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Original Article

EFFECTS OF AEROBIC TRAINING ON LIPID PROFILE

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ABSTRACT

Introduction: Aerobic exercises like walking, running, cycling scores for ordinary persons to improve their physical fitness and health. The aim of this study is to investigate the effects of tread mill exercise and ergometer cycling on lipid profile **Materials and methods:** This study includes 80 subjects, of these 40 subjects were in control group (Group A) and 40 subjects were in aerobic training (study group). The study group is further subdivided into Group B consists of 20 subjects who underwent treadmill training and Group C consists of 20 subjects who underwent cycling. Study subjects underwent aerobic training of moderate intensity for 12 weeks, five days in a week, one hour per day on tread mill for Group B individuals and five days in a week, fifteen minutes per day on the cycle for Group C individuals. **Results:** Students paired 't' test was used to test statistical significance between pre and post tests for each group. Results showed significant reduction in Total Cholesterol, Triglycerides, Very low density lipoprotein, Low Density Lipoprotein, Total Cholesterol/High Density Lipoprotein ratio, Low Density Lipoprotien/High Density Lipoprotein ratio and elevation of High Density Lipoprotein in post test compared to pre test with p value of < 0.05 in aerobic training group. Control group, showed no significant improvement in post test compared to pre test with p value of > 0.05. **Conclusion:** The study concluded that aerobic exercise has a definite favourable impact on lipid profile, compared to sedentary individuals. Thus both treadmill and bicycle ergometer can be recommended for the favourable improvement on lipid profile

Keywords: *Aerobic exercise, Lipid profile, Tread mill, Bicycle ergometer*

INTRODUCTION

Elevation of blood lipid level is directly proportional to Coronary Heart Disease; Hyperlipidemia is a crucial component in developing atherosclerosis. It is aggravated by physical inactivity and excess body fat. The amount of LDL (bad cholesterol) and HDL (good cholesterol), their ratio Total Cholesterol / High Density Lipoprotein, Low Density Lipoprotein/High Density Lipoprotein, is a good indicator of coronary artery disease risks rather than cholesterol as such. High Density Lipoprotein protects against heart disease; Regular moderate intensity aerobic exercise can increase High Density Lipoprotein level, decrease Low Density Lipoprotein and alter Low Density Lipoprotein/High Density Lipoprotein ratio favourably to prevent cardiovascular diseases [1]. "Raveenan Sitiwicheanwong, et al" [2] studied the effects of moderate exercise training on lipid profile for twelve weeks in sedentary women. Triglycerides, triacylglycerol-rich lipoproteins, small dense LDL and its ratio were significantly reduced in exercise group compared to the control group. "Valeria Sales Do Valle et al" [3] studied the effects of indoor cycling and dieting on serum lipid profile for 12 weeks. Aerobic exercise intervention showed significant favourable outcome on lipid profile (Total Cholesterol, Low Density Lipoprotein, Very Low Density Lipoprotein, High Density Lipoprotein) in exercise group compared with sedentary control group who had unfavourable result. "Tambalis K et al" [4] observed the effect of blood lipids to aerobic, resistance, combined mode of exercise for 12 weeks. Results revealed that high intensity aerobic exercise training showed elevation of High Density Lipoprotein cholesterol. "O Donovan et al" [5] observed the effects of aerobic exercise of moderate intensity for 24 weeks, 3 sessions per week, which showed significant reduction in total cholesterol and Low Density Lipoprotein cholesterol.

MATERIALS AND METHODS

Study is a randomized control trial for 12 weeks, observing the effects of aerobic training on lipid profile. Subjects were recruited from Thanjavur Medical College Hospital and Raja Mirasudhar Hospital, Thanjavur, in the 25 to 35 years age group, study was conducted between January 2014 and June 2014. This study was conducted in the research laboratory, Department of physiology, Thanjavur Medical College, Thanjavur. Subjects were randomized into three groups Group A Control Group; Group B Treadmill group; Group C Ergometer Cycle group[3] This study included 80 subjects[46 were males, 34 were females], of these 40 subjects (22 were males, 18 were females) were in control group - Group A and 40 subjects(24 were males, 16 were females) were in aerobic training group (study group). The study group is further subdivided into two groups, Group B consisted of 20 subjects (13 were males, 7 were females) who underwent treadmill training and Group C consisted of 20 subjects (11 were males, 9 were females) who underwent cycling. Before starting our study, we obtained ethical committee approval and clearance from the college. Informed consent was obtained from all subjects who were participating in the study. Subjects

included in our study were healthy individuals. Subjects with history of diabetes, hypertension, hyperlipidemia, intake of drugs (lipid lowering drugs), smoking, alcoholism, coronary artery disease, pulmonary illness, endocrinal diseases, and orthopaedic limitation to physical activity were excluded from the study. If an individual was involved in any other exercise activities (including yoga) were also excluded from the study.

For tread mill group(B) subjects, hundred steps per minute for one hour per session, five days in a week for twelve weeks, in cycle group(C) subjects, sixty to seventy revolutions per minute(RPM), fourth resistance in tension adjuster, for fifteen minutes duration, five days in a week for twelve weeks were followed. Both of these protocols were qualified for the moderate exercise intensity as per World Health Organization [WHO] guidelines and American Heart Association [AHA] guidelines. Instruments used in the study are Treadmill (Cardiotrack 900 XL, Whispermill, Browndove Health care Ltd, Bangalore), Pedometer (Omron health care, Singapore, model No: HJ-005) –To calibrate number of steps in tread mill walking, fingertip pulse oximeter (Model No: MD 300C22 Nidek Medical India (P) LTD, Kolkata) - to monitor heart rate during aerobic training session, Ergometer cycle (Aerofit India, Hyderabad), Keragen Biosystem – Semi Auto analyser (Keragen Technologies,Pvt Ltd, Bangalore). All subjects who were participated in the treadmill group (Group B) wore a pedometer (to quantify the number of steps) in a belt strapped in their waist, before stepping on to the treadmill. Exercise was performed for one hour. Warm up was done on the treadmill itself for 10 minutes. To start with 1.1 km/hr was gradually increased, and finally attained the desired speed of 3.2 to3.7 km/hr (equivalent to 100 steps per minute in pedometer). Exercise intervention continued in treadmill, 100 steps per minute for 1 hour. This is followed by 10 minutes cool down with light stretching exercises. This qualifies for a moderate intensity exercise. Like this, exercise session was followed for 5 days in a week and for 12 weeks for all subjects who were in treadmill group. During the exercise, heart rate and oxygen saturation in the blood was monitored closely using finger pulse oximeter. Before starting the exercise in cycle group (Group C), seating arrangement was made comfortable and adjusted according to the height of the individual. To start the exercise session, warm up with slow pedalling speed of 30 to 40 RPM for 5 minutes with resistance level in tension controller is set to first level (equivalent to 1 Kilopond). After completing the warming up, the pedalling speed gradually increased to 60 to 70 RPM for 15 minutes with resistance being increased from 1 to 4 in the tension adjuster gradually. This is followed by 10 minutes cool down with light stretching exercises. Like this, exercise session continued for 5 days in a week for 12 weeks. Before starting the exercise intervention, in all subjects (both study group and control group) blood samples were collected for pre-test evaluation of lipid profile (base line sample). For all subjects in study groups (after 12 weeks of exercise intervention) and control group (sedentary non-exercise group) blood samples were again collected for post-test evaluation of lipid profile. Blood was analysed in Keragen Biosystem – SemiAuto analyser in the biochemistry laboratory by standard enzymatic technique CHOD-PAP, End point method Total Cholesterol[TC], Triglycerides[TGL], and High Density Lipoprotein[HDL] noted from the analyser monitor, Very Low Density lipoprotein[VLDL], Low Density Lipoprotein[LDL], Total Cholesterol / High Density Lipoprotein[TC/HDL] ratio, Low Density Lipoprotein/High Density Lipoprotein[LDL/HDL] ratio were calculated

RESULTS

Students paired't' test was used to compare between pre-test and post-test for testing statistical significance. Results showed significant reduction in Weight, Body Mass Index(BMI), Total Cholesterol[TC], Triglycerides[TGL], Very Low Density lipoprotein[VLDL], Low Density Lipoprotein[LDL], Total Cholesterol / High Density Lipoprotein[TC/HDL] ratio, Low Density Lipoprotein/High Density Lipoprotein[LDL/HDL] ratio and significant elevation of High Density Lipoprotein[HDL], in post test compared to pre test with p value of < 0.05 of treadmill group (B), cycle group(C), Aerobic training group (B+C) whereas in Control group (A), showed no significant improvement in post test compared to pre test with p value of > 0.05. (Table No: 1). We used a level of significance of 95% (P value <0.05 as significance). The Mean difference between pre and post tests were compared for all groups (Figure no: 1)

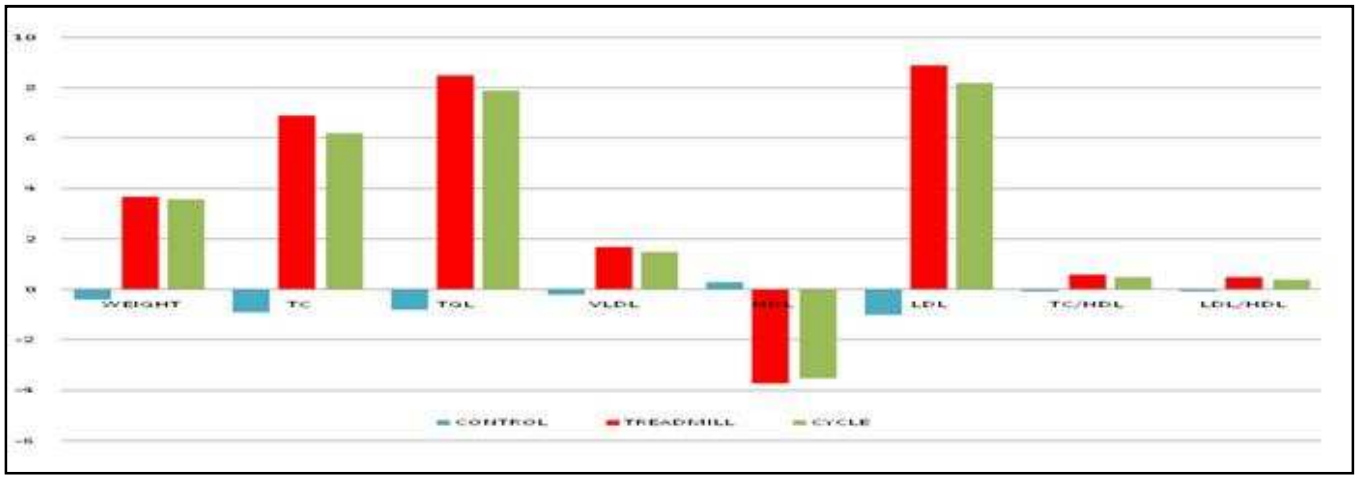

Fig1: Mean difference between Pre and Post tests

Total Cholesterol[TC]; Triglycerides[TGL]; Very Low Density lipoprotein[VLDL]; High Density Lipoprotein[HDL]; Low Density Lipoprotein[LDL]

Table 1: comparison of Pre and Post tests of Control, Treadmill, Cycle, and Aerobic training groups and its significance

Variable	Test type	Group A n = 40 CONTROL Mean ± SD	P value	Group B n = 20 TREADMILL Mean ± SD	P value	Group C n = 20 CYCLE Mean ± SD	P value	Group B + C n = 40 AEROBIC TRAINING Mean ± SD	P value
Weight	Pre	69.05 ± 8.62	0.058	67.9 ± 13.92	0.000	70.8 ± 15.34	0.000	69.35 ± 14.53	0.000
	Post	69.45 ± 8.44		64.2 ± 11.96		67.2 ± 13.96		65.7 ± 12.92	
BMI	Pre	26.31 ± 3.03	0.054	26.04 ± 5.03	0.000	27.11 ± 5.11	0.000	26.56 ± 5.03	0.000
	Post	26.47 ± 3.02		24.61 ± 4.26		25.75± 4.72		25.18 ± 4.48	
TC	Pre	184.53 ± 18.31	0.307	184.26 ± 21.99	0.000	180.42 ± 20.24	0.000	182.34 ±20.95	0.000
	Post	185.46 ± 16.58		177.29 ± 22.42		174.19 ± 19.19		175.74 ± 20.66	
TGL	Pre	132.68 ± 23.19	0.476	128.33 ± 16.39	0.003	129.93 ± 12.80	0.000	129.13±14.54	0.003
	Post	133.51 ± 21.76		119.74 ± 18.47		121.99 ± 12.59		120.87 ± 15.64	
VLDL	Pre	26.53 ± 4.63	0.476	25.66 ± 3.28	0.000	25.98 ± 2.58	0.000	25.82 ± 2.91	0.000
	Post	26.70 ± 4.35		23.94 ± 3.69		24.39 ± 2.51		24.17 ± 2.51	
HDL	Pre	37.26 ± 4.08	0.136	37.85 ± 4.59	0.000	37.14 ± 4.04	0.000	37.49± 4.28	0.000
	Post	36.97 ± 3.92		41.58 ± 4.67		40.72 ± 4.48		41.15 ± 4.54	
LDL	Pre	120.72 ± 18.32	0.314	120.74 ± 21.37	0.000	117.29 ± 20.43	0.000	119.01 ± 20.71	0.000
	Post	121.78 ± 16.85		111.76 ± 21.73		109.06 ± 19.23		110.41 ± 20.30	
TC/HDL	Pre	5.00 ± 0.73	0.132	4.94 ± 0.89	0.000	4.90 ± 0.70	0.000	4.92 ± 0.79	0.000
	Post	5.07 ± 0.71		4.32 ± 0.81		4.31 ± 0.579		4.32 ± 0.69	
LDL/HDL	Pre	3.28 ± 0.66	0.156	3.25 ± 0.79	0.000	3.19± 0.66	0.000	3.22 ± 0.72	0.000
	Post	3.34 ± 0.65		2.74 ± 0.72		2.71 ± 0.55		2.72±0.63	

(SD-Standard Deviation; Body Mass Index(BMI]; Total Cholesterol[TC]; Triglycerides[TGL]; Very Low Density lipoprotein[VLDL]; High Density Lipoprotein[HDL]; Low Density Lipoprotein[LDL]; Total Cholesterol / High Density Lipoprotein[TC/HDL] ratio; Low Density Lipoprotein/High Density Lipoprotein[LDL/HDL] ratio)

DISCUSSION

This study assessed the effects of twelve weeks moderate intensity aerobic training in tread mill and ergometer cycling on lipid profile. CA millesis[6], Savage MP[7], were studied the effects of aerobic exercise on lipid profile (Total Cholesterol, Triglycerides, Low Density Lipoprotein) and showed significant improvement in these parameters. Thompson et al[8] studied the effects of aerobic exercise on High density Lipoprotein and showed favourable result. Juneau M Rogers F[9]; showed the effects of aerobic training on lipid profile for 12 weeks. Results showed significant improvement in Body Mass index, elevation of High Density Lipoprotein, lowering of Low density lipoprotein, Total Cholesterol, and Triglycerides. Similar results were observed in our study.

The study results are encouraging for both treadmill and cycle groups which show significant improvement in post test results compared to pre test results, whereas in control (sedentary) group showed no significant change (no improvement) in post test results compared to pre test results . Limitations of the study includes, this study was done only in young healthy volunteers. Whereas in older patients

with systemic diseases like diabetes, hypertension, etc., usually associated with lipid abnormalities, they are more prone to develop cardio vascular disease; hence older individuals should be targeted in future studies. In old individuals, change in lipid profile is not so quick as in younger.

CONCLUSION

The study results revealed that aerobic exercise has a definite favourable impact on lipid profile, compared to sedentary individuals. Thus both treadmill and bicycle ergometer can be recommended for the favourable improvement (Lowering of Body Mass Index(BMI], Total Cholesterol[TC], Triglycerides [TGL], Very Low Density lipoprotein[VLDL], Low Density Lipoprotein[LDL], Total Cholesterol / High Density Lipoprotein[TC/HDL] ratio, Low Density Lipoprotein/High Density Lipoprotein[LDL/HDL] ratio and elevation of High Density Lipoprotein[HDL].

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Conflict Of Interest: Nil

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