ABSTRACT

Background: Exercise is a lifestyle change that has been recommended for lowering atherogenic index in adults. The intensity and duration of exercise to bring about a change in the lipid parameters are yet to be determined. Previous studies examining the effects of exercise intensity on lipid and lipoprotein levels have reported conflicting findings. Thus we aimed at determining the changes in lipid profile in sedentary obese adults influenced by different intensity of exercise.

Methodology: Study included 51 obese adults with sedentary lifestyle. Participants performed exercise of moderate intensity (n=22) and high intermittent intensity (n=29) for a duration of 40 min/day for 5 days/week and 20 min/day for 3 days/week respectively on bicycle ergometer for a period of 15 weeks.

INTRODUCTION

Physical inactivity is a state of concern as it leads to major health problems like obesity, hypertension and various metabolic disorders. Exercise is recommended as a therapeutic lifestyle change as it leads to various health benefits. It is also known to bring about changes in lipid parameters. The important factors that have to be considered during an exercise session are its intensity and duration which has to be determined to produce major health benefits. Low intensity exercise done for longer periods uses fat as the substrate for energy whereas high intensity exercise uses carbohydrate rather than fat. This finding has led to the recommendation that traditional low to moderate intensity exercise is beneficial to produce changes in lipid parameters compared to high intensity exercise as observed by few studies [1-3]. Recently high intensity intermittent exercise has been highlighted for the purpose of weight reduction and lowering atherogenic index [4,5]. The advantages of high intensity exercise which has been stated is the shorter duration of activity, and as observed by Abby et al. [6] the better long term adherence rate. Conflicting results exist that suggests high intensity exercise and few recommending low to moderate intensity exercise for improving the lipid, lipoprotein levels and blood pressure. Therefore, we aimed at evaluating the effect of exercise on lipid values and blood pressure in sedentary obese individuals and to compare the effects of moderate and high intermittent intensity exercise on these parameters.

METHODOLOGY

The study was conducted in the Department of Physiology at Indira Gandhi medical college and hospital in the age group of 19-35 years, who volunteered for the study, were selected randomly by lot method. Information pamphlet regarding the study was given and informed consent was taken from the volunteers who wished to participate in the study. Sedentary obese individuals Body mass index (BMI ≥25) in the age group of 19-35 were included in the study. Individuals with history of previous surgery, diabetic, hypertensive, asthmatics, cardiopulmonary and musculoskeletal disorders were excluded. Complete clinical examination, ECG and echocardiogram were taken and fitness obtained from physician before volunteers were recruited for exercise. Blood sample was taken after overnight fast of 12 hrs for lipid profile and estimated using standardised enzymatic methods [7]. A digital weighing scale that could measure to the nearest 0.1 kg was used to record weight, and height was measured to the nearest centimeter using a stadiometer, in the Frankfurt plane position. Body mass index (BMI) was calculated based on Quetelet index [8]. Blood pressure was recorded using mercury sphygmomanometer with the subject in sitting posture. Subjects were instructed to abstain from caffeine and alcohol at least two days prior to the exercise session and to have food two hours prior to the exercise session. During the visit to the laboratory, subjects were acquainted well with the exercise protocol for two weeks and instructed to abstain from caffeine and alcohol at least two days prior to the exercise session and to have food two hours prior to the exercise session. During the visit to the laboratory, subjects were acquainted well with the exercise protocol for two weeks and encouraged to get their doubts clarified. Exercise was performed on the bicycle ergometer at the fixed weight to reach the calculated target heart rate using karvonen formula [9]. Nineteen volunteers opted out due to following reasons, 12 could not come to the department out of the working hours (they were willing to continue the exercise at home), four had shift duties at their office (could not come to the department during night duties), one became pregnant and two lost contact.

Exercise protocol for moderate intensity exercise group included performance of Steady state cycling at the heart rate of 50% -74% of functional capacity (predicted maximum heart rate given by the formula: 220− age). Exercise protocol for high intermittent intensity group included performance of Steady state cycling at the heart rate of 50% -74% of functional capacity and as observed by Abby et al. [6] the better long term adherence rate. Conflicting results exist that suggests high intensity exercise and few recommending low to moderate intensity exercise for improving the lipid, lipoprotein levels and blood pressure. Therefore, we aimed at evaluating the effect of exercise on lipid values and blood pressure in sedentary obese individuals and to compare the effects of moderate and high intermittent intensity exercise on these parameters.

Outcome Measures: Pretesting and post testing included measurement of height, weight, blood pressure and lipid profile.

Statistical Analysis: Results were analysed using the Paired and Unpaired samples t-test.

Results: Postexercise revealed significant reduction in the LDL-C and diastolic blood pressure (p<0.05) with the high intensity exercise group. There was a significant difference in BMI, lipid profile and blood pressure in both the moderate and high intensity exercise group.

Conclusion: This study suggests that exercise is “elixir” for a healthy life. High intermittent intensity can be considered for individuals who have time constraints and lead a sedentary lifestyle and moderate intensity exercise advised for individuals who are willing to create time for their health benefits. A programmed protocol of exercise will help in reduction of lipid parameters.

Keywords: Exercise, High intensity, Lipid, Moderate intensity
of heart rate maximum reserve for a duration of 40 min, 5days/week and High intensity exercise group performed 8sec sprint cycling on bicycle ergometer at the heart rate of 75% -84% of heart rate maximum reserve followed by 12 sec of low intensity cycling for a duration of 20min , 3times/week with 5min of warm up and 5 min of cool down in both the groups. 

Lipid profile, height and weight, blood pressure were recorded after 15 weeks of completion of exercise.

RESULTS
Seventy (this number includes drop outs) obese individuals with sedentary lifestyle volunteered to participate in the study. Of this 51 completed the exercise protocol for a period of 15 weeks. They were grouped into moderate intensity exercise group (n=22) and high intensity exercise group (n=29). The mean ages of the participants were 24.5±5 and 23.6±4 in the respective groups. The gender distribution was 54.5% males, 45.5% females in the moderate intensity group and 55.2% males and 44.8% females in the severe intensity groups. Insert Table/Fig 1 shows the significant changes (p<0.05) in lipid parameters, body mass index and blood pressure before and after moderate intensity exercise. BMI and Lipid levels and blood pressure showed a significant change in the high intensity exercise group except very low density lipoprotein – cholesterol (VLDL – C) and Triglycerides as in [Table/Fig-2]. Comparing the lipid parameters between the two groups there was a significant change in the low density lipoprotein - cholesterol (LDL-C) (p<0.05) in the high intensity exercise group.

BMI and Lipid parameters in both the groups before exercise were similar. [Table/Fig-1] shows the significant changes (p<0.05) in lipid parameters, body mass index and blood pressure before and after moderate intensity exercise. BMI and Lipid levels and blood pressure showed a significant change in the high intensity exercise group except very low density lipoprotein – cholesterol (VLDL – C) and Triglycerides as in [Table/Fig-2]. Comparing the lipid parameters between the two groups there was a significant change in the low density lipoprotein - cholesterol (LDL-C) (p<0.05) in the high intensity exercise group.

BMI showed a reduction in the moderate intensity exercise group as represented in Table/Fig-3. The mean Systolic and diastolic blood pressure was 129.5±10.9, 81.5±6.0 and 125.8±10.9, 80±5.1 respectively before start of exercise protocol that did not show any significance whereas there was a significant change in the diastolic blood pressure in the high intensity group after 15 weeks of exercise as shown in [Table/Fig-4].

DISCUSSION
Exercise is a subset of physical activity defined as “planned, structured, and repetitive bodily movement done to improve or maintain one or more components of physical fitness.” Physical activity is an important determinant of energy expenditure and regular exercise is essential for weight control and weight loss. The awareness about complications of obesity and the significance of exercise in reduction of cholesterol levels are becoming popular amongst people that are obvious with increase in the number of people walking for health, moving towards gyms and various physical activities. Even the National program for prevention and control of diabetes and cardiovascular disease suggests moderate to vigorous activity for 5-7days/week [10].

The response of the lipid profile to an exercise session or training program is dependent on the type of exercise undertaken, its intensity and frequency, the duration of each session, and the time spent on such a program [11]. Conflicting results exist suggesting one form of exercise as superior to another. Few Studies have observed a decrease in total cholesterol and LDL- C after six months of higher but not lower intensity exercise [12] and an interval training program on hypertensive patients exercising at 60-79% Heart rate (HR) max reserve program of between 45 minutes and 60 minutes at a work/ rest ratio of 1:1 revealed a significant change in Systolic Blood pressure (SBP), Diastolic Blood pressure (DBP), Total Cholesterol (TC), High density lipoprotein (HDL) level [13]. These results are in favor of high intensity exercise, whereas 21 weeks of high intensity exercise in 45-60yr old failed to attain changes in the Total cholesterol, LDL- C and triglycerides [14] and as observed by Benson et al., [15] who did not find significant differences on cardio-metabolic factors HDL-C, LDL-C, Total cholesterol, triglycerides, TC/HDL, between the intervention and control group, after a 8-week high-intensity progressive resistance program twice a week. Studies [16] comparing aerobic and resistance exercise have observed a significant changes in VLDL and HDL in both groups and changes only with aerobic exercises observed by Chaudhary et al., [17]. There is lacuna as to which type and intensity of exercise would be sufficient to produce a remarkable change in the cardiovascular metabolic profile.

From our results, comparing moderate and high intensity exercise LDL- C levels showed a statistical significant reduction in the high intensity group. The reason for this could be due to the fact that energy expenditure is more with the high intensity exercise during recovery period. Though fat provides more Kcal of energy/gm than
and overweight. Instead of using lifestyle modification as a treatment based on the health and fitness levels of the individual. It should be The importance of exercise has been emphasised in our study of atherogenic index. Therefore, we suggest high intensity exercise over not only target on weight loss but should also be efficient in lowering HDL-C, LDL-C and BMI in the high intensity group. Exercise should be because of favorable changes in vascular compliance due to release of hormones that could reduce peripheral resistance. More studies examining the effects of high intermittent intensity exercise in hypertensive patients is the need of the hour. A 10% reduction of Total cholesterol reduces risk of coronary artery disease mortality by 13% and 1% reduction of LDL-C reduces risk of major coronary events by approximately 2% [19]. Our finding of decrease in total cholesterol and an increase in HDL- C in both the groups is consistent with previous results of Fahri et al., and Kraus et al., [3,14]. However, not all studies have found change in lipid parameters. Rad et al., [20] have demonstrated that weight loss mostly was due to combined effects of exercise and diet and exercise alone was insufficient to stimulate change in any lipid or lipoprotein measures. The only dietary advice given to our subjects was to take dinner 1-2 hrs before going to bed which is a limitation of this study and long term studies examining the effects of diet and exercise intensity on cardiovascular metabolic factors are required. Comparison of lipid parameters and BMI within the groups showed significant changes in total cholesterol, LDL-C, HDL-C, TGL, VLDL in the moderate intensity group and changes in total cholesterol, HDL-C, LDL-C and BMI in the high intensity group. Exercise should not only target on weight loss but should also be efficient in lowering atherogenic index. Therefore, we suggest high intensity exercise over moderate intensity exercise for people who have time constraints. The importance of exercise has been emphasised in our study and it has been suggested that exercise prescription should be based on the health and fitness levels of the individual. It should be progressively introduced to individuals who are relatively sedentary and overweight. Instead of using lifestyle modification as a treatment measure after the onset of the disease, approach to weight reduction and improvement in cardiovascular fitness should include physical activity and diet modification which was a limitation of this study. Long term studies are required to confirm these findings. **CONCLUSION** High intensity intermittent exercise which can be done for 15 – 20 min for 3-4 days/week has produced a significant change in the LDL C and a reduction of diastolic blood pressure. Moderate intensity exercise is efficient in reducing the BMI. Both forms of exercise have shown a significant change in the cardiac metabolic profile. In summary, high intensity exercise of short duration can be performed during the active stage of life instead of complaining about lack of time and moderate intensity exercise can be suggested to people who show interest and are willing to create time for their exercise protocol. More long term studies are required to explore the benefits of high intermittent intensity exercise. **REFERENCES**


