

ORIGINAL ARTICLE

Assessment of Dietary Intake among Elite Jordanian Football Players

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ARTICLE INFO

Keywords:

Jordan
Athletes
Football players
Nutrition
Dietary intake

ABSTRACT

Background: With elite players often competing in matches and facing limited recovery time, dietary strategies must be optimized to support energy availability, enhance recovery, and reduce the risk of fatigue-related injuries. This study assessed dietary intake of macronutrients and micronutrients among elite Jordanian football players and the adequacy of their intake in relation to international sports nutrition guidelines.

Methods: A cross-sectional observational study was conducted on 30 male professional football players from the Jordanian national team. Dietary intake was assessed using a 7-day food record, and nutrient analysis was performed using specialized dietary analysis software. Macronutrient and micronutrient intakes were compared to established reference values for athletic populations.

Results: Significant differences in carbohydrate and fat intake were noticed. Approximately 74% of players consumed less than recommended carbohydrate intake, and 70% had low fat intake despite falling within the acceptable macronutrient distribution range (31%). Additionally, 63% of players failed to meet their estimated energy requirements. Protein intake was generally adequate, with most players meeting or slightly exceeding the recommended levels. Most micronutrients showed statistically significant differences, indicating that the majority of players consumed levels below the recommended dietary intakes, except significantly for vitamin C and vitamin B5. Intakes of vitamins A, D, K, biotin, choline, calcium, iodine, magnesium, and potassium were significantly below recommended.

Conclusion: Elite Jordanian football players present with suboptimal intake levels of calories, carbohydrates, and multiple essential micronutrients. These findings underscore the need for targeted nutrition education and intervention to optimize high-level athletes' performance, recovery, and metabolic health.

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Email: h.ghazzawi@ju.edu.jo
Received: November 2, 2025
Revised: January 25, 2026
Accepted: February 3, 2026

Please cite this article as: Iblasi R, Ghazzawi H, Abualsaud M, Amawi A. Assessment of Dietary Intake among Elite Jordanian Football Players. Int J Nutr Sci. 2026;11(1). doi:

Introduction

Football, with roughly 265 million registered players, has become the most popular and frequently played sport worldwide in recent decades (1, 2). In Jordan, football holds a similarly prominent position, with the national team achieving a historic milestone by qualifying for the 2026 FIFA World Cup and actively participating in regional and international competitions. This reflects the country's growing investment in elite player development and high-performance sport. As the level of competition intensifies globally and locally, the increasing physical and competitive demands of elite football characterized by higher match intensity, frequent fixture congestion, and extended seasons have placed greater emphasis on the role of nutrition in supporting performance and recover (3). With elite players often competing in over 60 matches per season and facing limited recovery time, dietary strategies must be optimized to support energy availability, enhance recovery, and reduce the risk of fatigue-related injuries (4). Prolonged low energy availability can lead to Relative Energy Deficiency in Sport (RED-S), a condition that impairs metabolic rate, bone health, immunity, and cardiovascular and psychological health (5).

A well-balanced diet that ensures adequate intake of macronutrients and micronutrients, while maintaining energy balance, is fundamental to optimizing performance, supporting recovery, and reducing the risk of illness and injury in athletes especially in elite football players (6, 7). Dietary habits are connected to physical activity, nutrition, and overall well-being, they are essential to a competitive workout program. The international guidelines, based on scientific data, advocate for precise quantities, types, and timing of food intake to maximize the effectiveness of training while simultaneously decreasing the risk of illness and injury (8). In order to get the energy, players must consume a wide range of meals, including carbohydrates, proteins, fats, and micronutrients (6). While general recommendations for athletes are available, football-specific dietary requirements differ based on factors such as training intensity, match frequency, positional demands, and individual variation. However, there remains a lack of comprehensive, evidence-based dietary guidelines tailored specifically to football players (3, 9, 10).

Even though football is a team sport, FIFA (11) asserts that players must have dietary regimens. A considerable rise in the need for macronutrients may be attributed to football focusing on physical training and rising competitiveness (2). Energy requirements for elite footballer players typically range from 40 to

70 kcal/kg/day, depending on training intensity and individual demands (6). Balancing energy intake with expenditure is essential to prevent energy deficits or surpluses, both of which can negatively impact performance and recovery. Dietary strategies must therefore be adjusted in accordance with fluctuating training loads (3, 12). Carbohydrates are the primary fuel source for high-intensity exercise, supporting muscle contraction, central nervous system function, and glycogen replenishment (10).

Protein intake, typically 1.2 to 2.0 g/kg/day, is essential for muscle repair, adaptation, and the maintenance of structural tissues, including tendons and bones (3, 13). Dietary fat should account for 25-35% of total energy intake, contributing to the absorption of fat-soluble vitamins and supplying essential fatty acids such as omega-3 (6, 10). In football players, inadequate intake of key micronutrients such as iron, vitamin D, calcium, and B vitamins may impair muscle function, bone health, and energy metabolism (14). Greater attention must be directed toward optimizing the nutritional intake of football players in Jordan, since no studies have been carried out to evaluate the dietary intake of Jordan football players, which indicates that further study is required. To address this gap, the objective of this study was to evaluate the nutrient intake of elite football players over a seven-day period, assessing the adequacy of their macronutrient and micronutrient intakes.

Materials and Methods

This cross-sectional observational study included thirty male football players from the Jordan national team, selected through the Jordan Football Association (JFA) and collection of the sample was taken during pre-season in July, 2025. Sample size calculation was not performed using inferential statistical formulas because the target population itself was finite and fully covered. The study included the entire roster of the national football team at the time of data collection. This approach is often used in studies with small, well-defined populations where it is feasible and meaningful to include all members, thereby avoiding sampling error altogether. Consequently, the study represented the total population of interest within this specific context, and no further sample size estimation was required.

This study was part of a larger research project investigating various factors influencing athletic performance. The next phase will examine the effects of intermittent fasting on body composition, selected hormone levels, and physical performance, providing a comprehensive understanding of key

elements impacting Jordanian football players' success. These players ranged in age from 19 to 35. Inclusion was limited to male participants, Jordanian nationality, exhibiting more than 5 years of continued experiences. Female athletes were not included due to physiological differences associated with the menstrual cycle, particularly fluctuations in cortisol and testosterone levels across different phases, which could potentially influence dietary intake and metabolism (15-17). Exclusion criteria were active smoking (cigarettes, pipes, cigars, and e-cigarettes), diagnosed metabolic diseases, cardiovascular or respiratory disorders, and orthopedic issues within the past five years that could have limited exercise performance. Additionally, individuals who used anabolic steroids, or took medications (e.g., steroidal and non-steroidal) or dietary supplements (such as creatine, beta-alanine) that might have interfered with study outcomes were excluded from participation. In accordance with the approved research design authorized by the Faculty of Graduate Studies, the Deanship of Scientific Research, and the Institutional Review Board (IRB) at the University of Jordan (Decision Code: 250/2024), and submitted by Dr. Hadeel Ali Ghazzawi from the School of Agriculture, written informed consent was obtained from each football player who participated in the study.

The bioelectrical impedance (BIA) was measured by an InBody 230 device (InBody Co., Ltd., Korea). All the anthropometric and BIA measures were carried out at the team campus. In this study, bioelectrical impedance analysis (BIA) was used to assess muscle mass (%), muscle mass (kg), body fat percentage (BFP), fat mass (kg), and weight. The weight measurements were obtained with participants wearing only light clothing and no footwear to ensure accuracy. All items, including belts, metallic buttons, and piercings that have the potential to induce considerable attenuation, were removed from the subjects prior to each BIA assessment. The readings were obtained within 0.1 kilograms of the closest unit. The participants implanted with platinum were not allowed to participate in the research. Participants' height was measured to the nearest 0.5 cm using a SECA wall-mounted portable stadiometer. All the measures were carried out in the morning, following a fasting period of eight to ten hours.

Daily food intake of football players was recorded over a seven-day period to evaluate nutritional intake. Using the Food Processor® Nutrition Analysis ESHA program (Ver 10.9/2011), participants were advised to keep their regular caloric intake and to complete a dietary record for seven consecutive days.

Prior to data collection, participants were provided with written instructions outlining the timing and quantity of food consumed. A customized guidebook was distributed, offering detailed guidance on portion size estimation and accurate documentation of all food and beverage intake. To ensure accurate estimation of quantity, each participant was given food models as visual aids. Using the Dietary Processor® Nutrition Analysis ESHA program (Version 10.9/2011), we determined the total amount of calories consumed and the intake of carbohydrates, fats, and proteins of participants' diets. A telephone contact was made available to participants for any queries during the study. Upon completion, dietary records were carefully reviewed, and demographic data were collected, including habitual eating behaviors, supplement use, dietary preferences, and weight management strategies, to enable a comprehensive dietary assessment. Data were collected and entered into the Statistical Package for the Social Sciences (SPSS17.0.1.2008, SPSS Inc., Chicago, IL, USA) software. A two-tailed t-test and ANOVA was used to evaluate grouped data. The outcome data were presented in numbers, proportions, means, and standard deviation. The significance of the test was set at $p < 0.05$.

Results

Anthropometric characteristics of participants at baseline were presented in Table 1, with values reported as mean±standard deviation. Weight (in kilograms), muscle mass (in kilograms), muscle mass (in percentages), fat (in kilograms), and fat (in percentages) were estimated using bioelectrical impedance analysis (BIA).

Table 1: Anthropometric characteristics of the enrolled participants.

Anthropometric indices	Mean±SD
Age (years)	25.57±3.89
Weight (kg)	76.23±5.92
Height (cm)	178.25±6.03
Fat (kg)	9.98±3.22
Fat (%)	12.98±3.74
Muscle mass (kg)	38.05±2.90
Muscle mass (%)	49.91±5.32

Values are presented as mean±standard deviation (SD).

Table 2 presents the participants' energy and macronutrient intakes alongside the recommended levels for football players as established by the ISSN and IOC. It also details the proportion of participants whose intake fell below or exceeded these guidelines. Most players' average daily intake of carbohydrates (CHO) and calorie were below the dietary requirements, whereas their daily intake of protein

Table 2: Macronutrient intake of football players (n=30) compared to recommended values (RV): mean values, distribution, and classification above or below recommendations.

Nutrient	Dietary intake (Mean±SD)	RV	P value	L% (N)	W% (N)	H% (N)
Average intake	2630±636.81	-	0.14	63% (19)	37% (11)	0% (0)
Energy (kcal/kg)	34.64±9.94	40-70				
CHO (g)	310±79.56	-	0.00*	74% (22)	23% (7)	3% (1)
CHO (g/kg/day)	4.09±1.38	5-10				
CHO (%)	47%	50-60				
Dietary protein (g)	144±35.26	-	1.74	7% (2)	60% (18)	33% (10)
Dietary protein (g/kg/day)	1.9±0.46	1.2-2				
Dietary protein (%)	22	15-20				
Dietary fat (g)	98±34.61	-	0.02*	70% (21)	30% (9)	0% (0)
Dietary fat (g/kg/day)	1.29±0.53					
Dietary fat (%)	31	25-35				

Values were presented as mean±standard deviation (SD), percentages (%), and participant numbers (N). Macronutrient intake values were compared against the recommended values (RV) set by the International Society of Sports Nutrition (ISSN) and the International Olympic Committee (IOC). Intake was categorized as below (L), within (W), or above (H) the recommended values. Statistical significance was set at $p \leq 0.05$.*

was within the recommendations. Carbohydrate intake was significantly below recommendations for 74% of participants (mean 4.09 ± 1.38 g/kg/day, $p=0.00$). Additionally, 70% of players consumed fat at levels significantly lower than recommended ($p=0.02$), with an average intake of 1.29 ± 0.53 g/kg/day.

Discussion

The Jordanian football team demonstrated commendable competitiveness in regional tournaments, recently securing a place in the finals of the 2024 AFC Asian Cup and earning qualification for the 2026 FIFA World Cup, marking a significant milestone in the nation's football history. Proper nutrition is essential for optimal athletic performance. This study examined the energy, carbohydrate, protein, fat and micronutrients intake of these athletes, identifying potential deficiencies; while also acknowledging that intake levels might be adequate in certain cases (18). These findings emphasized the urgent need for targeted dietary interventions to enhance performance and overall health. Furthermore, the apparent lack of prior research evaluating the dietary intake of Jordanian football players revealed a substantial gap in the existing literature, underscoring the necessity for further empirical investigation in this context.

Burke *et al.* recommended that football athletes to eat an adequate amount of energy in order to engage in physical activity, improve their fat-free body weight, and decrease the amount of fat in their body mass (12). The guidelines state that the energy need of an athlete is between 40 and 70 kcal/kg of body mass. In our research, we found that the average amount of energy that football players consumed daily was 2630 ± 636.81 kcal,

equivalent to 34.64 ± 9.94 kcal per kilogram of body mass. These values are lower when compared to the results for athletes from various countries like the Netherlands (2988 ± 583 kcal per day and 38.8 ± 7.6 kcal per kilogram of body mass per day) (19), a group of Brazilian professional football players with a daily calorie of 40.74 ± 12.81 kcal) (20), football athletes in the Dutch Premier League (3285 ± 354 kcal per day; 42.4 ± 3.5 kcal per kilogram of body mass per day) (21), the professional junior players in Spain (3,003 calories) (22), Olympic athletes from Puerto Rico (3,952 calories) (23), Italian professionals (3,650 calories) (24), and top Swedish athletes (4,929 calories) (25), as well as Danish players (3,738 kcal) (26), and Greek footballers who play professionally (3442 ± 158 kcal/day; 46 ± 2.1 kcal/kg body weight/day) (27) were analyzed. These discrepancies may be attributed to differences in athletes' body sizes, training statuses, skill levels, and the methods used to assess dietary intake across studies.

Since the findings indicated that athletes needed to consume sufficient energy for practical training, their physical load may have decreased compared to football teams from other countries. In addition, it is important to mention that while there is a general belief that athletes can easily replace their energy by adhering to a well-balanced diet, this is challenging for most athletes since their exercises are often highly intense and extended throughout the preparation period. Following strenuous physical activity, athletes have a significant decrease in their appetite. During extended training days, the short intervals between meals may make it difficult for athletes to consume the necessary amount of calories. It is possible that participants failed to meet recommended energy intake due to limited time

for eating or insufficient appetite (28). In addition, research conducted by Caruana and colleagues concluded that when players have a competitive training schedule packed with activities, they may lose their appetite after training, eat badly or often skip meals, or become famished and resort to eating takeout or fast food (29).

Macronutrient intake showed notable deficiencies, particularly in carbohydrates. The average carbohydrate intake (4.09 ± 1.38 g/kg/day) was significantly below the recommended 5-7 g/kg/day, which is essential for sustaining glycogen levels and supporting high-intensity performance (23). Only a small percentage of players met the recommended intake, and the total energy derived from carbohydrates (47%) was lower than that of Italian (55.8%) (24) and Puerto Rican (53.2%) (23) professional football players. Given that glycogen depletion is a major cause of fatigue and decreased endurance, insufficient carbohydrate intake may negatively impact match-day performance, cognitive function, and recovery (12, 23, 26, 30-34).

Protein intake (1.9 ± 0.46 g/kg/day) fell within recommended ranges but varied compared to other football teams. While current guidelines suggest 1.2-2.0 g/kg/day for optimal muscle repair and recovery, ensuring even distribution of protein intake across meals is essential for maximizing muscle protein synthesis (6, 18). Meanwhile, the average fat intake (1.29 ± 0.53 g/kg/day), contributing 31% of total energy intake, fell within the recommended range for athletes (25-35% of energy) (6). However, the findings revealed that 70% of players consumed below-average amounts of dietary fat ($p=0.02$), indicating a potential imbalance at the individual level. Inadequate fat intake can compromise hormone production and the absorption of fat-soluble vitamins, potentially affecting recovery, immune function, and overall health. When coupled with low energy and carbohydrate intake, this may lead to negative energy balance and impair athletic performance (13).

Micronutrients play a crucial role in energy production, hemoglobin synthesis, bone health, activeness of immune functions, and body protection against oxidative damage. Exercise stresses the activity of many metabolic pathways that require micronutrients and increases their turnover and loss from the body (35). Athletes are prone to consuming insufficient micronutrients due to inappropriate dietary habits, especially if they do not match their physical activity requirements (36). The findings revealed significant deficiencies in several micronutrients, including vitamins A, D, K, biotin, choline, calcium, iodine, magnesium, and potassium ($p<0.05$). However, the players covered only vitamins C and

B5 and showed statistically insignificant differences between groups compared to the recommendation. Football players regularly consumed a cup of fresh orange juice after each meal, providing 124 mg of vitamin C per cup. Consuming approximately three cups of orange juice daily exceeds twice the daily requirement, ensuring sufficient vitamin C intake. Similarly, vitamin B5 is naturally present in various foods, including plant and animal sources such as meat, vegetables, cereal grains, legumes, eggs, and milk. According to the National Institutes of Health (NIH), vitamin B5 deficiency is rare in the United States (37). Football players typically consume fortified cereals for breakfast daily, supporting adequate vitamin B5 intake as shown in Table 3.

Inadequate nutritional intake can lead to impaired physiological function, increased risk of fatigue, illness and injury, and maladaptation to the training stimulus (37). A key factor contributing to the observed micronutrients deficiencies is the lack of access to qualified nutritionists and structured meal services, limiting the availability of balanced diets tailored to athletes' needs. Inadequate nutrition education leaves players unaware of the critical role of micronutrients in performance, recovery, and health, often leading to poor dietary habits and limited variety. Addressing these gaps requires integrating a performance nutritionist to deliver personalized plans, practical education, and ongoing support (38). Embedding nutrition support within teams can improve dietary adequacy, enhance performance, and reduce injury risk (39, 40). Further research is needed to assess the effectiveness of such interventions on dietary behavior and long-term outcomes in professional football players.

This study has several advantages that enhanced its significance. It provided detailed biochemical, anthropometric, performance, and dietary assessments, offering a multi-faceted perspective that contributes to a deeper understanding of the subject. Additionally, the study focused on elite athletes from the Jordan national football team. This unique aspect enhanced the study's relevance by providing insights specifically applicable to high-performance athletes. We have included these advantages in the manuscript to further clarify the strengths of our study. However, the limitations are obvious too. First, the sample size was relatively small, which may limit the generalizability of the findings to a broader population of football players. Additionally, dietary intake data were self-reported, which may introduce recall bias and inaccuracies in reported food consumption. Lastly, hydration and fluid intake were not measured, which could impact overall athletic performance and recovery.

Table 3: Micronutrient intakes of football players compared to reference values.

Micronutrients intake	Mean±SD	EAR-UL	P value
Vitamin A (mcg)	609.24±2088.23	625-3000	0.00*
Vitamin B1 (mg)	2.141±1.39	0.8-1.2**	0.00*
Vitamin B2 (mg)	2.51±1.75	1.1-1.8	0.01*
Niacin eq (mg)	32.92±14.67	12-35	0.00*
Vitamin B5 (mg)	7.33±6.08	5**	0.08
Vitamin B6 (mg)	4.42±8.40	1.1-100	0.00*
Vitamin B12 (mcg)	7.04±16.77	2-2.4	0.00*
Biotin (mcg)	20.29±9.33	30**	0.00*
Vitamin C (mg)	120.70±96.12	75-2000	0.06
Vitamin D (mg)	1.21±1.08	10-100	0.00*
Vitamin E (mg)	14.72±48.79	12-1000	0.00*
Folate (mcg)	470.61±199.63	320-1000	0.01*
Vitamin K (mcg)	60.09±57.85	120**	0.00*
Choline (mg)	209.432±161.90	550-3500**	0.00*
Calcium (mg)	628.66±403.23	800-2500	0.00*
Copper (mg)	1.64±3.24	0.7-10	0.00*
Iodine (mcg)	72.29±42.74	95-1100	0.00*
Iron (mg)	19.03±8.83	6-45	0.00*
Magnesium (mg)	286.53±152.15	330-350	0.00*
Manganese (mg)	8.18±18.06	2.3-11**	0.00*
Phosphorus (mg)	890.92±511.07	580-4000	0.00*
Potassium (mg)	2398.19±814.12	3400**	0.00*
Selenium (mcg)	90.89±50.19	45-400	0.00*
Sodium (mg)	2828.21±871.46	1500-300**	0.00*
Zinc (mg)	13.10±11.24	9.4-40	0.00*

Values were presented as mean±standard deviation (SD). Macronutrient intakes were compared against the Estimated Average Requirement (EAR), Tolerable Upper Intake Level (UL), and Adequate Intake (AI) according to dietary guidelines. Statistical significance was set at $p \leq 0.05^*$.

Conclusion

Jordanian football players failed to meet the recommended energy intake levels necessary to support their training demands. Carbohydrate and fat consumption were particularly deficient relative to their workload, falling below the recommended thresholds for optimal athletic performance. These findings underscore the urgent need for targeted nutritional interventions and highlight the importance of further research to address dietary inadequacies and their implications for performance and recovery among athletes.

Acknowledgement

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Funding

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Authors' Contribution

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Conflict of Interest

The authors declare no conflict of interest.

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