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The Effect of High Intensity Interval Training in Reducing the Risk of Cardiovascular Diseases in Obese Type-I Individuals

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Abstract

Background

This study aimed to investigate the potential of High-Intensity Interval Training (HIIT) as a non-pharmacological intervention to reduce the risk of cardiovascular disease in a specific population.

Methods

A quasi-experimental design was employed; involving 20 young adults aged 25-30 recruited from a fitness centre. The participants underwent an 8 weeks high-intensity exercise program consisting of 3 weekly sessions. Baseline measurements of body mass, height, BMI, cholesterol, triglycerides, LDL, and HDL levels were taken before the intervention. Post-intervention measurements were obtained at the end of the 8 weeks.

Results

The results demonstrated significant improvements in various parameters following the 8 weeks workout program. BMI decreased from 32.2±1.42 to 31.67±1.45, while cholesterol levels decreased from 221.37±9.3 to 201±9.64, indicating a reduction in total cholesterol. Triglyceride levels decreased from 181.5±10.98 to 170.1±11.93. LDL values decreased from 144.5±8.9 to 134.2±8.13, indicating a decrease in low-density lipoprotein. Additionally, HDL levels increased from 36.53±4.53 to 46±5.44, reflecting an increase in high-density lipoprotein levels. All these changes were statistically significant ($p \leq 0.005$).

Conclusion

The findings suggest that HIIT is an efficient and effective exercise for sedentary and inactive young males. The study supports using HIIT as a non-pharmacological approach to improve physical well-being, enhance fitness, and reduce the risk of cardiovascular diseases. HIIT provides a time- and cost-efficient alternative for individuals with limited exercise time who still desire optimal health and fitness outcomes.

Keywords

Cardiovascular Diseases, High-Intensity Interval Training, Sedentary Lifestyle, Young Adults.

Introduction

Obesity is a major global health issue characterized by accumulated extra body fat, frequently connected with a sedentary lifestyle and reduced mobility[1]. It is linked to coronary artery disease and is a separate risk factor[2]. Obesity also influences other risk factors for coronary heart disease, such as elevated blood pressure, increased left ventricular hypertrophy, resistance to insulin, adverse effects on plasma lipids (higher triglyceride levels and decreased HDL levels), and, eventually, a more sedentary lifestyle[3]. Studies have shown an inverse relationship between HDL levels and the prevalence of coronary artery disease[3]. On the other hand, decreasing LDL levels further reduces the likelihood of heart attacks, ischemic cerebrovascular accidents, and re-angiogenesis. The probability of cardiac disease is reduced by one-fifth for every mmol per litre decrease in LDL. Similarly, a 2 to 3 mmol per litre rise in HDL lowers the risk by nearly 40 to 50%[4].

Regular physical activity and exercise, such as running, walking, and aerobics, have become essential in preventing chronic diseases like obesity and improving overall fitness. These exercises have been shown to lower total cholesterol, LDL cholesterol, and triglycerides and enhance HDL levels[5]. However, the appropriate training dosage to improve lipids profiles remains to be identified. Physical exercise is acknowledged as a significant component of homeostatic and energy balance[6]. The American College of Sports Medicine (ACSM) advises engaging in a large amount of continuous, moderate-intensity exercise, often between 150 and 250 minutes per week, to avoid gaining weight[7]. The recommended amount of activity each week rises to around 150 minutes for moderate weight loss, ranging from 225 to 420 weekly for significant weight loss[8].

Nevertheless, the high exercise volume has been a common barrier to public adherence and adaptability to training regimes due to time limitations, especially among young adults[9]. On the other hand, High-Intensity Interval Training (HIIT) has gained popularity as an effective exercise regimen for improving cardiorespiratory and metabolic consequences, such as excess weight and deposited fat[10]. Some research suggests that HIIT may be more effective than Moderate-Intensity

Continuous Training (MICT) for decreasing body fat in those who are overweight or obese[10]. HIIT incorporates short bursts of high-intensity physical activity that raise the heart rate to 80% of the maximum heart rate with little recovery time[11].

Methodology

Study Design

A quasi-experimental approach was used in this study to explore the impact of HIIT on lowering the risk of cardiovascular diseases (CVDs) in obese Type-1 individuals. Rather than using a control group, the study compared pre- and post-intervention data within a single group of individuals.

Participants Characteristics

A convenience sample of 20 inactive, sedentary young adult males aged 25-30 years with a BMI in the obese Type-1 category was recruited from various sites in Karachi, Pakistan. Individuals with a sedentary lifestyle, low activity levels (less than 1.5 MET per day), and no use of medicines, boosters, or nutritional supplements met the inclusion criteria. Participants who smoked or had an unstable body mass were excluded from the study.

Study Setting

The intervention was carried out by collaborating with fitness centres in Karachi, Pakistan, which offered a monitored and regulated setting for implementing the HIIT programme. These facilities had the appropriate exercise equipment and supplies. The HIIT sessions were supervised by qualified exercise specialists, who ensured proper exercise technique, individual safety, and adherence to the intended duration and intensity of the exercise programme.

Intervention Protocol

The HIIT programme comprised a regimented training regimen conducted thrice weekly for 8 weeks. Each session began with a warm-up, followed by high-intensity exercise and active recovery cycles, and ended with a cool-down. The warm-up and cool-down phases were

designed to prepare participants for high-intensity practice and to aid recovery as shown in Table1-.

Table-1HIIT protocol

Intensity	Muscle failure after the failure of exercise							
Progression	Week 1	Week 2	Week 3	Week 4	Week 5	week 6	Week 7	Week 8
	Half squat	Deep squat	Deep squat with side kick	Deep squat with jump side kick side	Deep squat with side kick jump ,crunch exercise	Deep squat with side kick jump, crunches cross legged crunch	Deep squat with side kick jump, crunches, cross legged crunch thrust	Deep squat with side kick jump, crunches, cross legged crunch thrust
	9 mins	9 mins	9 mins	18 mins	18 Mins	30 mins	40 mins	40 mins
Methods	1 minute exercise 2 mins passive rest to recovery pulse 3 repetitions 3 times/week on alternate days							
Materials	No equipment implementation required							

Data Collection Procedure

Before beginning the training procedure, baseline measurements such as anthropometric data (height, weight, BMI) and evaluations of levels of fitness were taken. These baseline measurements were used to compare the intervention measures. Changes in lipid profile (total cholesterol, HDL-C, LDL-C, triglycerides) were considered significant outcome measures in the study, whereas changes in BMI were considered supplementary outcome measures. Following the 8-week intervention phase, post-intervention measures were taken. This study's methodology is consistent with previous study[12]. The intervention primarily addressed abdominal muscles and extensors of hip and knee joints, with a focus on multi-joint movement chains.

Data Analysis

The SPSS (Statistical Package for Social Sciences) version 23.0 was used for statistical analysis. The mean and standard deviation were used to represent all descriptive data. Pre- and post-data were used to calculate inferential statistics using the paired t-test while p-value≤0.05 was considered significant.

Results

A total of 20 obese with sedentary lifestyles participated in the study with a mean age of 27.79±1.813 and height of 170±4.702. The results revealed significant changes in several parameters following the 8 weeks workout programme. The BMI went from 32.2±1.42 to 31.67±1.45, showing a decreased body mass index. The cholesterol level reduces from 221.37±9.3 to 201±9.64, indicating a drop in total cholesterol. Triglyceride levels reduced from181.5±10.98 to 170.1±11.93, showing that triglyceride levels decreased. Furthermore, LDL values reduced from144.5±8.9 to 134.2±8.13, indicating a drop in low-density lipoprotein. Moreover, HDL levels rose from 36.53±4.53 to 46±5.44, showing a rise in high-density lipoprotein levels. With a significant p-value (≤0.005), all these changes were deemed statistically significant.

Table-2 Pre and post measurement lipid profiles

Variable	Before training	After 8 weeks	Mean differences	P-value
BMI	32.2±1.42	31.67±1.45	0.52±0.15	<0.001
Cholesterol level	221.37±9.3	201±9.64	11.57±3.7	<0.001
Triglycerides	181.5±10.98	170.1±11.93	11.474±2.65	< 0.001
LDL	144.5±8.9	134.2±8.13	10.368±2.33	<0.001
HDL	36.53±4.53	46±5.44	6.52+2.91	<0.001

BMI: Body Mass Index
LDL: Low-Density Lipoprotein
HDL: High-Density Lipoprotein
Mean±S.D.

Discussion

This study aimed to assess the efficacy of a high-intensity interval training program on the lipid profile of young adult males. The study results demonstrated that implementing this program or training method without including expenses and obtaining results in lipid profile. However, the impact of the HIIT program on the outcomes of lipid profiles is currently a topic of discussion. The findings of our study also revealed that 8 weeks of HIIT training resulted in substantial modifications in lipid profiles in overweight and obese youth. The findings of various studies investigating the impact of HIIT on lipid profiles in overweight and obese populations are mixed, with some studies finding no significant improvements in lipid profiles after 8 weeks of HIIT[13-14]. Other studies, on the other hand, revealed substantial decreases in TC and LDL-C following 8 or 6 weeks of HIIT in overweight or obese people[15-18]. These disparities could be attributed to variances in characteristics such as the specific training program utilized, measuring methodology, gender, age group, and level of obesity. More study is needed to discover the best effective HIIT regimens for changing lipid profiles in obese and overweight people. The recent findings show how HIIT could improve lipid profiles, which has important therapeutic and medical implications. Even 1% reduction in plasma LDL and TC values reduces the risk of coronary heart disease (CHD)[19].

Dietary control was one of the limitations of our study. However, most research recommends lengthier exercise training sessions, particularly for lipid profiles and body composition modifications. Some lipid profile alterations showed minor impact sizes while being statistically significant. Longer training trials are recommended to identify clinically meaningful changes in lipid profiles. We recommend that the researchers consider and address dietary control and training length in future trials.

Conclusion

The 8-week HIIT program resulted in significant improvements in BMI, total cholesterol, triglyceride levels, LDL values, and HDL levels among obese individuals with sedentary lifestyles. These changes indicate positive effects on weight management and cardiovascular

health. Further investigation is needed to clarify the contradictory findings on the impact of HIIT on lipid profiles in overweight and obese individuals. Study comparability must standardize training regimens, measuring techniques, and participant characteristics to maximize its efficacy in changing lipid profiles.

Authors Contribution

Rajar HA: Conception, design and data acquisition.

Hashmi AM: Drafting and data acquisition.

Akhter S: Critical revision and data analysis.

Amin U: Critical revision

John A: Final approval.

Declaration of Interest

None.

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