Research Article

The Role of Omega-3 Fatty Acids Combined with a Physical Exercise Program in Reducing Inflammation and Improving Metabolism among Obese Women in Thi-Qar Governorate

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Abstract

This study aimed to identify the role of omega-3 fatty acids, when combined with a physical exercise program, in reducing inflammation and improving metabolism among obese women in Thi-Qar Governorate. The study was framed by the close association between obesity, elevated inflammatory activity, and metabolic disturbances.

Omega-3 fatty acids are essential fatty acids with anti-inflammatory properties. They contribute to reducing the production of inflammatory cytokines and improving cellular sensitivity to insulin, thereby supporting metabolic processes within the body. Physical exercise also plays a significant role in enhancing metabolism and increasing the efficiency of energy utilization.

The study adopted an experimental method on a sample of obese women. The experimental group underwent a physical exercise program accompanied by omega-3 intake, whereas the control group did not receive this intervention.

The findings showed a reduction in inflammatory indicators and an improvement in metabolism among the experimental group, indicating the effectiveness of combining omega-3 supplementation with physical exercise.

Keywords: omega-3, inflammation, metabolism, obesity, women, physical exercise.

1-1 Introduction

Obesity is one of the major global health problems associated with an increased risk of chronic diseases, including diabetes and cardiovascular disease. It is also linked to elevated levels of low-grade chronic inflammation, which plays a key role in the development of metabolic disorders.

Studies indicate that chronic inflammation among individuals with obesity is associated with increased secretion of inflammatory cytokines. This, in turn, weakens cellular response to insulin and leads to disturbances in metabolic regulation.

Omega-3 fatty acids are considered nutritional components with anti-inflammatory effects, as they help reduce inflammation and improve metabolic balance. Physical exercise improves insulin sensitivity and increases energy expenditure, thereby contributing to better health status.

Accordingly, combining omega-3 intake with exercise represents an effective strategy for improving metabolism among individuals with obesity. However, applied studies in the local environment remain limited.

1-2 Research Problem

Obesity is a health problem associated with elevated levels of chronic inflammation and metabolic disorders. Fat accumulation increases the secretion of inflammatory cytokines, which negatively affects the body's response to insulin and leads to multiple metabolic disturbances.

Although many therapeutic interventions are available, reliance on natural approaches, such as physical exercise and omega-3 fatty acids, has become a central interest among researchers because of their roles in reducing inflammation and improving metabolism.

Nevertheless, studies examining the combined effect of these two factors, particularly in the local environment, remain limited. This highlights the need to investigate this effect scientifically.

The research problem is represented by the following question:

What is the effect of omega-3, combined with exercise, on reducing inflammation and improving metabolism?

1-3 Research Objectives

- To identify the effect of omega-3 combined with exercise on improving metabolic status.
- To measure the effect of the intervention on inflammatory indicators.
- To identify its effect on insulin levels.
- To evaluate improvement in metabolism.

1-4 Research Hypotheses

- There are statistically significant differences in inflammatory indicators in favor of the experimental group.
- There are statistically significant differences in insulin 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 suitability for examining the effects of nutritional and physical interventions on physiological variables. This design is among the most accurate designs in applied research, as it allows the effect of independent variables to be isolated and their direct influence on dependent variables to be determined (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 from 30 to 40 years, and they were classified as obese according to body mass index (BMI ≥ 30), which is a globally recognized criterion for diagnosing obesity (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 before the beginning of the experiment.

Table (1): Equivalence between the Two Groups

Variable	Experimental (Mean ± SD)	Control (Mean ± SD)	t	Sig.

Age (years)	34.2 ± 3.1	33.9 ± 3.4	0.28	0.77
Height (cm)	160.4 ± 4.2	159.8 ± 4.5	0.36	0.72
Weight (kg)	82.5 ± 6.3	81.9 ± 6.7	0.31	0.75
BMI	31.5 ± 2.2	31.2 ± 2.5	0.34	0.73

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:

- Inflammatory indicators (CRP).
- Metabolism, represented by insulin.

These indicators are among the most important measures used to evaluate metabolic status among individuals with obesity (Calder, 2015).

Fifth: Experimental Design

Table (2): Experimental Design

Element	Experimental Group	Control Group
Omega-3	1000 mg daily	—
Exercise	3 times weekly	—
Program duration	8 weeks	8 weeks
Measured variables	CRP – insulin	CRP – insulin

Sixth: Measurement Tools

Table (3): Measurement Tools

Variable	Tool Used	Unit of Measurement
CRP	Laboratory blood test	mg/L
Insulin	Blood test	µIU/mL

These laboratory analyses are internationally recognized methods for assessing inflammation and metabolism (Colberg et al., 2016).

Seventh: Physical Exercise Program

A moderate-intensity physical exercise program was designed in accordance with international physical activity recommendations. Studies indicate that regular aerobic exercise contributes to improving insulin sensitivity and reducing inflammation (Colberg et al., 2016).

- Number of sessions: 3 sessions per week.
- Session duration: 45–60 minutes.

- Intensity: 60–70% of maximum heart rate.
- Type of exercises: walking, cycling, and light resistance exercises.

Eighth: Field Experiment Procedures

1. Preparatory phase:

- Explaining the objectives of the study.
- Obtaining participants' consent.
- Examining health status.

2. Pre-measurements:

- Measuring weight and BMI.
- Collecting blood samples for CRP and insulin.

3. Experimental application:

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

Previous studies have shown that omega-3 fatty acids reduce inflammation and improve metabolism (Calder, 2015).

4. Post-measurements:

- Repeating laboratory tests.
- 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.
- Physical activity level.
- Timing of measurements.
- Health status.

Tenth: Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) was used. The following statistical procedures were adopted:

- 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.
CRP (mg/L)	3.2 ± 0.8	5.1 ± 1.0	4.12	0.001
Insulin (µIU/mL)	12.5 ± 2.3	17.8 ± 2.9	4.35	0.000

Second: Analysis of the Results

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

For the inflammation variable (CRP), the experimental group recorded a clear decrease (3.2 mg/L) compared with the control group (5.1 mg/L), indicating an improvement in inflammatory status among the participants.

For insulin, the experimental group showed a clear decrease (12.5 µIU/mL) compared with the control group (17.8 µIU/mL), indicating improved insulin sensitivity and reduced insulin resistance.

Third: Discussion of the Results

The results of the study indicate that combining omega-3 supplementation with a physical exercise program led to a noticeable improvement in inflammatory indicators and metabolism among obese women. This can be interpreted through the physiological effects of both omega-3 and physical activity.

Omega-3 fatty acids are essential fatty acids with anti-inflammatory properties. They reduce the production of inflammatory cytokines, such as TNF-α and IL-6, which contributes to lowering inflammation levels in the body (Calder, 2015). They also improve cellular response to insulin, thereby enhancing glucose metabolism.

Physical exercise, particularly aerobic exercise, contributes to improving insulin sensitivity by increasing glucose uptake into skeletal muscles and activating glucose transport mechanisms. This leads to reduced blood insulin levels (Colberg et al., 2016).

The combination of omega-3 and exercise produces an integrative effect: exercise increases the efficiency of metabolic processes, while omega-3 reduces inflammation and improves the internal physiological environment, thereby enhancing the effectiveness of both interventions.

These findings are consistent with Calder (2015), who confirmed that omega-3 reduces inflammation, and with Colberg et al. (2016), who indicated that physical exercise improves insulin sensitivity. Other studies have also shown that combining nutritional and exercise interventions produces better outcomes than using either intervention separately (Ross et al., 2015).

Accordingly, the observed improvement in the studied variables can be explained as the result of the combined effect of these factors, confirming the importance of adopting integrated therapeutic strategies to address obesity and its metabolic disturbances.

Fourth: Conclusions

- Omega-3 contributes to reducing inflammation among obese women.
- Physical exercise improves metabolism and insulin sensitivity.
- Combining omega-3 with exercise provides better outcomes than using either intervention separately.
- There are statistically significant differences in favor of the experimental group across all variables.

Fifth: Recommendations

- Adopt omega-3 supplements within health programs designed for obesity management.
- Apply regular exercise programs for obese women.
- Integrate therapeutic nutrition with physical activity to achieve better outcomes.
- Conduct future studies on larger samples and different population groups.

References

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