Mohammed S.G.S., et al. Yemeni J Med Sci. 2025; 19(3): 74 - 80
https://doi.org/10.20428/yjms.v19i3.2761
https://journals.ust.edu/index.php/yjms

OPEN ACCESS CASE REPORT

Comparative Nutritional Analysis: Routine Dietary Intake vs. Recommended Guidelines – A Case Study of a 27-Year-Old Male Athlete in Khartoum, Sudan

Somiya Gutbi Salim Mohammed[1], Maida Taher Mohammed Hussein[1], Sara Mohamed Ali Kulais[1]

[1] *Department of Health Sciences, College of Medicine and Health sciences, University of Science and Technology, Aden, Yemen*

ABSTRACT

This case report evaluates the nutritional status of a 27-year-old male basketball athlete who trains for approximately 3 hours once a week on the basketball court at Umst/Mecca Street in Khartoum state. Using the Mifflin-St Jeor Equation, his Basal Metabolic Rate (BMR) was calculated at 1,740 kcal/day, leading to a Total Daily Energy Expenditure (TDEE) of 4,618.95 kcal/day when accounting for physical activity. A 24-hour dietary recall revealed an energy intake of 2,714.7 kcal/day, resulting in a significant caloric deficit of around 1,904.25 kcal/day. Macronutrient analysis showed that his intake of carbohydrates (265 g), protein (188 g), and fats (100.3 g) fell short of optimal recommendations for an athlete of his profile. Specifically, carbohydrate intake was far below the recommended 500-700g, while protein was high but could be moderated for better recovery. Recommendations include substantially increasing carbohydrate intake to 500-600g, reducing protein to 128-160g to better align with recovery needs, and incorporating more healthy fats (120-130g) to enhance caloric intake. These adjustments are essential to improve performance, support recovery, and ensure the athlete's long-term health and well-being. Regular dietary assessments will help adapt to the training demands effectively.

Keywords: Athlete, Basketball, Energy Expenditure, MET.

**** Corresponding author address:*** **Somiyagutbi@gmail.com**

https://doi.org/10.20428/yjms.v19i3.2761
https://journals.ust.edu/index.php/yjms

INTRODUCTION

Nutrition serves as the cornerstone of an athlete's life, profoundly impacting their performance and overall well-being (1). Athletes must adhere to a well-balanced diet tailored to their specific nutritional needs to unlock their full potential. However, many athletes struggle with adhering to such dietary requirements, which can lead to suboptimal performance, inefficient recovery, and an increased risk of injuries (2). Despite the critical role of nutrition in achieving peak physical condition, many athletes fail to meet their nutritional needs accurately due to a lack of knowledge, resources, or guidance (3). Optimal nutrition is instrumental in supporting physical activity, enhancing sports performance, and facilitating post-exercise recovery. Professional athletes are expected to comprehensively meet their nutritional requirements by consuming foods in appropriate quantities and quality (3). Yet, achieving this balance remains a challenge for many, leading to a gap between theoretical knowledge and practical application. Sports nutrition involves the nutrients found in sports-related foods that enhance physical capabilities. These nutrients are essential for meeting the metabolic requirements of athletes or bodybuilders engaged in regular physical exercise and for maintaining their health and performance (4). The nutritional needs of athletes are primarily dictated by the demands of their activities and their goals for peak performance and health. Inadequate energy intake can adversely affect an athlete's performance, resulting in reduced fat-free mass, compromised immune function, decreased bone mineral density, heightened susceptibility to injuries, and an increased incidence of symptoms related to overtraining (5). Accurate nutritional assessment is crucial for athletes to optimize performance and recovery. Understanding an athlete's energy expenditure and macronutrient needs is essential for guiding dietary adjustments that enhance physical performance and support overall health (2). To support growth, performance, and recovery, youth athletes need balanced nutrition, including macronutrients (proteins, carbohydrates, fats), micronutrients (vitamins, minerals), and fluids (6). Protein intake of 1.5 g/kg daily ensures muscle repair and growth with smaller, regular portions throughout the day. Carbohydrates are essential for energy, especially in high-glycemic drinks for faster glycogen recovery (7). Fat, particularly from natural sources like nuts and oily fish, aids vitamin absorption and provides essential Omega-3 and Omega-6 fatty acids. Fat should comprise 20-35% of total energy intake (8). Bridging the gap in nutritional knowledge and application among athletes is essential for enhancing performance and well-being. In sports, assessing nutrition and dietary supplement use is crucial to ensure athletes follow a well-planned sports nutrition regimen that meets their energy and nutrient needs (9).

- Assess the athlete's daily energy expenditure based on basketball training.
- Determine the optimal macronutrient distribution (carbohydrates, protein, fats) to support performance, recovery, and overall health.
- Determine the athlete's hydration needs, considering both general daily fluid intake and additional fluid requirements due to exercise.

METHODOLOGY

Demographics

A 27-year-old male employed at an information technology center leads an active lifestyle, playing basketball weekly for 3 hours at a court on Mecca Street in Khartoum. He weighs 77 kg and is 176 cm tall.

Methods

The athlete was prompted to detail their diet from the previous day, focusing on their intake of proteins and carbohydrates. To assess their energy expenditure, measurements were taken using the Mifflin-St Jeor Equation:

BMR = (10 x weight in kg) + (6.25 x height in cm) - (5 x age in years) + 5

Energy expenditure = BMR × PA

Where:

- **BMR** = Basal metabolic rate
- **PA** = Physical activity

The MET equivalent was used to calculate the calories burned by the athlete using the following equation:

Calories burned per minute = Calories burned per minute = MET × 3.5 × weight in kg / 200

Where:

https://doi.org/10.20428/yjms.v19i3.2761
https://journals.ust.edu/index.php/yjms

- **MET (Metabolic Equivalent)** is a measure of the energy cost of physical activity.
- **3.5** represents the resting oxygen consumption in milliliters per kilogram per minute (ml/kg/min). This value is a constant in the equation and reflects the amount of oxygen consumed at rest.
- **Weight** is the individual's body weight in kilograms.
- The constant **200** serves to adjust the output to match common calorie calculations based on energy expenditure per minute.

The 24-hour recall method was utilized to estimate the caloric intake of the athlete based on his food consumption for exercise. This technique requires the athlete to provide a detailed account of all the items they consumed, including main meals, snacks, and beverages. Once compiled, the food items are analyzed to determine their nutrient content, allowing for an accurate assessment of the athlete's dietary habits and caloric intake. This method provides valuable insights into their nutrition, which can be crucial for optimizing performance and overall health.

RESULTS

Once the Basal Metabolic Rate (BMR) is calculated, it is multiplied by an activity factor to determine the Total Daily Energy Expenditure (TDEE).

BMR Calculation

1. **BMR**= 10×77+6.25×176−5×27+5=1,740 kcal/day
2. **Calculate TDEE:** 1,740×1.4=2,436 kcal/day

Calories Burned Per Minute

3. **Met for basketball is 9 = 9×3.5×77 /200 =** 12.1275kcal /minute
4. **Total Calories Burned Calculation**: 12.1275×180=2,182.95 kcal/day
5. **Total Daily Energy Expenditure**: 2,182.95+2,436=4,618.95 kcal/day
6. **Daily fluid intake =** 77kg×30−35ml/kg≈2310−2695

Daily Dietary Intake

Table (1) Daily Dietary Intake Summary.

Table 1: Daily Dietary Intake Summary

Nutrient	Total (grams)	Calories (approx.)
Carbohydrates	265g	1,060 calories
Protein	188g	752 calories
Fat	100.3g	902.7 calories
Total energy in food		2714.7kcal/day

Athlete's Nutritional Assessment and Recommendations

1. Total Daily Energy Expenditure (TDEE)

- Calculated TDEE: 4618.95 kcal/day
- Current Energy Intake: 2,714.7 kcal/day
- Caloric Deficit: ~1,904.25 kcal/day

Macronutrient Recommendations

Table (2) Macronutrient Recommendations.

https://doi.org/10.20428/yjms.v19i3.2761
https://journals.ust.edu/index.php/yjms

Table 2: Macronutrient Recommendations

Nutrient	Current Intake	Recommended Intake	Notes
Carbohydrates	265 g (~3.4 g/kg)	500-600 g (6.4-8 g/kg)	Essential for energy; increase intake to better fuel performance and recovery.
Protein	188 g (~2.4 g/kg)	128-160 g (1.6-2 g/kg)	Support muscle repair; reduce slightly to avoid excess protein intake and optimize recovery.
Fats	100.3 g (~1.3 g/kg)	120-130 g (20-35% of total calories)	Healthy fats for energy and hormone regulation; increase intake to meet energy needs.

Carbohydrates

The athlete's current carbohydrate intake of 265 g (~3.4 g/kg) is significantly lower than the recommended intake of 500-700 g (6.4-9 g/kg). Carbohydrates are a critical energy source, particularly for athletes or individuals involved in high-intensity exercise (10). Research consistently shows that a higher carbohydrate intake supports glycogen replenishment, energy production, and endurance during prolonged or intense physical activities. Inadequate intake can impair performance and recovery. Increasing carbohydrate intake, particularly in the range of 6.4-9 g/kg, would better support high-level performance and energy demands (2).

Protein

The athlete is consuming 188 g of protein, which is within an adequate range for supporting muscle repair but is slightly on the higher end compared to the recommended intake of 128-160 g. While high protein intake is beneficial for muscle repair, it may be excessive given the athlete's level of activity. Moderating protein intake will allow for a more balanced diet, prevent unnecessary strain on the kidneys, and ensure optimal recovery and muscle maintenance (11).

Fat

The athlete's fat intake (100.3 g) is below the recommended 120-130 g, which represents 20-35% of total caloric intake. Healthy fats are crucial for providing sustained energy, supporting hormonal function, and promoting general health. Increasing fat intake will help close the caloric deficit and ensure the athlete maintains adequate energy levels, particularly for recovery after intense physical activity (12). Healthy fats, particularly those from unsaturated sources like nuts, seeds, and fish, contribute to better overall health outcomes and are essential for athletes needing sustained energy release (13).

Total Daily Energy Expenditure (TDEE)

The athlete's energy expenditure analysis reveals a significant caloric deficit between calories burned through daily activities and training versus current food intake. This deficit can lead to fatigue, reduced performance, and potential muscle loss over time. Energy balance is essential for supporting high-intensity activities like basketball (14). Examination of the athlete's Total Daily Energy Expenditure (TDEE) shows a concerning caloric deficit that can negatively affect performance. Research consistently indicates that athletes consuming fewer calories than they expend face risks of fatigue, decreased performance, and muscle loss over time (15). For high-intensity sports like basketball, maintaining energy balance is vital for sustained performance and recovery. To address this issue, it is crucial to develop a comprehensive nutrition plan that aligns with the athlete's energy demands (2). This plan should emphasize not only adequate caloric intake but also the quality of foods consumed. A focus on nutrient-dense foods—rich in carbohydrates, proteins, and healthy fats—will provide the necessary building blocks for recovery and muscle repair. Additionally, the timing of nutrient intake plays a pivotal role, with strategic meals and snacks designed to support both pre- and post-training recovery (16). Incorporating carbohydrates is particularly important, as they serve as the primary fuel source during high-intensity activities like basketball. The athlete should aim to consume sufficient carbohydrates throughout the

https://doi.org/10.20428/yjms.v19i3.2761
https://journals.ust.edu/index.php/yjms

day, tailoring intake to training schedules. This will enhance glycogen stores, which are essential for maintaining energy levels during extended practice sessions and competitive games. Furthermore, adequate protein intake is vital for muscle repair and growth, helping to mitigate any potential muscle loss from the caloric deficit (9).

Fluid Requirements Calculation

1. **Base Fluid Intake**: A general guideline for fluid intake is approximately 30-35 mL per kg of body weight per day. This recommendation accounts for basic hydration needs without factoring in the increased needs due to exercise.
   The athlete's daily fluid requirement is: Baseline fluid intake = 77 kg × 30 mL/kg = 2,310 mL/day
2. **Additional Fluid for Exercise**: For 3 hours of basketball:
   Additional fluid required = 500−700 mL/hour × 3 hours = 1,500−2,100 mL
3. **Total Fluid Intake**:
   Lower end (1,500 mL of extra fluid):
   2,310 mL + 1,500 mL = 3,810 mL (3.81 liters)
   Upper end (2,100 mL of extra fluid):
   2,310 mL + 2,100 mL = 4,410 mL (4.41 liters)
4. **Total fluid intake on basketball days**:
   3,810 to 4,410 mL (3.81 to 4.41 liters).
5. **On non-basketball days**: 2,310 mL (2.31 liters).

Regular hydration assessments are essential for athletes, especially during changes in training intensity or environmental conditions. Proper hydration significantly affects performance and recovery, with inadequate fluid intake potentially hindering physical performance, impairing cognitive function, and increasing injury risk (17). Athletes should recognize the importance of staying hydrated before, during, and after exercise to optimize their performance. Monitoring hydration alongside body composition and performance metrics provides a clearer insight into nutritional adequacy and overall health. Adjustments to macronutrient distribution and caloric intake may be needed depending on training cycles or competition phases (18).

MACRONUTRIENT RECOMMENDATIONS FOR ATHLETES

- **Carbohydrates:** Vital for energy, particularly in high-intensity activities. Athletes should aim for 6-10 grams per kg of body weight daily to aid glycogen replenishment, prioritizing complex carbs from whole grains, fruits, and vegetables (10).
- **Protein:** Supports muscle repair, but too much can be detrimental. The ideal range is 1.2-2.0 grams per kg of body weight, depending on training requirements. Focusing on quality sources such as lean meats, fish, and legumes optimizes recovery (2).
- **Healthy Fats:** Important for energy and overall health. Incorporating sources like avocados, nuts, and fatty fish can boost energy without compromising carbohydrate intake, which is particularly useful for prolonged activities (19).
- **Hydration**: Crucial for performance and preventing heat-related issues. Regular fluid intake and electrolyte-rich drinks during extended training sessions are recommended (17).

CONCLUSION

This study evaluates the nutrition of a 27-year-old male basketball player, identifying a significant caloric deficit and improper macronutrient distribution. Recommendations include increasing carbohydrates (500-600 g), moderating protein (128-160 g), and enhancing healthy fats (120-130 g), along with ensuring adequate hydration. These adjustments will enhance performance, recovery, and long-term health. Regular assessments are crucial for personalized nutrition.

CONFLICT OF INTEREST

The authors declare that no conflict of interest.

REFERENCES

[1] McArdle WD. Sports and exercise nutrition. New York: Lippincott Williams and Wilkins; 2018.

[2] Amawi A, AlKasasbeh W, Jaradat M, Almasri A, Alobaidi S, Hammad AA, et al. Athletes' nutritional demands: a narrative review of nutritional requirements. Front Nutr. 2024;10:1331854.
[3] Thomas DT, Erdman KA, Burke LM. Nutrition and athletic performance. Med Sci Sports Exerc. 2016;48:543–68. doi: 10.1249/MSS.0000000000000852.
[4] Bagheri R, Karimi Z, Mousavi Z, Ziaee Bashirzad M, Camera DM, Sadeghi R, et al. High-protein diets during either resistance or concurrent training have no detrimental effect on bone parameters in resistance-trained males. Nutrients. 2024;16(2):325.
[5] Bo S, Fadda M, Fedele D, Pellegrini M, Ghigo E, Pellegrini N. A critical review on the role of food and nutrition in the energy balance. Nutrients. 2020;12(4):1161. https://doi.org/10.3390/nu12041161.
[6] Morton RW, Murphy KT, McKellar SR, Schoenfeld BJ, Henselmans M, Helms E, et al. A systematic review, meta-analysis and meta-regression of the effect of protein supplementation on resistance training-induced gains in muscle mass and strength in healthy adults. Br J Sports Med. 2018;52(6):376–84. https://doi.org/10.1136/bjsports-2017-097608.
[7] Desbrow B, Burd NA, Tarnopolsky M, Moore DR, Elliott-Sale KJ. Nutrition for special populations: young, female, and masters athletes. Int J Sport Nutr Exerc Metab. 2019;29(2):220-7.
[8] Borgen J, Burke L, Ackerman KE, Blauwet C, Constantini N, Budgett R, et al. International Olympic Committee (IOC) consensus statement on relative energy deficiency in sport (RED-S): 2018 update. Int J Sport Nutr Exerc Metab. 2018;28:316–31.
[9] Martín-Rodríguez A, Belinchón-deMiguel P, Rubio-Zarapuz A, Tornero-Aguilera JF, Martínez-Guardado I, Villanueva-Tobaldo CV, et al. Advances in understanding the interplay between dietary practices, body composition, and sports performance in athletes. Nutrients. 2024;16(4):571. https://doi.org/10.3390/nu16040571.
[10] Murray B, Rosenbloom C. Fundamentals of glycogen metabolism for coaches and athletes. Nutr Rev. 2018;76(4):243–59. https://doi.org/10.1093/nutrit/nuy001.
[11] Yang Y, Churchward-Venne TA, Burd NA, Breen L, Tarnopolsky MA, Phillips SM. Myofibrillar protein synthesis following ingestion of soy protein isolate at rest and after resistance exercise in elderly men. In: Clinical nutrition and aging. Apple Academic Press; 2017. p. 105-26.
[12] D'Angelo S, Madonna G, Di Palma D. Effects of fish oil supplementation in sport performance. J Phys Educ Sport. 2020;20:2322–9. doi: 10.7752/jpes.2020.s4313.
[13] Ghazzawi HA, Alshuwaier GO, Alaqil AI, Bursais AK, Al-Nuaim AA, Alhaji JH, et al. Correlation of consumption of vegetables, fruit, and nuts with body mass index and fat deposition in Saudi elite male soccer players. Int J Hum Mov Sports Sci. 2023;11(2):350-9.
[14] Janssen TAH, Van Every DW, Phillips SM. The impact and utility of very low-calorie diets: the role of exercise and protein in preserving skeletal muscle mass. Curr Opin Clin Nutr Metab Care. 2023;26(6):521–7. https://doi.org/10.1097/MCO.0000000000000980.
[15] Kaufman M, Nguyen C, Shetty M, Oppezzo M, Barrack M, Fredericson M. Popular dietary trends' impact on athletic performance: a critical analysis review. Nutrients. 2023;15(16):3511. https://doi.org/10.3390/nu15163511.
[16] Bonilla DA, Pérez-Idárraga A, Odriozola-Martínez A, Kreider RB. The 4R's framework of nutritional strategies for post-exercise recovery: a review with emphasis on new generation of carbohydrates. Int J Environ Res Public Health. 2020;18(1):103. https://doi.org/10.3390/ijerph18010103.
[17] Zhang N, Du SM, Zhang JF, Ma GS. Effects of dehydration and rehydration on cognitive performance and mood among male college students in Cangzhou, China: a self-controlled trial. Int J Environ Res Public Health. 2019;16(11):1891. https://doi.org/10.3390/ijerph16111891.

[18] Judge LW, Bellar DM, Popp JK, Craig BW, Schoeff MA, Hoover DL, et al. Hydration to maximize performance and recovery: knowledge, attitudes, and behaviors among collegiate track and field throwers. J Hum Kinet. 2021;79:111–22. https://doi.org/10.2478/hukin-2021-0065.

[19] Hever J, Cronise RJ. Plant-based nutrition for healthcare professionals: implementing diet as a primary modality in the prevention and treatment of chronic disease. J Geriatr Cardiol. 2017;14(5):355–68. https://doi.org/10.11909/j.issn.1671-5411.2017.05.012.