



**International Journal of Biology, Pharmacy
and Allied Sciences (IJBPAS)**

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

**INVESTIGATION OF CARDIOVASCULAR RISK FACTORS OF PHYSICAL
ACTIVITIES IN ANCIENT ATHLETES AND CYCLISTS**

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ABSTRACT

The aim of this study was to investigate differences between risk factors for cardiovascular and immune system with sports among cyclists and ancient athletes. Subjects were 30 male athletes (15 person ancient athletes with average age of 31.26 ± 3.654 , height 178.13 ± 2.996 , weight 89.93 ± 9.844 and (15 person cyclists with a mean age of average age of 31.60 ± 3.157 , height 172.66 ± 3.177 , weight 79.73 ± 9.617 that participate voluntarily in this research. This study was retrospective and Subjects had at least three years of professional experience in the fields of sports were mentioned above. The subjects' blood samples were taken at one stage. Statistical analysis of research data were done by independent t method. And significance level $P < 0.05$ was considered. The results showed that the factors discussed in ancient athletes and cyclists in the amount of reactive protein C ($p < 0.004$) was significant, but in the amount of low-density lipoprotein ($p < 0.75$), high-density lipoprotein ($p < 0.66$), cholesterol ($p < 0.37$) and triglyceride ($p < 0.06$) was not significant. According to the results of this study, aerobic exercise cause to decrease the serum lipoprotein's level by effect on lipoprotein lipase enzyme.

Keywords: low-density lipoprotein, cholesterol, triglyceride, high-density lipoprotein, ancient athlete, cyclist, CRP

INTRODUCTION

Vascular stiffness is one of the factors in causing atherosclerosis, is high cardiovascular diseases. The most important concentration of cholesterol in the blood

plasma in the form of Low-density lipoproteins. Lipoproteins are considered as the major transporter of blood lipids. Lipoproteins are divided into based on density:

1- high-density lipoproteins that have the lowest amount and carry cholesterol to the liver from the walls of vessels to convert it into bile salts. These bile salts formed in the body pour into intestine and they are disposed through excrement.

2- Low-density lipoproteins that carry 60 to 80 percent of plasma cholesterol and they show greater tendency to stick to walls of arteries.

Deposit of cholesterol in the walls of arteries leads into growth of smooth muscle cells in the arteries wall below the sediment and absorption of fibroblasts, and if this happens in the blood-carrying coronary vessels to heart tissue, it may prevent from adequate oxygen supply to the heart tissue that causes necrosis in the area heart. Inflammation is also an important feature in the emergence of diseases and development of atherosclerosis damage and inflammatory responses in the early development of plaque at the beginning of discussed arteriosclerosis. Growing evidence suggests that the expansion cardiovascular disease paves the way for inflammation, and inflammation plays a

central role in the development of atherosclerosis. Considering these results, researchers have focused mainly on the inflammatory markers as predictors of cardiovascular disease.

While there are several inflammatory markers, C-reactive protein has been introduced as the most sensitive inflammatory marker of a strong independent predictor of cardiovascular risk that its increase is associated with an increase of 2 to 5 times of heart events (1). Regular physical activities play an important role in improving cardiovascular system, and leaving exercise or physical activities and inactivity remove the advantages related to these activities and body is exposed to the risk of cardiovascular diseases (1).

Regular aerobic exercises, such as walking, slow running, swimming and cycling can have positive impact on lipid and lipoprotein levels, although anaerobic exercise cannot have similar impacts as aerobic exercise do (2).

Research findings have shown that exercise can increase beneficial blood fat that is high-density lipoprotein. Increase of high-density lipoprotein prevents from cholesterol deposits inside arteries. On other hand, doing exercise or physical activity, especially aerobic exercise, causes greater metabolism

of fat, and therefore more fats are used to supply energy (3). Studies show that physical activity, proper care and regular medical checkups are among the factors that increase the life span and improve the life quality of humans (4). Coronary artery disease is one of the manifestations of atherosclerosis phenomenon. It is also responsible for most heart attacks, strokes, kidney failure, and peripheral artery disease that usually lead into gangrene and amputation if it happens in the hands and feet. Coronary heart disease is the most important cause of death in industrialized and developing countries. In the United States, approximately two million cases of myocardial infarction and unstable angina occur per year, leading to 515,000 deaths (5).

Atherosclerosis is the most common cause of coronary heart disease and it is the main cause of heart ischemic diseases as a result. That is why the number of heart attack cases is increasing due to aging and the presence of other risk factors such as hypertension, smoking and diabetes. In addition, inflammatory cells and their mediators play role in the development, progression and complications of atherosclerotic lesions. C-reactive protein is one of the acute phase proteins, and it is a systemic marker of inflammation, that its amount increases due

to inflammation, infection and collagen vascular diseases.

The increase of C-reactive protein is faster than other acute phase reactants, and its decrease occurs faster after removing stimulating factor (6). Some researchers investigated the impact of exercise distance or consumed calories on some cardiovascular risk factors and reported that there was a positive relationship between them. In addition, intensity of exercise that may increase by increasing exercise time or frequency of exercise steps has impact on this interaction.

Most of studies investigated the impact of physical and architectural weekly or daily exercise sessions on the fitness and risk factors indicate that there is no scientific evidence that how much daily or weekly exercise increase fitness and reduce risk factors. In addition, no researcher has studied the effect of the number of exercise sessions per week on the inflammation, while most of studies have investigated the impact of intensity of exercise on the risk factors of blood fats. Considering the points discussed above, this study aims to examine the impacts of exercise sessions of cycling on some cardiovascular indicators exercise and it compares the two exercises with each other

and finds proper solutions to improve their physiological indicators.

METHODOLOGY

Participants

The research is causal in terms of data collection method. It is also applied in terms of goal of study. The population of this study was 120, 60 of them were ancient athletes and 60 of them were cyclists of Jahrom city. Thirty samples (15 ancient athletes) and (15 cyclists) were selected on a voluntary basis.

Apparatus

Digital scale for weighing

Wall stadiometer to measure height

Syringe for bloodletting

Centrifuge machine

Eliza machine

Procedure

In order to collect information, the weight of fasting people, with a minimum of clothing, was measured by digital scale. Height of participants was measured in a standing position in a way that heel and calf were tangent to the wall, and none of them put on shoes. Then, body mass index was calculated. Participants of this study had at least 3 years of experience in professional sports. Having examined and ensured the competence of individuals to participate in this study, 10 cc of venous blood was taken from left hand of participants in a morning,

while they were fasting. Then, investigated factors (low-density lipoprotein, high-density lipoprotein, triglycerides, cholesterol and C-reactive protein) were assessed.

Analysis

To investigate descriptive statistics and draw tables, descriptive and inferential statistics were used. To determine the normal distribution of data, Kalmogorof- Smiranov test was used, and independent t-test was used to examine the relationship between cardiovascular risk factors and type of physical activity at the significant level 0/5.

RESULTS

In Table 4.2, the results of the inter-group comparison of variable of the serum total cholesterol among the ancient athletes and cyclists have been provided. Results of independent t-test indicated that the differences of serum total cholesterol variable were not statistically significant among two different groups of athletes [$t(28)=0/89$ and $p=0/37$]

In Table 4.3, the results of the inter-group comparison of variable of the serum triglyceride among the ancient athletes and cyclists have been provided. Results of independent t-test indicated that the differences of serum triglyceride variable were not statistically significant among two

different groups of athletes [$t(28)=1/93$ and $p=0/06$].

In Table 4.4, the results of the inter-group comparison of variable of low-density lipoprotein cholesterol among the ancient athletes and cyclists have been provided. Results of independent t-test indicated that the differences of low-density lipoprotein cholesterol variable were not statistically significant among two different groups of athletes [$t(28)=0/31$ and $p=0/75$].

In Table 4.5, the results of the inter-group comparison of variable of high-density lipoprotein cholesterol among the ancient

athletes and cyclists have been provided. Results of independent t-test indicated that the differences of high-density lipoprotein cholesterol variable were not statistically significant among two different groups of athletes [$t(28)=0/44$ and $p=0/66$].

In Table 4.6, the results of the inter-group comparison of variable of C-reactive protein among the ancient athletes and cyclists have been provided. Results of independent t-test indicated that the differences of C-reactive protein variable were statistically significant among two different groups of athletes [$t(28)=3/17$ and $p=0/004$].

Table 4-1: Descriptive characteristics of subjects and variables of study divided into ancient athletes (n=15) and cyclists (n=15)

variable	group	mean	Standard of deviation
Age (year)	Ancient athletes	31.26	3.65
	cyclists	31.60	3.15
Body mass (kg)	Ancient athletes	89.93	9.84
	cyclists	79.73	9.61
Height (cm)	Ancient athletes	178.13	2.99
	cyclists	172.66	3.17
Serum total cholesterol (mg.dl ⁻¹)	Ancient athletes	210.13	48.09
	cyclists	197.33	27.19
Serum triglyceride (mg.dl ⁻¹)	Ancient athletes	135.93	42.56
	cyclists	165.46	40.94
High-density lipoprotein cholesterol (mg.dl ⁻¹)	Ancient athletes	39.06	6.94
	cyclists	40.47	10.16
low-density lipoprotein cholesterol (mg.dl ⁻¹)	Ancient athletes	134.66	35.09
	cyclists	138.23	26.82
C-reactive protein	Ancient athletes	1.80	.77
	cyclists	3.00	1.23

Table 4-2: Comparison of serum total cholesterol among ancient athletes (n=15) and cyclists(n=15) ($p \leq 0/05$)

variable	group	mean	Standard of deviation	Means difference	Degree of freedom	Value of t	significance
Serum total cholesterol (mg.dl ⁻¹)	Ancient athletes	210.13	48.09	12.80	28	0.89	0.37
	cyclists	197.33	27.19				

Table 4-3: Comparison of serum triglyceride among ancient athletes (n=15) and cyclists (n=15) ($p \leq 0/05$)

variable	group	mean	Standard of deviation	Means difference	Degree of freedom	t value	significance
serum triglyceride (mg.dl ⁻¹)	Ancient athletes	135.93	42.56	29.53	28	1.93	0.06
	cyclists	165.46	40.94				

Table 4-4: Comparison of low-density lipoprotein cholesterol among ancient athletes (n=15) and cyclists (n=15) ($p \leq 0/05$)

variable	group	mean	Standard of deviation	Means difference	Degree of freedom	t value	significance
low-density lipoprotein cholesterol (mg.dl ⁻¹)	Ancient athletes	134.66	35.09	3.56	28	0.31	0.75
	cyclists	138.23	26.82				

Table 4-5: Comparison of high-density lipoprotein cholesterol among ancient athletes (n=15) and cyclists (n=15) ($p \leq 0/05$)

variable	group	mean	Standard of deviation	Means difference	Degree of freedom	t value	significance
high-density lipoprotein cholesterol (mg.dl ⁻¹)	Ancient athletes	39.06	6.94	1.40	28	0.44	0.66
	cyclists	40.47	10.16				

Table 4-6: Comparison of C-reactive protein variable among ancient athletes (n=15) and cyclists (n=15) ($p \leq 0/05$)

variable	group	mean	Standard of deviation	Means difference	Degree of freedom	t value	significance
C-reactive protein	Ancient athletes	1.80	.77	1.20	28	3.17	0.004
	cyclists	3.00	1.23				

DISCUSSION

The results showed that the comparison between low-density lipoprotein in the ancient athletes and cyclists is not significant ($p < 0/75$). Results of the study are consistent with results of studied that have been conducted by Gholipour and Tabrizi (2012), Azerbaijani and Abedi (2012), Alijani et al (2002) and Asad (2012), (7-10). The reason for this consistency may be cases such as age and type of training provided to participants. The results of this study are not in line with

results of studies conducted by Taghizadeh et al (2009). The reason of this inconsistency can be cases such as using different research methods (being causal) and subjects of study were not athlete.

Low-density lipoproteins normally carry 60 to 80 percent of plasma cholesterol. By doing aerobic exercises, body's endocrine hormones system can increase fat oxidation by increasing epinephrine, norepinephrine, growth hormone, and cortisol. It also can use fat acids as fuel.

Aerobic exercises use fat as the main source of energy production. Therefore, low level of low-density lipoprotein can be due to its effect on body fat percentage because of using fat as a main source of energy (Suri et al., 2011), (11). This is probably due to the presence of aerobic exercises strength exercises in the exercise program of athletes that these exercises increase fat oxidation by increasing the epinephrine, norepinephrine, cortisol, and growth hormone. According to the results of this hypothesis, it is recommended to athletes to use aerobic exercises for the sake of their cardiovascular health.

The results showed that the comparison between high-density lipoprotein in ancient athletes and cyclists is not significant ($p < 0/66$). The results of the investigation are consistent with results of studies carried out by Gholipour and Tabrizi (2012), Arazi et al (2012), Suri et al (2007), Ahmadi (2012) and Kang et al (2009), (7, 12- 14). The reason for this consistency could include things such as the number and type of physical activity. The results of this research are not consistent with results of study conducted by Taghizadeh et al (2009). This inconsistency may relate to type of comparison exercise and method of research. Doing physical activities, especially aerobic exercises, can lead to an increase in

beneficiary blood fat that is high-density lipoprotein. Increasing high-density lipoprotein prevents from cholesterol deposition in the artery. On other hand, doing physical activities, especially aerobic exercises, increases the further fat metabolism by increasing of lipase hormone. As a result, high level of fats is used to supply energy (3). Those who are doing stable and permanent exercise have high-density lipoprotein cholesterol than those who do not have any exercise.

Exercise increases serum high-density lipoprotein capacity and certainly changes RCT. It also makes clear that the RCT is a complex mechanism that involves great number of interactions, and high-density lipoprotein may be a small part (component) of mechanisms responsible for decreasing the risk of heart disease. According to the results of this study, the inter-group comparison of ancient athletes group with cyclists group is not significant, probably because of this fact that ancient athletes have combined strength –power exercised in their professional life. As both groups are professional athletes, doing sport activities, especially aerobic exercises, can increase high-density lipoprotein. Based on results of this hypothesis, it is recommended to coaches and Sport Federations that constantly include

aerobic exercises in the exercise program of athletes in order to increase the activities of enzymes of lipolytic cycle and its positive impact on serum lipids of athletes.

The results showed that comparison of cholesterol in the ancient athletes and cyclists is not significant ($p < 0.37$). The results of this study are in line with studies conducted by Mora et al (2006), Nicou et al (2009) and Diorestin et al (2002), (15-17). However, results of this study are not consistent with results of studies carried out by Gurra et al (2007), (18). This lack of consistency can relate to gender of subjects and different exercise or training methods.

Cholesterol presents in the diet of all people and it can be slowly absorbed into intestinal lymph from gastrointestinal system and be synthesized by the liver. It is usually transferred by lipoprotein packages such as low-density lipoprotein and high-density lipoprotein in the body. Energy used by fats reduce total cholesterol amount by activating mediator of lipoprotein lipase and fatty acid oxidation (13).

According to the results of this study, the comparison between ancient athletes group and cyclists is not significant that is probably due to nutritional habits of professional athletes and less use of fat and regular participation of professional athletes,

including ancient athletes and cyclist, in aerobic exercises to burn fat. As a result, it has caused that sensitivity of isolated fatty tissue increase to lipolytic stimulus by isoproterenol and epinephrine that one of its results is the reduction of blood cholesterol. According to the results of this hypothesis, it is recommended to coaches and athletes to use aerobic exercises and using appropriate meal plan in order to increase their cardiovascular health.

The results showed that the comparison between triglycerides in ancient athletes and cyclists is not significant ($p < 0.06$). Results of this study are consistent with results of study conducted by Suri et al. (2007), Lynn Wolfe (2006) and Gaeeni et al (2012) are consistent (13, 19, 20). This consistency can be justified by this fact similar exercises may be used and the subjects were young. However, these results are not consistent with results of studied conducted by Azerbaijani et al (2012) and Ghanbari-Niaki et al (2010), (8, 21). Lack of consistency can back to type of training and research methods. A large amount of carbohydrate used at each meal is converted into triglycerides, and it is stored. Then it is used to produce energy in the form of fatty acids released from triglycerides. While doing exercise and physical activities, adrenaline and glucagon, that are released

from adrenal glands and islets of Langerhans respectively, activate and lipoprotein lipase. Therefore, fatty acids released from triglycerides, are delivered to muscle tissue in the form of FFT through bloodstream and from of intracellular fat sources. According to the results of this hypothesis, it is recommended to professional athletes to use appropriate training plan to burn fat in order to further use of their muscle cells.

The results showed that the comparison between C-reactive protein in the ancient athletes and cyclists is significant ($p < 0/004$). The results of the study are consistent with results of study conducted by Hoffman et al (2007), Dabidi Roshan et al (2009) and Gaeini et al (2012), (22, 3, 20). Its reason may back to age and gender of subjects. However, results of this study are not in line with results of study conducted by Isasi et al (2003), (23) Its reason may back to differences in the training comparison and type of test.

C-reactive protein, as a reactive protein of the acute phase, increases in the process of inflammation, stress, infections, and physical activity. As atherosclerosis is an inflammatory in the early stages of process and inflammatory events are involved in its creation, the amount of C-reactive protein also increases in this process. An intense

exercise increases levels of C-reactive protein for the first few days and then a chronic suppression occurs. Based on results of this study, the comparison between ancient athletes group and cyclists group indicated that cyclists group enjoys higher C-reactive protein than other group. Its reason may be presence of strong and intense exercises and high pressure of exercises, and much time of exercise in the cyclists group than other one. The mentioned reasons have increased the C-reactive protein level among the cyclists.

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