JPPIPA 10(SpecialIssue) (2024)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

The Impact of Nutrition on Performance and Health of Badminton Athletes: A Literature Review

Rusdiar[1], Arsil[1], Umar[1], Ahmad Chaeroni[1]

[1] Faculty of Sport Sciences, Universitas Negeri Padang, Padang, Indonesia

Received: June 30, 2024
Revised: July 27, 2024
Accepted: August 25, 2024
Published: August 31, 2024

Corresponding author:
Rusdiar
rusdiar02zr@gmail.com

DOI: 10.29303/jppipa.v10iSpecialIssue.8529

Abstract: Badminton is a physically demanding sport that requires a combination of speed, agility, endurance, and strength. This literature review investigates the impact of nutrition on the performance, recovery, and long-term health of badminton athletes. A systematic search was conducted in major academic databases, including Scopus, ScienceDirect, and Google Scholar, using the keywords "badminton," "nutrition," and "athlete." Studies published within the last ten years were selected to ensure the information was current and relevant to the sport. Key topics examined include macronutrients (carbohydrates, proteins, fats), micronutrients (calcium, iron, vitamin D, magnesium), hydration, and nutritional timing. Carbohydrates are identified as the primary fuel source, essential for sustaining high-intensity efforts and endurance during matches. Protein plays a critical role in muscle recovery and repair, while fats provide a reserve energy source for prolonged training or competition. Micronutrients like calcium, iron, and magnesium are crucial for bone health, oxygen transport, and muscle function. Proper hydration is equally important to maintain performance, reduce fatigue, and prevent muscle cramps. Nutritional timing—consuming specific nutrients before, during, and after exercise—can optimize energy stores, improve endurance, and accelerate recovery. Despite the clear benefits of nutrition in enhancing performance, many athletes still exhibit gaps in nutritional knowledge, which can lead to suboptimal dietary practices. This review emphasizes the importance of balanced, well-timed nutrition strategies and highlights the need for improved nutrition education to help badminton athletes maximize their performance, prevent injuries, and support long-term health.

Keywords: Sports; Energy Metabolism; Performance; Physical Conditioning

Introduction

Badminton is one of the most popular sports worldwide, known for its fast pace and the high level of skill required from its players (Choi et al., 2024; Gómez et al., 2020). Athletes in badminton must possess not only technical expertise but also exceptional physical attributes, such as agility, speed, endurance, strength, and coordination (Bafirman et al., 2024; Darajat et al., 2024). Consequently, an athlete's performance in badminton is influenced by a combination of factors, with training and technical abilities being paramount. However, nutrition plays an equally vital role in optimizing performance and maintaining an athlete's health. Proper nutrition helps meet the energy demands of the sport, facilitates muscle recovery, prevents injuries, and supports long-term physical health. Given the high-intensity nature of badminton, athletes' nutritional needs are specific and require careful consideration to ensure that they can perform at their best. Nutrition is essential for athletes because it directly influences various aspects of physical performance, including energy production, muscle strength, endurance, and metabolic function (Sorrenti et al., 2019). Badminton is a sport that demands short bursts of speed, rapid changes in direction, and the use of various muscle groups throughout the body. To meet these demands, athletes require a balanced intake of macronutrients—

How to Cite:
Prayuda, R., Fauzihardani, E., Yulhendri, Y., Rino, R., Mustika, S., Insan, R. R., & Haris, F. (2024). Integrated Health Management: A Literature Review on Effective Approaches for Quality and Sustainable Healthcare Services. *Jurnal Penelitian Pendidikan IPA*, *10*(SpecialIssue), 121–126. https://doi.org/10.29303/jppipa.v10iSpecialIssue.10251

carbohydrates, proteins, and fats—along with adequate micronutrients, such as vitamins and minerals. Nutrition plays a critical role in enhancing performance, reducing recovery time, and supporting overall health, especially given the repetitive nature of training and competition in badminton (Phomsoupha & Laffaye, 2015; Valenta & Dorofeeva, 2018).

Research in sports nutrition has consistently shown that dietary strategies can significantly impact athletic performance. For instance, consuming the right nutrients before, during, and after training or competition can help improve endurance, accelerate recovery, and reduce the risk of injuries. Proper nutrition also supports long-term health, which is crucial for athletes who are subjected to the physical stresses of frequent training and competition. A well-rounded diet not only boosts performance but also prevents health issues that could arise due to malnutrition or improper diet (Valenta & Dorofeeva, 2018; Williams, 1998). Athletes' nutritional needs in badminton are influenced by various factors, including the duration and intensity of their training sessions, the style of play, and individual nutritional requirements. Carbohydrates are the primary source of energy for badminton players, as the sport demands quick, explosive movements that require immediate energy release. Ensuring adequate glycogen stores in muscles is essential for sustaining performance throughout a match. Protein is crucial for muscle repair and growth, especially following intense physical activity. While fats are not used as quickly as carbohydrates during short bursts of activity, they are an important energy reserve, especially during prolonged training sessions. Micronutrients also play an essential role in an athlete's diet. Vitamins such as Vitamin D and minerals like calcium and iron are vital for bone health, muscle function, and oxygen transport within the body. A deficiency in any of these essential nutrients can lead to poor performance, fatigue, and an increased risk of injury. Adequate intake of these micronutrients is not only necessary for peak performance but also for maintaining the overall health of the athlete in the long term (Wimalawansa, 2023).

In addition to macronutrients and micronutrients, hydration is another critical aspect of nutrition in sports like badminton. Dehydration can negatively affect performance by impairing concentration, reducing physical endurance, and increasing the likelihood of muscle cramps and injuries. Therefore, staying properly hydrated before, during, and after physical activity is crucial for optimal performance. Athletes should develop strategies to maintain hydration levels, particularly during extended training sessions or high-intensity matches. Additionally, the timing of meals and snacks can play a significant role in optimizing energy levels, allowing athletes to perform at their peak. Despite the growing body of knowledge about the relationship between nutrition and athletic performance, many badminton athletes still neglect the importance of proper nutrition.

The purpose of this literature review is to explore and summarize existing research on the impact of nutrition on the performance and health of badminton athletes. This review will discuss the role of key nutrients—such as carbohydrates, proteins, fats, and micronutrients (including vitamins and minerals)—in supporting optimal performance. It will also examine the importance of hydration, the timing of meals, and recovery strategies that incorporate nutritional considerations. By providing a deeper understanding of how nutrition affects an athlete's performance, this review aims to empower badminton players, coaches, and sports nutritionists with the knowledge they need to improve training outcomes, prevent nutritional deficiencies, and support long-term health.

Method

This study employs a literature review to explore the impact of nutrition on the performance and health of badminton athletes. Articles were sourced from Scopus, ScienceDirect, and Google Scholar using keywords: "badminton," "nutrition," and "athlete." These databases were selected for their comprehensive coverage of peer-reviewed research. The review focuses on studies published in the last ten years to ensure relevance and incorporates empirical data on how nutrition affects performance, recovery, and injury prevention in badminton. The aim is to synthesize findings to guide effective nutritional strategies for improving athletic performance and maintaining long-term health.

Results and Discussion

The table below summarizes key findings from the literature review on the impact of nutrition on the performance and health of badminton athletes. It includes the Author, Topic, and Results of various studies examining how different nutritional strategies influence athletic performance, recovery, and overall health. This concise format highlights the specific nutrients or dietary interventions studied, the methodologies used, and their outcomes on the athletes' performance in badminton. The table provides a clear comparison of the findings across different studies, offering insights into effective nutrition practices for badminton athletes, and serving as a valuable reference for coaches, nutritionists, and athletes seeking evidence-based strategies to optimize performance and health in this sport.

Table 1. Summary of Data Descriptions

Author	Topic	Results
(Choi et al., 2024)	Combined association of aerobic and muscle strengthening activity with mortality in individuals with hypertension.	The study concludes that meeting both aerobic and muscle-strengthening activity guidelines significantly reduces mortality risk, particularly in individuals with hypertension. Engaging in both activities offers greater survival benefits, emphasizing the need for public health initiatives to promote these guidelines for hypertensive individuals.
(Saha et al., 2022)	Influence of Hand Anthropometry and Nutrient Intake on Hand Grip Strength: A Correlational Study Among Young Indian Badminton Players.	The study highlights the significant impact of hand anthropometry and nutrient intake on grip strength among young Indian badminton players. Positive correlations were found between arm measurements, nutrient consumption, and grip strength, emphasizing the importance of physical development and nutrition for enhancing athletic performance in this age group.
(Hoseini & Hoseini, 2019)	Investigating Nutritional Literacy of Male Student Athletes Contributed in 2018 Iran University Games.	The study concluded that male student athletes participating in the 2018 Iran University Games exhibited poor nutritional literacy. A significant relationship was found between nutritional literacy and factors such as education level and sports experience, indicating a need for improved nutrition education among these athletes.
(Vicente-Salar et al., 2020)	Nutritional ergogenic aids in racquet sports: A systematic review.	The systematic review concludes that nutritional ergogenic aids (NEAs) can enhance performance in racquet sports, particularly caffeine, which has shown positive effects on skills and accuracy. However, more research is needed for other NEAs like creatine and glycerol to establish their efficacy in improving performance.
(Hasanpouri et al., 2023)	Nutritional knowledge, attitude, and practice of professional athletes in an Iranian population (a cross-sectional study).	The study concludes that professional athletes in Qazvin, Iran, possess moderate to weak nutritional knowledge, attitudes, and practices. Despite recognizing the importance of nutrition for performance, improvements are necessary.
(Sukur et al., 2022)	Nutritional status and adequacy of disabled athletes from Indonesia	The study concluded that the nutritional status of disabled athletes in Indonesia varies, with most having a normal status, while some are underweight, overweight, or obese. Energy and carbohydrate intake were generally inadequate, while fat and protein intake were excessive. Improvements in nutrition education and counseling are necessary.

The role of nutrition in enhancing the performance and health of badminton athletes is critical, as shown by the findings in this literature review. Nutrition not only supports optimal performance during high-intensity bursts typical in badminton but also plays a pivotal role in muscle recovery, injury prevention, and long-term health. The reviewed studies highlight the importance of balancing macronutrient intake, ensuring sufficient hydration, timing meals strategically, and addressing micronutrient needs—all of which contribute to maximizing an athlete's potential both on and off the court.

Badminton demands quick bursts of explosive movements, rapid changes in direction, and sustained agility, all of which require specific energy systems. Carbohydrates are the primary fuel source for such activities. As Saha et al. (2022) found, adequate carbohydrate intake is essential for maintaining glycogen stores, which directly supports endurance and performance. During intense rallies, carbohydrates supply glucose to the muscles, ensuring that players can continue executing quick movements without early fatigue. The ability to maintain high-intensity efforts over the course of a match or training session is thus heavily dependent on proper carbohydrate consumption, both before and during physical exertion. Protein is equally important, although its role differs. Protein supports the repair and rebuilding of muscle tissues that are stressed during high-intensity sports like badminton. The Hasanpouri et al. (2023) study suggests that while athletes recognize protein's importance, there is often an imbalance in their dietary practices. Protein intake post-exercise can accelerate muscle recovery, reduce soreness, and prevent overuse injuries, all of which are critical for players who engage in repetitive movements and frequent training sessions. In a sport like badminton, where explosive power and muscle agility are key, proper protein intake ensures players are ready for each game and able to recover quickly between sessions.

Fats, while not immediately used during short, high-intensity bursts, play a significant role in longer, more sustained activities. Hasanpouri et al. (2023) point out that while fats provide a reserve energy source for prolonged training, they can sometimes be consumed in excess. However, fats are essential during extended periods of exercise when the body taps into fat stores for energy. Thus, an athlete's ability to balance fat intake

while ensuring it doesn't overshadow the need for carbohydrates is crucial for maintaining energy levels during long tournaments or training marathons. Beyond macronutrients, micronutrients such as calcium, iron, vitamin D, and magnesium are critical for optimal performance and health. Calcium is vital for bone health, and given the high-impact nature of badminton, ensuring adequate calcium intake can prevent stress fractures and enhance overall skeletal strength. Iron, on the other hand, plays a critical role in oxygen transport, which is fundamental for sustaining energy levels and endurance during extended physical activity. Without sufficient iron, players may experience fatigue and diminished performance. Vitamin D is crucial for calcium absorption and muscle function, while magnesium is involved in muscle relaxation and recovery, reducing the risk of cramps and overuse injuries.

The study by Hoseini & Hoseini (2019) illustrates that a lack of nutritional literacy among athletes, especially at the amateur level, can lead to deficiencies in essential micronutrients. The failure to meet these micronutrient requirements may limit the athlete's potential to recover from fatigue, perform at peak levels, or maintain long-term health. Therefore, educating athletes on the importance of these micronutrients is crucial for enhancing their physical well-being and performance longevity. The importance of hydration cannot be overstated, especially in a sport as physically demanding as badminton. Vicente-Salar et al. (2020) emphasize that dehydration can severely impair an athlete's ability to perform, leading to decreased endurance, slower reaction times, and an increased risk of cramps. In high-intensity sports like badminton, where athletes often play multiple matches in one day or participate in long training sessions, maintaining optimal hydration levels is crucial. Dehydration can not only affect physical performance but also mental focus, which is necessary for decision-making and reaction time during fast-paced rallies. Proper hydration strategies should include both water and electrolyte replenishment, especially during long or intense training sessions. The body loses not only water but also important minerals like sodium and potassium, which need to be replaced to maintain muscle function and fluid balance. Therefore, players must develop effective hydration habits before, during, and after physical exertion to sustain peak performance.

Nutritional timing is another important factor highlighted in the literature. Research indicates that eating the right foods at the right times can optimize energy levels, enhance endurance, and speed up recovery. As noted by Choi et al. (2024), consuming a meal rich in carbohydrates prior to a match or training session helps ensure that glycogen stores are maximized. This allows athletes to perform at their best for longer periods, without early onset of fatigue. Similarly, consuming protein after exercise aids in muscle repair and reduces the impact of muscle breakdown, thereby supporting faster recovery. Despite its importance, many athletes neglect the timing of their meals, either by eating the wrong foods before competitions or failing to replenish their bodies post-exercise. Improper nutritional timing can lead to suboptimal performance and longer recovery periods. Educating athletes on how to time their meals effectively, such as consuming easily digestible carbohydrates and protein prior to and after exertion, can significantly improve their competitive edge and training outcomes.

A recurring theme in the literature is the lack of nutritional literacy among athletes, especially at the non-professional level. Hoseini & Hoseini (2019) and Hasanpouri et al. (2023) both highlight that many athletes fail to fully understand the role of nutrition in their performance and overall health. While many players are aware that a healthy diet is important, they may not have the knowledge to implement effective nutrition strategies that are tailored to their needs. This gap in nutritional knowledge can result in poor food choices, inadequate nutrient intake, and an increased risk of nutritional deficiencies. The solution lies in improving nutrition education for athletes at all levels. Coaches, nutritionists, and sports scientists can play a pivotal role in promoting better eating habits, educating athletes about the importance of balanced nutrition, and helping them develop personalized dietary plans that support both their athletic goals and overall well-being. By fostering a better understanding of nutrition, athletes can make more informed decisions that directly benefit their performance and long-term health.

Conclusion

In conclusion, proper nutrition plays a multifaceted role in enhancing the performance, recovery, and overall health of badminton athletes. From the importance of carbohydrates and protein for fueling and recovering muscles to the crucial roles of vitamins, minerals, and hydration in maintaining peak physical function, the evidence supports the need for a well-rounded approach to diet. Furthermore, nutritional timing and education are essential for maximizing performance and minimizing recovery time. Despite the growing body of evidence linking nutrition to performance, many athletes continue to overlook these factors, which can limit their potential. It is imperative that coaches, nutritionists, and athletes themselves recognize the importance of comprehensive nutritional strategies in supporting both short-term performance and long-term health. By incorporating these principles into their training regimens, badminton athletes can enhance their competitive edge, reduce the risk of injury, and ensure longevity in their careers.

Acknowledgements
In the course of this research, I wish to express my deepest gratitude to my beloved family for their steadfast support, love, and encouragement. I am also profoundly thankful to the esteemed lecturers at the Faculty of Sport Science of for their exceptional guidance, knowledge, and inspiration. Additionally, I would like to acknowledge my fellow students in the Master of Sports Education Program, whose camaraderie has been a continuous source of inspiration and motivation.

Author Contributions
Rusdiar conceptualized the research, designed the study framework, and contributed significantly to the data collection, analysis, and drafting of the manuscript. Arsil assisted in data collection, analyzed relevant studies on nutrition's impact on athlete performance, and supported the manuscript revision. Umar contributed to the interpretation of the data, synthesized findings, and played a key role in the discussion of the results. Ahmad Chaeroni oversaw the research process, guided the manuscript structure, and ensured the final manuscript was clear, accurate, and consistent. All authors contributed to the manuscript revision and approved the final version.

Funding
This research was not funded by any party. The funding comes from the author of this article.

Conflict of Interest
The content of this article does not create a conflict of interest.

References

Bafirman, Hidayat, R. A., Sabillah, M. I., Rahman, D., Zarya, F., Ockta, Y., & Festiawan, R. (2024). The role of sport psychology in improving the performance of badminton athletes: a systematic review. *Retos*, *61*, 1126–1137. https://doi.org/10.47197/retos.v61.109088

Choi, Y., Lee, D. C., Han, Y., Sung, H., Yoon, J., & Kim, Y. S. (2024). Combined association of aerobic and muscle strengthening activity with mortality in individuals with hypertension. *Hypertension Research*, 3056–3067. https://doi.org/10.1038/s41440-024-01788-3

Darajat, J., Negara, K., Nuryadi, N., Firmansyah, H., Gumilar, A., Hambali, B., Purnomo, E., Festiawan, R., Ockta, Y., & Soedirman, U. J. (2024). The effect of vo2max on muscle oxygen saturation (SMO2) in University Badminton Athletes El efecto del VO2máx sobre la saturación de oxígeno muscular (SMO2) en atletas universitarios de bádminton. *Retos*, *2041*.

Gómez, M. Á., Rivas, F., Leicht, A. S., & Buldú, J. M. (2020). Using network science to unveil badminton performance patterns. *Chaos, Solitons and Fractals*, *135*. https://doi.org/10.1016/j.chaos.2020.109834

Hasanpouri, A., Rahmani, B., Gharakhanlou, B. J., Solaimanian, S., Shahsavari, S., Rasouli, A., Abbasi, S., Ebrahimi-Kalan, A., Rouzitalab, T., Hoseinabadi, Z., & Shiri-Shahsavar, M. R. (2023). Nutritional knowledge, attitude, and practice of professional athletes in an Iranian population (a cross-sectional study). *BMC Sports Science, Medicine and Rehabilitation*, *15*(1), 1–10. https://doi.org/10.1186/s13102-023-00776-3

Hoseini, R., & Hoseini, Z. (2019). Investigating Nutritional Literacy of Male Student Athletes Contributed in 2018 Iran University Games. *Journal of Health Literacy*, *1*(1), 53–59. https://doi.org/10.22038/jhl.2019.40251.1053

Phomsoupha, M., & Laffaye, G. (2015). The Science of Badminton: Game Characteristics, Anthropometry, Physiology, Visual Fitness and Biomechanics. *Sports Medicine*, *45*(4), 473–495. https://doi.org/10.1007/s40279-014-0287-2

Saha, S., Nande, P., & Nimonkar, R. (2022). Influence of Hand Anthropometry and Nutrient Intake on Hand Grip Strength: A Correlational Study Among Young Indian Badminton Players. *Journal of Experimental Biology and Agricultural Sciences*, *10*(3), 584–598. https://doi.org/10.18006/2022.10(3).584.598

Sorrenti, V., Caudullo, G., Lucignano, F., Fortinguerr, S., Zusso, M., Giusti, P., & Buriani, A. (2019). Personalized sports nutrition: Role of nutrients in athletic performance. In *Sports, Exercise, and Nutritional Genomics: Current Status and Future Directions*. Elsevier Inc. https://doi.org/10.1016/B978-0-12-816193-7.00018-X

Sukur, A., Lubis, J., Fitrianto, E. J., Hartono, F. V., Jauhari, M., Nurulfa, R., & Hernawan. (2022). Nutritional status and adequacy of disabled athletes from Indonesia. *Journal of Physical Education and Sport*, *22*(12), 2939–2946. https://doi.org/10.7752/jpes.2022.12371

Valenta, R., & Dorofeeva, Y. A. (2018). Sport nutrition: The role of macronutrients and minerals in endurance exercises. *Foods and Raw Materials*, *6*(2), 403–412. https://doi.org/10.21603/2308-4057-2018-2-403-412

Vicente-Salar, N., Santos-Sánchez, G., & Roche, E. (2020). Nutritional ergogenic aids in racquet sports: A systematic review. *Nutrients*, *12*(9), 1–20. https://doi.org/10.3390/nu12092842

Williams, C. (1998). Dietary macro- and micronutrient requirements of endurance athletes. *Proceedings of the Nutrition Society*, *57*(01), 1–8. https://doi.org/10.1079/pns19980003

Wimalawansa, S. J. (2023). Physiological Basis for Using Vitamin D to Improve Health. *Biomedicines*, *11*(6). https://doi.org/10.3390/biomedicines11061542