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LOWERING CHOLESTEROL WITH HIIT: AN EFFECTIVE SOLUTION FOR OVERWEIGHT WOMEN

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Abstract **Abstract** A sedentary lifestyle is a major risk factor for cardiovascular disease, particularly in overweight women. High-Intensity Interval Training (HIIT) is recognized as an effective exercise method for improving cardiometabolic health. This study aimed to analyze the effect of HIIT on total cholesterol levels in overweight women with a sedentary lifestyle. The research employed an experimental design with two groups: a treatment group that participated in a HIIT program for eight weeks and a control group that did not perform any exercise intervention. Total cholesterol levels were measured before and after the intervention in both groups. Data were analyzed using paired and independent sample t-tests to determine within-group and between-group differences, respectively. The results revealed a significant reduction in total cholesterol levels in the treatment group compared to the control group, with the HIIT group showing a greater decrease. These findings suggest that HIIT is a practical and efficient exercise method for reducing total cholesterol levels and managing cardiometabolic risk in overweight women with a sedentary lifestyle. HIIT offers an alternative intervention for individuals with limited time to improve heart and metabolic health. Further studies are recommended to explore the long-term effects and adherence to HIIT in diverse populations.

Keywords: High-Intensity Interval Training (HIIT), overweight, sedentary lifestyle, cardiovascular health.

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INTRODUCTION

The problem of overweight and sedentary lifestyles is increasing worldwide and is one of the major challenges in the field of public health (Kerr et al., 2017). A sedentary lifestyle in women, especially those who are overweight, contributes to an increased risk of various metabolic diseases, including dyslipidemia, hypertension, and type 2 diabetes (Clark et al., 2019). One of the main indicators of this risk is an increase in total cholesterol levels in the blood, which is a significant risk factor for cardiovascular disease (Mamikutty et al., 2014; Vigriawan et al., 2022).

High-Intensity Interval Training (HIIT) has become a popular approach in reducing the risk of cardiometabolic disease in individuals with obesity and sedentary lifestyles (Reljic et al., 2018). HIIT is a training method that combines high-intensity training intervals with periods of rest or low-intensity exercise, allowing for greater energy expenditure in less time than continuous aerobic exercise (Syamsudin et al., 2023). Previous research has shown that HIIT is effective in weight loss, increasing cardiorespiratory capacity, and reducing body fat levels in various populations (Airlangga & Malang, 2022; Syamsudin, 2021). However, the specific impact of HIIT on total cholesterol levels in overweight women who lead a sedentary lifestyle still needs more research.

Women with overweight face serious health risks, including metabolic syndrome which is the leading cause of coronary heart disease. Based on (World Health Organization, 2016) the prevalence of overweight women continues to increase globally, becoming a major concern in efforts to prevent cardiovascular diseases. Metabolic syndrome is characterized by metabolic disorders such as increased cholesterol levels, hypertension, and insulin resistance, which directly contribute to cardiovascular complications. Therefore, effective, practical, and easily adoptable interventions are needed by this group to prevent further risks.

High-Intensity Interval Training (HIIT) is emerging as one of the sports approaches that is not only accessible but also efficient in overcoming time and motivation challenges. HIIT has been proven to be able to improve physical fitness while lowering total cholesterol levels, which is one of the important

indicators in the prevention of metabolic syndrome. With a short workout duration, HIIT offers a practical solution that can be applied by women with limited time but want to improve their metabolic and cardiovascular health. This study is urgent to provide further scientific evidence on the effectiveness of HIIT, especially in lowering total cholesterol in overweight women who lead a sedentary lifestyle, so that it can be a guide in designing broader health interventions.

This study aims to analyze the effect of the HIIT program on total cholesterol levels in overweight women who have a sedentary lifestyle. The findings of this study are expected to provide scientific evidence regarding the effectiveness of HIIT in managing cardiometabolic health in this group and serve as a reference for intervention programs that can be adopted to improve their quality of life.

METHOD

The research used secondary data collection in 2021. This research has received ethical approval from the Ethics Committee of the Faculty of Medicine, Universitas Airlangga with the ethical number: 227/EC/KEPK/FKUA/2020. The research conducted is an experimental research. The design of this study uses a pretest and posttest control group design, namely data collection before and after treatment. There were two groups in the study, namely the experimental group that was given high-intensity physical exercise at intervals (HIIT) with ergocycles and the control group without intervention. The subjects of the study were women who were categorized in the overweight body mass index (BMI), namely in Asia Pacific 23-24.9, age 21-30 years, and sedentary lifestyle category. The sample size in this study was 10 people in the control group and 10 people in the HIIT group. The HIIT protocol is a high-intensity physical exercise of 90% of the maximum pulse rate (HRmax) at intervals. Physical training using an ergocycle for 10 seconds at a speed of 100 rpm and 50 seconds at a speed of 50 rpm, is carried out alternately (interval), with a total time of 20 minutes. The exercise is carried out 3x/week or as many as 8 sessions in 3 weeks (Alansare et al., 2018).

In this study, total cholesterol data was taken before (pre) and after (post) given treatment in the form of

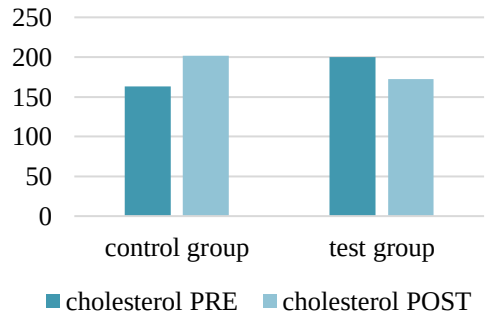
HIIT exercise. Cholesterol measurement with the Easy Touch GCU Meter Device with the provision that normal cholesterol levels are less than 200 mg/dL, while high cholesterol levels are more than 240 mg/dL (Ummah, 2019). The data was analyzed using SPSS software to provide a descriptive description of the variables studied. Furthermore, a normality test was carried out to determine whether the data was normally distributed, as well as a homogeneity test to ensure that the variance between data groups was uniform. If the data is proven to be normally distributed and homogeneous, then a differential test between groups with an independent T-test is carried out. The test aims to identify significant differences between two independent sample groups.

RESULT AND DISCUSSION

Research Result

The data from the observation results of the average cholesterol (mg/dl) before and after from women with a sedentary lifestyle are depicted in the following histogram

Figure 1. Average Cholesterol Before and After HIIT from Two Different Groups



Source: Author's Calculation

The histogram above illustrates the difference in cholesterol levels in two groups of overweight women who were differentiated based on HIIT (High-Intensity Interval Training) exercise treatment for two weeks. The control group consisted of women who did not receive HIIT treatment, while the treatment group consisted of those who underwent HIIT training for two weeks. From the histogram, it can be seen that in the control group, the average cholesterol level showed an increase after two weeks without treatment. On the other hand, in the treatment group given HIIT exercise, the average cholesterol level actually decreased after two weeks. The following table is the profile of the respondents as seen from cholesterol levels before and after HIIT training.

Table 1. Cholesterol Data of Respondents Before and After HIIT

Respondent	Cholesterol	
	Pretest	Posttest
1	194	195
2	195	205
3	200	206
4	216	217
5	205	225
6	168	180
7	180	212
8	165	178
9	190	202
10	184	189
11	200	195
12	207	197
13	219	193
14	259	201
15	190	184
16	215	213
17	216	198
18	208	180
19	217	207
20	216	196

Source: Author's Calculation

Based on the data after observation, there are indications that HIIT exercise may be effective in lowering cholesterol levels in overweight women, while the absence of exercise actually has the potential to increase their cholesterol levels.

To answer the purpose of the study, the quantitative analysis method used in this study is a differential test (t-test) by looking at two groups of samples that are given different treatments, namely HIIT exercise for two weeks. The main requirement in conducting a t-test is that the analyzed data must be normally distributed. This is important because the t-test is based on the assumption that samples are taken from populations that follow a normal distribution. Testing the normality of the data can be done by statistical methods such as the Shapiro-Wilk test.

Table 2. Test of Normality

Changes in Cholestero	*Shapiro-Wilk Normality Test*		
	Statistics	*df*	*Sig.*
Controlled Group	0.923	10	0.383
Treated Group	0.958	10	0.768

Source: Author's Calculation

The results of the normality test using the Shapiro-Wilk Normality Test in the table above showed that the distribution of cholesterol change data for the two groups, namely the control group and the treated group, was normal. In the control group, the statistical value of Shapiro-Wilk was 0.923 with a significance value of 0.383. Because the significance value (Sig.) is greater than 0.05, we fail to reject the null hypothesis, which states that the cholesterol change data in the control group are normally distributed. Similarly, in the treated group, the statistical value of Shapiro-Wilk was 0.958 with a significance value of 0.768, which was also greater than 0.05. This shows that the cholesterol change data in the treatment group is normally distributed.

Table 2. Independent Sample T-Test

Cholesterol	***t***	***df***	***Sig. (2-tailed)***
Equal Variances Assumed	8.168	18	0.000
Equal Variances Not Assumed	8.168	17.178	0.000

Source: Author's Calculation

The results of the differential test using the Independent Samples Test in the table showed an analysis of the difference in cholesterol changes between the control group and the group that was given treatment in the form of HIIT exercise. First, Levene's Test for Equality of Variances was conducted to evaluate the assumption of equality of variances between the two groups. The F value on the Levene's Test is 1.362 with a significance value of 0.258, which is greater than 0.05. This suggests that we do not have enough evidence to reject the null hypothesis, so it can be concluded that the variance of both groups is considered equal.

Analysis of the mean difference was carried out on the line "Equal variances assumed," with a t-value of 8.168 and a degree of freedom (df) of 18. The significance value (Sig. (2-tailed)) for this test is 0.000, which is much smaller than the significance threshold of 0.05. These results showed a statistically significant difference in cholesterol changes between the two groups. The mean difference in cholesterol changes between the control group and the treatment group was 65,700, with a standard difference of 8,043. In addition, the 95% confidence interval for this mean difference was between 48,802 and 82,598, which means that the mean difference in cholesterol change between the control group and the treatment group with HIIT is estimated to be within this range.

Discussion

The results of this study show that the High-Intensity Interval Training (HIIT) program has a significant impact on changes in total cholesterol levels in women with overweight and sedentary lifestyle (Mann et al., 2014). The group that participated in the HIIT program experienced a greater decrease in total cholesterol levels compared to the control group that did not participate in this exercise program. These results indicate that HIIT is not only effective in increasing physical capacity, but also has a positive impact on lipid profile, especially in groups at risk of metabolic

disorders (Ma et al., 2019; Mamikutty et al., 2014; Moreno-Fernández et al., 2018; Rask Larsen et al., 2018).

The significant reduction in cholesterol levels observed in this study highlights the potential of HIIT as a targeted intervention for overweight women, a group often overlooked in conventional fitness regimens. By focusing on measurable health outcomes like lipid profiles, this study strengthens the argument for integrating HIIT into broader public health strategies aimed at combating metabolic disorders.

The significant difference in the reduction in total cholesterol levels between the treatment group and the control group can be explained by the unique characteristics of HIIT, which involves high-intensity exercise in short durations followed by rest intervals. Physical activity with HIIT patterns has been shown to significantly improve the body's metabolism, including fat burning and increased activity of the enzyme lipoprotein lipase, which plays a role in breaking down low-density lipoprotein (LDL) in the blood. Thus, HIIT training contributes to reducing harmful cholesterol levels and improving cardiovascular health (Kong et al., 2016). These physiological mechanisms not only support the immediate health benefits of HIIT but also underline its practicality for populations with limited time or motivation to engage in prolonged exercise sessions. Such insights are crucial in designing accessible fitness interventions that cater to the specific needs of at-risk populations, particularly women with a sedentary lifestyle.

The findings of this study are in line with previous studies that stated that HIIT was effective in lowering total cholesterol levels and improving lipid profiles. HIIT is able to provide significant benefits to lipid profile compared to continuous aerobic exercise. This suggests that HIIT can be an effective and efficient alternative, especially for time-limited individuals who need a practical exercise approach while still providing optimal cardiovascular benefits (Chin et al., 2022). Moreover, the comparative advantage of HIIT over traditional aerobic exercises lies in its ability to maximize metabolic benefits in a shorter duration. This feature makes HIIT a viable recommendation not just for fitness enthusiasts, but also for healthcare practitioners looking to

prescribe exercise regimens tailored to time-constrained patients.

The limitations of this study are the relatively short duration of the HIIT program and the variability of metabolic response in each individual which can be influenced by factors such as diet, age, and initial fitness level. Further research examining the effects of HIIT over a longer period of time and involving a larger population group is urgently needed to validate these findings and look at the long-term impact of HIIT on lipid profile and cardiometabolic health.

Overall, the results of this study confirm that HIIT is an effective exercise method in lowering total cholesterol levels, especially in overweight women with a sedentary lifestyle. HIIT interventions have the potential to be a practical solution to reduce cardiovascular risk in this population, and can be used as a reference for exercise programs aimed at improving lipid profiles and overall heart health (Rif et al., 2021).

CONCLUSION

This study aims to analyze the effectiveness of High-Intensity Interval Training (HIIT) in lowering total cholesterol levels in overweight women who have a sedentary lifestyle. The results showed that HIIT significantly lowered total cholesterol levels compared to the control group that did not receive the intervention. These findings provide evidence that HIIT is an effective, efficient, and practical exercise method for managing cardiometabolic risk in the group, in line with the purpose of the study.

However, this study has limitations, such as the relatively short duration of the intervention and the variability of metabolic responses between individuals that may be affected by diet, age, and initial fitness level. Therefore, further research is recommended to explore the long-term impact of HIIT on lipid profile and cardiometabolic health by involving a more diverse population.

The recommendations of the study include the adoption of HIIT as one of the components of a health program for women with overweight and sedentary lifestyles. HIIT can be integrated in community-based interventions to reduce the risk of cardiovascular disease in an efficient and affordable way.

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