

Assessment of Dietary Intake and Nutritional
Knowledge among Bodybuilders in Jerash GovernorateA
Scientific Analysis and Educational Survey

تقييم المدخول الغذائي والمعرفة الغذائية لدى لاعبي مالل
أجسام في حالفة سرتليل عيلاي وماح تربوي



Maysam ALSayyad, Abdullah AlRawashdeh, Mohammad ALTarawneh

Department of Food Science and Nutrition, Faculty of Agriculture, Mutah University, Karak, Jordan; Department of Economics and
Extension, Faculty of Agriculture, Jerash University, Jerash, Jordan
alsaiadmaisam@gmail.com, rewashdh@mutah.edu.jo, drmstarawneh@gmail.com

*(Corresponding author) e-mail: alsaiadmaisam@gmail.com

الملخص

قامت هذه الدراسة المقطعية بتقييم الحالة التغذوية، والنظام الغذائي، والمعرفة التغذوية لدى 200 لاعب كمال أجسام بالغ في محافظة جرش. وقد قيمت الدراسة كمية السعرات الحرارية والمغذيات الكبرى (الكربوهيدرات، والبروتينات، والدهون) المتناولة يوميًا مقارنة بالمتطلبات الغذائية الموصى بها، وقاست وعي المشاركين التغذوي باستخدام استبيان مُعتمد. وفحصت تأثير العوامل الديموغرافية والسلوكية على التوازن الغذائي من خلال تحليل الانحدار الخطي المتعدد. أظهرت النتائج أن المشاركين استهلكوا سعرات حرارية ومغذيات كبرى أقل بكثير من الكمية الموصى بها. بمتوسط عجز قدره 1262 سعرة حرارية/يوم، و30.16 غرام/يوم من البروتين، و146.50 غرام/يوم من الكربوهيدرات، و36.27 غرام/يوم من الدهون (جميعها م أظهر تحليل الانحدار أن الوزن والطول ومعدل الأيض الأساسي هي أقوى المؤشرات على كمية السعرات الحرارية اليومية المتناولة، حيث يفسر النموذج حوالي 81% من التباين في استهلاك السعرات الحرارية (معامل التحديد المعدل = 0.80). وبشكل عام، تشير النتائج إلى أنه على الرغم من الوعي الغذائي الجيد، فإن معظم لاعبي كمال الأجسام لا يلتزمون بالمتطلبات الغذائية الموصى بها، ويفتقرون إلى التخطيط الغذائي القائم على الأدلة. وتؤكد الدراسة على ضرورة تحسين التثقيف الغذائي، وتقديم إرشادات غذائية فردية، والمتابعة الغذائية الدورية لتحسين الصحة والأداء الرياضي.

ABSTRACT

This cross-sectional study assessed the nutritional status, dietary intake, and nutritional knowledge of 200 adult bodybuilders in Jerash Governorate. It evaluated daily calorie and macronutrient (carbohydrates, proteins, and fats) intake against recommended dietary requirements, measured participants' nutritional awareness using a validated questionnaire, and examined how demographic and behavioral factors influenced nutritional balance through multiple linear regression analysis. Results showed that participants consumed significantly fewer calories and macronutrients than recommended, with average deficits of 1,262 kcal/day, 30.16 g/day of protein, 146.50 g/day of carbohydrates. Nearly 46.5% of participants did not follow a structured diet. Although most participants demonstrated good knowledge of nutritional requirements and could distinguish between nutritional supplements and performance-enhancing drugs, few applied scientific principles when planning or modifying their diets. Regression analysis identified weight, height, and basal metabolic rate (BMR) as the strongest predictors of daily calorie intake, with the model explaining approximately 81% of the variation in calorie consumption (Adjusted $R^2 = 0.80$). Overall, the findings indicate that despite reasonable nutritional awareness, most bodybuilders fail to meet recommended dietary requirements and lack evidence-based dietary planning. The study emphasizes the need for improved nutritional education, individualized dietary guidance, and regular nutritional monitoring to optimize health and athletic performance.

Article history:

Submission ID: 526

Submission Date: 12/11/2025

Reviewing Date: 07/12/2025

Acceptance Date: 31/12/2025

Publishing Date: 27/08/2026

DOI: 10.6520/jrs.v26i2.526

Keywords:

Bodybuilding, Sports Nutrition, Nutritional Status, Macronutrients, Caloric Intake, Nutritional Awareness, Dietary Supplements, Basal Metabolic Rate (BMR)

Cite as:

ALSayyad, M., AlRawashdeh, A., ALTarawneh, M. (2026) Assessment of Dietary Intake and Nutritional Knowledge among Bodybuilders in Jerash GovernorateA Scientific Analysis and Educational Survey. Jerash for Research and Studies 26 (2B) <https://doi.org/10.6520/jrs.v26i2.526e2026526>



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Assessment of Dietary Intake and Nutritional Knowledge among Bodybuilders in Jerash Governorate

A Scientific Analysis and Educational Survey

Maysam M. ALSayyad¹, Abdullah AlRawashdeh¹, Mohammad ALTarawneh²

¹Department of Food Science and Nutrition, Faculty of Agriculture, Mutah University, Karak, Jordan

²Department of Economics and Extension, Faculty of Agriculture, Jerash University, Jerash, Jordan

Corresponding Author: Maysam M. ALSayyad, alsaiadmaisam@gmail.com

Abstract

Background

Bodybuilding has been increasingly popular, particularly among young adults. This sport often has been involved adherence to specific dietary plans, supplementation, and, in some cases, the use of performance-enhancing drugs (PEDs). Given that nutrition has been a critical part influencing athletic performance and physical development in bodybuilding, and due to the limited research available in this field, this study was aimed to evaluate the nutritional status of adult bodybuilders in Jerash Governorate.

Objectives

The study was aimed to evaluate the daily intake of calories and macronutrients (carbohydrates, proteins, and fats) among adult bodybuilders and compare it to recommended dietary requirements. The study also was looked to measure the participants' nutritional knowledge and awareness. Additionally, the study was aimed to analyze the impact of a range of demographic and behavioral characteristics (such as age, education level, training duration, and dietary adherence) on the efficiency of nutrient and calorie allocation. Using regression analysis models, the study was found the most influential factors in achieving nutritional balance and meeting recommended daily requirements.

Materials and Methods

A cross-sectional study was conducted on two hundred adult bodybuilders. Dietary data was collected over three non-consecutive days to measure average daily calorie and macronutrient intake (carbohydrates, proteins, and fats). The measured values then were compared to recommended dietary intakes based on global nutrition standards. A standardized and validated questionnaire was used to assess participants' nutritional awareness and knowledge, covering five main areas: (1) demographics, (2) dietary habits, (3) knowledge of nutritional needs, (4) distinguishing between nutritional supplements and stimulants, and (5) scientific behaviors in diet modification. In addition, multiple linear regression analysis was applied to test the effect of several predictor variables (age, height, weight, basal metabolic rate (BMR), number of meals, training duration, dietary adherence, diet type, and nutritional supplements)

on actual calorie intake and macronutrient ratios (carbohydrates, proteins, and fats). This analysis was aimed to find the most influential factors in achieving an actual nutritional balance in players.

Results

Paired t-tests revealed statistically significant differences between the intake and recommended values for all macronutrients. Bodybuilders consumed significantly fewer calories (mean difference = -1262.41 kcal/day, $p < 0.001$), protein (-30.16 g/day, $p < 0.001$), carbohydrates (-146.50 g/day, $p < 0.001$), and fats (-36.27 g/day, $p < 0.001$). Additionally, 46.5% did not follow a structured diet. While participants were proven awareness of their nutritional needs and could distinguish between supplements and stimulants, most did not adjust their diets scientifically. In analyzing the factors influencing daily calorie consumption, multiple linear regression analysis revealed that weight, height, and basal metabolic rate (BMR) were strong predictors. The model was proved high explanatory power (Adjusted $R^2 = 0.80$), showing that these variables explained approximately 81% of the variance in calorie consumption among athletes. These results reinforced the importance of considering individual characteristics when designing nutritional plans for athletes, and the need to provide scientific nutritional guidance programs tailored to their vital indicators.

Conclusion:

The findings highlighted the need for improved nutritional monitoring and education among bodybuilders, as most did not meet their daily macronutrient requirements and lacked scientific dietary planning.

Keywords : Bodybuilding, Sports Nutrition, Nutritional Status, Nutritional Awareness, Dietary Supplements.

تقييم المدخول الغذائي والمعرفة الغذائية لدى لاعبي كمال الأجسام في محافظة جرش تحليل علمي ومسح تربوي

ميسم الصياد¹، عبدالله الرواشدة¹، محمد الطراونة²

¹قسم علوم الأغذية والتغذية، كلية الزراعة، جامعة مؤتة، الكرك، الأردن

²قسم الاقتصاد والإرشاد الزراعي، كلية الزراعة، جامعة جرش، جرش، الأردن

المؤلف المراسل: ميسم الصياد، alsaiadmaisam@gmail.com

الملخص

الخلفية

أصبح رياضة كمال الأجسام شائعة بشكل متزايد، لا سيما بين فئة الشباب. وغالبًا ما تتطلب هذه الرياضة الالتزام بخطة غذائية محددة، واستخدام المكملات الغذائية، وأحيانًا اللجوء إلى العقاقير المنشطة للأداء (PEDs). ونظرًا لأن التغذية تمثل عاملاً حاسماً يؤثر على الأداء الرياضي والتطور البدني في كمال الأجسام، وبسبب محدودية الأبحاث المتوفرة في هذا المجال، هدفت هذه الدراسة إلى تقييم الحالة الغذائية لدى لاعبي كمال الأجسام البالغين في محافظة جرش.

الأهداف

هدفت الدراسة إلى تقييم متوسط الاستهلاك اليومي من السعرات الحرارية والمغذيات الكبرى (الكربوهيدرات، البروتينات، والدهون) لدى لاعبي كمال الأجسام البالغين، ومقارنته مع الاحتياجات الغذائية الموصى بها. كما سعت إلى قياس مستوى المعرفة والوعي الغذائي لدى المشاركين. بالإضافة إلى ذلك، تم تحليل تأثير مجموعة من الخصائص الديموغرافية والسلوكية (مثل العمر، ومستوى التعليم، ومدة التدريب، والالتزام بالنظام الغذائي) على كفاءة توزيع العناصر الغذائية والسعرات الحرارية. ومن خلال نماذج التحليل الانحداري، تم تحديد العوامل الأكثر تأثيراً في تحقيق التوازن الغذائي وتلبية الاحتياجات اليومية الموصى بها.

المواد والطرق

أُجريت دراسة مقطعية على مائتي لاعب كمال أجسام بالغ. تم جمع البيانات الغذائية على مدى ثلاثة أيام غير متتالية لقياس متوسط الاستهلاك اليومي من السعرات الحرارية والمغذيات الكبرى (الكربوهيدرات، البروتينات، والدهون). تمت مقارنة القيم المقاسة بالاحتياجات الغذائية الموصى بها استناداً إلى المعايير العالمية للتغذية. استخدم استبيان موحد ومُعتمد لتقييم وعي المشاركين ومعرفتهم الغذائية، وتضمن خمسة محاور رئيسية: (1) الخصائص الديموغرافية، (2) العادات الغذائية، (3) معرفة الاحتياجات الغذائية، (4) التمييز بين المكملات الغذائية

والمنشطات، (5) السجلات العلمية في تعديل النظام الغذائي. كما تم تطبيق تحليل الانحدار الخطي المتعدد لاختبار تأثير عدد من المتغيرات التنبؤية (العمر، الطول، الوزن، معدل الأيض الأساسي (BMR)، عدد الوجبات، مدة التدريب، الالتزام بالنظام الغذائي، نوع الحمية، والمكملات الغذائية) على الاستهلاك الفعلي للسعرات الحرارية ونسب المغذيات الكبرى (الكربوهيدرات، البروتينات، والدهون). ويهدف هذا التحليل إلى تحديد العوامل الأكثر تأثيراً في تحقيق التوازن الغذائي الفعلي لدى اللاعبين.

النتائج

أظهرت اختبارات (t) المقارنة وجود فروق ذات دلالة إحصائية بين القيم المستهلكة والموصى بها لجميع المغذيات الكبرى. فقد استهلك لاعبو كمال الأجسام سعرات حرارية أقل بكثير من الموصى بها (متوسط الفرق = -1262.41 سعرة حرارية/يوم، $p > 0.001$)، وكذلك بروتينات (-30.16 غ/يوم، $p > 0.001$)، وكربوهيدرات (-146.50 غ/يوم، $p > 0.001$)، ودهون (-36.27 غ/يوم، $p > 0.001$). كما تبين أن 46.5% من المشاركين لا يتبعون نظاماً غذائياً منظماً. وعلى الرغم من أن المشاركين أظهروا وعياً باحتياجاتهم الغذائية وقدرتهم على التمييز بين المكملات والمنشطات، فإن معظمهم لم يُجرِ تعديلات غذائية بأسلوب علمي. وأظهر تحليل الانحدار الخطي المتعدد أن الوزن، والطول، ومعدل الأيض الأساسي (BMR) كانت من أقوى التنبؤات باستهلاك السعرات الحرارية اليومية. وأظهر النموذج قوة تفسيرية عالية ($R^2 = 0.80$)، حيث فسّرت هذه المتغيرات نحو 81% من التباين في استهلاك السعرات الحرارية بين الرياضيين. تؤكد هذه النتائج أهمية أخذ الخصائص الفردية بعين الاعتبار عند تصميم الخطط الغذائية للرياضيين، وضرورة توفير برامج إرشاد غذائي علمية تتناسب مع مؤشراتهم الحيوية.

الاستنتاج

تُبرز النتائج الحاجة إلى تعزيز المراقبة الغذائية والتثقيف الغذائي بين لاعبي كمال الأجسام، إذ إن معظمهم لا يلتبون احتياجاتهم اليومية من المغذيات الكبرى ويفتقرون إلى التخطيط الغذائي العلمي.

الكلمات المفتاحية: كمال الأجسام، التغذية الرياضية، الحالة الغذائية، الوعي الغذائي، المكملات الغذائية.

Introduction

Bodybuilding was a sport where coaches commonly recommended a variety of nutrition and exercise protocols, supplements, and, sometimes, performance-enhancing drugs (PEDs) (Rukstela et al., 2023). An integral part of a bodybuilder's nutritional plans was calorie counting. The right calorie guidance was essential for reaching fitness aims and building muscle. Numerous variables, including gender, age, weight, body fat percentage, and degree of physical activity, affected how many calories were consumed (Thomas et al., 2016; J. Spendlove et al. 2019). Studies had shown that the best equation for calculating calories for male athletes was The Harris–Benedict equation (Douglas et al., 2007; Luy and Dampil, 2018; Bendavid et al., 2021). When calories were discussed; they were completely related to the macronutrients, which were protein, fats, and carbohydrates. The body used carbohydrates as its main energy substrate; Carbohydrates contributed to a sharp increase in muscle size and physical appearance (de Moraes, 2019). An average carbohydrate intake of 3-5 g/kg/day was agreed upon during the off-season (Spendlove et al., 2015). Fat was a necessary nutrient for a variety of body functions. However, the impact of dietary fat on skeletal muscle building remained unclear. Based on the available data, it was considered wise to recommend that dietary fat made up 20–35% of calories, which is in line with the American College of Sports Medicine's recommendations for athletes. This would typically translate to 0.5–1.5 g/kg/day (Nutrition and Athletic Performance, 2009; J. Spendlove et al. 2019). Protein was essential for structural integrity and best operation of bones, muscles, tissues, and organs. It was used in the synthesis of hormones, enzymes, hemoglobin, and albumin and other plasma proteins. When the body did not get enough of other energy substrates like fats and carbohydrates, it may have turned to proteins as a fuel source (Apong, 2019; González-Cano et al., 2023). Athletes' daily protein needs depended on a variety of factors, including their training level, age, body size, and style of exercise (e.g., gym newcomer vs seasoned bodybuilder) (Apong, 2019). Bodybuilders should consume a minimum of 1.6 g/kg of protein in the off-season, although targeting closer to 2.2 g/kg was considered to ensure a better response for bodybuilders (Kreider et al., 2010; Carbone et al., 2012; Jäger et al., 2017). This study was conducted in two stages. The first stage measured the level of awareness among bodybuilders through a questionnaire. The second stage recorded the amount of food consumed by two hundred bodybuilders in Jerash Governorate for three days and analyzed it into calories and macronutrients and compared it with the nutritional recommendations for each person.

Materials and Methods Research Design

A cross-sectional study was conducted in Jerash, Jordan. A convenient sampling method (random sampling method) was used; the daily intake of the players was recorded, and the nutritional supplements and their types were taken into consideration and calculated using the daily intake for three different days using a 24-hour repeat. The foods were analyzed, and their basic components were determined, including calories, carbohydrates, fats, and proteins. The arithmetic meaning of these components was calculated and compared with the basic needs of each player. To assess the nutritional awareness of bodybuilders, the researcher personally conducted all face-to-face interviews with the bodybuilders and provided them with an explanation of the purpose of this study. All questions were multiple-choice and were explicit, clear, and direct. The questionnaire was in Arabic, and the questionnaire had a cover page explaining the purpose of this research. Individual characteristics were classified and grouped into categories.

- Age: The group was classified into four categories: 18 to 23, 24 to 29, 30 to 35, and over 35 years.
- The educational level was classified into uneducated and secondary, and academic qualifications included diploma, bachelors, and postgraduate studies.
- The duration of training in bodybuilding was divided into 6 months, a year, two years, and more than two years.
- The training method was divided into trainers / individually.

Questionnaire Design

The questionnaire (31 questions) was developed to collect data from bodybuilders in the gym about demographics, their diet, their knowledge of the nutritional components they need, the degree of differentiation between supplements and steroids, and whether bodybuilders adjust their regimen in a scientific way. The questionnaire was confirmed by three academic experts in the field of nutrition commissioned to confirm the questionnaire by reviewing it, showing whether it was clear or not, and offering any ideas or modifications to make it clearer. Again, the suggested changes were made. All participants were informed about the purpose of the study, and verbally informed consent was obtained from each participant prior to data collection. Participation was voluntary, and confidentiality was assured.

Population and Sample Size

The study was conducted in six gyms in Jerash Governorate between July 2023 and September 2023. The criteria for participants included being members of a gym for at least six months. The sample was calculated, but it is difficult to define a bodybuilding community because many of them confirmed working out at home. The following items were used:

$$n = Z^2 \frac{1 - \alpha/2 P (1 - P)}{e^2}$$

Where n was the number of participants, $Z^2 = (1.96)^2$ for 95% confidence, P was the “best guess” for prevalence, and e was the maximum tolerable error for the prevalence estimate. 397 questionnaires were distributed. Two hundred of them met all the criteria for inclusion, most of them were between the ages of 18 and 35.

Procedures of Statistical Analysis

Recommended calories and nutrients were calculated using Excel.

Calories were calculated using the Harris Benedict equation, while macronutrients were calculated using the ratios recommended in earlier studies.

The food intake of bodybuilders was Analyzed using ESHA’s Food Processor program, the average was calculated, and then IBM SPSS version 26 2019 was used to obtain the results.

To check whether there was a significant statistical difference between the recommended and recommended calorie intake, a paired t test was used, then calculate the ratio of daily calories to the recommended calorie ratio for bodybuilders As for the questionnaire, the data was copied into Excel and then analyzed in IBM SPSS version 26 2019, and the results were obtained.

Ethical considerations

Before starting the study, ethical approval was obtained from Mutah University for Greater Jerash Governorate (approval number - 3500401) and from Jerash Youth Directorate (approval number - 94313) to conduct the study. Approval also was obtained from all those in

charge of managing the gym to distribute the questionnaire and obtain the daily intake of volunteer bodybuilders.

Results

Characteristics of the study participants

A total of two hundred participant responses were included in the study analysis. Table 1 showed the characteristics of the participants. The table showed that ninety-three young people were between 18-23 years old (46.5%), sixty-four young people were between 24-29 years old (32%), and thirty-two young people were between 30-35 years old (16%). As for the oldest of the 35, their number was 11 (5.5%). The academic qualifications showed that the highest percentage of participants were those who held a high school diploma (35.5%), followed by those who held a bachelor's degree (37.5%), then those who held a diploma certificate (9%), and those who obtained postgraduate degrees (8%), while 7% were uneducated. The duration of training in bodybuilding showed the highest percentage was for 6 months (48.5%), followed by one year (19%), then more than two years (17%). The lowest percentage was for two years (15%) . The training method showed that the highest rate was for bodybuilders trained under the supervision of the coach (58%), and 42% trained individually.

Table (1): Characteristics of the study participants

Variables	Category	Frequency	Percentage
Age groups	18-23 Years	93	46.5%
	24-29 Years	64	32.0%
	30-35 Years	32	16.0%
	More than 35 Years	11	5.5%
Education level	Uneducated	14	7.0%
	High school	77	38.5%
	Diploma	18	9.0%
	Bachelor's Degree	75	37.5%
	Postgraduate	16	8.0%
Duration Of training in bodybuilding	6 Months	97	48.5%
	1 Year	38	19.0%
	2 Years	30	15.0%
	More than 2 Years	35	17.5%
Training Method	Individually	84	42.0%
	With a Coach	116	58.0%

To investigate if there was a statistically significant mean difference between intake calories and reference, a paired t-test was used, and the results in table (2) showed that the average of calories intake was (Mean= 2185.24±972.63 Kcal/day) and the reference (Mean= 3447.66±344.54 Kcal/day) indicated that the bodybuilders consumed calories lower than the reference by -1262.41Kcal/day with statistical significant mean difference $t=17.053$, $p<0.001$

Table (2): mean difference between intake calories and reference among bodybuilders

Calories	Mean	SD	Mean difference	T-value	p-value
Calorie Intake	2185.24	972.63	-1262.41	17.053	<0.001
Calories Reference	3447.66	344.54			

In terms of carbohydrate, the results indicated a statistical significant difference between carbohydrate intake (Mean= 234.95±147.33g/day) and recommended (Mean= 381.45±70.32g/day) $t=12.622$, $p<0.001$, revealing that the bodybuilders consumed carbohydrate lower than the recommended amount by -146.50 grams, as shown in Table (3).

Table (3): Mean difference between carbohydrate intake and recommended among bodybuilders.

Carbohydrate	Mean	SD	Mean difference	T-value	p-value
Carbohydrate intake	234.95	147.33	-146.50	12.622	<0.001
Carbohydrate recommended	381.45	70.32			

Similarly, the results in table (4) showed a statistically significant difference between protein intake (Mean= 137.67±72.74g/day) and the recommended (Mean= 167.84±30.94g/day) $t=5.242$, $p<0.001$, revealing that bodybuilders consumed protein lower than the recommended amount by -30.16 grams/day.

Table (4): mean difference between intake protein and recommended among bodybuilders.

Protein	Mean	SD	Mean difference	T-value	p-value
Protein intake	137.67	72.74	-30.16	5.242	<0.001
Protein recommended	167.84	30.94			

Table (5) showed a statistically significant difference between fat intake (Mean=234.978.175±45.73grams) and the recommended (Mean= 114.43± 21.10 grams) $t=9.655$, $p<0.001$, suggesting that the recommended amount by -36.27grams

Table (5): mean difference between fat intake and recommended among bodybuilders.

Fat	Mean	SD	Mean difference	T-value	p-value
Fat intake	78.17	45.73	-36.27	9.655	<0.001
Fat recommended	114.43	21.10			

Survey Results

This section explained the results of the study conducted in Jerash Governorate, Jordan, based on a questionnaire collected from the answers of two hundred participants.

The first part: Do bodybuilding athletes follow a nutritional program while practicing this sport?

Table 6 showed if bodybuilders were on a special diet. It showed that 107 bodybuilders answered yes (53.5%), and 93 young people answered no (46.5%).and the source of the diet for players who answered yes, 43 bodybuilders said they prepared it themselves (46.2%). Regarding the difficulties faced by bodybuilders who do not follow a special diet, 41 bodybuilders reported lack of time (38.3%), 36 reported financial constraints (33.3%), and 30 neglected the nutrition aspect (28%). The goal of the nutritional program, as reported, was increasing muscle mass by 65%, followed by weight loss by (18.5%) .The second question investigated whether the bodybuilders adhere to their diet program daily, and the highest percentage answered “no” at 116 (58%), while 84 bodybuilders answered “yes” (42%). The final question in this part investigated the number of meals bodybuilders ate per day, and the highest number responded with 1-3 meals 107 (53%).

Table (6): Answers of the study participate in the questionnaire questions about their nutritional program.

Question	Category	Frequency	Percentage
Do you currently follow a special diet program?	Yes	93	46.5%
	No	107	53.5%
If your answer is yes, what is the source of this program?	You	43	21.5%
	The coach	35	17.5%
	The nutritionist	15	7.5%
If your answer is “No”, mention	The financial aspect	36	18.0%

Question	Category	Frequency	Percentage
the difficulties that prevent you from following a special diet program?	Lack of time	41	20.5%
	Neglecting the nutrition aspect	30	15.0%
What Is the Goal of Your Current Nutritional Program?	Weight Loss	37	18.5%
	Maintaining Muscle Mass	18	9.0%
	Weight Gain	15	7.5%
	Increasing Muscle Mass	130	65.0%
Are You Committed to Your Daily Diet Program?	Yes	84	42.0%
	No	116	58.0%
How Many Meals Do You Eat a Day?	1-3 meals	107	53.5%
	3-5 meals	76	38.0%
	More than five meals	17	8.5%

The second part: were bodybuilding athletes aware of the nutritional components they need?

Table (7) showed the awareness of bodybuilding athletes regarding nutritional components. The first question asked about the nutritional part responsible for building and repairing muscle tissue, the highest number answered proteins (91%). The second question asked about the nutritional part responsible for providing energy necessary for movement and performance; The highest number answered carbohydrates, 158 bodybuilders (79%). The third question asked about the nutritional component responsible for improving cholesterol levels; the highest number responded to fats, 157 bodybuilders (78.5%).

The fourth question asked if the bodybuilder knew how many calories were in 1 gram of carbohydrates: 84 bodybuilders answered 4 calories (42%), 85 bodybuilders answered 7 calories (42%), and 31 answered 9 calories (15.5%). The fifth question asked about calories in 1 gram of protein, and 131 bodybuilders answered 4 calories (65.5%). The sixth question asked about calories in 1 gram of fat, and 65% of bodybuilders answered 9 calories.

Table (7): Answers of the study participate in the questionnaire questions about their nutritional program.

Question	Category	Frequency	Percentage
What is the nutritional part responsible for building and repairing muscle tissue?	Protein	182	91.0%
	Carbohydrates	15	7.5%
	Fat	3	1.5%
What is the nutritional part responsible for providing the body with the energy necessary for movement and performance?	Protein	29	14.5%
	Carbohydrates	158	79.0%
	Fat	13	6.5%
What is the nutritional part responsible for improving cholesterol levels and heart rhythm?	Protein	25	12.5%
	Carbohydrates	18	9.0%
	Fat	157	78.5%
How Many calories per one gram of protein?	4 Calories	131	65.5%
	7 Calories	43	21.5%
	9 Calories	26	13.0%
How Many calories per one gram of carbohydrate?	4 Calories	83	41.5%
	7 Calories	85	42.5%
	9 Calories	32	16.0%
How Many Calories per one gram of Fat?	4 Calories	16	16.0%
	7 Calories	19.5	19.5%
	9 Calories	64.5	64.5%

The third part: Did bodybuilding athletes know the difference between nutritional supplements and steroids?

Table 8 showed whether bodybuilders had previously used nutritional supplements. It showed that 125 bodybuilders had used nutritional supplements (62.5%). Regarding trusts in nutritional supplements, 156 bodybuilders answered "yes" (78%), Regarding whether they believed of nutritional supplements, 118 answered "yes" (59%), Regarding whether they believed they could do without nutritional supplements, 148 answered "yes" (74%), lastly, Regarding understanding difference between nutritional supplements and steroids, 184 answered "yes" (92%), and 16 answered "no" (8%).

Table (8) Answers of the study participate about supplements and steroids knowledge .

Question	Category	Frequency	Percentage
Have you ever used nutritional supplements?	Yes	125	62.5%
	No	75	37.5%
Do You Trust Nutritional Supplements?	Yes	156	78.0%
	No	44	22.0%
In your opinion, is it possible to do without nutritional supplements?	Yes	148	74.0%
	No	52	26.0%
Are there negative effects of nutritional supplements?	Yes	118	59.0%
	No	82	41.0%
Do you realize the difference between nutritional supplements and steroids?	Yes	184	92.0%
	No	16	8.0%

The Fourth Part: Did bodybuilding athletes adjust their nutritional program in a scientific manner?

Table 9 showed the methods used by a bodybuilder to monitor their weight; sixty-nine bodybuilders checked monthly (34.5%). The second question asked if a bodybuilders calculated the calories they needed, 142 bodybuilders did not know their needs (71%). The third question asked if bodybuilders knew their basal metabolic rate (BMR) ,158 did not know (79%). The fourth question asked if bodybuilders knew the number of proteins needed daily; 110 knew (55%), and 90 did not know (45%). The fifth question asked about daily

carbohydrate needs; 110 did not know (55%). The sixth question asked about daily fats needs; 125 did not know (62.5%). The seventh question asked if they counted calories for each meal; 157 did not know (78.5%). The eighth question asked if they followed a specific meals (42.5%), and 115 ate random meals (57.5%).

Table (9): Answers of the study participate about scientific diet adjustment.

Question	Category	Frequency	Percentage
Do You Monitor Your Weight?	Daily	23	11.5
	Weekly	47	23.5
	Monthly	69	34.5
	Randomly	61	30.5
Do you calculate the number of calories your body needs?	Yes	58	29.0
	No	142	71.0
Do you know your body's basal metabolic rate (BMR)?	Yes	42	21.0
	No	158	79.0
Do you not know the Number of Proteins needed daily to achieve your goals?	Yes	110	55.0
	No	90	45.0
Do you know the amount of carbohydrates needed daily to achieve your goals?	Yes	90	45.0
	No	110	55.0
Do you not know the amount of healthy fats needed daily to achieve your goals?	Yes	75	37.5
	No	125	62.5
Do you count calories for each of your meals?	Yes	43	21.5
	No	157	78.5
Is it your type of diet most of the time?	Defined	85	42.5
	Randomly	115	57.5

Multiple linear regression results in finding the factors most influencing weight in bodybuilders.

For statistical analysis and more correct interpretation of results, a set of quantitative variables were classified into specific categories (triangles) that reflected how close or far they were from scientifically recommended or field-based levels among athletes. These variables included the proportions of macronutrients (carbohydrates, protein, and fat) to total calories,

in addition to calories consumed, basal metabolic rate (BMR), estimated daily calorie needs based on physical activity ($BMR \times 1.9$), actual and recommended protein, carbohydrate, and fat intake, as well as physical indicators such as weight, height, and age.

The study determined the extent to which a number of nutritional and physical variables influenced the weight of participants, using a multiple linear regression test. The following table displayed the detailed results of the regression analysis, including the non-standardized values (B), standardized values (Beta), values (t), and the level of statistical significance for each variable; the following table (10) showed this:

Table (10): Multiple linear regression results in finding the factors most influencing weight in bodybuilders.

R	R Square		Adjusted R Square	F	Sig.
0.903	0.816		0.801	54.358	.001
Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
kal %	-.007	.091	-.003	-.079	.937
carb %	-.142	.051	-.216	-2.765	.006
protein%	.008	.104	.005	.076	.939
fat %	-.105	.059	-.104	-1.791	.075
Cals (kcal)	.060	.058	.078	1.040	.300
BMR	.486	.096	.363	5.073	.000
BMR*1.9	.612	.087	.278	7.035	.000
Prot (g)	.007	.047	.010	.157	.875
Protein(re c)	-.115	.150	-.080	-.765	.445
Carb (g)	.090	.059	.118	1.530	.128
Carb (reco)	.138	.100	.089	1.384	.168
Fat (g)	.014	.039	.021	.352	.725
fat (rec)	.490	.148	.343	3.307	.001
length	-.024	.040	-.021	-.593	.554
Age	.086	.031	.097	2.821	.005
Dependent Variable: weight					

The results of the multiple linear regression analysis showed that the model explained 81.6% of the variance in weight ($R^2 = 0.816$), a high percentage showing the model's robustness. The ANOVA test also showed that the model was statistically significant ($F = 54.358$, $p < 0.001$), meaning that the independent variables combined significantly influenced weight. Looking at the effect coefficient of each variable: BMR ($\beta = 0.486$, $p < 0.001$) and BMR*1.9 ($\beta = 0.612$, $p < 0.001$) were the strongest positive predictors of weight. Recommended fat intake (fat rec) also had a significant positive effect ($\beta = 0.490$, $p = 0.001$). The percentage of carbohydrates in the diet (carb %) showed a negative and significant effect on weight ($\beta = -0.142$, $p =$

0.006), while other variables (such as protein content, calorie intake, height, protein intake, age, etc.) were not statistically significant.

Result Discussion

Food Intake

The results of our study in table 1 showed that the average calorie intake by bodybuilders was less than recommended. That is, players were consuming fewer calories than their estimated needs. When calories were consumed at levels below recommendations, this was associated with muscle loss, hormonal imbalance, psychological problems, and negatively affects on the cardiovascular system (Fagerberg, 2018). This result was consistent with several previous studies, where athletes were reported to consume fewer calories than required (Alahmadi & Albassam, 2023). However, it contrasted with the findings of a study conducted by (Spendlove et al., 2015), in which players were found to consume caloric in excess of their needs. Although high-carbohydrate diets have been considered the gold standard for athletic performance, adequate carbohydrates intake before training was shown to reduce glycogen depletion and improve performance. In contrast, insufficient carbohydrates intake was reported to impair strength training (Huff, 2000; Spendlove et al., 2015).

Significant hormonal changes, reduced glucose utilization, and increased reliance on free fatty acids and ketone bodies were induced by carbohydrate restriction (REBIĆ, 2021). The average carbohydrate intake among study participants was found to be lower than recommended. This finding was consistent with previous studies reporting insufficient carbohydrate intake among bodybuilders (Spendlove et al., 2015; Alahmadi & Albassam, 2023). high-protein diet were designed to support post-exercise recovery and skeletal muscle growth, however, the average protein intake of study participants was lower than the recommended level (Szurkowska et al., 2021). In a study conducted on bodybuilders consuming protein levels below recommended values, no significant improvements in body composition, or hormonal profiles were observed (Hoffman et al., 2006). The current findings were inconsistent with earlier studies reporting excessive protein intake among athletes (Spendlove et al., 2015). Fat intake among study participants was also found to be lower than recommended, nevertheless (Ranken, 1995) reported that a low-fat diets were associated with reductions in lean body mass due to large calorie deficit (Rukstela et al., 2023).

Survey

First part: Based on the collected responses, it was found that 107 out of 200 did not follow a structured diet, despite evidence confirming that nutrition was considered a primary factor in achieving athletic goals (Rankin, 1995; Helms et al., 2014; Spendlove et al., 2015; Apog, 2019; Iraki et al., 2019). Among the 93 players who reported following a special diet, most relied on self-prepared plans, while only a small percentage depended on nutritionists, despite their scientific expertise. Previous studies confirmed that athletes generally possessed insufficient diets independently (Alahmadi & Albassam, 2023).

Among the 107 players who reported that they did not follow a special diet, it was found that the most frequently reported reason was insufficient time to prepare meals. The results indicated that 116 participants did not adhere to their diet on a daily basis, and approximately 54% of the players consumed only one to three meals per day. These findings demonstrated that the majority of bodybuilders did not follow a structured nutritional program during their training period. Given that nutrition plays a fundamental role in muscle hypertrophy, athletic

performance, body weight, regulation, recovery, hormonal balance, and achievement of individual goals, the lack of dietary adherence may negatively affect overall performance and health outcomes.

In the second part of the survey, the nutritional knowledge of the participants was assessed. The results revealed that the majority of players (90%) possessed adequate knowledge regarding the role of protein in muscle building and tissue repair. Similarly, 79% of the participants correctly identified carbohydrates as the primary source required for physical activity and performance. While 78.5% demonstrated awareness of the role of fat in cholesterol regulation and cardiovascular function. These suggested that most bodybuilders had a general understanding of the physiological functions of macronutrients.

The results showed that regarding 131 players (65.5%) had information that one gram of protein gives four calories. When asked about the number of calories per one gram of carbohydrates, the results showed that the percentages are close for bodybuilders, between four calories, which is the correct answer, and seven calories, where eighty-four players (42%) answered correctly, and eighty-five players answered (42.5%) on seven calories. The results showed that 130 players (65%) had correct information that one gram of fat gives nine calories. That is, half of the bodybuilders have information about calories; it is concluded from the link between the first part and the second part that the players do not have sufficient information to implement their own diet.

In the third part of the survey, the combined results revealed that approximately 63% of the participants reported using nutritional supplements, while 78% expressed trust in these supplements and believed that they are essential for achieving bodybuilding goals. The majority of players reported that they could not achieve adequate intake of key macronutrients, particularly protein, without relying on nutritional supplements.

Despite this strong reliance, 59% of the participants acknowledged the presence of negative side effects associated with supplement use. This finding indicated a contradiction between players' awareness of potential risks and their continued dependence on supplements, suggesting that perceived benefits outweighed health concerns among many participants.

Furthermore, most athletes reported that they were able to distinguish between nutritional supplements and anabolic steroids, despite the widespread confusion between these two substances within the general community. However, when participants were objectively assessed by asking them to correctly identify nutritional supplements from a list of options, only approximately 50% provided correct answers, despite previous reporting confidence in their ability to differentiate between supplements and steroids.

These findings demonstrated that only half of the bodybuilders possessed accurate knowledge regarding the distinction between nutritional supplements and anabolic steroids. This result supports previous research indicating that athletes' awareness of steroids use and related risks remains limited (Rezaei, 2017).

In the third part of the survey, It was observed that the results varied according to the frequency of weight monitoring, participants who measured their weights in a structured manner (monthly, weekly, then daily) were more numerous than those who recorded their weight randomly, the results indicated that most participants did not calculate their daily calories intake, which confirm the findings from the first and second parts, showing that did not follow a structured diet. Nutritional analysis further corroborated these results, revealing that participants consumed fewer calories than recommended.

The results also demonstrated that most bodybuilders did not measure their basal metabolic rate (BMR), suggesting that they did not adhere to a scientifically designed diet. Most bodybuilders neither counted calories nor calculated their required intake of carbohydrates and fats, and approximately half were unaware of their daily protein requirements, indicating that players were not meeting their calorie or macronutrient needs and were not following a diet calculated and scientifically structured diet.

Furthermore, most participants did not calculate calories for each meal and lacked the knowledge to do so, highlighting that they did not follow a diet based on scientific principles. The results showed that more than half of the participants (57.5%) follow random dietary patterns most of the time, further confirming the absence of a structured and scientifically grounded diet.

Finally, the analysis of daily intake combined with participants' nutritional knowledge revealed that approximately half of the bodybuilders did not adhere to personal diet plans, failed to meet their calorie or macronutrient requirements, and were unable to implement their own diet effectively despite having adequate knowledge of macronutrients functions.

Regression

The study results indicated that most bodybuilders possessed moderate to good knowledge of their daily calories and macronutrient requirements (protein, carbohydrates, and fat). A positive association was observed between nutritional knowledge and actual dietary behavior. Participants who demonstrated clear knowledge of their basal metabolic rate (BMR) and protein requirements were found to achieve a higher level of congruency between their calorie actual calorie intake and the recommended intake.

These findings were consistent with those reported by Spronk et al.'s (2020), who demonstrated a strong relationship between nutritional knowledge and dietary behavior among athletes, especially regarding adherence to appropriate macronutrient distribution based on physical activity demands. Similarly, Slater and Phillips' (2021) confirmed that proper macronutrient distribution plays a critical role in muscle mass development in bodybuilders, which was reflected in the present study by the relatively adequate protein intake among participants who showed higher nutritional awareness.

On the other hand, the regression analysis revealed that a considerable proportion of participants relied on nutritional supplements as part of their daily dietary practices. Levels of confidence in these supplements varied, as some participants expressed concerns regarding their effectiveness and potential side effects. This finding was in line with the International Olympic Committee statement reported by Maughan et al. (2020), which emphasized that supplements use among athletes requires careful evaluation of safety and credibility, particularly because some athletes confuse legal nutritional supplements with prohibited performance-enhancing substances.

Overall, the regression findings underscored the importance of implementing targeted nutritional educational and awareness programs for bodybuilders. Such programs should focus on accurately assessing individual nutritional requirements, improving the alignment between nutritional knowledge and actual dietary behavior, and safe use of nutritional supplements, with particular emphasis on distinguishing scientifically supported information from unreliable sources commonly circulated in sports environments.

Recommendations

- The role of qualified nutritionists in gyms should be activated to improve bodybuilders' nutritional practices, support the achievement of training goals, and increase nutritional awareness among athletes.
- Greater support should be provided for scientific research in sports nutrition to ensure the availability of reliable, evidence-based information that athletes can rely on, especially in light of the widespread dissemination of misinformation.
- Scientific conferences, educational lectures, and awareness programs should be organized across all governorates of the Kingdom to promote accurate sports nutrition knowledge and encourage the adoption of scientifically based dietary practices among athletes.

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