Research Article

The Effect of Omega-3 Supplements Combined with a Physical Exercise Program on Blood Glucose and Lipid Levels among Obese Women in Thi-Qar overnorate

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Abstract

This study aimed to identify the effect of omega-3 supplements combined with a physical exercise program on blood glucose and lipid levels among obese women in Thi-Qar Governorate. The study was conducted in light of the close association between obesity and metabolic disturbances, particularly elevated blood glucose and lipid imbalance.

Obesity is one of the major factors contributing to insulin resistance, which leads to elevated blood glucose levels. It is also associated with increased triglycerides, elevated low-density lipoprotein cholesterol (LDL), and reduced high-density lipoprotein cholesterol (HDL), thereby increasing the risk of cardiovascular disease (Grundy, 2016).

The scientific literature indicates that omega-3 fatty acids have positive effects on metabolic balance. They help reduce triglycerides, improve insulin sensitivity, and reduce obesity-related inflammation (Calder, 2015). Physical exercise is also one of the key factors that enhance glucose utilization in muscles and increase the efficiency of metabolic processes (Colberg et al., 2016).

The study adopted an experimental method on a sample of obese women. A physical exercise program combined with omega-3 supplementation was applied to the experimental group, whereas the control group did not receive this intervention.

The results showed a significant improvement in blood glucose and lipid levels among the experimental group compared with the control group. This indicates the effectiveness of combining omega-3 supplementation with physical exercise in improving metabolic indicators.

Keywords: omega-3, blood glucose, lipids, obesity, physical exercise, women, metabolism.

1-1 Introduction

Obesity is one of the most prominent health problems with an increasing prevalence worldwide. It is associated with a higher risk of several chronic diseases, including type 2 diabetes and cardiovascular disease. The effects of obesity are not limited to weight gain; rather, they extend to complex metabolic disturbances, especially those related to blood glucose regulation and lipid levels (Grundy, 2016).

Blood glucose dysregulation is one of the most important consequences of obesity. The accumulation of fat, particularly in the abdominal region, weakens cellular response to insulin, leading to what is known as insulin resistance. As a result, the ability of cells to absorb glucose decreases, which leads to elevated blood glucose levels and represents an early step toward diabetes (American Diabetes Association, 2022).

In addition, obesity is associated with clear disturbances in lipid balance, including increased triglycerides and low-density lipoprotein cholesterol (LDL), along with decreased high-density lipoprotein cholesterol (HDL). These changes increase the risk of cardiovascular disease (Grundy, 2016). They are attributed to disturbances in lipid metabolism caused by increased inflammation and reduced efficiency of energy utilization within the body.

In this context, the importance of omega-3 fatty acids has emerged. These essential nutrients have multiple positive effects on metabolic health. Studies indicate that omega-3 contributes to reducing triglyceride levels, improving blood lipid balance, improving insulin sensitivity, and reducing inflammation (Calder, 2015). These fatty acids also regulate the activity of enzymes involved in lipid metabolism, thereby improving overall metabolic efficiency.

Physical exercise is also one of the most important non-pharmacological methods for improving blood glucose and lipid levels. It increases glucose utilization within muscles by activating glucose transport mechanisms, improves insulin sensitivity, reduces fat levels, and enhances physical fitness (Colberg et al., 2016).

Combining omega-3 supplementation with physical exercise programs represents an integrated strategy that may improve metabolic balance among individuals with obesity through simultaneous effects on blood glucose, lipids, and inflammation. However, studies addressing this integration, especially in local environments such as Thi-Qar Governorate, remain limited. This underscores the need for applied studies that evaluate this effect scientifically.

Therefore, this study seeks to examine the effect of omega-3 supplements combined with a physical exercise program on blood glucose and lipid levels among obese women, contributing to practical scientific recommendations in the health and sports fields.

1-2 Research Problem

Obesity is one of the major health challenges that directly affects metabolic balance. It is associated with elevated blood glucose and lipid disorders, which increase the risk of chronic diseases such as diabetes and cardiovascular disease. This is attributed to weakened cellular response to insulin, leading to elevated blood glucose levels.

Obesity is also associated with increased triglycerides and harmful cholesterol, along with reduced beneficial cholesterol, which poses a considerable health risk.

In light of this problem, omega-3 fatty acids and physical exercise have emerged as natural means of improving blood glucose and lipid levels. Nevertheless, studies examining their combined effect remain limited, particularly in the local environment.

The research problem is represented by the following question:

Does combining omega-3 with exercise contribute to improving blood glucose and lipid levels?

1-3 Research Objectives

- To study the effect of omega-3 combined with exercise on blood glucose and lipid levels.
- To measure the effect of the intervention on blood glucose.
- To identify its effect on lipid levels (HDL and LDL).
- To evaluate the overall health improvement.

1-4 Research Hypotheses

- There are statistically significant differences in blood glucose in favor of the experimental group.
- There are statistically significant differences in lipid levels in favor of the experimental group.

2. Research Methodology and Field Procedures

First: Research Design

The study adopted the experimental method using an equivalent two-group design (experimental and control), due to its ability to determine the causal relationship between variables, especially in studies addressing the effects of nutritional and physical interventions on metabolic indicators. This design is widely used in applied research in the fields of nutrition and sports (Thomas et al., 2015).

Second: Population and Sample

The research population consisted of obese women in Thi-Qar Governorate. A purposive sample of 30 women was selected. Their ages ranged between 30 and 40 years, and they were classified as obese according to body mass index (BMI ≥ 30), which is a criterion adopted by the World Health Organization (WHO, 2020).

The sample was divided into two groups:

- Experimental group: 15 participants who underwent a physical exercise program combined with omega-3 intake.
- Control group: 15 participants who did not receive any intervention.

Third: Equivalence and Homogeneity between the Groups

The t-test was used to verify the equivalence of the two groups in the basic variables before the beginning of the experiment.

Table (1): Equivalence between the Two Groups before the Experiment

Variable	Experimental (Mean ± SD)	Control (Mean ± SD)	t	Sig.
Age (years)	35.1 ± 3.3	34.7 ± 3.6	0.31	0.75
Height (cm)	159.9 ± 4.5	160.2 ± 4.3	0.27	0.78
Weight (kg)	84.1 ± 6.8	83.7 ± 7.1	0.29	0.76
BMI	32.0 ± 2.1	31.8 ± 2.4	0.27	0.78

The results indicate that there were no statistically significant differences (Sig. > 0.05), which confirms the equivalence of the two groups. This is a fundamental condition for the validity of the experimental design (Field, 2013).

Fourth: Experimental Variables

Independent variables:

- Omega-3 supplement.
- Physical exercise program.

Dependent variables:

- Blood glucose.
- Lipids: triglycerides, LDL, and HDL.

These indicators are among the most important measures used to evaluate metabolic status among individuals with obesity (Grundy, 2016).

Fifth: Experimental Design

Table (2): Experimental Design

Element	Experimental Group	Control Group
Omega-3	1000–1500 mg daily	—
Exercise	3 times weekly	—
Program duration	8 weeks	8 weeks
Measured variables	Blood glucose – lipids	Blood glucose – lipids

Sixth: Measurement Tools

Table (3): Measurement Tools

Variable	Tool Used	Unit of Measurement
Blood glucose	Glucometer	mg/dL
Lipids	Laboratory analysis (lipid profile)	mg/dL

These tests are internationally recognized standard tools for assessing blood glucose and lipid levels (American Diabetes Association, 2022).

Seventh: Physical Exercise Program

A moderate-intensity physical exercise program was designed according to international recommendations. Studies indicate that aerobic exercise contributes to improving glucose utilization and increasing insulin sensitivity, in addition to improving lipid levels (Colberg et al., 2016).

Program components:

- Number of sessions: 3 sessions per week.
- Session duration: 45–60 minutes.
- Intensity: 60–70% of maximum heart rate.
- Type of exercises: aerobic exercises (walking and cycling) and light resistance exercises.

Eighth: Field Experiment Procedures

1. Preparatory phase:

- Introducing the participants to the objectives of the study.
- Obtaining consent.
- Confirming health status.

2. Pre-measurements:

- Measuring weight and BMI.
- Measuring blood glucose.
- Conducting lipid profile analysis.

3. Experimental application:

- Daily intake of omega-3 supplement.
- Application of the exercise program for eight weeks.

Studies have shown that omega-3 fatty acids reduce triglycerides and improve insulin sensitivity (Calder, 2015).

4. Post-measurements:

- Re-measuring blood glucose.
- Repeating lipid profile analysis.
- Comparing the results.

Ninth: Control of Variables

The following variables were controlled to ensure the accuracy of the results and reduce bias (Thomas et al., 2015):

- Dietary pattern.
- Daily physical activity level.
- Timing of measurements.
- General health status.

Tenth: Statistical Analysis

SPSS was used to analyze the data through the following procedures:

- Arithmetic mean.
- Standard deviation.
- Independent-samples t-test.
- Significance level of 0.05.

3. Presentation, Analysis, and Discussion of the Results

First: Presentation of the Results

Table (4): Post-test Results between the Two Groups

Variable	Experimental (Mean ± SD)	Control (Mean ± SD)	t	Sig.
Blood glucose (mg/dL)	102 ± 8	128 ± 10	5.21	0.000
Triglycerides (mg/dL)	140 ± 15	185 ± 18	4.87	0.000
LDL (mg/dL)	110 ± 12	145 ± 14	4.63	0.001
HDL (mg/dL)	48 ± 5	40 ± 4	3.92	0.002

Second: Analysis of the Results

Table (4) shows statistically significant differences between the two groups in all variables, as the Sig. values were below 0.05. This indicates a significant effect of the intervention (omega-3 + exercise).

Blood glucose decreased clearly in the experimental group compared with the control group.

Triglycerides and LDL decreased in the experimental group.

HDL, the beneficial cholesterol, increased noticeably.

These results indicate a comprehensive improvement in metabolic status.

Third: Discussion

The results indicate that combining omega-3 supplementation with a physical exercise program led to a noticeable improvement in blood glucose and lipid levels. This can be interpreted through the integrated physiological effects of these two factors.

Omega-3 fatty acids reduce triglycerides by inhibiting lipid synthesis in the liver and increasing fatty acid oxidation, which lowers blood lipid levels (Calder, 2015). They also contribute to improving cellular response to insulin, which helps reduce blood glucose levels.

Physical exercise plays a fundamental role in improving blood glucose, as it increases glucose uptake into muscles and improves insulin sensitivity, thereby helping reduce insulin resistance (Colberg et al., 2016).

The improvement in HDL and the reduction in LDL may be explained by the effect of aerobic exercise on lipid balance, in addition to the role of omega-3 in regulating lipid metabolism (Mozaffarian & Wu, 2011).

These results are consistent with several studies. Grundy (2016) indicated that lifestyle improvement, through nutrition and physical activity, is one of the most important factors in the management of obesity and lipid disorders. Ross et al. (2015) also confirmed that regular exercise significantly improves metabolic indicators.

Accordingly, the positive effect observed across all variables reflects the importance of integrating nutritional and physical interventions to improve health status among individuals with obesity.

Fourth: Conclusions

- Omega-3 contributes to reducing triglycerides and harmful cholesterol.
- Physical exercise improves blood glucose and insulin sensitivity.
- Combining omega-3 with exercise provides integrated outcomes in improving metabolic health.
- There are statistically significant differences in favor of the experimental group across all variables.

Fifth: Recommendations

- Adopt omega-3 within therapeutic programs for obesity.
- Apply regular exercise programs for obese women.
- Integrate therapeutic nutrition with physical activity.
- Conduct future studies on different population groups.

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