Effect of Aerobic Exercise on the Blood Lipid Profile in Young Adults: Case Study

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Abstract

Aims & objectives: The aim of the present research was to determine the effect of aerobic exercise training on blood lipid profile in young adults. The path physiology of blood lipid in young adults its increase the atherosclerosis formation on the coronary artery and during the physical inactivity results it developed cardiac diseases. Therefore use of aerobic exercise will be helpful in setting up a better aerobic exercise protocol for improving the lipid profile level and prevention of cardiac disease.

Methodology: This experimental study was carried out with 6 subjects including both male and female with age 20- 30year at college of Himalayan hospital. The data is collected by taking outcome variables in form of blood lipid profile level, BP, THR time.

Protocol: Aerobic exercise 30 minute session/ 5 days/ weeks for 4 weeks with 60 – 70 %THR.

Data analysis: Data was analyzed with parametric test in form of T-test which required with a significant level set at (pd"0.05) and confidence interval was 95%.

Result: There was a beneficial effect of exercise on HDL variables, BP, & THR seen most clearly with the 4 week of aerobic exercise training, other than HDL, BP &THR no other variable has been able to differentiate among both groups.

Discussion: The increase in HDL and decreases the BP, THR time among both group after the aerobic exercise training. Minimal weekly exercise increases the HDL level. BP & THR time are due to the parasympathetic activity.

Conclusions: Aerobic exercise is widely believed to induce changes in the lipid profile, BP & THR time of subjects.

Key words: Aerobic exercise training; Blood lipid profile level; HDL (high density lipoprotein); BP (blood pressure) and THR (target heart rate) & cardiac disease.

Introduction

Coronary heart disease (CHD) is the leading cause of death in India and the leading cause of death worldwide. CHD leads to more death and disability in low and middle income countries and its affects people at younger ages in low and middle income countries.[1] According to world health organization (WHO) bulletins, 1.2 million Indians died from heart disease in 1990 and it predicts that by 2010, 100 million Indians will have heart disease and by 2020, India will super cede all other nations in terms of CAD prevalence.

The WHO reports that in India risk factors for the premature CHD subjects could be multiple, ranging from smoking, sedentary lifestyle, improper diet, abnormal lipids, hypertension, diabetes and obesity and genetic factors.[2] These studies also reported that more than 90 % of acute coronary events can be predicted by major coronary risk factors.[3] In response to the rising incidence of CHD in adults, the AHA and other governing bodies have continued to emphasize the importance of exercise in childhood as a means of preventing CHD later in life (Kavey *et al.*, 2003).[4,5]

CAD is almost always due to athermanous

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narrowing and subsequent occlusion of the vessel. Growth mainly by lipid accumulation of first to third decade of life due to the fatty streak formation , intermediate lesion and the atheroma formation of the intima & media and thrombosis/hematoma formation at the fourth decade of life and it is cause the CAD.[6]

The effect of aerobic exercise on the prevention of atherosclerotic disease has been proved by many epidemiological and experimental studies (Thompson, *et al.*, 2003).[7] Regular exercise is effective in reducing the risk of developing arteriosclerotic disease as the biological mechanism (i.e. beneficial effects on atherosclerotic risk factor, myocardial function, coronary artery size and

vasodilator capacity and vascular tone, fibrinolysis, platelet function) in many intervention.[7,8]

There is lack of dearth of literature regarding research outcome related to effect of aerobic exercise in blood lipid profile. That's why this study is design on aerobic exercise to find a better effect for prevention of CAD in risk factor subjects and non risk factor subjects.

Methodology

This pilot study was carried out with sample size of 6 subjects who have been selected from physiotherapy department of Himalayan hospital, with CAD risk factors or non risk factor-normal subjects.

Inclusion criteria: Male and female subjects between ages 20–30 yrs were taken with history of smoking, alcoholic, family history of CAD and diabetic, hypertension, obesity, high blood lipid profile level, THR>60-70% max. HR and asymptomatic with all risk factor subjects.

Exclusion criteria: All symptoms with cardiac, vascular, pulmonary, neurological,
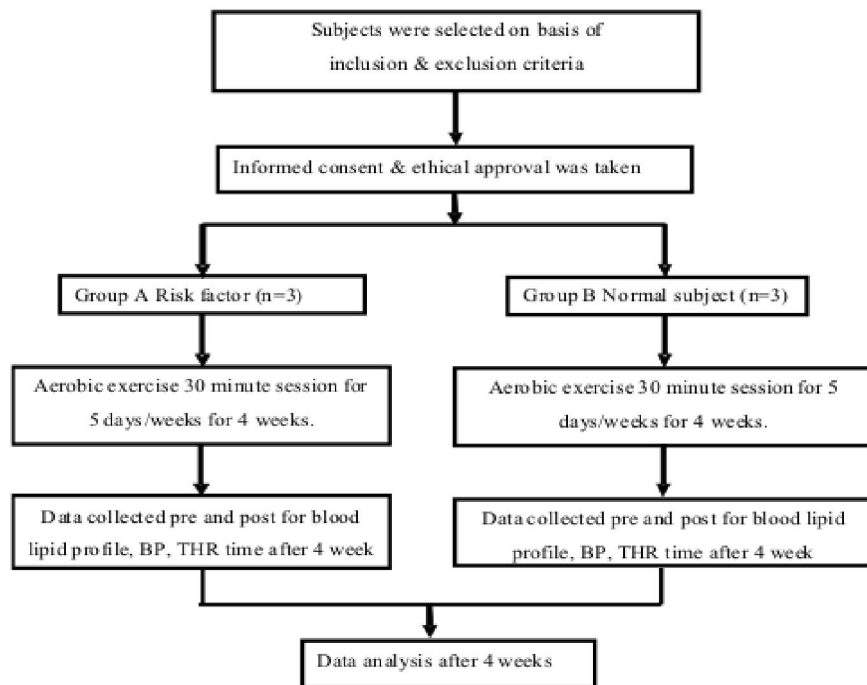
Procedure flow chart

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┌─────────────────────────────────────┐
│  Subjects were selected on basis of  │
│     inclusion & exclusion criteria   │
└─────────────────────────────────────┘
                  │
┌─────────────────────────────────────┐
│ Informed consent & ethical approval was taken │
└─────────────────────────────────────┘
          │                    │
┌──────────────────────┐  ┌──────────────────────┐
│ Group A Risk factor (n=3) │  │ Group B Normal subject (n=3) │
└──────────────────────┘  └──────────────────────┘
          │                    │
┌──────────────────────┐  ┌──────────────────────┐
│ Aerobic exercise 30 minute session for │  │ Aerobic exercise 30 minute session for 5 │
│ 5 days/weeks for 4 weeks. │  │ days/weeks for 4 weeks. │
└──────────────────────┘  └──────────────────────┘
          │                    │
┌──────────────────────┐  ┌──────────────────────┐
│ Data collected pre and post for blood │  │ Data collected pre and post for blood lipid │
│ lipid profile, BP, THR time after 4 week │  │ profile, BP, THR time after 4 week │
└──────────────────────┘  └──────────────────────┘
          │                    │
          └──────────┬─────────┘
          ┌──────────────────────┐
          │ Data analysis after 4 weeks │
          └──────────────────────┘
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Table 1.1: The comparison of mean of blood pressure intervention both risk factor (group A) and non risk factor (group B).

Variable		Pre (Mean±SD)	Post (Mean±SD)	T valve	P valve
Group A BP	Sys.	130±10.0	125.6±5.7	0.017	0.001
	Dias.	100±10.0	93.3±5.7	1.242	0.001
Group B BP	Sys.	128±10.0	120±0.0	0.354	0.001
	Dias.	93.3±10.0	86±10.0	0.761	0.001

Significance Level (Pd"0.05)

orthopedic and surgical conditions**,** THR < 80% max. HR on exercise testing.

Variables: Independent variables were aerobic exercise. Dependent variables were in form of blood lipid profile level (Total cholesterol-TC, Low density lipoprotein-LDL, High density lipoprotein HDL, Very low

Figure 1.1: Comparison of mean of cholesterol Level between risk factor (group A) and non risk factor (groupB)
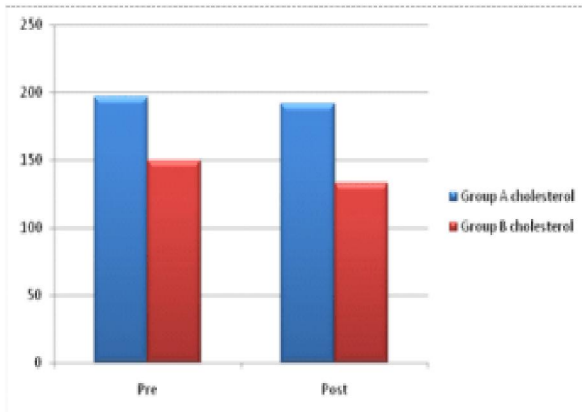
Figure1.2: Comparison of mean of LDL intervention between risk factor (group A) and non risk factor (group B)
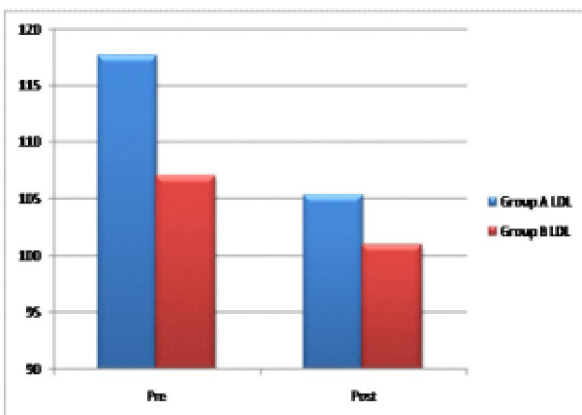

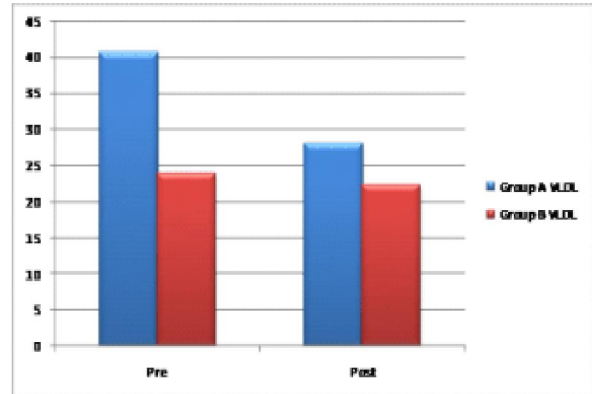**Figure1.3: Comparison of mean of VLDL Level between risk factor (grp A) and non risk factor (grp B)**

Figure1.4: Comparison of mean of HDL Level between risk factor (grp A) and non risk factor (grp B)
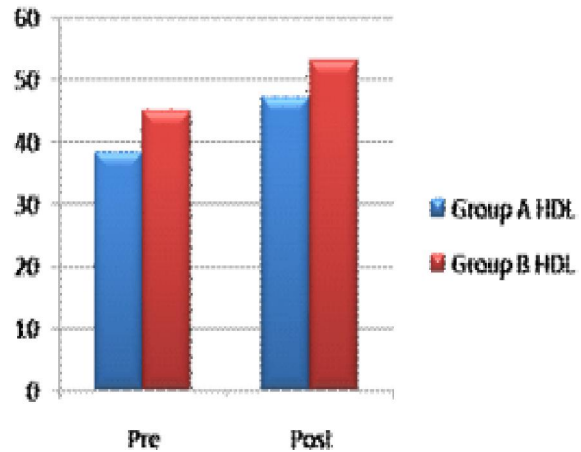

Figure 1.5: Comparison of mean of TG level between risk factor (grp A) and non risk factor (grp B)
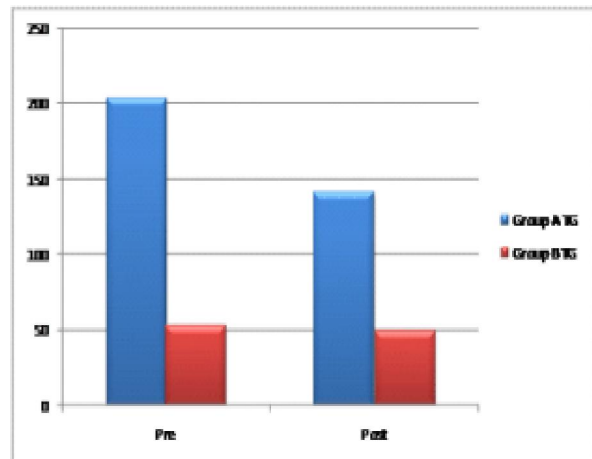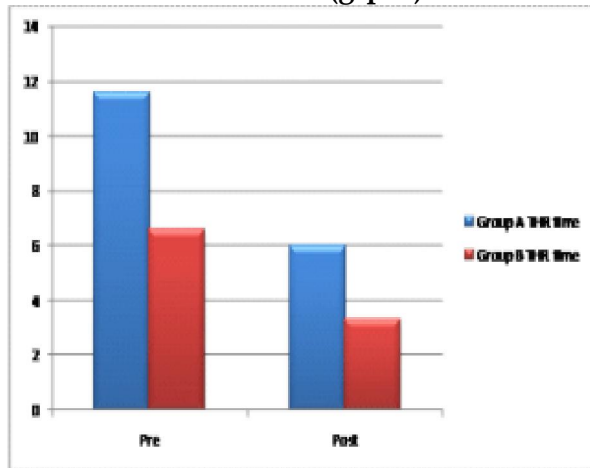
Figure 1.6: Comparison of mean of THRAT level between risk factor (grp A) and non risk factor (grp B)

density lipoprotein VLDL, and Triglysrides TG), Blood Pressure-BP and Target Hear Rate Achievement Time-THART.

Instrumentation: Treadmill, polar heart rate monitor, syphagnomanometer, stethoscope

Data Analysis

The data was analyzed by the statistical package of SPSS-17, graphical pad software as required and significant level was set at pd"0.05 and confidence interval was 95%. The dependent variables used for the comparisons of scientific analysis were blood lipid profile (TC, LDL, HDL, VLDL, and TG), blood pressure and THR time by parametric test in form of pre and post intervention. The intra group comparison was done with the help of mean and standard deviation analysis by paired t test by taking two values in both groups. Inter group comparison was done by unpaired t test as required.

Result

The result presentation of data is based on the two groups including risk factor group-A and non risk factor group-B.

Thus an overall analysis of various scores showed that HDL increase, blood pressure and target heart rate time valve decreased more significantly with four weeks of aerobic exercise training.

Discussion

Result of this research is derived from the sample of six subjects with abnormal blood lipid profile level, blood pressure and THR time based on ratio of male and female 1:1 with a mean age of 20-30 years. Setting of this study is supported that the atherosclerosis formation in the form of fatty streaks formation start at the second to third decade of life and increase the prevalence of coronary artery disease in young adults.

Our study is based on number of physiological variables in form of total cholesterol, low density lipoprotein, high density lipoprotein, very low density lipoprotein, triglycerides, blood pressure and THR time. All these variables are able to represent the improvement of cardiac rehabilitation intervention as described by victor F. Froelicherin their textbook for exercise testing and training.[9] These outcome variables also supported by research studies of Georg A, Kelley, U. Narayani, Kerstin stoedefalke, satoru kodama *et al*.[10, 11, 12]

Pre exercise Comparison of Data

The comparison of all variables before exercise prescription suggest that both group lie at same physiological state (HDL, BP and THR time) and shows no significant difference, so it can be concluded that both groups before treatment lie at same physiological condition.

Post exercise Comparison of Data

1. *Discussion of blood cholesterol variable.*

The comparison of both group (risk factor and non risk factor group) to see between and within groups shows improvement of blood lipid profile and cholesterol level after four weeks of aerobic exercise training. But this improvement is not significant and it may be

due to the aerobic exercise training required more than 4 weeks of aerobic exercise training to shows significant effect.

George A, Kelley et al have suggested that more than 4 week of aerobic exercise reduces total cholesterol, triglycerides and increases high density lipoprotein in adults 18 years of age and older.[10] U. Narayani et al have suggested that the total cholesterol decreases and increase high density lipoprotein cholesterol in obese women after six weeks of aerobic exercise and endurance training.[11]

2. Discussion of low density lipoprotein variables.

Risk factor and normal group showed not significant decline in low density lipoprotein from four week by the physiotherapy intervention in the form of aerobic exercise training.

Kelley et al suggest that the effect of aerobic exercise training > 8 week are effective in low density lipoproteins level in blood.[10] Kerstin Stoedefalke et al, shows that the 15 week aerobic exercise training program resulted in significant decreases in low density lipoproteins.[12]

3. Discussion of high density lipoprotein variable.

The third important finding both the risk factor and normal subject groups shows significant effect after four weeks of aerobic exercise training and this finding supporting the effect of aerobic exercise on high density lipoprotein cholesterol.

Satoru Kodama et al, study conclude that the regular aerobic exercise increases high density lipoprotein level it can also shows that the minimal weekly exercise volume for increasing HDL level was estimated to be 900kcal of energy expenditure per week or 120 minutes of exercise per week.[13]

Gilliam and Burke (1978) showed a significant increase in HDL levels with no changes in triglycerides levels in the six week aerobic exercise.[14] Paul D. Thompson et al,

suggested that the effect of aerobic exercise training in risk factor subjects and normal individual showed a significant effect and increase the high density lipoproteins with the changes of low density lipoprotein.[15]

4. Discussion of very low density lipoproteins variable.

Both groups the risk factor and normal subject group showed non- significant improvement in the very low density lipoproteins outcome from one month after doing aerobic exercise training. The fact behind these changes may be due to the aerobic exercise training more than four week of aerobic exercise training to shows significant effect.

William E. Kraus et al, shows the highest amount of weekly exercise, with minimal weight change, had widespread beneficial effects on the lipoprotein profile. The improvements were related to the amount of activity and the intensity of exercise or improvement in physical activity of the subject.[16]

5. Discussion of triglycerides variable.

The risk factor and normal subjects group shows not significant effect in the triglycerides level outcome from one month aerobic exercise training protocol. It may be due to the duration of the aerobic exercise training.

George A. Kelley et al, suggest that the more than 8 weeks of aerobic exercise training reduces the triglyceride level of the lipoprotein in men 18 years of age and older.[10] William E. Kraus et al, showed the duration and the amount of the aerobic exercise training had beneficial effects on the lipoprotein profile.[16] Ignigo and Mahon et al, suggest that the effect of ten week aerobic exercise training program had on triglycerides.[17]

6. Discussion of blood pressure variable.

The next important physiological finding in the form of BP within group and between

groups shows significant effect after four weeks of aerobic exercise training.

Robert H. Fagard *et al*, have suggest that aerobic exercise training decreases blood pressure through a vascular resistance , in which the sympathetic nervous system and due to the involvement of the rennin angiotensin system.[18]

The fact that the decrease of HR is counterbalanced by an increase in stroke volume with unchanged CO is compatible with the generally accepted effect of aerobic exercise training on resting hemodynamic. A decrease in the activity of the autonomic nervous system is most likely involved in the training induced reduction of BP.

7. Discussion of THR time variable.

The next important finding comparison of THR time in risk factor group shows significant effect on exercise training this may be due to the both group having the low level of parasympathetic tonicity or activities which is significantly strengthen by the four week of aerobic exercise training. So one week of aerobic exercise training is effective for THR time and increasing the endurance capacity.

Conclusion

On the basis of our result it can be concluded that TC, TG, VLDL and LDL required more than four week of aerobic exercise training for improvement by both groups.

HDL is the only cholesterol variables which show the significant effect .so four weeks of aerobic exercise training are improve the HDL lipid valves. It can be associated HDL is a heart protective cholesterol. It can be to counter effect the LDL, VLDL level.

Aerobic exercise training significant effects on BP mean systolic and diastolic and it can improve cardiac endurance and better parasympathetic activity. Four week of aerobic exercise training is effective for in increasing the endurance capacity.

Therefore aerobic exercise training should be incorporated in rehabilitation protocol of CAD patients which in turn will help in improving their quality of life and improvement of physiological parameters.

Clinical Relevance

Aerobic exercise training is best for improvement of the marked decrease in the serum cholesterol level was associated with a correction of endothelial dysfunction , improvement in myocardial perfusion , and decrease in the incidence of CAD .Subject with risk factors such as diabetes, hypertension, hypercholesterolemia and smoking effect the affect endothelial function and latter on lead to atherosclerosis.

So exercise training improves the endothelial function of arteries and reduces the risk factors after aerobic exercise training. Therefore, aerobic exercise has proved as a valuable and preventable tool of cardiac rehabilitation. Aerobic exercise improves cardio-pulmonary endurance, quality of life, makes them fit and its help in better life.

Future research & Limitation of study

This study is limited to a very small sample size. So it is strongly recommended for future research based on large sample size and aerobic exercise protocols may be tried more than four weeks.

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