. Tsigilis and V. Mougios, 2003. Hematologic and biochemical profile of juvenile and adult athletes of both sexes: Implications for clinical evaluation. Int. J. Sports Med., 24: 506-511.

Pasman, W.J., W.H. Saris, E. Muls, G. Vansant and M.S. Westerterp-Plantenga, 1999. Effect of exercise training on long-term weight maintenance in weight-reduced men. Metabolism, 48: 15-21.

Pitsavos, C., D.B. Panagiotakos, C. Chrysohoou, P.F. Kokkinos and J. Skoumas *et al*., 2002. The effect of the combination of mediterranean diet and leisure time physical activity on the risk of developing acute coronary syndromes, in hypertensive subjects. J. Hum. Hypertens, 16: 517-524.

Swain, D.P. and B.A. Franklin, 2006. Comparison of cardioprotective benefits of vigorous versus moderate intensity aerobic exercise. Am. J. Cardiol., 9: 141-147.

Yokozawa, T., A. Ishida, E.J. Cho and T. Nakagawa, 2003. The effects of *Coptidis rhizome* extract on a hypercholesterolemia animal model. Phytomedicine, 10: 17-22.

Ziogas, G.G., T.R. Thomas and W.S. Harris, 1997. Exercise training postprandial hypertriglyceridemia and LDL subfraction distribution. Med. Sci. Sports Exerc., 29: 986-991.