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The Impact of Nutritional Supplements on Elevated Cholesterol and Low-Density Lipoprotein (*LDL*) Levels among Female Bodybuilder

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Abstract

This study aimed to investigate the effect of dietary supplements on increasing cholesterol and low-density lipoprotein (LDL) levels among women practicing bodybuilding. To achieve this objective, the study was conducted on a purposive sample of 15 female bodybuilders from the Sétif region, Sétif Province, aged between 25 and 27 years. Using the experimental method, cholesterol and LDL levels were measured as indicators of body fat. After a period of three months, post-test measurements were conducted, and the differences between the pre-test and post-test results were calculated.

After data collection, the Statistical Package for the Social Sciences (SPSS) was used for data analysis. Two statistical methods were applied: the one-sample *t*-test and Cohen's *d* to calculate effect size. These methods were employed to answer the research questions posed in the study problem. The results revealed statistically significant differences between the pre-test and post-test measurements in cholesterol and LDL levels. Furthermore, Cohen's coefficient indicated a relatively large effect size, suggesting that dietary supplements have a substantial effect on increasing these levels.

Based on these findings, it was concluded that dietary supplements have a significant impact on increasing cholesterol and LDL levels among women practicing bodybuilding.

Keywords: Nutritional Supplements, Cholesterol, Lipoprotein (LDL), Female Bodybuilder.

1.Introduction

Through reviewing previous studies on dietary supplements and their effects on athletes, it was observed that most research highlighted potential risks for bodybuilders when consuming supplements, affecting various aspects such as the nervous system, liver, and sexual capacities. However, the specific aspect we chose to address in our study has not been previously examined: the impact of dietary supplements on fat accumulation, particularly concerning one of the most prevalent modern diseases worldwide—obesity, which results from excessive fat accumulation in the human body.

The problem of our study focuses on the extent to which dietary supplements affect the increase of fat levels, specifically cholesterol and low-density lipoprotein (LDL), not in men but in women entering the field of bodybuilding. Most women attending gyms aim for a lean, toned body free of sagging. Therefore, this study seeks to determine whether these supplements contribute to achieving an athletic physique or if they lead to fat accumulation, particularly cholesterol and saturated LDL fats, which are considered among the most harmful fats to the human body.

Thus, bodybuilding, while generally beneficial for health, may pose risks to women's health when it involves fat accumulation, especially elevated cholesterol and LDL levels. Accordingly, the central research problem of this study revolves around the following general question:

-Do dietary supplements have an effect on increasing cholesterol and low-density lipoprotein (LDL) levels in women practicing bodybuilding?

General Hypothesis:

-Dietary supplements have an effect on increasing cholesterol and low-density lipoprotein (LDL) levels in women practicing bodybuilding.

Specific Hypotheses:

-Consumption of dietary supplements leads to an increase in cholesterol levels among women practicing bodybuilding.

-Consumption of dietary supplements leads to an increase in low-density lipoprotein (LDL) levels among women practicing bodybuilding.

-Dietary supplements contribute more to fat accumulation than to achieving a lean athletic physique in female bodybuilders.

Study importance:

-It clarifies the effect of dietary supplements on increasing cholesterol and low-density lipoprotein (LDL) levels among women practicing bodybuilding, an aspect not sufficiently addressed in previous research.
-It contributes to raising awareness among female bodybuilders about the potential health risks of dietary supplements, particularly regarding fat accumulation that affects cardiovascular health.
-It provides accurate scientific information to help trainers and nutrition experts guide athletes safely, balancing the achievement of a lean athletic body with overall health preservation.
-It enriches scientific knowledge about the relationship between dietary supplements and blood lipids, a topic of great importance in addressing modern health issues such as obesity and high cholesterol.

Study objectives:

-Determine the effect of dietary supplements on cholesterol levels in women practicing bodybuilding.
-Determine the effect of dietary supplements on low-density lipoprotein (LDL) levels in women practicing bodybuilding.
-Identify whether dietary supplements contribute to achieving a lean athletic body or lead to fat accumulation.
-Provide scientific recommendations to female athletes and trainers regarding the safe use of dietary supplements.

Study terminology:

Dietary supplements are defined as "preparations with therapeutic properties, although they fall outside the definition of drugs" (Abdel Halim Reda & Abdel Magid, 2005, p.18).

Dietary supplements are products consumed to complement the daily diet or enhance physical performance, including proteins, vitamins, minerals, and amino acids. Maughan, R. J., Burke, L. M., & Dvorak, J. (2018) p 439

Cholesterol is a type of fat found in the blood, essential for cell membrane and hormone formation; elevated levels may lead to cardiovascular diseases. Grundy, S. M. (2016)p1109

Low-density lipoprotein (LDL) is considered “bad cholesterol” because it can accumulate in arteries, increasing the risk of cardiovascular disease. Ginsberg, H. N. (2002)

Bodybuilding is defined by Khaled Heikal as “a physical preparation based on sound scientific principles aimed at achieving muscle size and strength, including balance, endurance, and flexibility” (Khaled Heikal, 2004, p.9).

Previous studies:

Title: Awareness of the Effects of Dietary Supplements among Bodybuilding Practitioners

Authors: Murad Qahlouz & Zoubir Latrash, 2021

Objective: To investigate the level of awareness regarding the effects of dietary supplements among bodybuilding practitioners.

Sample: The study included 30 bodybuilders selected randomly.

Methodology: Descriptive method.

Data Collection Tools: Questionnaire.

Results: The researchers concluded that most athletes consume dietary supplements based on their trainer's advice without consulting a physician or pharmacist. Overall awareness of the effects of dietary supplements was low**.**

Title: Risks of Addiction to Industrial Dietary Supplements among Athletes

Author: Dr. Yahya Nougui, 2020

Objective: To explore the risks associated with the consumption of industrial dietary supplements by bodybuilders in gyms.

Sample: 20 athletes from Djelfa Province.

Methodology: Descriptive method.

Data Collection Tools: Questionnaire consisting of 20 statements divided into two main axes.

Results: The study found that addiction to industrial dietary supplements poses risks to bodybuilders, affecting liver and nervous system functions, and causing psychological symptoms such as sleep disturbances, poor emotional control, weak decision-making, and headaches.

Title: Prevalence of Dietary Supplement Use among Gym-goers in Jeddah

Author: Ziyad Issa Zayed, 2018

Objective: To determine the prevalence of dietary supplement use among gym-goers and assess their awareness of what they consume.

Sample: 208 male gym-goers in Jeddah.

Methodology: Descriptive survey method.

Data Collection Tools: Questionnaire.

Results: 78.8% of participants consumed dietary supplements; 81.5% consumed supplements without physician recommendation; and 65.9% believed that dietary supplements could pose risks to the body.

Title: Effects of Creatine Supplementation on Muscle Strength and Body Composition during the Training Season in Female Soccer Players

Authors: Larrison Meyer et al.

Objective: To examine the effects of dietary supplements (creatine) on muscle strength through push-up and leg exercises.
Sample: 14 female soccer players, selected randomly.
Methodology: Quasi-experimental design.
Data Collection Tools: 13-week training program + muscle strength tests.
Results: Muscle strength increased in the players, with improvement in push-up and leg exercises. Significant differences were observed between the end of week 5 and the end of week 13. Creatine supplementation improved lean muscle tissue and muscle strength.

Title: Effects of Protein, Creatine, and Carbohydrate Intake on Strength Performance and Body Composition in Recreational Training among Youth

Authors: Cooper et al.
Objective: To determine the effects of protein, creatine, and carbohydrate intake on maximal muscle strength, bench press performance, and endurance.
Sample: 13 participants divided into experimental and control groups.
Methodology: Experimental method.
Data Collection Tools: Proposed training program + muscle strength tests.
Results: The experimental group consuming supplements showed improvement in maximal muscle strength, upper limb strength, and endurance. No significant changes were observed in body composition.

Title: Effects of Creatine Intake before and after Resistance Training on Body Composition and Muscle Strength

Authors: Antonio & Victoria
Objective: To examine the effects of creatine on lean body mass, muscle strength, and body fat percentage.
Sample: 19 bodybuilders divided into control and experimental groups.

Study Approach

Data Collection Tools: 5-week training program + tests measuring lean body mass, muscle strength, and body fat percentage.
Results: Creatine intake combined with resistance training increased lean body mass and muscle strength, but did not affect body fat percentage.

In response to the nature of the research, this study employed a single-group experimental design. The experimental method is defined as “a method based on field experimentation and testing, relying on an experimental design” (Sadou Mohamed & Bouhaj Meziane, 2022, p.180). It is also described as the approach followed by researchers to study a problem in order to discover the truth, where selecting the appropriate method to solve a research problem depends primarily on the nature of the problem and its hypotheses (Khefaja, 2002, p.57).

This study required a laboratory experiment on the participants, measuring cholesterol and LDL levels before starting the dietary supplement regimen for female bodybuilders. After three months, under dietary and training supervision, post-tests were conducted on the same indicators, and the differences were calculated.

Thus, the single-group experimental design was the most suitable for this study, as it is considered “one of the closest scientific methods to solve problems through a scientific and experimental approach, whether conducted in a classroom or elsewhere” (Bouglidih & Qasimi Sofiane, 2020, p.290).

2. Methodology

Human field:

Regarding the human field, the study sample consisted of 15 women who regularly practice bodybuilding, and they were from Sétif municipality, Sétif Province, Algeria.

Spatial field:

The study was conducted in a bodybuilding gym in Sétif municipality, while medical examinations and blood analyses were performed at Badi Al-Zaman Touhami Medical Analysis Center, Sétif Province, Algeria.

Temporal field:

The study spanned the period from September 20, 2025, to November 19, 2025, lasting three months. During this period, the female bodybuilders consumed creatine phosphate dietary supplements, while their training and laboratory measurements were monitored.

Research community and sample:

Selecting the research community is considered one of the most important foundations for the success of a study. The research community is defined as "all individuals who share observable characteristics" (Raja Mahmoud Abu Al-Alam, 2006, p.154). In this study, the research community consisted of female bodybuilders who regularly practice bodybuilding in Sétif municipality, Sétif Province, Algeria.

Research Sample

Selecting the research sample is considered one of the crucial steps in any study, and it is chosen based on the research problem and objectives, as the nature of the study and its hypotheses determine the steps of implementation and the selection of tools (Abdel-Yamine Boudaoud, 2010, p.50). In this study, a sample of 15 women who regularly practice bodybuilding from Sétif municipality, Sétif Province, Algeria, was purposively selected to fit the experimental design and requirements of the study.

Sample homogeneity:

The study sample consisted of 15 female bodybuilders aged 25–27 years, all of whom regularly practice bodybuilding. The participants were homogeneous in terms of age, training experience, and physical activity level, which ensured that the differences in cholesterol and LDL levels could be attributed to the dietary supplement intervention rather than external factors.

Statistical Analysis

Since our study relies on comparing the pre-test and post-test measurements for the same group before and after consuming dietary supplements, and measuring the differences between the two tests, the following statistical tools were used:

1- One-sample t-test:

This statistical tool is used to examine whether the mean of a single sample differs from a known average. It is applied when the sample size is small (less than 30 individuals). The t-test calculates the t-value using the difference between the sample mean and the known mean and the sample standard deviation, then the corresponding p-value is computed. If the p-value is less than the predetermined significance level, the null hypothesis can be rejected, indicating a difference between pre-test and post-test measurements.

2- Cohen's d (Effect Size Test):

This statistical tool is used to measure the effect size of differences between two groups in inferential research. The test determines whether the differences between groups exceed random variation or have practical significance. Cohen's d measures the effect size based on the differences between group means and their standard deviations, allowing researchers to estimate the actual impact of the independent variable on the dependent variable.

3. Results

Table1. There are statistically significant differences between the pre-test and post-test measurements of cholesterol levels in female bodybuilders, in favor of the post-test

Cohen's d	Non-overlapping Percentage	Percen	Effect Size	Decision	Significance Level	t-value	Standard Deviation	Mean	Sample	Cholesterol Level

		tile							Size	
Large Effect Size	%51,6	82	0,968	Significant (0.01=α) at	0,006	-3,214	0,04821	1,6733	15	Pre-test
							0,04906	1,6807		Post-test

It can be observed from the table above that the mean cholesterol level of the experimental group (female bodybuilders) in the pre-test was 1.6733, while their mean in the post-test was 1.6807. Comparing the two means, there is a difference in favor of the post-test, indicating an increase in cholesterol levels after the intervention.

This is confirmed by the t-test value (t = -3.214), which is statistically significant at α = 0.01. Therefore, the null hypothesis, which states that there is no difference between pre-test and post-test measurements, can be rejected, and the research hypothesis is accepted, which states:

"There are statistically significant differences between the pre-test and post-test measurements of the experimental group's mean cholesterol levels in favor of the post-test."

Regarding the effect size, it reached d = 0.968, indicating a 51.6% non-overlap between the distributions of pre-test and post-test scores for the experimental group. This represents a large effect size of dietary supplements on increasing cholesterol levels among female bodybuilders.

Thus, it can be concluded that consuming dietary supplements was effective in increasing cholesterol levels among the female participants of the experimental group, with a confidence level of 99% and a 1% probability of error.

Table2. There are statistically significant differences between the pre-test and post-test measurements in LDL levels among female bodybuilders, in favor of the post-test measurement

Cohen's d	overlapping Percentage	Percentile	Effect Size	Decision	Significance Level	t-value	Standard Deviation	Mean	Sample Size	LDL Cholesterol Test
Large Effect Size	%51,6	82	0,996	Signifiant (0.01=α) at	0,000	-13,229	0,07594	0,8633	15	Pre-test
							0,07435	0,8800		Post-test

The table above shows that the arithmetic mean of LDL levels among the experimental group of female bodybuilders in the pre-test measurement reached (0.8633), while the arithmetic mean in the post-test measurement reached (0.8800). A comparison between the two means indicates a difference in favor of the post-test measurement, reflecting an increase in LDL levels following the intake of dietary supplements.

This result is supported by the value of the T-test, which reached (-13.229) and is statistically significant at the significance level ($\alpha = 0.01$). Accordingly, the null hypothesis that denies the existence of differences between the pre-test and post-test measurements is rejected, and the research hypothesis is accepted, which states that:

"There are statistically significant differences between the pre-test and post-test measurements in the mean scores of the experimental group on the LDL level test in favor of the post-test measurement."

Regarding the effect size, its value reached ($d = 0.996$), indicating that 51.6% of non-overlap exists between the score distributions of the pre-test and post-test measurements for the experimental group. This reflects a large effect size of dietary supplement intake on increasing LDL levels.

In other words, it can be concluded that dietary supplements have a clear effect on increasing LDL levels among female bodybuilders in the experimental group, with a confidence level of 99% and a probability of error of 1%.

Conclusion:

Through the discussion and analysis of the test results, and after their statistical processing and interpretation, as well as linking these results to the study hypotheses formulated at the beginning of the research, it was ultimately concluded that dietary supplements have an effect on increasing fat levels among bodybuilders. This conclusion was based on the measurement of total cholesterol and low-density lipoprotein (LDL) levels, from which the general conclusion was derived through a set of partial findings related to these two variables.

Based on the results related to the first hypothesis, and through the analysis of the measurements conducted on the study sample, it was concluded that dietary supplements—particularly creatine phosphate—resulted in an increase in cholesterol levels in the post-test compared to the pre-test. Nevertheless, this increase remained within the normal physiological range, which can be largely attributed to the disciplined training regimen and the controlled nutritional program followed by the participants.

Based on the results of the fourth hypothesis, it was found that dietary supplements had an effect on increasing low-density lipoprotein (LDL) levels in the blood among the study sample of bodybuilders. This was evident from the differences between the pre-test and post-test measurements, where LDL levels increased in the post-test compared to the pre-test. LDL is considered a harmful fat when its levels exceed the normal range. However, the post-test measurements did not exceed 100 mg/dL, indicating that the values remained within healthy limits. Therefore, despite the significant effect of dietary supplements on LDL levels, this increase does not pose a health risk to the participants.

Recommendations:

-Monitoring Cholesterol and LDL Levels: Female bodybuilders who use dietary supplements should regularly monitor their cholesterol and low-density lipoprotein (LDL) levels to ensure they remain within safe and healthy ranges.

-Maintaining a Balanced Diet: Supplement intake should be accompanied by a strict and balanced nutritional program to minimize potential risks associated with elevated cholesterol and LDL levels.

-Consulting Health Professionals: Prior to starting any supplementation regimen, it is recommended to consult a physician or nutrition specialist to determine the appropriate type and dosage based on individual health status.

-Regular Physical Activity: Adherence to a structured and consistent training program is essential, as regular exercise can help regulate cholesterol and LDL levels.

-Avoiding Over-Reliance on Supplements: Athletes should not rely solely on dietary supplements to achieve physical results but should integrate them with proper nutrition and consistent physical training.

-Education and Awareness Programs: Sports clubs and training centers should organize awareness programs highlighting both the benefits and potential risks of dietary supplements and their effects on blood lipid levels.

-Periodic Health Check-Ups: Regular blood tests should be conducted to scientifically monitor any changes in cholesterol and LDL levels over time.

-Limiting Unhealthy Dietary Habits: Reducing the intake of foods high in saturated fats and cholesterol can support training outcomes and prevent potential increases in LDL and cholesterol levels.

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