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Effect of Regular Physical Exercise (Among Circus Athlets) on Lipid Profile, Lipid Peroxidation and Enzymatic Antioxidants

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Authors' contributions

This work was carried out in collaboration between all authors. Author SN designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors SN and PN managed the analyses of the study, managed the literature searches. All authors read and approved the final manuscript.

Research Article

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ABSTRACT

Aims: The study was planned to see the effect of regular physical exercise on levels of lipid profile, activity of lecithin cholesterol acyl transferase, lipid peroxidation and antioxidant enzymes in those involved in regular physical exercise (among athlete in circus) and those involved in sedentary lifestyle.
Study Design: Cross sectional study.
Place and Duration of Study: The study was carried out during September 2012 to December 2012 in the department of biochemistry, BIMS, Belgaum.
Methodology: A total of 70 participants were studied, aged 25-55 years. Group I consists of 35 participants working as circus athletes, involved in regular physical exercise. Group II consisted of 35 age and sex matched healthy controls, with sedentary life style. Total cholesterol and HDL cholesterol were measured by CHOD-PAP method. Triglyceride was measured by GPO-PAP method. LDL and VLDL were calculated by formula. MDA was

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determined as the measure of thiobarbituric acid reactive substances (TBARS). SOD Catalase and GPX activity was determined by the method of Mishra and Fridovich, Beer and Seazer and Paglia and Valentine respectively.
Results: The levels of lipid peroxide, TC, TC / HDL and LDL / HDL ratio were significantly lowered in Group I on comparison with Group II. The levels of HDL, activity of SOD, GPX and catalase were significantly higher in Group I on comparison with Group II. Individuals engaged in regular physical activity had lowered levels of atherogenic lipid components and subjects with sedentary lifestyles had higher atherogenic lipid components (lipid profile and lipid peroxide).
Conclusion: The study indicates that engaging in regular physical exercise protects cardiovascular diseases by increasing the HDL Cholesterol levels, activity of LCAT enzyme and activity of antioxidant enzymes. Thus regular physical exercise is an important in the protection of atherosclerosis and management cardiovascular disease.

Keywords: Regular physical exercise; lipid profile; lipid peroxidation; antioxidant enzymes.

1. INTRODUCTION

Physical inactivity is a serious growing health problem. Epidemiological studies have shown that a sedentary lifestyle will contribute to the early onset and progression of atherosclerotic cardiovascular disease and is associated with a doubling of the risk of premature death [1-4]. Physical exercise and fitness are considered key factors affecting overall risk of cardiovascular disease. It is an effective intervention for prevention and treatment of coronary artery disease (CAD) as well as for rehabilitation of coronary patients [5,6]. Regular participation in physical activity as well as a single exercise session can positively alter cholesterol metabolism. Exercise is involved in increasing the production and action of several enzymes that function to enhance the reverse cholesterol transport system [7].

Exercise favorably affects a number of cardiovascular risk factors, such as obesity, insulin resistance, and hypertension; it also has a beneficial effect on the lipid profile. The latter may be a significant contributor to the protective effect of exercise partly by lowering the concentrations of triglyceride-rich lipoprotein (TRL) and low-density lipoprotein (LDL), especially atherogenic small LDL. However, the most distinct and sustained effect of exercise on lipoproteins is the increase in circulating high density lipoprotein (HDL), both as HDL cholesterol and the number of HDL particles [8,9].

Physical Activity is “any bodily movement produced by skeletal muscles that result in energy expenditure”. The energy cost of physical activity may not necessarily be equivalent to body movement. Exercise is a specific type of physical activity that is planned, structured and repetitive done to improve or maintain physical fitness[10]. As the contributions of exercise to health and well being are becoming increasingly recognized, interest in health promotion has stimulated demand for practical methods of assessment of physical activity patterns.

1.1 Sedentary Life Style

Physical inactivity is a predictor of CVD events and related mortality rate. Many components of the metabolic syndrome are associated with a sedentary lifestyle, including increased adipose tissue (predominantly central), and a trend toward increased triglycerides, high blood pressure, and increased glucose in the genetically susceptible. Compared with

individuals who watched television or videos or used the computer <1 h daily, those who carried out those behaviors for >4 h daily had a twofold increased risk of the metabolic syndrome [11].

Body Fitness Prolongs Life: Multiple studies have now shown that people who maintain appropriate body fitness, using judicious regimens of exercise and weight control, have the additional benefit of prolonged life. Especially between the ages of 50 and 70, studies have shown mortality to be three times less in the most fit people than in the least fit [12].

1.2 Physiology of Exercise

Two principal dimensions of physical activity should be captured in population's surveys. These are (1) total physical activity, which is equivalent to energy output-with energy intake this controls the body weight, affecting also body composition, ie, the muscle to fat ratio; (2) aerobic exercise, which involves the dynamic, rhythmic contraction/relaxation of large muscle groups. When sustained and performed more energetically than is customary for the individual, this will have cardiovascular training (conditioning) effects, improving physical fitness-the capacity for physical work and movement.

Considering these facts, the study was planned to see the effect of regular physical exercise on levels of lipid profile, activity of lecithin cholesterol acyl transferase, lipid peroxidation and antioxidant enzymes in those involved in regular physical exercise (among athlete in circus) and those involved in sedentary lifestyle.

2. MATERIALS AND METHODS

2.1 Source of the Data

The study was carried out during September 2012 to December 2012 in the department of biochemistry, BIMS, Belgaum. In this study total of 70 participants were included in between age group 25-55 years (Table1). There were 96 circus employees working in the circus. Out of 38 athletes who were doing regular exercise only 35 athletes gave their consent to participate in the present study. Another 35 employees equally matched age and sex were chosen as a control group. Study group is divided into two groups, Group I consisted of 35 athletes working in jumbo circus who were involved in regular physical exercise. Group II consisted of 35 age and sex matched healthy controls, with sedentary life style. All authors hereby declared that all experiments have been examined and approved by the institutional ethical committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. The serum was used for measuring various parameters. Total cholesterol and HDL cholesterol were measured by CHOD-PAP method. Triglyceride was measured by GPO-PAP method. LDL and VLDL were calculated by formula.

The buffy coat was removed and the packed cells were washed three times with physiological saline. The erythrocyte suspension was prepared by the method of Dodge et al. [13], modified by Quist [14]. The packed cells were used for the analysis of MDA, SOD, catalase and GPx. MDA was determined as the measure of thiobarbituric acid reactive substances (TBARS) [15]. SOD activity was determined in the hemolysate by the method of Mishra and Fridovich [16]. Catalase activity was measured by the method of Beer and Seazer, [17] and GPx activity by Paglia and Valentine [18].

2.2 Sample Collection

All authors declared that written informed consent was obtained from the patient or other approved parties.5ml of the fasting venous blood sample was collected from Group I and Group II under all aseptic conditions. The blood samples were centrifuged and serum separated. All the measurements were carried out by using Microsoft office 'Excel' with Windows 2007 operating system and all the data were analyzed using the statistical package SPSS-10.0.

2.3 Exclusion Criteria

Patients with Type 1 and Type 2 Diabetes Mellitus, Patients on hypolipidemic drugs, steroids and oral contraceptives, known cases of hypothyroidism, hyperthyroidism, Cushing's syndrome, kidney and hepatic diseases, Alcoholics, smokers and tobacco chewers were excluded from the study.

3. RESULTS

Table 1. Characteristics of group I and group II subjects

Sl. No		Group I	Group II
1	Age	32.8± 8.95	30.76 ± 9.39
2	M/F ratio	10 /25	11 / 24

Table 2. Various serum parameters in group I and group II

Sl. no		Group I (n = 35)	Group II (n = 35)	P - value
1	HDL (mg / dl)	47.68 ± 16.91*	32.16 ±4.85	< 0.05
2	LDL (mg / dl)	76.45 ± 30.95*	119.21 ± 35.8	< 0.05
3	VLDL (mg / dl)	25.42 ± 12.81*	39.207 ± 28.5	<0.05
4	Total Cholesterol (mg/ dl)	154.1 ± 20.34*	191.9± 42.75	< 0.05
5	Triglycerides (mg / dl)	136.5 ± 95.68*	192.3 ± 138.6	<0.05
6	TC / HDL	4.0 ± 1.8	6.0 ± 1.3	< 0.05
7	LDL / HDL	2.2 ± 1.0	3.9 ± 1.1	< 0.05
8	MDA n moles/gm of Hb.	2.80±0.10	3.95± 0.57	< 0.05
9	LCAT (IU/L)	99.9 ± 5.23	75.9 ± 5.40	< 0.05
10	SOD IU/gm of Hb.	1990±203.02	1764.60± 501.35	< 0.05
11	GPx IU/gm of Hb.	68.36±3.15	53.55±4.25	< 0.05
12	Catalase nmole/H_2O_2 decomposed/mg protein/min.	813±103	605±112.0	< 0.05

Values are expressed in mean ± SD. p < 0.05 = Significant, n = Number of subjects

4. DISCUSSION

The effect of physical exercise on plasma HDL levels has been demonstrated in a number of interventional studies. The present study was aimed to determine that, can exercise induce an increase in CVD protecting factors.

The study found that the levels of TC, TC / HDL and LDL / HDL were significantly low in Group I on comparison with Group II. The levels of HDL were significantly high in Group I compared to Group II (Table 2). Thiobarbituric acid reactive substances (TBARS), the indicator of lipid peroxidation were significantly higher in group II than group I. Antioxidant enzymes status was studied by investigating erythrocyte SOD, GPx and catalase activity and found that the activity of SOD, GPx and catalase were significantly higher in Group I compared to Group II.

The major finding of study is that physical fitness associated with increments in plasma concentrations of HDL cholesterol and antioxidant enzymes. Higher levels of HDL Cholesterol and antioxidant enzymes in those involved in regular exercise was an expected finding and was consistent with other cross-sectional and interventional studies.

Study by Beata Olchawa et. al. showed that higher levels of HDL Cholesterol in athletes may be a consequence of increased formation of HDL from apo-A-I and cellular cholesterol, enhanced flow of cholesterol along the RCT pathway, and hence increased functionality of RCT [19]. Study by Halle M showed that increase in physical fitness improve the lipoprotein profile and reduce the incidence of cardiovascular events [20]. Jaume et. al. observed that Physical activities with intensity greater than 7 kcal/minute were significantly associated with a higher level of high density lipoprotein (HDL) cholesterol and a lower atherogenic index (total cholesterol: HDL cholesterol) [21].

Physical exercise may influence physiological effects that enhance the formation of Apolipoprotein A-I and lecithin cholesterol acyl transferase enzyme; hence there might be increased HDL formation and activity of lecithin cholesterol acyl transferase.

Physical exercise can influence physiological effects that enhance antioxidant enzyme formation and activity SOD, GPx and catalase in regular exercise athletes.

The decreased LDL / HDL ratio and Total Cholesterol / HDL ratio are considered as the atherogenic index. The raised HDL and reduced atherogenic index reduces the incidence of atherosclerosis in subjects involved in regular physical activity.

The study concluded that engaging in regular physical exercise contributes to physical fitness, helps to decrease the incidence of cardiovascular diseases by increasing the HDL Cholesterol levels, activity of LCAT enzyme and activity of antioxidant enzymes. Thus regular physical exercise is an important in the protection of atherosclerosis and management cardiovascular disease.

5. CONCLUSION

The study concluded that engaging in regular physical exercise contributes to physical fitness, helps to decrease the incidence of cardiovascular diseases by increasing the HDL Cholesterol levels, activity of LCAT enzyme and activity of antioxidant enzymes. Thus regular physical exercise is an important in the protection of atherosclerosis and management cardiovascular disease.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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