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*Research Paper :*

# Aerobic training approaches on alteration in blood lipid profiles in adolescent male

**SOUMITRA MANDAL** AND SAKTI RANJAN MISHRA

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See end of the article for authors' affiliations

Correspondence to:
**SOUMITRA MANDAL**
Department of Physical Education EIT, Mai-nefhi, Asmara Eritrea ( N.E. AFRICA)
soumitramk@yahoo.co.in

## ABSTRACT

The modern living style attributed various changes in physiological mechanism in the human body of which the major concern is coronary heart disease. Measures to reduce the incidence of CHD were mainly focused to elderly aged group and are well documented. The present research was intended to examine the effects of aerobic training on blood lipids profiles of 14-16 year old male adolescents. The total 12 weeks aerobics working indicated variable effects in increasing the HDL-C concentration and decreasing TC and TG levels which are discussed in the present paper.

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**Key words :** Aerobic training , Lipid profile, Adolescent males

The mortality due to coronary heat disease (CHD) has been steadily increasing in many parts of the world and research relating to this has undertaken extensively in this century (Brownell, *et al.,* 1982; Huttunen, *et al.,* 1979; Xiao-Rong *et al.,*1997 ). Estimates of lipid profile have been used as one of the markers for cardiovascular risks. The high density lipoprotein cholesterol (HDL-C) has an antiatherogenic effects and lipoprotein lipase (LPL) is the enzyme responsible for increasing HDL-C level(Miller and Miller, 1975). LPL catabolise triglyceride rich lipoproteins to free fatty acid and protein, which has the effect of increasing HDL-C production by the liver (Krauss *et al*., 1979; Peltonen *et al.,* 1981; Haskell,1984)

Physical activity is one of the important tools in management of favourable blood lipid changes. When exercise is accompanied by a body mass, total cholesterol (TC) and low density lipoprotein cholesterol (LDL-C) concentration may get reduced. There is a large mass of research that advocated the benefits of aerobic exercise which influence the blood lipid profiles by modifying the activities of intravascular enzymes and transfer of proteins (Berg *et al.,*1994, Crouse, *et al.*, 1995; Durstine and Haskell, 1994). The aerobic training approach has made dent impact on transient changes after one set of exercise. This included concerning decrease in TC, LDL-C and TG, elevation in HDL-C in both the HDL2 and HDL3 sub- fractions (Gordon *et al.,* 1994; Kantor *et al.*, 1987; Kuusi *et al.,*1984).

The lack of physical activities has been suspected to be associated with an increased incidence of CHD. It is essential to assess the effect of aerobic training *de facto* physiological changes in blood lipid characteristics. The present investigation therefore, entails about the effects of aerobic training approach on alterations of lipid profiles in adolescent males and thus to assist in avoiding the risks of cardiovascular diseases.

## METHODOLOGY

The untrainined healthy adolescent male were screened and thus considered for the study from Kendriya Vidyalaya, Puri, Orissa, India. All the selected volunteers consented were considered healthy, if they were not presently taking any medication. A thorough orientation of the experimental procedure *vis-à-vis*- exercise schedule and laboratory testing were explained to them. Total 30 subjects of 14 -16 yrs age participated in a voluntary programme of 12 weeks of aerobic training which included jogging and running .Experimental design was statistically worked out in which thirty subjects were randomly divided into one experimental and the other normal group consisting of 15 each subjects. Jogging and running were prescribed as a means of aerobic training

while control group did not participate in any of these endurance.

The subjects were asked to fast overnight 12-16 hrs before the test and requested to abstain from exercise for 48 hrs. adherence to the requirement for abstinences from recent exercise, fasting, or both were checked carefully at the time of their test. Equally non fasting individuals were rescheduled.

**Blood sampling:**

Venous blood was drawn into vacutainer tubes containing 1mg /ml disodium, EDTA as an anticoagulant. From each subject, 10ml of blood samples was taken twice i/e before and after the training programme. Post test blood samples were drawn 48 hrs. after the last exercise in an attempt to minimize the potential of acute exercise and the effect of training on the plasma lipids and lipoprotein plasma from pre and post heparin blood was isolated by centrifugation at 1500g for 20 min at $4^0$C and 0.01% NaNo3 solution was introduced into all plasma samples (4µl/ml plasma) for preservation. Aliquots of pre and post heparin plasma were sealed separately in 2ml cryovials and stored at -$70^0$ C for later analysis.

**Biochemical analysis :**

Plasma samples were analyzed for HDL-cholesterol, LDL-cholesterol, VDL-C, total cholesterol and triglycerides, following the procedures as ascribed by the lipid research clinics Liebemann- Burchard reaction (Sehgal, 1984) was used for cholesterol measurement. Lipoprotein was separated by ultracentrifugal floatation at saline density (d=1.006g/ml), to yield a supernatant fraction containing VLDL-cholesterol and an infranatant fraction containing both LDL- cholesterol and HDL-cholesterol HDL- cholesterol was estimated into plasma after precipitation. After direct estimation of HDL-cholesterol, LDL-cholesterol was observed by the formula, LDL-cholesterol = Cholesterol in the 1.006 intranatant minus HDL-Cholesterol for triglycerides by the Kessler and Lederer (!965) method.

**Statistical analysis:**

For all variables, descriptive statistics were calculated by statistical analysis system 76. The significance of difference between the pre-test mean of the experimental and control group, the't' test was employed.

## OBSERVATIONS AND DISCUSSION

The aerobic training resulted profound effects on plasma lipids, lipoprotein variables like HDL-cholesterol, LDL-cholesterol, triglyceride, total cholesterol and HDL-C/total cholesterol ratio (Table 1 and Fig. 1-3). We observed several potentially important relationships in blood profile characteristic in male adolescents and thus revealed improvement in physical work capacity in the subjects.

The aerobic training programme proved effective in increasing the HDL-C and HDL-C/total cholesterol ratio and equally brought decrease in triglycerides and total cholesterol levels (Table 1). However, no significant change was observed for LDL-C and VLDL-C values in experimental group following training. In order to determine the significance of difference , between experimental and control group for pre-test and post-test means, the t- test was applied.

The t-value obtained for the experimental group in HDL-C was 7.37 which was significant as it was greater than t-value of 2.04 required for significance at 0.05 levels. However, the't' ratio for the control group yielded an insignificant value of 1.25 which was much lesser than the required t-value of 2.04. The significance of difference among the experimental and control groups for HDL-C, the analysis of co-variance was computed. It indicated that the resultant F-ratio of 0.000038 fro the pre-test means fall short of the f-ratio 4.20, which 13 required to be significant at 0.05 levels. However, value of 1.25 which was much lesser than the required t-value of 2.04. The significance of difference among the experimental and control

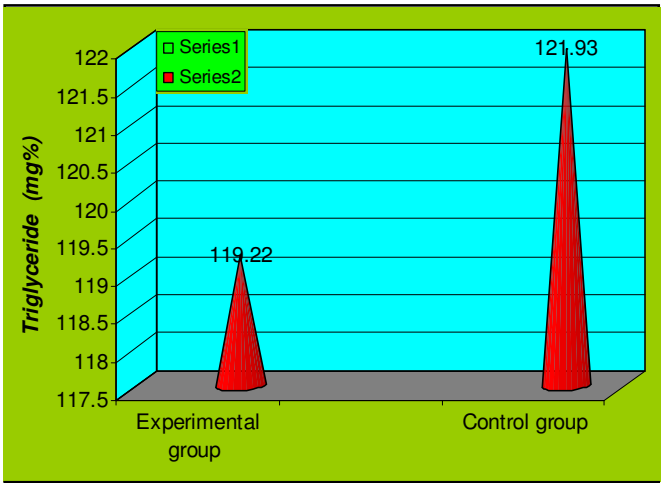


**Fig. 1: Adjusted final means of experimental and control group in trigyleride**

groups for HDL-C, the analysis of covariance indicated that the resultant F-ratio of 0.000038 for the pre-test means fall short of the F-ration 4.20, which is required to be significant at 0.05 level.

The no group association was observed for low density lipoprotein cholesterol variables. Thus, it indicated that the insignificant alterations in the magnitude of LDL-C responses to aerobic training. The t-ratio obtained for the experimental and control group in LDL-C were 1.3 and 0.58, respectively which were insignificant, as it was less than the t-value of 2.04 required for significance at 0.5 level. Also, the t-ratio obtained for experimental group of VLDL-C yielded value of 3.18, which was significant at 0.5 level, since it was greater than t-value of 2.04, required for significance. However, the t-ratio for the control group (0.65) was insignificant. The analysis of the experimental and control groups in triglycerides and the total cholesterol revealed insignificant influence in its levels due to exercise.

It is important to evaluate the effects of life style of risks factors amongst the young people. It is logical to consider that the proper habits of physical activity during childhood and adolescence may prove useful for prevention of cardiovascular disease in later stages of life. Many reports are available of lipid profile changes in accordance with physical exercise. The overall changes in lipids and lipoproteins among children's and adolescents where generally modest. However, aerobic exercise should almost always be recommended because of numerous other benefits as a means of defining inflammatory markers. This positive benefits should be obtainable by adhering to the recent physical activity guidelines for children and adolescents as set forth by United States Dept. of Health and Human service and the United States Dept. of Agriculture (Yamasaki *et al.,* 1994).

Thus, in the present investigation, total 12 weeks aerobics working indicated variable effects in increasing the HDL-C level and decreasing TG and TC levels. However, in some studies the effects of exercise in HDL-C is controversial. In some circumstances, the adaptation of programme of vigorous exercise has been followed by modest reduction in cholesterol concentration (Bonetti *et al.,* 1988). While in other studies, it was found no such changed or decrease. Stubbe *et al.* (1983) compared the effects of high intensity versus low intensity exercise training, and thus reported a negative co-relation between plasma HDL-C level and exercise intensity.

However, the exact mechanism of exercise induced elevation of HDL-C is still not clear. A negative association had earlier been reported in cross sectional studies of triglyceride and the HDL-C cholesterol level (Castelli *et al.,* 1977). Though, the common denominator in the metabolism of HDL and VLDL has been suggested to be LPL. The discussion of effects of aerobic training may remain unresolved. Some of the workers have suggested that in long term studies, several factors appropriately control the study duration. In one such experimentation, when a six week exercise programme was implemented under an iso-weight diet, there was no change in HDL-C level (Lipson *et al.*, 1980). This suggests that whether weight loss per se is implicated in increasing HDL-C concentration, the exercise training might not be the cause of concern. However, this necessitates systematic studies to be undertaken in this regards.

The present study thus reveals that, aerobic training of routine intensity may alter the blood lipid patterns and

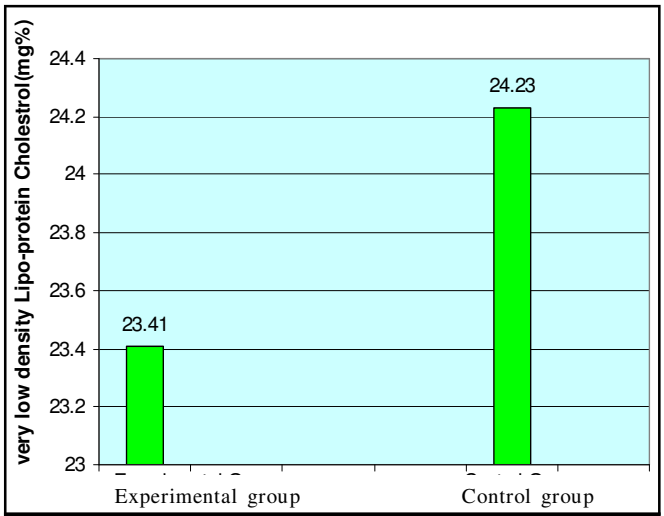


**Fig. 2: Adjusted final means of experimental and control group in very low density Lipoprotein-Cholesterol**

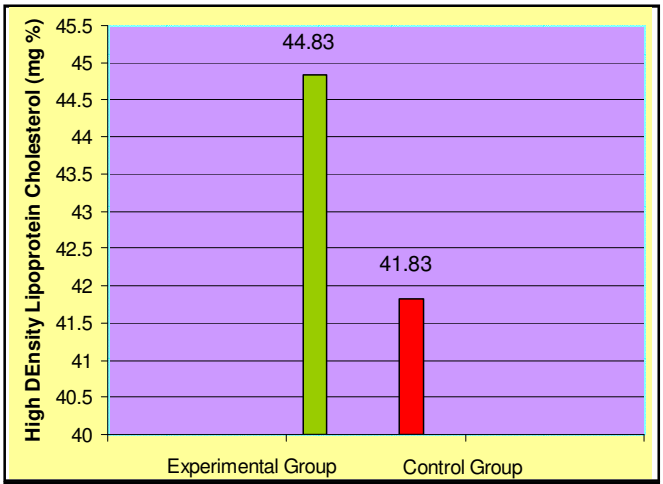


**Fig. 3: Adjusted final means of the experimental group and the control group in high density lipoprotein-cholesterol**

thus can assist in reducing the risks of CHD. (Xiao-Rong *et al.*, 1997) studied the effects of exercise training on physical fitness and plasma lipid in young Chinese men and women. Their result indicated that the plasma triglyceride, HDL-C,LDL-C and VLDL-C differences between before and after exercise were significant in males. Our results are also in agreement of the findings of (Xiao-Rong *et al.,* 1997).

As of, by and large discussion, the results of our studies advocated the aerobic exercise increased HDLC concentrations alternatively reducing TG in adolescents. However, intensity and duration of the training did not favor in alteration of the HDL-C level of the subjects. Also, the endurance resulted in VLDL-C decrease. Consequently these relationship needs to be tested further in large and well designed manner to tackle the key issues of present day life.

Authors' affiliations:
**SAKTI RANJAN MISHRA,** Balipal College of Physical Education, BALASORE (ORISSA) INDIA.

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