

Evaluation of 24-hour nutrition intake in indoor hockey student-athletes

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Received 18 February 2024; Accepted 30 July 2024; Published 12 September 2024
Ed 2024; 9(3): 367-376

ABSTRACT



Background Problems: Nutrition is an important factor in improving athlete performance, but many athletes still experience problems such as ignorance about the right portion and type of food, unbalanced energy intake, and a lack of knowledge about the nutrients the body needs. **Research Objectives:** This study aims to evaluate the nutritional intake of hockey student-athletes who are members of indoor hockey clubs in Tangerang City. **Methods:** This study used a quantitative descriptive method with a survey approach. Data were collected using a single and 24-hour reported food recall, and as many as 24 research subjects were involved in this study, there are student-athletes in the club's indoor hockey in Tangerang City. Data analysis used a statistical approach in the form of percentages. The nutritional analysis in this study focused more on the percentages of carbohydrate, protein, fat, and caloric intake eaten by athletes within a 24-hour period. **Findings and Results:** This study showed the average results of the nutrition intakes include 83% for protein, 53% for carbohydrates, 72% for fat, and 52% for calories. The results show that the knowledge of indoor hockey athletes was still lacking. **Conclusion:** The findings of this study indicate that the nutritional intake of indoor hockey athletes in Tangerang City is still far from optimal. It is vital for athletes to enhance their understanding of proper nutrition and energy needs, as this can significantly impact their fitness levels and performance outcomes. Coaches and trainers should prioritise nutrition education as part of regular training programs, collaborating with nutritionists to ensure that athletes receive the necessary guidance on their dietary habits. In the future, developing integrated nutritional programs tailored to the specific needs of indoor hockey athletes will be crucial. This research contributes to a growing understanding of the importance of nutrition in sports and underscores the need for continued efforts to address the dietary challenges faced by student athletes.

Keywords: Nutrition; hockey; student-athletes; indoor

 [https://doi.org/10.25299/sportarea.2024.vol9\(3\).16365](https://doi.org/10.25299/sportarea.2024.vol9(3).16365)

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How to Cite: Hamabli, S., Rizal, A. K., Alpen, J., Rizal, R. M., & Juditya, S. (2024). Evaluation of 24-hour nutrition intake in indoor hockey student-athletes. *Journal Sport Area*, 9(3), 367-376. [https://doi.org/10.25299/sportarea.2024.vol9\(3\).16365](https://doi.org/10.25299/sportarea.2024.vol9(3).16365)

Authors' Contribution: a – Study Design; b – Data Collection; c – Statistical Analysis; d – Manuscript Preparation; e – Funds Collection

INTRODUCTION

Hockey games are known to be games that require a lot of energy because the characteristics are almost the same as in football, whose style of play is fast in passing and little in processing the ball (Lestari & Amin,

2019). The hockey players are required to have a good level of physical condition to achieve optimal results in a game (Lestari & Amin, 2019). Someone can have a good physical condition with adequate energy and nutritional intake (Dieny et al., 2020). Balanced nutritional intake may lead to the optimal performance of athletes in the game (Mielgo-Ayuso et al., 2015). Athletes whose energy and nutritional intake are insufficient or excessive can have an unfavourable physiological function (Wijayanti, 2017).

Athletes who are not fulfilled with energy and nutrients through good nutritional management will hinder the training process (Giriwijoyo, 2016). Nutrition is a factor that must be considered to support the stamina and performance of athletes (Larasati & Yuliana, 2020). It is also said that nutritional intake has an important role in supporting the strength of athletes (Setiowati, 2014). The fulfilment of balanced nutrition for athletes can indirectly affect performance and physical health. Therefore, it is necessary to monitor nutritional status, meet nutritional needs, and engage in physical activity (Statuta, 2017; Fernanda et al., 2021).

Some critical situations that are still widely encountered by athletes are eating in insufficient quantities, not knowing how much to eat, not consuming enough calories, choosing unbalanced and improper food, having less knowledge about nutrition, and improper energy intake (Afriani et al., 2015; Puspaningtyas et al., 2019; Roring et al., 2020). Some of these things seem to have an impact on athlete performance and remain a serious issue in sports. The problem of athletes' ignorance in consuming nutrition is still a serious problem (Marquart et al., 2022), the problem of lack of nutritional knowledge among athletes also has an impact on their performance (Merawati et al., 2019). Athletes must know some food intakes to achieve their best performance (Thomas et al., 2016).

Knowledge about nutritional intake is very necessary for athletic purposes to control the intake of nutrients entered in the body (Wijaya et al., 2021). Therefore, research on nutritional knowledge can contribute to the nutritional intake they consume, because some studies say that athletes who consume appropriate nutritional intake are found to have good stamina (Chandradewi & Irianto, 2017), and lack of nutritional intake can result in fatigue in athletes due to the absence of glucose availability during activity (Lee et al., 2017). Based on this, it is very important to know and evaluate the nutritional status of athletes through the knowledge of the nutrients they consume.

Several previous studies have begun to examine the nutritional intake and physical condition of athletes (Oktavia & Effendi, 2019), and food and fluid intake (Penggali et al., 2019). However, the study looked more at individual athletes, such as in rowing and athletics. Other studies have examined the nutritional intake of outstanding athletes, seen from the intake of carbohydrates, proteins, and fats, as well as the intake of other supplements (Lun et al., 2009). In addition, understanding of athletes' nutritional intake has also been carried out in football athletes (Sasmarianto et al., 2021). From some of these studies, it seems that no one has examined the evaluation of nutritional intake knowledge, especially in indoor hockey. So the question in this study is how the nutritional intake of indoor hockey athletes in Tangerang City.

Although some of these studies use the same type of measurement, the presentation and sports are different. So it is hoped that later the results of this research will enrich scientific treasures in sports aspects, especially in hockey. Nutrition can be sourced from various foods that contain carbohydrates, fats, and proteins (Shan et al., 2019). These nutrients can actually be easily found around us and are of daily consumption (Desiplia et al., 2018). The well-programmed consumption of food can improve the level of physical fitness. Nutritional elements such as carbohydrates, proteins, fats, vitamins, minerals, and water must be available in the body (Muharam, 2019).

Knowing exactly the nutritional intake of athletes is also very important, because this will have an impact on performance on the field. The fact that balanced nutritional intake of athletes can affect their performance, as has been shown in several studies (Sale & Elliott-Sale, 2019), means athlete performance can be improved by providing individually tailored nutritional intake (Sousa et al., 2016). This is certainly very urgent, as a coach must know how the nutritional intake of his athletes (Spronk et al., 2015). Even though nutrition is a supporting factor for athletes' performance in a match, unfortunately it is still not considered and understood by athletes and coaches (Dieny et al., 2021).

This is certainly very urgent, as a coach must know how the nutritional intake of his athletes. This explanation certainly indicates that nutritional intake for athletes needs to be known, and this is what attracts

researchers to conduct research on the evaluation of athletes' nutritional intake, especially hockey in Tangerang City. This study seems to be providing new information for readers and other researchers because there is very little information about nutritional intake for athletes, especially in hockey, especially in Tangerang City. This will later prove whether the intake of nutrients or nutrients they consume has met sufficient standards, or even less and/or more, and this is the novelty of this study because, besides, the study on the evaluation of nutritional intake in hockey athletes has never been carried out there.

This study will also provide an overview of the nutritional intake of hockey athletes in consuming three energy-forming substances in the body, namely carbohydrates, proteins, and fats. This will also be the first study to explore the nutritional intake habits of hockey athletes in Tangerang City, and so it is hoped that later the results of this study can have an impact on making training programs that suit the circumstances of the athletes. This is in accordance with the purpose of this study, which is to evaluate the nutritional intake of 24 hockey athletes who are members of the indoor hockey club in Tangerang City.

METHOD

Type of Research

This study was quantitative descriptive research with a survey approach, which allowed the researchers to directly observe an actual situation in real time (Fraenkel et al., 2023). The survey technique is an in-research that expects to straightforwardly figure out the image of the subject's condition (Pandey & Pandey, 2021).

Participant

The research subjects in this study were all 24 indoor hockey athletes who were members of the high school hockey club in Tangerang City, which consisted of 12 boys and 12 girls. Previously, researchers had asked permission in advance for athletes to be made subjects in this study.

Instrument

The instrument used to collect the data was a single, 24-hours reported food recall that viewed and recorded the type and amount of food consumed over 24 hours. This instrument has generally been agreed upon as a good enough to strong method to determine a person's nutritional intake (Timon et al., 2016).

Research Procedures

The quantitative data counted for the amount of individual food consumption using URT tools (tablespoons, etc.) or other sizes that are commonly used daily. The analysis of food recall was conducted using Fat Secret Indonesia on fatsecret.co.id. After the data is collected from all respondents, the researcher immediately calculates the data provided.

Data Analysis

Meanwhile, the quantitative data were processed using a statistical approach in the form of percentages. The formula used is as follows:

$$P = \frac{\sum X_i}{\sum X_n} \times 100 \%$$

Information:

P = Percentage Magnitude

$\sum X_i$ = Total Actual Score

$\sum X_n$ = Ideal Number of Scores (Hambali & Suwandar, 2019)

The analysis of the nutrition data was focused more on the percentages of carbohydrate, protein, fat, and caloric consumption eaten by athletes within 24 hours.

RESULTS AND DISCUSSION

After giving questionnaires to research subjects, then processing data according to the food that has been consumed in the last 24 hours and getting the content of substances taken in the form of protein, carbohydrates, fat, and the number of calories. In studies of athletes, assessments have included general concepts relevant to maintaining health, such as knowledge of sport-specific nutrition (e.g., understanding of energy, protein, carbohydrate, fat, and fluid requirements for sports performance) (Burke & Deakin, 2015). The results of this study describe the condition of nutritional intake of 24 indoor hockey athletes who were members of the hockey club of the Senior High School of Tangerang City. The results of this study will provide information on the amount of food consumption of athletes from the types of protein, carbohydrates, fats, and calories. This certainly provided information about the state of nutritional intake of indoor hockey athletes in Tangerang City. Table 1 shows the food recall of athletes of the high school hockey club in Tangerang City.

Table 1. Food Recall of Indoor Hockey Athletes Senior High School in Tangerang City

No	Subject	Food Recall			
		Protein Intake	Carbohydrate Intake	Fat Intake	Calory Intake
1	Subject 1	33%	64%	18%	42%
2	Subject 2	43%	28%	59%	22%
3	Subject 3	64%	72%	65%	61%
4	Subject 4	76%	62%	120%	63%
5	Subject 5	41%	45%	48%	45%
6	Subject 6	114%	69%	69%	77%
7	Subject 7	81%	66%	63%	66%
8	Subject 8	124%	39%	72%	61%
9	Subject 9	128%	50%	126%	82%
10	Subject 10	133%	56%	50%	67%
11	Subject 11	144%	37%	56%	59%
12	Subject 12	26%	44%	24%	36%
13	Subject 13	48%	56%	77%	45%
14	Subject 14	102%	40%	61%	56%
15	Subject 15	98%	56%	71%	68%
16	Subject 16	101%	59%	104%	78%
17	Subject 17	121%	50%	83%	64%
18	Subject 18	79%	47%	89%	63%
19	Subject 19	52%	63%	35%	55%
20	Subject 20	117%	62%	89%	66%
21	Subject 21	62%	49%	79%	59%
22	Subject 22	108%	65%	98%	79%
23	Subject 23	40%	48%	57%	50%
24	Subject 24	56%	48%	105%	63%

Table 1 describes the percentage of athletes' food consumption of each content (protein, carbohydrates, fat, and calories) over the last 24 hours. For example, in subject 1, for a period of 24 hours he has consumed foods that contain protein as much as 33%, carbohydrates as much as 64%, and fat as much as 18% so that the calories are 42% of the content data in grammes with the RDA (Daily Value andard), w which must be met by every athlete using the help of programmes from *Fatsecret Indonesia* located on the <https://www.fatsecret.co.id/> website. From the results of calculations and data collected about the food consumed by athletes during the last 24 hours, the average percentage value of athletes' nutrition in terms of protein, carbohydrates, fat, and calories was obtained.

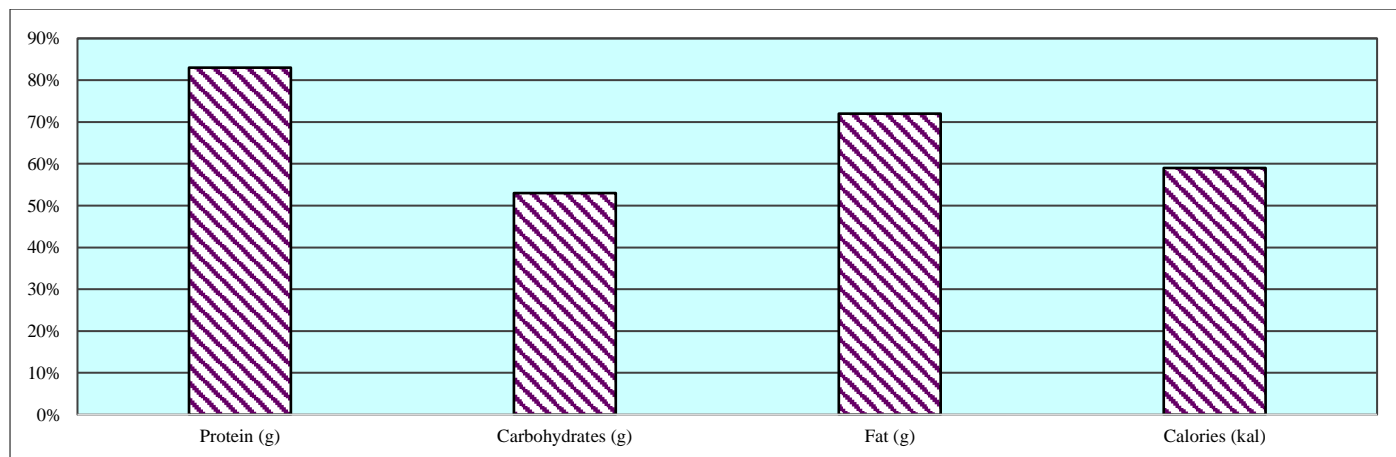


Figure 1. Food recall percentage chart

Based on the data in the table and figure, the average results of nutrition consumption include 83% for protein, 53% for carbohydrates, 72% for fat, and 52% for calories. It can be seen that indoor hockey athletes at Senior High School Tangerang City had lacking knowledge of the importance of nutrition for training and matches to maintain athletes' fitness. Hockey sports require a high carbohydrate intake, but instead they consume the least, while protein and fat intakes are the highest.

Based on the results of research that has been conducted, data was obtained that the nutritional knowledge of indoor hockey club athletes of Tangerang City is still in the category of still lacking; this is evidenced by the amount of percentage gain from three food ingredients; protein, carbohydrates, and fat, precisely the least carbohydrates. Some factors influencing their knowledge are the lack of information about good nutritional intake, no coaches providing knowledge about good nutrition, and low awareness of nutrition intakes (Afriani et al., 2015; Kurnia et al., 2020; Wulandini & Hamdani, 2017). Knowledge of nutrition intakes might contribute to the athletes' performance (Zahra & Muhlisin, 2020; Spriet, 2019; Smith et al., 2017). Giving ideal nourishing admission can goodly affect one's medical issue (Calder et al., 2020).

It seems that some previous research results support the findings in this study, where athletes are indeed knowledgeable about nutritional intake is still in the low category, which has an impact on the achievements of indoor hockey athletes in Tangerang City who have not shown the expected results. The results of this study indicate that the level of knowledge about nutritional intake for athletes really needs to be understood by coaches and athletes because it can affect their quality. The findings of this study can also reveal that the training program carried out so far still needs to be improved, especially in the aspect of understanding good nutritional intake.

Good and balanced nutritional intake is certainly needed for an athlete because his/her active work must be fit, particularly for competitors who need cardiorespiratory perseverance (Lemos et al., 2020). Physical fitness also determines the condition of the cardiovascular, insusceptible, respiratory, bone, and muscle frameworks (Filgueira et al., 2021; Lilić et al., 2019). Hockey athletes require endurance related to energy intake for the aerobic system and metabolic system (Akbar & Widiyanto, 2014). Since hockey athletes move their bodies a lot during the game, they also need to develop good aerobic endurance (Peterson et al., 2015). This hockey game requires speed in changing direction for almost between 30-80 seconds or between 15-25 minutes and produces almost 50% of the mileage at speed (Vigh-Larsen & Mohr, 2022). The sport also requires the aerobic energy systems to work (Polglaze et al., 2018), because the athletes need a lot of oxygen supply.

Carbohydrates, proteins, and fats become important nutrition elements for energy supply. These three substances can provide oxidation reactions in the body that contribute to glycolysis (Sandi, 2019). The nutritional intake must be balanced and propositional at a ratio of 3:1:2 between carbohydrates, proteins, and fats, or about 70% for carbohydrates, 10% for protein, and 20% for fat (Rismayanthi, 2015). A person's physical fitness will also be influenced by his or her nutrition intake (Mul et al., 2015), to suppress chronic diseases and complications (Rajabi et al., 2021), and improve bone health status (Asigbee et al., 2018). Some sources state that good nutritional intake has a positive impact on academic achievement, especially

intelligence (Asigbee et al., 2018). Poor knowledge about nutritional intake leads to the low quality of nutrients eaten (Janiczak et al., 2022). The same level of knowledge of athletes can be contributed by a coach's lack of nutritional knowledge (Andrews et al., 2016). Furthermore, the attitudes and behaviour of athletes are affected by their health and lack of nutritional knowledge (Vázquez-Espino et al., 2022).

Nutritional intake is an important thing in supporting the performance of an athlete; athletes must understand the nutritional intake provided and must be able to implement it in life so that their performance does not experience a decrease or obstacle during the competition. However, although the findings of this study show that there is still low knowledge of the nutritional intake of athletes, presumably this still cannot describe the overall condition of indoor hockey athletes in Tangerang City. This is because this study is only limited to a small scope, namely in school clubs. Therefore, research is needed that includes more respondents so that the overall picture of the state of understanding of nutritional intake for athletes, especially for indoor hockey, In addition, the type of measurement in this study is also limited to independent evaluation, meaning that the data is taken based on direct recognition from respondents without direct control by researchers, so it could be possible that respondents only guess and guess the food they consume. Then the data collection process is only carried out for one measurement, which is likely not to reflect the habits of athletes in consuming their food. Therefore, it is necessary to conduct research that can be controlled directly by researchers or teams on the consumption of athletes' nutritional intake and should be done for at least 3 days (Lun et al., 2009).

CONCLUSION

The results of this study show that knowledge of indoor hockey athletes was low due to several factors, such as lack of information and awareness of nutritional intakes. Increasing the accessibility to information related to nutrition intake can be done through training for the coaches and athletes. Despite all the results, this study only discussed nutritional intakes of hockey athletes. With a small group of respondents, this study offered a general idea of nutrition intake. Besides connecting the research topic to physical fitness and physical activity, future studies can address the psychological characteristics of the sport players. The results of this study can certainly contribute to additional science regarding the nutritional intake of indoor hockey athletes in Tangerang City. The results of these findings can also be used as evaluation material for hockey coaches to create training programs that are in accordance with the circumstances of their subjects, and at least regular nutritional monitoring is needed in order to support the achievements of athletes.

ACKNOWLEDGEMENTS

The researchers would like to acknowledge the participation of a hockey club of the high school hockey club in Tangerang City in this study.

CONFLICT OF INTEREST

This research is not conflict of interest.

REFERENCES

- Afriani, Y., Putri, K. R., Penggalih, M. H. S. T., Kandarina, I., & Sofro, Z. M. (2015). Effect of Banana Isotonic Drink to Maintain Hydration Through Urine and Blood Electrolytes. *Pakistan Journal of Nutrition*, 14(8), 453-456. <https://doi.org/10.3923/pjn.2015.453.456>
- Akbar, M. Y., & Widiyanto. (2014). Kemampuan Daya Tahan Anaerobik Hoki. *MEDIKORA*, 12(1), 2. <https://doi.org/10.21831/medikora.v0i1.4576>
- Andrews, A., Wojcik, J. R., Boyd, J. M., & Bowers, C. J. (2016). Sports Nutrition Knowledge among Mid-Major Division I University Student-Athletes. *Journal of Nutrition and Metabolism*, 2016, 3172460. <https://doi.org/10.1155/2016/3172460>

- Asigbee, F. M., Whitney, S. D., & Peterson, C. E. (2018). The Link Between Nutrition and Physical Activity in Increasing Academic Achievement. *Journal of School Health*, 88(6), 407-415. <https://doi.org/10.1111/josh.12625>
- Burke, L., & Deakin, V. (2015). *Clinical Sport Nutrition* (Fifth Edit). McGraw-Hill Education.
- Calder, P. C., Carr, A. C., Gombart, A. F., & Eggersdorfer, M. (2020). Reply to “Comment on: Optimal Nutritional Status for a Well-Functioning Immune System is an Important Factor to Protect Against Viral Infections. *Nutrients*, 12(8), 1–3. <https://doi.org/10.3390/nu12082326>
- Chandradewi, A., & Irianto. (2017). The Intake of Energy, Protein, and Athletes' Stamina at the Center of Education and Sports Training for Learners of West Nusa Tenggara. *Jurnal Kesehatan Prima*, 11(1), 28-35. <https://doi.org/10.32807/jkp.v11i1.79>
- Desiplia, R., Indra, E. N., & Puspaningtyas, D. E. (2018). Asupan Energi, Konsumsi Suplemen, dan Tingkat Kebugaran pada Atlet Sepak Bola Semi-Profesional. *Ilmu Gizi Indonesia*, 2(1), 39-48. <https://doi.org/10.35842/ilgi.v2i1.72>
- Dieny, F. F., Widyastuti, N., Fitranti, D. Y., Tsani, A. F. A., & Fikri J, F. (2020). Profil Asupan Zat Gizi, Status Gizi, dan Status Hidrasi Berhubungan dengan Performa Atlet Sekolah Sepak Bola di Kota Semarang. *Indonesian Journal of Human Nutrition*, 7(2), 108-119. <https://doi.org/10.21776/ub.ijhn.2020.007.02.3>
- Dieny, F. F., Jauharany, F. F., Rahadiyanti, A., Fitranti, D. Y., Tsani, A. F. A., & Kurniawati, D. M. (2021). Program Asuhan Gizi Olahraga (PAGO) Atlet Sepatu Roda sebagai Strategi Memperbaiki Profil Status Gizi, Biokimia dan Kualitas Asupan. *Jurnal Keolahragaan*, 9(2), 148-158. <https://doi.org/10.21831/jk.v9i2.34747>
- Fernanda, C., Gifari, N., Mulyani, E. Y., Nuzrina, R., & Ronitawati, P. (2021). Hubungan Asupan, Status Gizi, Aktivitas Fisik, Tingkat Stres, dan Siklus Menstruasi. *Sport and Nutrition Journal*, 3(1), 1-14. <https://doi.org/10.15294/spnj.v3i1.41133>
- Filgueira, T. O., Castoldi, A., Santos, L. E. R., de Amorim, G. J., de Sousa Fernandes, M. S., Anastácio, W. de L. do N., Campos, E. Z., Santos, T. M., & Souto, F. O. (2021). The Relevance of a Physical Active Lifestyle and Physical Fitness on Immune Defense: Mitigating Disease Burden, with Focus on COVID-19 Consequences. *Frontiers in Immunology*, 12(February), 1-23. <https://doi.org/10.3389/fimmu.2021.587146>
- Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2023). *How to Design and Evaluate Research in Education Eleventh Edition*. In McGraw-Hill Higher Education (Eleventh E, Issue 0). McGraw-Hill.
- Giriwijoyo, H. Y. S. S. (2016). *Kesehatan, Olahraga dan Kinerja*. CV. Bintang Warli Artika.
- Hambali, S., & Suwandar, E. (2019). Body Mass Index Artistic Gymnastics Athlete in West Java. *JUARA: Jurnal Olahraga*, 4(2), 84-89. <https://doi.org/10.33222/juara.v4i2.517>
- Janiczak, A., Devlin, B. L., Forsyth, A., & Trakman, G. L. (2022). A Systematic Review Update Of Athletes' Nutrition Knowledge and Association with Dietary Intake. *British Journal of Nutrition*, 128(6), 1156-1169. <https://doi.org/10.1017/S0007114521004311>
- Kurnia, D. I., Kasmiyetti, K., & Dwiyaniti, D. (2020). Pengetahuan Pengaturan Makan Atlet dan Porsen Lemak Tubuh terhadap Kebugaran Jasmani Atlet. *Sport and Nutrition Journal*, 2(2), 56-64. <https://doi.org/10.15294/spnj.v2i2.39001>
- Larasati, M. D., & Yuliana, S. (2020). Food Intake, Nutritional Status and Cardio Respiration Health of Swimming Athletes. *Jurnal Riset Gizi*, 8(1), 76-84. <https://doi.org/10.31983/jrg.v8i1.5763>

- Lee, E. C., Fragala, M. S., Kavouras, S. A., Queen, R. M., Pryor, J. L., & Casa, D. J. (2017). Biomarkers in Sports and Exercise: Tracking Health, Performance, and Recovery in Athletes. *The Journal of Strength & Conditioning Research*, 31(10). <https://doi.org/10.1519/jsc.0000000000002122>
- Lemos, J. R., da Cunha, F. A., Lopes, A. J., Guimarães, F. S., do Amaral Vasconcellos, F. V., & dos Santos Vigário, P. (2020). Respiratory Muscle Training in Non-Athletes and Athletes with Spinal Cord Injury: a Systematic Review of the Effects on Pulmonary Function, Respiratory Muscle Strength and Endurance, and Cardiorespiratory Fitness Based on the FITT Principle of Exercise Prescription. *Journal of Back and Musculoskeletal Rehabilitation*, 33, 655-667. <https://doi.org/10.3233/bmr-181452>
- Lestari, Y. N. A., & Amin, N. (2019). Hubungan Status Gizi, Tingkat Kecukupan Energi dan Zat Gizi dengan Kecepatan pada Atlet Hockey Kota Surabaya. *Sport and Nutrition Journal*, 1(1), 19-26. <https://doi.org/10.15294/spnj.v1i1.31275>
- Lilić, A., Petković, E., Hadžović, M., & Prvulović, N. (2019). Nutrition Level and Cardiorespiratory Fitness in Student Population – a Systematic Review. *Facta Universitatis, Series: Physical Education and Sport*, 17(2), 339-351. <https://doi.org/10.22190/fupes1907050311>
- Lun, V., Erdman, K. A., & Reimer, R. A. (2009). Evaluation of Nutritional Intake in Canadian High-Performance Athletes. *Clinical Journal of Sport Medicine*, 19(5), 405-411. <https://doi.org/10.1097/jsm.0b013e3181b5413b>
- Marquart, L. F., Cohen, E. A., & Short, S. H. (2022). Nutrition Knowledge of Athletes and Their Coaches and Surveys of Dietary Intake. In *Nutrition in Exercise and Sport, Third Edition* (pp. 559–595). CRC Press.
- Merawati, D., Sugiharto, Andiana, O., Susanto, H., & Taufiq, A. (2019). The Influence of Nutritional Knowledge on Nutritional Status and Physical Performance in Young Female Athletes. *IOP Conference Series: Earth and Environmental Science*, 276(1). <https://doi.org/10.1088/1755-1315/276/1/012055>
- Mielgo-Ayuso, J., Maroto-Sánchez, B., Luzardo-Socorro, R., Palacios, G., Palacios Gil-Antuñano, N., & González-Gross, M. (2015). Evaluation of Nutritional Status and Energy Expenditure in Athletes. *Nutricion Hospitalaria*, 31(3), 227-236. <https://doi.org/10.3305/nh.2015.31.sup3.8770>
- Muharam, R. R. (2019). Hubungan antara Pola Makan dan Status Gizi dengan Tingkat Kebugaran Atlet Dayung. *JOSSAE: Journal of Sport Science and Education*, 4(1), 14-20. <https://doi.org/10.26740/jossae.v4n1.p14-20>
- Mul, J. D., Stanford, K. I., Hirshman, M. F., & Goodyear, L. J. (2015). Chapter Two - Exercise and Regulation of Carbohydrate Metabolism. In C. B. T.-P. in M. B. and T. S. Bouchard (Ed.), *Molecular and Cellular Regulation of Adaptation to Exercise*, 135, 17-37. <https://doi.org/10.1016/bs.pmbts.2015.07.020>
- Oktavia, S., & Effendi, H. (2019). Tinjauan Asupan Gizi dan Tingkat Kondisi Fisik Atlet Dayung Putri Kabupaten Agam. *Jurnal Stamina*, 2(3), 112-120. <https://doi.org/10.7143/jhep.46.172>
- Pandey, P., & Pandey, M. M. (2021). *Research Methodology Tools and Techniques*. Bridge Center.
- Penggalih, M. H. S. T., Dewinta, M. C. N., Solichah, K. M., Pratiwi, D., Niamilah, I., Nadia, A., & Kusumawati, M. D. (2019). Identifikasi Status Gizi, Somatotipe, Asupan Makan dan Cairan pada Atlet Atletik Remaja di Indonesia. *Journal of Community Empowerment for Health*, 1(2), 85-95. <https://doi.org/10.22146/jcoemph.38410>
- Peterson, B. J., Fitzgerald, J. S., Dietz, C. C., Ziegler, K. S., Ingraham, S. J., Baker, S. E., & Snyder, E. M. (2015). Aerobic Capacity is Associated with Improved Repeated Shift Performance in Hockey. *The Journal of Strength & Conditioning Research*, 29(6), 1465-1472. <https://doi.org/10.1519/jsc.0000000000000786>

- Polglaze, T., Dawson, B., Buttfield, A., & Peeling, P. (2018). Metabolic Power and Energy Expenditure in An International Men's Hockey Tournament. *Journal of Sports Sciences*, 36(2), 140-148. <https://doi.org/10.1080/02640414.2017.1287933>
- Puspaningtyas, D. E., Sari, S. P., & Afriani, Y. (2019). Edukasi Gizi Efektif meningkatkan Pengetahuan Atlet mengenai Gizi Seimbang dan Pemenuhan Kebutuhan Cairan. *Jurnal Pengabdian "Dharma Bakti"*, 2(2), 34-38. <https://doi.org/10.35842/jpdb.v2i2.87>
- Rajabi, H., Sabouri, M., & Hatami, E. (2021). Associations between Physical Activity Levels with Nutritional Status, Physical Fitness and Biochemical Indicators in Older Adults. *Clinical Nutrition ESPEN*, 45, 389-398. <https://doi.org/10.1016/j.clnesp.2021.07.014>
- Rismayanthi, C. (2015). Sistem Energi dan Kebutuhan Zat Gizi yang diperlukan untuk Peningkatan Prestasi Atlet. *Jorpres*, 11(1), 109-121. <https://doi.org/10.21831/jorpres.v11i1.10270>
- Roring, N. M., Posangi, J., & Manampiring, A. E. (2020). Hubungan antara Pengetahuan Gizi, Aktivitas Fisik, dan Intensitas Olahraga dengan Status Gizi. *Jurnal Biomedik: JBM*, 12(2), 110-116. <https://doi.org/10.35790/jbm.12.2.2020.29442>
- Sale, C., & Elliott-Sale, K. J. (2019). Nutrition and Athlete Bone Health. *Sports Medicine*, 49(s2), 139-151. <https://doi.org/10.1007/s40279-019-01161-2>
- Sandi, I. N. (2019). Sumber dan Metabolisme Energi dalam Olahraga. *Jurnal Pendidikan Kesehatan Rekreasi*, 5(2), 64-73. <https://doi.org/10.5281/zenodo.3340183>
- Sasmarianto, Henjilito, R., Zulrafla, Kamarudin, & Nazirun, N. (2021). Understanding the Needs of Nutrition Intake on Athletes. *Journal Sport Area*, 6(2), 244-253. [https://doi.org/10.25299/sportarea.2021.vol6\(2\).6509](https://doi.org/10.25299/sportarea.2021.vol6(2).6509)
- Setiowati, A. (2014). Hubungan Indeks Massa Tubuh, Persen Lemak Tubuh, Asupan Zat Gizi dengan Kekuatan Otot. *Media Ilmu Keolahragaan Indonesia*, 4(1), 32-38. <https://doi.org/10.15294/miki.v4i1.4394>
- Shan, Z., Rehm, C. D., Rogers, G., Ruan, M., Wang, D. D., Hu, F. B., Mozaffarian, D., Zhang, F. F., & Bhupathiraju, S. N. (2019). Trends in Dietary Carbohydrate, Protein, and Fat Intake and Diet Quality among US Adults, 1999-2016. *JAMA - Journal of the American Medical Association*, 322(12), 1178-1187. <https://doi.org/10.1001/jama.2019.13771>
- Smith, J. W., Holmes, M. E., & McAllister, M. J. (2017). Nutritional Considerations for Performance in Young Athletes. *Journal of Sports Medicine*, 2017, 1-1. <https://doi.org/10.1155/2017/6904048>
- Sousa, M., Fernandes, M. J., Carvalho, P., Soares, J., Moreira, P., & Teixeira, V. H. (2016). Nutritional Supplements use in High-Performance Athletes is Related with Lower Nutritional Inadequacy from Food. *Journal of Sport and Health Science*, 5(3), 368-374. <https://doi.org/10.1016/j.jshs.2015.01.006>
- Spriet, L. L. (2019). Performance Nutrition for Athletes. *Sports Medicine*, 49(s1), 1-2. <https://doi.org/10.1007/s40279-018-1027-9>
- Spronk, I., Heaney, S. E., Prvan, T., & O'Connor, H. T. (2015). Relationship between General Nutrition Knowledge and Dietary Quality in Elite Athletes. *International Journal of Sport Nutrition and Exercise Metabolism*, 25(3), 243-251. <https://doi.org/10.1123/ijsnem.2014-0034>
- Statuta, S. M. (2017). The Female Athlete. *Clinics in Sports Medicine*, 36(4), xi-xii. <https://doi.org/10.1016/j.csm.2017.07.014>
- Thomas, D. T., Burke, L. M., & Erdman, K. A. (2016). Nutrition and Athletic Performance. *Medicine and Science in Sports and Exercise*, 48(3), 543-568. <https://doi.org/10.1249/mss.0000000000000852>

- Timon, C. M., Van Den Barg, R., Blain, R. J., Kehoe, L., Evans, K., Walton, J., Flynn, A., & Gibney, E. R. (2016). A Review of the Design and Validation of Web- and Computer-Based 24-H Dietary Recall Tools. *Nutrition Research Reviews*, 29(2), 268-280. <https://doi.org/10.1017/S0954422416000172>
- Vázquez-Espino, K., Rodas-Font, G., & Farran-Codina, A. (2022). Sport Nutrition Knowledge, Attitudes, Sources of Information, and Dietary Habits of Sport-Team Athletes. In *Nutrients*, 14(7), 1345. <https://doi.org/10.3390/nu14071345>
- Vigh-Larsen, J. F., & Mohr, M. (2022). The Physiology of Ice Hockey Performance: An Update. *Scandinavian Journal of Medicine and Science in Sports*, 34e, 1-14. <https://doi.org/10.1111/sms.14284>
- Wijaya, O. G. M., Meiliana, M., & Lestari, Y. N. (2021). The Importance of Nutritional Knowledge for Food Intake Optimalization on Football Athletes. *Nutrizione (Nutrition Research and Development Journal)*, 01(1), 22-33. <https://doi.org/10.15294/nutrizione.v1i2.51832>
- Wijayanti, N. (2017). *Fisiologi Manusia dan Metabolisme Zat Gizi*. Universitas Brawijaya Press.
- Wulandini, S. P., & HAmDani, F. (2017). Hubungan Pengetahuan dan Sikap Diet Calon Atlet Terhadap Status Gizi di SMA Negeri Olahraga Provinsi Riau. *Journal Sport Area*, 2(1), 64-69. [https://doi.org/10.25299/sportarea.2017.vol2\(1\).587](https://doi.org/10.25299/sportarea.2017.vol2(1).587)
- Zahra, S., & Muhlisin, M. (2020). Nutrisi Bagi Atlet Remaja. *Jurnal Terapan Ilmu Keolahragaan*, 5(1), 81-89. <https://doi.org/10.17509/jtikor.v5i1.25097>