

# The Effect of Mix Impact Aerobics and Garlic Supplementation on Decreasing Total Cholesterol and Triglyceride Levels of Obese Women

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**Abstract:** Obesity can cause an increase in cholesterol and triglycerides which can cause cardiovascular disease. The purpose of this study was to determine the effect of mix impact aerobics and garlic supplementation on decreasing total cholesterol and triglyceride levels of obese women. This type of research is quasi-experimental research with a pretest posttest control group design research design. The study sample consisted of 10 people divided into two groups namely the aerobic mix impact group (AMI) as a control group and the mix impact aerobic group with garlic supplementation (AMI-GS) as the experimental group. Aerobic exercise is done for a month, 3 times a week, within 45 minutes with a target heart rate of 60-70% MHR, while giving garlic once a day at a dose of 300mg. The results obtained by pretest total cholesterol levels in the AMI and AMI-GS groups were 212.9 mg / dl and 215.6 mg / dl, triglyceride levels 106.1 mg / dl and 110.3 mg / dl. Posttest total cholesterol levels were 180.2 mg / dl and 170 mg / dl, triglyceride levels were 93.8 mg / dl and 94.1 mg / dl. T test results showed a decrease in total cholesterol and triglyceride levels in both AMI and AMI-GS groups. The unpaired t-test results showed that there were differences in total post-test cholesterol levels between the AMI and AMI-GS groups. The conclusion of the study was that mix impact aerobics with garlic supplementation had more influence on decreasing total cholesterol and triglyceride levels compared to only doing mix impact aerobics in obese women.

**Keywords:** mix impact aerobic, garlic, cholesterol, triglyceride

## 1. Introduction

Obesity or overweight is a problem that has emerged in recent decades. WHO described that in 2016, more than 1.9 billion adults were overweight. Of this number, more than 650 million people are obese [1].

Generally women have more body fat percentage than men [2]. Fat is useful for the body, but if the amount is excessive it tends to cause disease [3]. Women with body fat more than 30% and men with body fat more than 25% are considered obese [4]. Obesity can cause an increase in cholesterol and trigger narrowing of blood vessels in the heart which can cause cardiovascular disease [5].

Studies show that weight gain is accompanied by an increase in serum cholesterol. Every 362 increase in 1 kg/m<sup>2</sup>, body mass index (BMI) is associated with a total plasma cholesterol of 7.7 mg/dl and a decrease in HDL of 0.8 mg/dl. In addition, studies show obesity causes an endogenous cholesterol synthesis rate of 20 mg daily for every kilogram of overweight, increased VLDL synthesis and triglyceride production [6].

In Indonesia, the incidence of hypercholesterolemia according to MONICA I (Multinational Monitoring of Trends Deter minantsin Cardiovascular Diseases) research is 13.4% for women and 11.4% for men. In MONICA II there was an increase of 16.2% for women and 14% for men. Women are the group most suffering from this problem which is 14.5% or almost double the men's group [7]. Several studies have proven that men and women of various age groups experience an increase in total cholesterol levels with an increase in Body Mass Index [8].

Hypercholesterolemia has been confirmed as an independent risk factor for atherosclerosis and thrombosis, coronary heart disease and ischemic stroke [9].

In order to maintain one's body weight so that it is ideal, the energy consumed must be the same as the energy expended which when this is the same there is an energy balance. So in order to lose weight, this energy balance needs to be adjusted, where physical exercise plays a role [10]. The things that need to be considered in losing weight through physical exercise are exercise duration (duration), intensity, and type of exercise [11].

According to [12] intervention through aerobic exercise is an important component for weight loss, and is usually included as part of a management program to lose weight.

In addition to doing aerobic exercise, herbal plants that can be used as an alternative to hypercholesterolemia are one of them by using garlic [13]. Some chemical compounds contained in garlic are allicin, niacin and vitamin C [14]. The content of vitamin C as an antioxidant plays a role in combating free radicals and maintaining cardiovascular health by improving blood lipid profile. Niacin (nicotinic acid) contained in garlic is known to reduce VLDL production in the liver so LDL cholesterol production decreases. Another useful ingredient is allicin which is known to have the effect of being able to reduce total cholesterol levels by inhibiting its synthesis [15].

Research on the effect of aerobic exercise and herbal plant supplementation is still limited, so research on the effect of aerobic exercise and garlic supplementation on total cholesterol levels in obese women.

## 2. Methods

### 2.1 Subject

The study used 10 obese women from various department of Universitas Negeri Medan volunteered to participate in the study. Before participation, all subject read and signed an informed consent form. Exclusion criteria were the presence of chronic medical conditions such as asthma, heart disease, or any other condition that would put the subjects at risk when performing the experimental tests. All Samples were measured for age, height, weight, body mass index (BMI) and hematology examination to measure total cholesterol levels. Then the sample did mix impact aerobics 3 times a week for 1 month. Furthermore, all samples were re-measured BMI and hematology to measure total cholesterol levels

### 2.2 Aerobic Training Protocol

Aerobic exercise follows the music bits used with a target heart rate of 60-70% MHR with a duration of 45 minutes. The frequency used is 3 times a week. Each exercise requires 3 stages, namely:

- Warming accompanied by music for 10 minutes
- Core training for 30 minutes
- Cooling down accompanied by music lowers the intensity slowly for 5 minutes

### 2.3 Measurements Cholesterol

Measurements of total cholesterol is done using hematology analyzer. Measurements procedures by following established procedures. Blood is put into a centrifugator. Furthermore, blood was centrifuged for 3 minutes at 4000 rpm to separate the serum from plasma in the sample. Serum pipette using automatic pipette as much as 50  $\mu$ L then enter into the serum cup. 1000  $\mu$ L cholesterol reagents were added using a micropipette and total cholesterol levels were read using ABX Pentra 400.

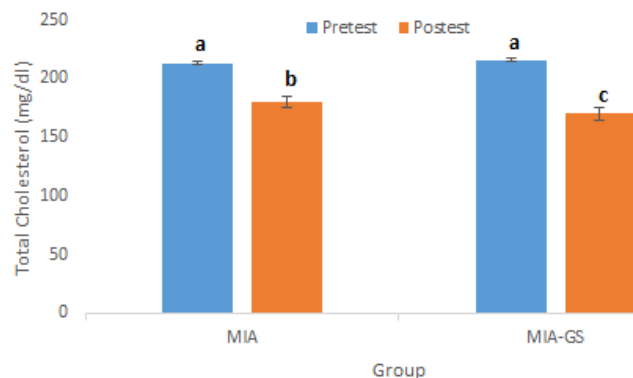
### 2.4 Statistical Analysis

The analysis used in this study was the paired two-sample t test (paired sample t-test) and independent sample t-test. Statistical analysis was performed using the Statistical Packet for Social Science (SPSS version 22.0) application.  $P < 0.05$  were considered significant

## 3. Result and Discussion

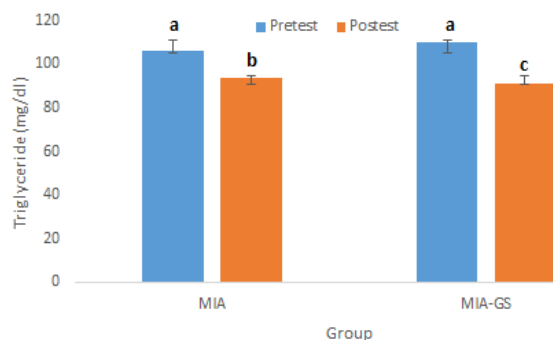
Total cholesterol levels before and after doing mix impact aerobic and mix impact aerobic with garlic supplementation for one month can be seen in Figure 1. The results of statistical tests on total cholesterol data of the mixed impact aerobic (MIA) exercise group and the mix impact aerobic exercise group and garlic supplementation (MIA-GS) before and after aerobic exercise obtained normal and homogeneous distributed data ( $p > 0.05$ ). Statistical test results using paired sample t-test obtained p value = 0,000 ( $p < 0.05$ ) which shows there are differences in total cholesterol levels in both

the LA group and the LA-BP group. The decrease in total cholesterol levels in the MIA group was 15.35% while the MIA-GS group experienced a decrease in cholesterol levels by 21.15%. The results of statistical tests using independent sample t test showed that there were differences in total post test cholesterol levels between the MIA and MIA-GS groups where the greatest reduction in total cholesterol was in the MIA-GS.



**Figure 1:** Total cholesterol levels in mix aerobic impact (MIA) and mix aerobic impact with garlic supplementation (MIA-GS). Data were mean  $\pm$  SD, n = 10,  $p < 0.05$

Triglyceride levels before and after mixing aerobic (MIA) and aerobic mix impacts with garlic supplements (MIA-GS) for one month can be seen in Figure 2. The statistical test results show triglyceride levels from MIA and MIA-GS before and after Aerobic training obtained data distributed normally and homogeneously ( $p > 0.05$ ). Statistical test results using paired sample t-test obtained p value = 0,000 ( $p < 0.05$ ) which shows there are differences in triglyceride levels in the MIA group and MIA-GS group. Decreased triglyceride levels in the MIA group by 14.68% while the MIA-GS group experienced a decrease in triglyceride levels by 17.40%. The results of statistical tests using the two sample unpaired t test (independent sample t test) showed that there were differences in post test triglyceride levels between the MIA and MIA-GS groups.



**Figure 2:** Triglyceride levels levels in mix aerobic impact (MIA) and mix aerobic impact with garlic supplementation (MIA-GS). Data were mean  $\pm$  SD, n = 10,  $p < 0.05$

The decrease in total cholesterol due to mix impact aerobic exercise is due to the use of fatty acids as an energy source. The use of fatty acids as an energy source in aerobic exercise for long periods of time, the release of epinephrine and norepinephrine by the adrenal medulla during activity. These two hormones directly activate the lipase enzyme which

causes very fast breakdown of triglycerides (lipolysis process) and mobilization of fatty acids out of fatty acids. Increased beta-adrenoceptor-mediated lipolysis in fat cells. This causes the breakdown of triglycerides in fat cells into glycerol and free fatty acids, which are then sent to the bloodstream [16]. The concentration of free fatty acids in the blood of someone who is active can increase up to eight times. Then these fatty acids will be transferred into the muscle as an energy source resulting in a decrease in LDL (Low Density Lipoprotein), because the main raw material for LDL formation comes from TG (Triglycerides) [17]. The decrease in total cholesterol levels in the study is in accordance with the results of the research of Samosir et al who reported that aerobic exercise with moderate intensity can reduce total cholesterol levels [18].

The results showed aerobik mix impact exercises with garlic supplementation performed 3 times a week for one month can reduce total cholesterol levels by 21.15% and triglyceric levels by 17.40% greater reduction compared to just doing mix impact aerobic exercise. Decrease in total cholesterol, LDL cholesterol, triglycerides and increase in HDL cholesterol levels, among others, caused by aliin and allixin content in garlic [19]. Allixin is produced when garlic is sliced or destroyed which will cause a reaction enzymatic namely allinase enzyme that converts aliin becomes allixin. Besides allixin, there are compounds which includes triterpenoids which can also be give effect to cholesterol and is a derivative of allixin itself, like diallyl sulfide, diallyl trisulfide and allyl mercaptan [20]. All of these compounds belong to the sulfur group indeed a lot contained in garlic. This sulfur will inhibit HMG-CoA reductase, squalene monooxygenase, lanosterol-14-demethylase, and sterol 4 $\alpha$ -methyloxidase found in cholesterol synthesis [21,22]. In addition, dialled disulfide has an allil chain with will easily be reduced to the propyl chain saturated, so that it will reduce NADH levels and NADPH which are also important for synthesis cholesterol. Allixin binds to the group sulfhydryl which is a functional part coenzyme A in the process of forming cholesterol Body. The enzyme HMG-CoA reductase is a catalyst biologically capable of transforming substrates (HMGKoA) into products (mevalonic acid) with decrease the activation energy of the reaction so the reaction is faster [22].

The results of this study are supported by research conducted by Warshafsky et al who reported that patients with total cholesterol levels > 200 mg / dL who consume garlic every day can experience a decrease in total cholesterol levels up to 9% [23].

#### 4. Conclusion

Conclusion of research results:

- Mix impact aerobics can reduce total cholesterol and triglyceride levels in obese women.
- Mix impact aerobics with garlic supplementation can reduce total cholesterol and triglyceride levels in obese women.
- Aerobic mix impact exercise with garlic supplementation has more effect on reducing cholesterol and triglyceride

levels in obese women compared to only doing mix impact aerobics

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