ORIGINAL ARTICLE

Comparison of Lipid and Lipoprotein Values of Wrestlers and Soccer Players

Güreşçiler ve Futbolcuların Lipit ve Lipoprotein Değerlerinin Karşılaştırılması

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ABSTRACT

Objectives: The aim of this study was to compare the lipid and lipoprotein values of wrestlers and soccer players.

Materials and Methods: A total of 35 subjects, 17 male wrestlers who are sporting for 11.5 years and 18 male soccer player students who are sporting for 11.9 years, participated in this study. Triglyceride (TG), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C) levels were determined by Hitachi 717 autoanalyzer. To determine the differences between the wrestlers and the soccer players the independent t-test was performed.

Results: There was a significant difference in body weight and body mass index between the wrestlers and the soccer players (p<0.05). Moreover, there were significant differences in plasma TC, LDL-C, and HDL-C values between the wrestlers and soccer players (all, p<0.05). However, there was no significant difference in plasma TG values between the wrestlers and the soccer players (p>0.05). On the other hand, TC and LDL-C values of the wrestlers were significantly higher than soccer players (p<0.05). The HDL-C values of the soccer players were significantly higher the wrestlers (p<0.05). The ratio TC/HDL-C of the wrestlers was markedly higher than soccer players (p<0.05).

Conclusion: TC, TG, HDL-C, and LDL-C values of the soccer players were in better ranges than wrestlers. This situation can be caused by the effect of different sports branches as well as the training differences. The lipid and lipoprotein values of the wrestlers and soccer players showed that they do not carry a risk of cardiovascular disease. In addition, it can be recommended that wrestlers should do jogging or aerobic training in their daily regular training.

Key words: Wrestler, soccer players, exercise, blood

ÖZ

Amaç: Bu çalışmanın amacı güreşçilerin ve futbolcuların lipit ve lipoprotein değerlerinin karşılaştırılmasıdır.

Gereç ve Yöntemler: Bu çalışmaya 11,5 yıl spor yapan 17 erkek güreşçi ve 11,9 yıl spor yapan 18 erkek futbolcu öğrenci olmak üzere toplam 35 kişi katılmıştır. Trigliserit (TG), total kolesterol (TC), yüksek dansiteli lipoprotein kolesterol (HDL-C) ve düşük dansiteli lipoprotein kolesterol (LDL-C) düzeyleri Hitachi 717 otoanalizörü ile belirlenmiştir. Güreşçi ve futbolcu arasındaki farkları belirlemek için "bağımsız t" testi yapılmıştır.

Bulgular: Güreşçiler ile futbolcular arasında vücut ağırlığı ve vücut kitle indeksinde anlamlı fark bulunmuştur (p<0,05). Ayrıca, güreşçiler ve futbolcular arasında plazma TC, LDL-C ve HDL-C değerlerinde anlamlı farklılıklar tespit edilmiştir (tümü, p<0,05). Bununla birlikte, güreşçiler ve futbolcular arasında plazma TG değerlerinde anlamlı bir fark bulunmamıştır (p>0,05). Güreşçilerin TC ve LDL-C değerleri futbolculara göre anlamlı derecede yüksektir (p<0,05). Futbolcuların ise HDL-C değerleri güreşçilerden anlamlı derecede yüksek bulunmuştur (p<0,05). Güreşçilerin TC/HDL-C oranının futbolculara göre daha yüksektir (p<0,05).

Sonuç: Futbolcuların TC, TG, HDL-C ve LDL-C değerleri güreşçilerle karşılaştırıldığında, daha iyi sınırlar içerisinde bulunmuştur. Bu duruma spor branşındaki ve antrenmandaki farklılıklar neden olabilir. Güreşçilerin ve futbolcuların lipit ve lipoprotein değerleri, kardiyovasküler hastalık tehlikesi taşımadıklarını göstermiştir. Bununla birlikte güreşçilerin günlük düzenli antrenmanlarında koşuya veya aerobik antrenmana daha fazla yer vermeleri tavsiye edilebilir.

Anahtar kelimeler: Güreşçi, futbolcular, egzersiz, kan

INTRODUCTION

Physically inactive lifestyle and low levels of cardiorespiratory fitness lead to an increase in the risk of developing numerous chronic diseases as well as all-cause mortality.[1] In the middle-aged and older periods health problems occur more commonly such as high blood pressure, obesity, muscular weakness, postural disorders, diabetes, and risk factors for coronary artery disease. Studies have shown that increasing risk factors for coronary heart disease (CHD) are high cholesterol, triglycerides (TGs), and low-density lipoprotein cholesterol (LDL-C) levels and low high-density lipoprotein cholesterol (HDL-C) levels in blood lipids.[2] Both aerobic and anaerobic exercises can decrease total cholesterol (TC), raise HDL-C levels, and lower the TC/HDL-C ratio. The effect of exercise on LDL-C generally has been inconsistent and is regarded to be minor in magnitude. Among elite athletes, exercise continues to promote favorable lipoprotein profiles. Elevation in body mass index (BMI) has been associated with less favorable lipoprotein profiles, with an increased relative risk of CHD, as well as increased mortality due to cardiovascular diseases.[3] Studies support a significant incremental effect of exercise on blood lipids and lipoproteins in men. It has been reported that changes in HDL-C levels with exercise training were inversely related to baseline HDL-C levels. These findings suggested that individuals with the lowest HDL-C levels would exhibit the greatest increases in HDL-C with exercise.[4] The effects of physical activity on lipid and lipoprotein metabolism, TC, LDL-C, TG, and TC/HDL-C ratio significantly decreased after exercises. Therefore, in order to become fit and to keep healthy, activities such as fitness, aerobics, and jogging are important.[5]

There is substantial, consistent, and strong evidence that physical activity is a deterrent for developing many forms of cardiovascular disease (CVD). Many studies have shown that the cholesterol is related to CHD. LDL-/HDL-C ratio can show an increased rate of arteriosclerosis. Low blood levels of HDL-C are an independent risk factor for CVD.[6,7] Positive effects of applied long regular exercises on physical, physiological, psychological, and motoric features have been reported and one of the most important positive effects of regular exercise is on blood biochemistry. Regular and well-tuned intensity aerobic exercise reduces TC, LDL-C, TGs, and blood lipid levels, while increases HDL-C levels when estimated.[8] Wrestling and soccer involve very vigorous physical activity. It has also been pointed out that hypercholesterolemia and low levels of HDL-C were more pronounced in power sports (i.e. weight lifting, boxing, wrestling, and judo) and anaerobic sports (i.e. tennis, sprints and jumps, gymnastics, and ice skating).[9,10] Physical activity has a beneficial effect on the serum lipid profile. The recognition of the cardiovascular risk in a sedentary lifestyle and of the benefits of regular exercise has led to the promotion of sport as a means to improve health and prevent certain diseases. However, the response of the lipid profile to an exercise session or training program is different depending on the type of exercise undertaken, its intensity and frequency, the duration of each session, and the time spent in such a program.[11] A large number of epidemiological studies have revealed a relationship between dyslipidemia and the prevalence of atherosclerosis and CHD. Increased physical activity is associated with a reduction in the risk of CVD, but there is conflicting information about the optimal intensity and the amount of exercise necessary for this reduction.[12] Epidemiological studies suggest that individually measured and programmed physical activity and the implementation of primarily aerobic physical activity lead to increased concentrations of HDL-C and lowered TG, TC, and LDL-C. When the intensity of the workout is well controlled, the power consumption is a major factor affecting lipids and lipoproteins. Training leads to a series of adaptation, morphological, and functional changes at the level of the cardiovascular system and neuromuscular system, as well as lipids. Recent studies have shown that dosed individually and programmed physical activity leads to increases in the concentration of HDL-C, and decreasing TG, TC, and LDL-C.[13]

The aim of the present study was to compare lipid and lipoprotein values of wrestlers and soccer players and to investigate CVD risks. It is thought that there is a difference between the lipid and lipoprotein values of soccer players and wrestlers because they have differences in terms of branches and training. Soccer players do aerobic training in their regular training more than wrestlers do. This study is important in terms of comparing lipid and lipoprotein values of wrestlers and soccer players.

MATERIALS AND METHODS

Subjects

Seventeen male wrestlers who had done sports for 11.5 years and 18 male soccer players who had done sports for at least 11.9 years, a total of 35 subjects, participated in the present study. The wrestlers were university students and national athletes. The soccer players were college students playing in different leagues. Written consent was obtained from all the participants, who volunteered to participate in the present study.

Lipid and lipoprotein measurement

Blood samples were obtained from the antecubital vein of the subjects 48 h before exercise sessions. Fasting blood samples were taken in the morning. The samples were analyzed for TG, TC, HDL-C, and LDL-C. These levels were determined by Hitachi 717 autoanalyzer. Blood samples were taken within the scope of the ethic committee report of Ondokuz Mayıs University (report no: B.30.2.ODM.O.20.08/255).

BMI=Body weight (kg)/Height $(m)^2=(kg/m^2)$

Statistical analysis

The analysis was performed using SPSS version 22. The Kolmogorov-Smirnov test was used to evaluate the normality of parameters. Comparisons of age and height were used and to determine the differences between the groups independent t-tests were performed. Statistical significance was set at $p<0.05$.

RESULTS

The physical anthropometric and motoric characteristics of the wrestlers and soccer players are given in Table 1. The

serum lipid values are compared in Table 2. Table 3 shows the cardiovascular risk status of the participants.

DISCUSSION

Previous epidemiologic studies have demonstrated an increased risk of CHD and cardiovascular death with an increase in BMI.[3] Stevens et al.[14] found among healthy men that increasing BMI was associated with an increased relative risk of cardiovascular death, particularly among younger subjects. The Canadian Heart Health Surveys Research group reported an increased prevalence of dyslipidemia associated with an elevated BMI; a positive association between BMI and TC, LDL-C, and TG levels; and an inverse relationship with HDLC levels.[15] In another study, Garry and McShane[3] found comparing mean lipid values among

Table 1. Physical characteristics of the wrestlers and soccer players

Parameters	Wrestlers	Soccer players	t
Age (year)	23.72±1.87	24.10±1.75	0.07
Body height (cm)	174.43±6.72	174.16±6.81	0.10
Body height (kg)	75.80±11.3	69.49±9.6	2.96*
BMI (kg/m^2)	25.04 ±3.64	22.95±3.62	2.88*
Years of training	11.5±5.4	11.9±5.5	0.29

*p<0.05, BMI: Body mass index

Table 2. Comparison of serum lipid values of the wrestlers and soccer players

mg/100 cc	Groups	Mean	SD	t
TC	Wrestlers	177.69	12.34	3.67**
	Soccer players	163.34	12.60	
TG	Wrestlers	96.65	14.95	0.92
	Soccer players	94.25	12.14	
HDL-C	Wrestlers	54.72	3.82	2.16*
	Soccer players	57.45	3.39	
LDL-C	Wrestlers	132.63	15.43	2.68*
	Soccer players	119.47	15.33	

*p<0.05, **p<0.001, SD: Standard deviation, TC: Total cholesterol, TG: Triglyceride, HDL-C: High-density lipoprotein cholesterol, LDL-C: L-density lipoprotein cholesterol

Table 3. Risk of cardiovascular diseases of the wrestler and soccer players

mg/100 cc	Groups	Mean	SD	t
TC/HDL-C	Wrestlers	3.25	0.34	2.28*
	Soccer players	2.84	0.35	
LDL-C/HDL-C	Wrestlers	2.42	0.27	1.16
	Soccer players	2.08	0.30	

*p<0.05, SD: Standard deviation, TC: Total cholesterol, HDL-C: High-density lipoprotein cholesterol, LDL-C: L-density lipoprotein cholesterol

BMI categories demonstrated lower HDL-C (p<0.01), higher TGs (p<0.05), and higher TC/HDL-C ratios (p<0.001) with an increasing BMI in soccer players. In the present study, BMI for the wrestlers was higher than that for the soccer players. BMI was 25.14 kg/m^2 for the wrestlers and 22.95 kg/m^2 for the soccer players. There was a significant difference in body weight and BMI between the wrestlers and the soccer players (p<0.05). There was no significant difference between them in terms of age, body height, or years of training (p>0.05). The majority of studies showed that decreased TG, cholesterol, and LDL-C levels and increased HDL were the result of applied training when the severity, duration, and frequency of exercise were approved.[16] A study involving soccer training found decreases in LDL, cholesterol, and LDH levels and a statistically significant result was found.[17] The most important effect of exercise on the human body is on the metabolic system, especially lipids. Lipids and lipoproteins are risk factors for CHD.[13] Most cross-sectional studies indicate smaller, nonsignificant differences in TC and LDL-C levels between exercise-trained and sedentary individuals.[18,19] Aydoğan[16] found TG and HDL-C levels did not differ between wrestling groups. Imamoglu et al.[4] stated that there were no significant differences in plasma TC and TG values between their groups of wrestlers and students. No significant differences were found in HDL-C and LDL-C values between wrestlers and male students. In the present study, there were significant differences in plasma TC, LDL-C, and HDL-C values between the wrestlers and the soccer players (p<0.05, p<0.001). There were no significant differences in plasma TG values between the wrestlers and the soccer players (p>0.05). TC and LDL-C values of the wrestlers were significantly higher than those of the soccer players (p<0.05). HDL-C values of the soccer players were significantly higher than those of the wrestlers (p<0.05).

Koc[8] found significant reductions in exercise-induced TC, cholesterol, and LDL-C and increases in HDL levels. Labović et al.[13] reported that athletes had lower TC, LDL-C, and TG levels and higher serum HDL than nonathletes. Friedmann and Kindermann[19] found HDL-C levels higher in an endurance training male group than in an inactive group. A lot of studies report that aerobic exercises increase HDL-C levels. Exercise is a potential factor that may modify lipid profiles and therefore reduce the risk for CHD.[20] Imamoglu et al.[4] did not find HDL-C to be significantly different between their groups. Because male wrestlers perform mostly nonaerobic exercises and strength training, exercises like these did not increase the HDL-C levels. At the end of their study, which investigated the effects of aerobic exercise on blood lipids, it was found that the exercise had no effect on TG or cholesterol parameters, but caused an increase in HDL-C level and a reduction in LDL-C level.[21] In a previous study examining the effect of 6 weeks of wrestling and wrestling-technique-based circuit exercise on the plasma lipoprotein profile, it was shown that cholesterol and HDL decreased significantly.[22] Some research reports a lower HDL-C in power-anaerobic athletes.[4,23] When the literature was reviewed about the effects of exercise on plasma lipids and lipoproteins, the results indicated that moderate and low

intensity exercises are of great importance. These events show an increase in HDL-C, decrease in LDL-C, and increased protective effects against arteriosclerosis.[4] It has been identified that regular aerobic exercise reduces total blood cholesterol, serum TGs, and LDL-C and increases HDL-C.[23,24] In the present study, the soccer players were found to have better HDL-C levels than the wrestlers. This may be the result of intensive training and nutrition. It is suggested that wrestlers should do more running and aerobic training.

People who have HDL-C cholesterol levels under 40 mg/100 cc have more than three times the risk of cardiovascular diseases than people who have high HDL-C levels.[18] The periodic risk of heart disease can be estimated by dividing TC by HDL-C. As a result of the estimation 4.5-5 levels show important CVD risk, while 3.8-4 levels show low CVD risk.[25] Another study reported that the risk factor is high if the TC/HDL-C ratio is higher than 5 and low if the ratio is lower than 3.5.[24] Imamoglu et al.[4] mentioned that the lipid and lipoprotein values of their four groups indicated that individuals in the exercise groups would not be exposed to the danger of cardiovascular diseases. The cardiovascular risk ratio of wrestlers is higher than that of other groups. Athletes engaging in aerobic sports at a high level are particularly favored with respect to their low overall risk of CHD and, in particular, to their highly favorable plasma lipoprotein pattern.[26] High-intensity aerobic training results in improvement in HDL-C.[2,27] Studies of large populations of men have shown that those who exercise at a moderate or strenuous level have a lower incidence of CHD. The effect of exercise has been shown in controlled studies to raise HDL-C levels, lower TG, and lower the TC/HDL-C ratio.[3] A training program that emphasizes strength, power, speed ability, resistance, explosive movements, and interval sprints can result in undesirable health and fitness consequences for the participants in power-anaerobic based sports.[22] Garry and McShane[3] demonstrated that the strongest relationship between BMI and lipoprotein levels occurred between BMI and the TC/HDL-C ratio. Wrestling is categorized as a power-anaerobic based sport on the basis of its nature of practice and competition times.[22] In the present study the cardiovascular risk ratio (TC/HDL-C) was 3.25 mg/100 cc for the wrestlers and 2.84 mg/100 cc for the soccer players. The LDL-C/HDL-C was 2.42 mg/100 cc for the wrestlers and 2.08 mg/100 cc for the soccer players. In the present study, it is meaningful that the TC/HDL-C ratio of the wrestlers was higher than that of the soccer players (p<0.05). There was no significant difference in the LDL-C/HDL-C ratio between the wrestlers and the soccer players (p>0.05). The TC/HDL-C and LDL-C/HDL-C ratios for the wrestlers were higher than those for the soccer players. This can be attributed to the fact that the training form of the wrestlers is more anaerobic than that of the soccer players. Wrestlers and soccer player with the highest BMIs and elevated TC/HDL-C ratios may be those at greatest risk for future CVD, regardless of their TC or LDL-C values.

CONCLUSION

The TC, TG, HDL-C, and LDL-C of the soccer players were better than those of the wrestlers. This situation can be caused by branches and training differences. This result shows that between wrestlers and soccer players there were differences in lipid and lipoprotein levels. The lipid and lipoprotein values of the wrestlers and soccer players showed that they are not at risk of cardiovascular disease. In addition, it is recommended that wrestlers should do jogging or aerobic training in their daily regular training.

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