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Research Article

Comparison of lipid profile in physically trained adults and sedentary adults

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Abstract: The incidence of diseases like angina pectoris, myocardial infarction, hypertension and cerebrovascular is increasing nowadays. The high blood lipid level is found to be the main cause of atherosclerosis. Present study is undertaken with the aim to evaluate the effect of physical training on BMI, Waist-hip ratio and lipid profile. Our research is focussed to study the Effect of Physical Training on Serum Lipids in physically trained adults and sedentary adults. To compare lipid profile between physically trained adult and sedentary adult. The study was conducted on 50 male physically trained adults and 50 male sedentary adults in the age group between 30-40 years. Following parameters were evaluated: Total cholesterol, Triglycerides, HDL, LDL and VLDL. There is statistically highly significant decrease in BMI, Waist-hip ratio, total cholesterol, triglycerides, LDL- C, VLDL- C, and highly significant increase in HDL- C in physically trained adults as compared to sedentary adults. From the results, it is concluded that combination of aerobic exercise and games causes highly significant decrease in total cholesterol, TG, LDL- C, VLDL-C and increase in HDL-C. Thus, combination of aerobic exercise and games is more beneficial instead of only aerobic exercise and hence should be recommended.

Keywords: lipid profile, cholesterol, LDL, HDL, Aerobic Exercise, sedentary.

Introduction

Coronary heart disease is the greatest killer of human being in modern age. It causes 25-30% of deaths in most of the developing countries. In India number of deaths due to coronary heart disease increased from 1.17 million in 1990 to 1.59 million in 2000 (1). The main patho-physiological change in most of these diseases is atherosclerosis of blood vessels which leads to further complications(2) It is accepted that high levels of total cholesterol (TC), total triglycerides (TG), low density lipoprotein (LDL-C) and low level of high density lipoprotein cholesterol (HDL-C) are the risk factors for coronary heart disease which in turn depends upon intrinsic factors such as age, genetic heritage, gender and other factors such as diet, overweight, obesity, smoking, psychological stress and sedentary life style (3). Physically trained adults means subjects who are doing exercise daily for half an hour at least for six months and sedentary adults are office, business workers who are not doing any active exercise. The present study is undertaken with the aim to evaluate the effect of physical training including aerobic exercises and games on lipid profile. This study has done to know what is effect of physical training on lipid profile in central India which is unfocused part of India regarding such study.

Objectives:

- To Study the Effect of Physical Training on Serum Lipids in physically trained adults and sedentary adults.
- To compare lipid profile between physically trained adult and sedentary adults.

Materials and Methods

The study was conducted in 50 physically trained adults and 50 sedentary adults and was conducted in the department of biochemistry at Government Medical College Miraj. Institute ethical committee approval was obtained. volunteers who wished to participate in the study reported to Biochemistry department. informed written consent was taken from volunteers. It was conducted from January 2011 to December 2011. All the subjects who participated in this study ware selected by certain inclusion and exclusion criteria.

Physically trained adults means, subjects who are doing exercise daily for half an hour at least for six months. they had undergone 6 months of physical training for 45 minutes daily. the training was taken in morning time from 6 a.m. to 6.45 a.m. it included warm up section, running and any 2 games from various games like volleyball, football, cricket, handball, basketball etc. Sedentary adults means they are not doing any physical exercise e.g. office, business workers.

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Inclusion criteria

Age groups:

a. Males between 21 to 30 years of age performing physical training.
b. Males between 21 to 30 years of age not performing any type of physical training or exercise**.**

Diet: Vegetarian (diet affects lipid profile.)

Occupation: Physically trained student's means subjects doing exercise daily for half an hour at least for 6 months. and sedentary office / business workers and medical college students.

Socio Economic status: Upper middle and lower middle socioeconomic class.

Exclusion criteria

Subjects with history of

a. Smoking, drinking alcohol, tobacco chewing.
b. Diabetes mellitus, hypertension or family history suggestive of coronary heart disease.
c. Any major illness.
d. Taking drugs, which are known to affect lipid metabolism.

An evaluation of the following parameters was done in physically trained adults

Lipid profile

Total cholesterol, Total triglycerides, HDL Cholesterol, LDL Cholesterol, VLDL Cholesterol. Erba Cholesterol kit was used manufactured by Transasia Bio-medicals Ltd.

Various reagents were supplied in the kit that involved Cholesterol reagent was prepared by dissolving reagent 1 into 10 ml of Aqua-4. The composition of cholesterol reagent after reconstitution. For taking readings, first blank was aspirated followed by standard tests. Absorbance of standard and each test tube was recorded against blank at 505nm or 505/670 nm. It directly displayed results. The color developed at the end of the test was stable for 30 minutes when protected from light and contamination.

Method of estimation of HDL Cholesterol (Phosphotungstic acid method, end point)

Liquixx HDL Cholesterol Kit was used manufactured by Transasia Bio-medicals Ltd.

In the kit, Reagent 1 and HDL-C standard was provided. Mixture was mixed well and incubated for 10 minute at 37^0C. Readings were taken of standard and each test at 505 nm or 505/670 nm with semi-auto analyzer against reagent blank.

Method of estimation of Triglycerides (Enzymatic calorimetric method)

Autopak triglyceride kit was used manufactured by Bayer diagnostics India Ltd. TG reagent was reconstituted by dissolving the contents of one bottle of reagent 1 with one bottle of reagent 1A. The mixture was incubated for 5 minutes at 37^0C. The readings were taken with the semi-autolyser.

Estimation of LDL-Cholesterol

By using Friedwald formula[4]

LDL-C = Total Cholesterol-[(HDL-C) – (Triglycerides/5)]

It is valid for triglycerides level < 400 mg/dl. When > 400 mg/dl the calorimetric enzymatic method is used.

Estimation of VLDL- Cholesterol

By using the formula[5]

VLDL= Triglyceride/5

Normal values

Total Cholesterol		140- 250 mg/dl
Triglycerides	(Males)	60- 165 mg/dl
	(Females)	40- 140 mg/dl
HDL Cholesterol	(Males)	30- 65 mg/dl
	(Females)	35- 80 mg/dl
LDL Cholesterol		80- 170 mg/dl

Statistical analysis

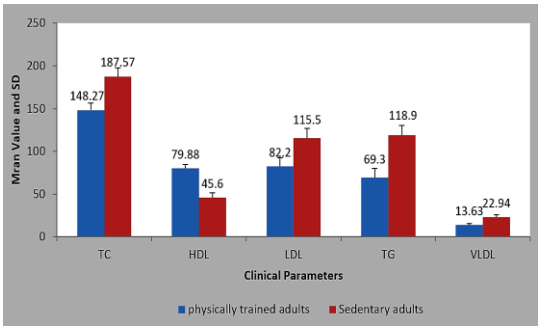
The present study is of comparative type. Statistical Technique is Purpose Random Sampling the data were analyzed by SPSS software and presented by percentage, mean and standard deviation. Unpaired t test was applied as test of significance, wherever applicable.

Results

Table **sh**ows statistically highly significant (P< 0.01) decrease in Total cholesterol, TG, LDL-C, VLDL-C and increase in HDL-C in physically trained adults as compared to that with sedentary adults.

Table: Comparison of Lipid profile in physically trained adults and sedentary adults

Test	Physically trained adults		Sedentary adults		't' test	Significance
	Mean	S.D.	MEAN	S.D.		
Total cholesterol (mg/dl)	148.27	8.22	187.57	9.92	21.57	P<0.001 **Highly significant**
HDL-C (mg/dl)	79.88	4.74	45.60	5.78	32.41	P<0.001 **Highly significant**
LD L-C(mg/dl)	82.2	10.6	115.5	11.3	15.20	P<0.001 **Highly significant**
TG	69.3	11.0	118.9	11.6	21.7	P<0.001 **Highly significant**
VLDL-C	13.63	2.16	22.94	2.82	18.43	P<0.001 **Highly significant**



Graph 1: Multiple Bar diagram showing comparison between mean Lipid Profile parameters between physically trained adults and sedentary adults.

Discussion

In our study, it was found that in physically trained adults there was decrease in total cholesterol, TG, LDL-C, VLDL-C and increase in HDL-C as compared to that with sedentary adults. These changes in values are statistically highly significant ($P<0.001$). Lhamo Y. Sherpa *et al.,* studied that there is high prevalence of hypertriglyceridemia in males, higher prevalence of low HDL-C in females and high hypercholesterolemia prevalence in both genders[6].

Abdus Salem *et al.,* found that regular aerobic exercise (brisk walk and jogging), as in the test civilian group, is by itself capable of decreasing total cholesterol, LDL, Triglycerides, Apoprotein B, Cholesterol/HDL ratio while increasing HDL levels. This work also shows that strenuous exercise, as in the test army group, is particularly useful in decreasing Triglycerides and Apo B levels as compared to simple walk. The study shows similar finding with our study. In our study Apoprotein B level is not estimated. Paul D *et al.,* had estimated Total cholesterol, TG, LDL, HDL, lipoprotein lipase level, body weight and % body fat in sedentary males before and after exercise training. They estimated the values of above parameters at 14 weeks, 32-48 weeks of exercise training. They found that there was average of 13% increase in HDL, 16% reduction in TG levels and 19% increase in lipoprotein lipase activity and the change in the values was statistically significant. JussiK Hutten studied the effect of moderate physical exercise on serum lipoprotein. He found that there was decrease in total cholesterol, TG, LDL, VLDL which was statistically highly significant and increase in HDL which was statistically highly significant after 4 months of moderate exercise also they found no change in TC or LDL. All these changes were seen after 14 weeks of aerobic exercise and did not change further with prolonged training. Body weight and percent body fat did not show statistically significant decrease after exercise training of the subjects[7].

All these changes are to the lesser extent as compare to our study possibly because in their study only aerobic exercise were included, while in our study combination of aerobic and anaerobic types of exercise are included. In our study % body fat is not estimated. The findings of decreased HDL levels in the study of the army group may be a reflection of this dietary factor, in that this group may have been exposed to such an intervention in attempts to maintain a healthy life style, whereas the civilian test group may have adopted a lifestyle with a moderate amount of low fat diet plus regular exercise[8]The study shows similar finding with our study.in our study Apoprotein B level is not estimated.

James A Blumenthal *et al.,* Gerhard Schuler and Kayatekin *et al.,* in also studied the effect of regular physical exercise on lipid profile. They also found decrease in TC, LDL-C, VLDL-C and increase in HDL-C levels in exercising groups[9]. Gerhard schuler *et al.,* studied the effect of regular physical exercise and low-fat diet on CHD patients. They found that in patients participating in this study, coronary artery disease progresses at a slower pace compared with a control group on a usual care. Wood P D *et al.,* found that the runners had significantly decreased mean plasma triglyceride total plasma cholesterol and low-density lipoprotein (LDL) Cholesterol concentrations which was statistically highly significant and a higher mean level of high-density lipoprotein (HDL) cholesterol than the comparison group which was statistically highly significant[10]the study shows similar finding with our study. Present study shows comparable results with those of Jussi K Hutten, J A Blumenthal, Gerhard Schuler, Wood P D. Contradictory results are obtained as an effect of exercise on serum cholesterol. Carlson and Mossfeldt are of the opinion that severe exercise does not bring about any change in serum cholesterol[11] Good *et al.,* have reported progressive decrease in serum cholesterol with exercise[12]our results does coincide with these findings.

Our results are also supported by Campbell[13] Malinow *et al.,* Malinow *et al.,* fox and spinner**.** They have reported lowering of serum cholesterol and reduction of incidence of atherosclerosis as a result of doing exercise. The generally accepted view about lowering of serum total cholesterol is due to exercise there is increased oxidation of cholesterol and increased uptake by the tissues Malinow *et al.,* further state that liver and adrenals are mainly responsible for catabolism of cholesterol during exercise[14]. However, literature does not clarify the role of increased levels of catecholamines in the cholesterol metabolism of a sportsman.

Combustion of fat produces energy 9.4 cal/g. free fatty acids are the main source of energy during the exercise. Glucose contributes only 10-15% while

fatty acids about 70-90%. Fat stores have enough potential energy to keep a sportsman to continue physical activity. Fats are used to spare the available glucose rather than to form glucose. The greater energy yield of fats (double that of glucose-4 cal/g) ensures that it can meet the demands of exercising muscles[15]. The energy from the phosphagen system (the combined amounts of cell ATP and cell phosphor creatinine are called phosphagen energy system) is used for maximal short bursts of muscle power. This provides maximal muscle power for 8-10 seconds. Glycogen-Lactic acid system provides 1.3-1.6 minutes of maximal muscle activity in addition to the 8-10 seconds provided by the phosphagen system. Aerobic system is the oxidation of foodstuffs in the mitochondria to provide energy. This system is required for prolonged athletic adults. The triglycerides transported from intestine (as chylomicrons) and liver (as VLDL) are stored in the adipose tissue and they are also utilized by the muscles, liver, heart etc., for energy as the needs of the body. Thus, in sportsman due to the regular training and exercise sympathetic activity is increased and there are high levels of circulating catecholamines in the blood. This is responsible to cause increased in lipolysis of triglyceride in the adipose tissue to supply more fatty acids for working muscles[16] the supply of free fatty acids for the synthesis of triglyceride in adipose tissue is made available by the lipoprotein lipase enzyme in the capillary endothelium of adipose tissues. The activity of this enzyme is found to be increased causing increased breakdown of triglycerides from blood which is reflected as reduction in triglyceride level of the blood of a person performing regular exercise.[17]

Cortisol secretion is significantly elevated during exercise. It mobilizes fats and promotes lipolysis. Glucagon stimulated by prolonged exercise, also mobilizes fatty acids from adipose tissue for fuel[18] The influence of physical exercise on serum TG level has been consistently favorable. as explained above fatty acids are used by active muscles for energy during exercise. So fatty acids are less available for the synthesis of Acetyl CoA molecules which are required for the formation of cholesterol.

Adrenal cortical hormones are also increased significantly during exercise mainly glucocorticoids (especially if exercise is prolonged and heavy.) This glucoticoids decrease cholesterol synthesis as glucocorticoids favor the formation of inactive HMG CoA reductase which is rate limiting enzyme in cholesterol synthesis[19] VLDL is synthesized mainly from liver and small amount from intestine. The large triglyceride rich VLDL particles emerging from the liver are acted upon by lipoprotein lipase as they pass through the capillary bed. This enzyme breakdown VLDL, Triglycerides and products are taken up into the various extra hepatic tissue. at the same time some of the apoproteins of VLDL are lost and large fraction of TG has been removed. So, there is decrease in levels of VLDL and LDL. Adrenal cortex and the gonads are extremely active in LDL degradation, as adrenal cortical hormones increase significantly during exercise; they also contribute to decrease in VLDL level[20]in our study it was found that there was increase in HDL-C in physically trained adults as compared to sedentary adults.

The HDL may operate to protect against atherosclerosis in two ways[21]

1. To carry cholesterol away from the arterial wall for the degradation to bile in the liver and subsequently excretion by the intestine.
2. To compete with the LDL fragments for entry into the cells of arterial wall.

The probable mechanism for increased HDL cholesterol is

a. Reduced apoprotein catabolism rather than increase synthesis.[22]
b. Resistance training and moderate aerobic exercise increase serum.

Testosterone levels of untrained subjects after 15 to 20 minutes. Testosterone increases the formation of HDL.[23]

Conclusion

Combination of aerobic and anerobic exercise/games in physically trained adult's causes:

1. Highly significant decrease in total cholesterol, Triglyceride, low density lipoprotein cholesterol, very low-density lipoprotein cholesterol.
2. Increase in high density lipoprotein cholesterol.
3. These beneficial effects of exercise are used as primordial in prevention of atherosclerosis which is the most important cause of death in adult's due to coronary heart disease.

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