

# The Relationship between Food Consumption and Nutritional Status of Male Junior Athletes: A Cross Sectional Study in Sumedang

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Received December 31, 2022; Revised July 4, 2023; Accepted July 26, 2023

## Cite This Paper in the Following Citation Styles

(a): [1] Hurry Mega Insani, Ayu Mutiara Santanu, Muchamad Rizki Sentani, "The Relationship between Food Consumption and Nutritional Status of Male Junior Athletes: A Cross Sectional Study in Sumedang," *International Journal of Human Movement and Sports Sciences*, Vol. 11, No. 5, pp. 1036 - 1043, 2023. DOI: 10.13189/saj.2023.110512.

(b): Hurry Mega Insani, Ayu Mutiara Santanu, Muchamad Rizki Sentani (2023). *The Relationship between Food Consumption and Nutritional Status of Male Junior Athletes: A Cross Sectional Study in Sumedang*. *International Journal of Human Movement and Sports Sciences*, 11(5), 1036 - 1043. DOI: 10.13189/saj.2023.110512.

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**Abstract** Excessive percentage of body fat as well as total energy, macronutrients, micronutrients and insufficient fluid intake with the athlete's dietary recommendations in practice can lead to poor nutritional status of athletes that affects their performance and fitness level. This descriptive study used a cross-sectional method which was carried out for 2 months in July-August 2022 with a sample of 62 male junior athletes in Sumedang, West Java. Research data were analyzed using the chi-square test to see the relationship between variables. The results showed that the average calorie intake for athletes was 2 218.8 Kcal with a percentage of 91.9% male junior athletes having less consumption. More than half (80.6%) of male junior athletes have poor nutritional status. The results of the chi square analysis showed that there was no significant relationship ( $p < 0.05$ ) between food consumption and the nutritional status of male junior athletes. It can be concluded that athletes need to increase food consumption and nutritional status in the normal category. Professional nutrition assistance can be used as a solution to increase appropriate food consumption according to dietary recommendations for each sport and normal nutritional status in a good way.

**Keywords** Food Consumption, Nutritional Status, Male Junior Athletes, Indonesia

## 1. Introduction

Male junior athletes have a regular physical exercise providing stimulation to all body systems so that they can maintain the body in a healthy condition. Whether the athlete's condition is good or not, in addition to physical exercise factors, are also closely related to food consumption such as nutritional intake, activities of daily life, rest time, work, family environment, school and health[1]. Consume healthy foods that prevent nutritional deficiencies and excesses, provide the right number of calories to maintain body weight in a healthy range by choosing foods wisely and following a healthy diet such as maintaining body weight within the desired range and providing a balanced combination of nutrients such as carbohydrates, protein, and balanced fat; lots of air; enough (but not too much) essential vitamins and minerals, participating in the right amount and type of physical activity. Limiting exposure to tobacco, alcohol, and illegal drugs can help maintain fitness and energy[2]. When preparing for the match, athletes are conditioned on a good diet by adjusting the time of the main meal and eating a schedule that is in accordance with the training schedule so as not to interfere with training by eating 5-6 times a day with 3 main meals with interludes that can be used by athletes safely in training [1]. On the other hand, these junior athletes are athletes during adolescence which is a period of deep biological growth, emotional, social and

cognitive changes from childhood to adulthood that affect their psychological side [3]. The nutritional needs of adolescents are influenced by psychological and social factors so that at this time an individual begins to be able to make decisions for himself including the type of nutritional intake consumed [4].

The athlete's diet must still meet a balanced diet ("well balanced diet") with the amount of food input that is adjusted to daily activities and exercises [1]. A study suggests that the interest and motivation of junior athletes in participating in training is in the high category, but junior athletes have a relatively unstable nervous system, so that their emotional state changes very quickly at times so it is necessary to pay attention to abilities and capacities at puberty according to their gender. And training should be started by adjusting to intermediate training before increasing to more intense or more strenuous exercises [5], [6].

Nutritional status is figure of an individual's daily nutritional intake with the categories of undernutrition (very thin and thin/underweight), good nutrition (normal) and overweight (overweight and obese) which can be measured by BMI or fat percentage in children athletes [7]. Body Mass Index (BMI) is a simple index of weight to height that is used to classify overweight and obesity with the formula for a person's weight in kilograms divided by the square of height in meters (kg/m<sup>2</sup>) [8]. Food intake and nutrition of athletes aims to evaluate the nutritional status of individuals. [9]. Studies suggest that the average nutritional status of athletes in several regions in Indonesia based on percent body fat is in the normal category, but athletes' stamina is still lacking when compared to national athletes [9], [10]. Height, weight, leg length, arm length are elements that have an important role for several sports, so it is necessary to pay attention to the harmony of the proportions. [6].

Excessive body fat percentage and insufficient total energy, macronutrients, micronutrients and fluid intake on athlete's dietary recommendations in practice can lead to poor nutritional status of athletes that affect their performance and fitness level [11]-[14]. Athletes need good nutrition education so that they can apply nutritional intake and the nutritional intake of athletes should be specifically regulated by professionals to meet maximum nutritional adequacy according to their sport [13].

## 2. Materials and Methods

This study is a descriptive study using a cross-sectional design that aims to analyze the relationship between food

consumption and nutritional status of male junior athletes in Sumedang, West Java. This research was conducted in Sumedang, West Java for 2 months, from July to August 2022 with an ethical clearance by The Medical and Health Research Ethics Committee (MHREC) Universitas Gadjah Mada number KE/FK/1170/EC/2022.

### 2.1. Participants

The research subjects were 600 male junior athletes in Sumedang, West Java, with a minimum sample size of 62 male junior athletes to be selected as research samples. The selection of research subjects was based on the inclusion criteria of this study that were male athletes aged 13-19 years at the time of the study, did not suffer from chronic and congenital diseases, and were willing to be respondents in the study. While the exclusion criteria were male junior athletes who did not collect a complete questionnaire.

### 2.2. Sampling Procedures

The sampling technique used in this research is purposive sampling, which is a sampling technique with accidental sampling [15]. After determining the sample inclusion criteria, the number of samples that meet the criteria is then calculated based on the [16] formula, which is as follows:

$$n = \frac{N}{N(d)^2 + 1}$$

Keterangan:

N = Total sample

N = Total population

d<sup>2</sup> = Set precision (set at 12% (0,12))

The sample used in this study was male junior athletes aged 13-19 years in Sumedang, West Java with a total population (N) of 600 male junior athletes. Where the precision is set at 12% (0.12) with an accuracy rate of 88%, so that the sample taken in this study was:

$$n = \frac{N}{N(d)^2 + 1}$$

$$n = \frac{600}{600(0,12)^2 + 1}$$

$$n = \frac{600}{9,64}$$

Thus, the minimum number of samples to be taken in this study was 62 male junior athletes that aged 13-19 years in Sumedang, West Java.

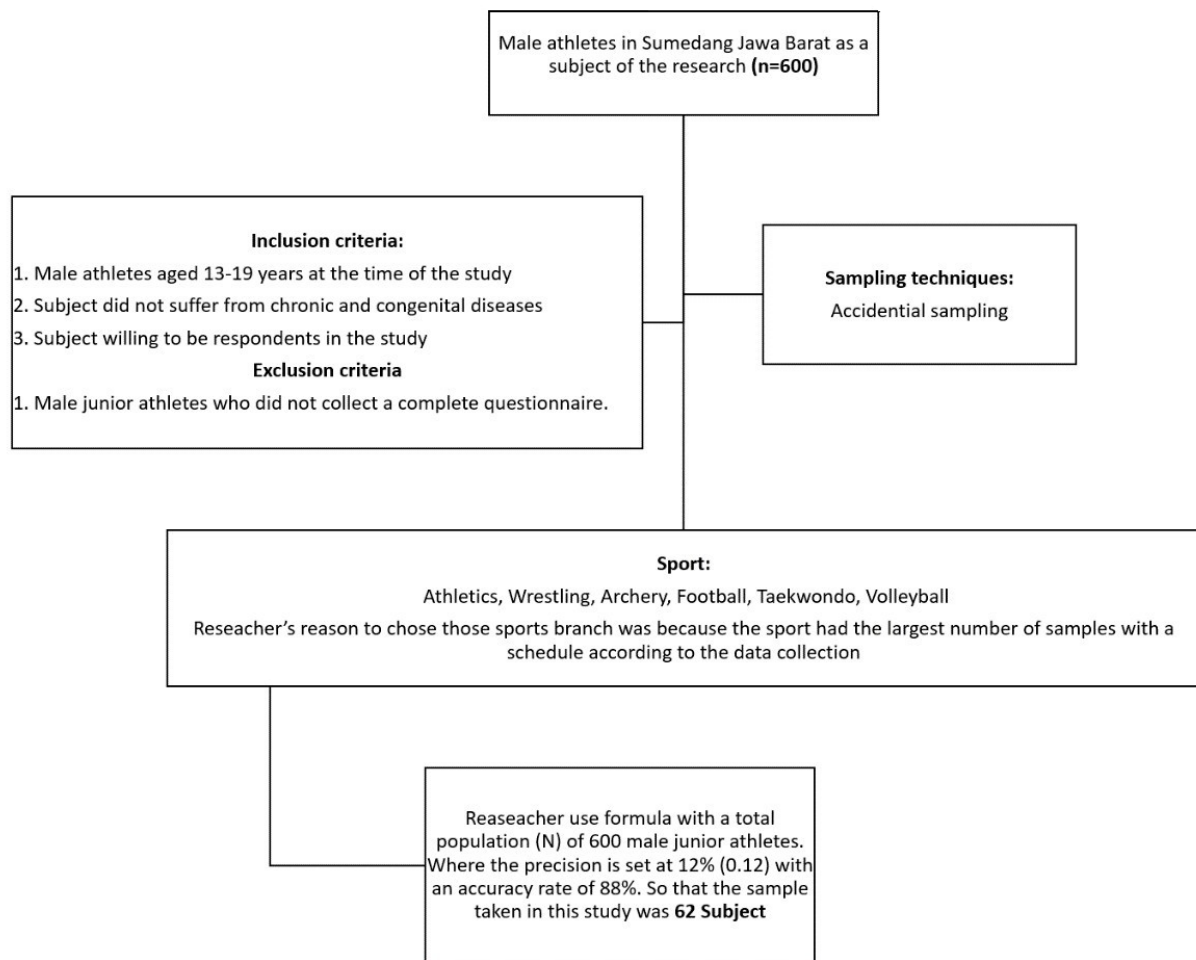


Figure 1. Sampling Method

### 2.3. Materials and Apparatus

Researchers used a questionnaire on this study. The questionnaire consisted of three parts. The first part consists of the characteristics of the respondents (name, date of birth, gender, mobile phone number, occupation, education and length of service); the second part presents the column for 24-H Food Recall and the third, the anthropometric questionnaire (sports, hourly exercise duration, weekly exercise frequency, weight, height, BMI/Bassal Metabolic Index, resting metabolic, skeletal muscle, subcutaneous fat and total fat).

### 2.4. Procedures

Researchers directly meet athletes at the training ground according to the training schedule of each sport. The sports that were sampled were Athletics, Wrestling, Archery, Soccer, Taekwondo and Volleyball. Filling out the questionnaire was done by conducting interviews by researchers to each athlete in the sport. 24-H Food Recall interview on the day of the training, Body weight was measured using a digital scale with a capacity of 150 kg and an accuracy of 0.1 kg, height using a microtoise with a

capacity of 200 cm and an accuracy of 0.1 cm, BMI/Bassal Metabolic Index, resting metabolic, skeletal muscle, subcutaneous fat and total fat using digital charts. After conducting interviews and taking measurements, the data collection procedure has been completed.

### 2.5. Design or Data Analysis

The data obtained were processed using Microsoft Excel and SPSS 26. The data were processed descriptively and analyzed by bivariate analysis using the chi-square test because the dependent and independent variables in this study were categorical variables and to see the relationship between variables.

## 3. Results

The results of the study describe subject characteristics, anthropometry, nutritional status and calorie adequacy of athletes and the relationship between food consumption and nutritional status according to the data obtained and processed by the researcher. The results of the study are presented in the tables 1.

Table 1 shows the characteristics of the respondents consisting of age, total subjects for each sport, amount of allowance, number of family members, education, occupation and training duration for each male athlete. The table above shows that the average age of the subjects is 16 years 7 months with an average allowance of IDR 22 097. Most of the subjects were volleyball athletes with a percentage of 61% and 39% of the subjects were athletic athletes (2%), wrestling (5%), archery (6%), football (16%) and taekwondo (10%). The average number of athlete's family members in one house is 4 people. More than half (65%) of athletes are high school students and only 5% of athletes with elementary education and almost all athletes (89%) are students. The average duration of athlete training is 2.5 hours in one day.

**Table 1.** Characteristic of Athletes

Characteristic	Amount (n= 62)	Percentage (%)
Age (n= 62)	16,7 ± 2,4*	
<b>Total Subject for each Sport (n= 62)</b>		
Athletics	1	2%
Wrestling	3	5%
Archery	4	6%
Football	10	16%
Taekwondo	6	10%
Volleyball	38	61%
Amount of Allowance (Rp/ Day)	22 096,8 ± 15 407,8*	
Number of Family Member	4,2 ± 1,1*	
<b>Education</b>		
Not Educational	0	0%
Elementary	3	5%
Junior High School	19	31%
Senior High School	40	65%
College	0	0%
<b>Occupation</b>		
Student	55	89%
Working	7	11%
Training Duration	2,5 ± 0,9*	

\*Keterangan: Skor (rata-rata ± SD)

Table 2 shows body weight, height, BMR, exercise energy expenditure, energy availability, skeletal muscle, subcutaneous fat, total fat and nutrient intake. The average athlete's weight and height are 60.8 kg and 167 cm with an average BMR of 1 482.4 and energy availability of 26 Kcal/kg. The average athlete's skeletal muscle composition is 37.6% with 9.4% subcutaneous fat and 9.4% total fat. The table above also shows the average nutrient consumption of male junior athletes. From the table above, it can be seen that male junior athletes consume food with an average of 2218,8 Kcal calories; 65,5 g protein average; 62,1 g fat average; 348,4 g carbohydrate average; 660,1 mg calcium average; 665,4 mg phosphorus average; 16,9 mg iron average; 742 RE vitamin A average; 0,8 mg vitamin B average; and 22.4 mg vitamin C average.

**Table 2.** Anthropometric status and calorie intake

No	Anthropometric	Mean ± Standard Deviation
1	Weight (kg)	60,8 ± 9,8
2	Height (cm)	167,0 ± 6,1
3	Basal Metabolic Rate (Kkal)	1 482,4 ± 240,0
4	Exercise Energy Expenditure (Kkal)	486,7 ± 409,7
5	Energy Availability (Kkal/kg)	26,0 ± 14,8
6	Skeletal Muscle (percentage)	37,6 ± 2,2
7	Subcutaneous Fat (percentage)	37,6 ± 2,2
8	Total Fat (percentage)	9,4 ± 3,5
9	Nutrient Intake	12,8 ± 5,1
10	Energy (Kkal)	2 218,8 ± 802,5
11	Protein (g)	65,5 ± 26,2
12	Fat (g)	62,1 ± 30,5
13	Carbohydrate (g)	348,4 ± 134,8
14	Calcium (mg)	660,1 ± 516,1
15	Phosphor (mg)	665,4 ± 359,7
16	Iron (mg)	16,9 ± 11,6
17	Vitamin A (RE)	742,0 ± 690,8
18	Vitamin B (mg)	0,8 ± 0,9
19	Vitamin C (mg)	22,4 ± 37,0

Table 3 shows the distribution of the categorization of the nutritional status of male junior athletes. The table shows that more than half (80.6%) of male junior athletes have nutritional status in the deficient category. 8.1% are in the over nutritional status category, and only 4.8% are in the sufficient category and 6.5% are in the good category.

**Table 3.** Distribution of male junior athlete nutritional status categories

Category	Total	Percentage (%)	
<35 Kkal/Kg/Ffm/day	Deficient	50	80,6
35-40 Kkal/Kg/Ffm/day	Sufficient	3	4,8
40-45 Kkal/Kg/Ffm/day	Good	4	6,5
>45 Kkal/Kg/Ffm/day	Over	5	8,1

Table 4 shows the categorization of male junior athletes' food consumption. In the table, it can be seen that the results of the study showed 91.9% of male junior athletes had deficient food consumption calories and only 8.1% had sufficient food consumption calories from athletes' diet recommendation and each of their nutritional sufficiency. Table 4 also shows that the food consumption of male junior athletes is not significantly related ( $p$ -value  $< 0.05$ ) with nutritional status.

**Table 4.** Distribution of food consumption calories categories for male junior athletes and the relationship between food consumption and nutritional status

Category	Total	Percentage (%)	Nutritional Status ( $P$ -value)
Sufficient	5	8,1	0,521*
Deficient	57	91,9	

\*chi-square test, significant if  $p$ -value  $< 0.05$

## 4. Discussion

The results show that even the average nutritional intake of athletes does not meet the nutritional adequacy for normal male adolescents, such as the caloric adequacy of normal male adolescents is 2650 Kcal but male junior athletes are only able to meet 2285.5 Kcal which should be sufficient for athletes to reach 3000-4000 Kcal per day due to the special diet recommended for athletes [17]. Athletes also only meet approximately 60% -80% of macronutrients and micronutrients for normal adolescents. Nutrient consumption of young athletes at the beginning of their professional life must be monitored by a qualified dietitian and each athlete must have an individual dietary plan and the athletes' family should be arranged of

nutrition education trainings [13]. The nutritional care should be shared among sport's leaders, coaches, parents, teachers, and the athletes themselves [18]. In fact, it is known the athletes nutrient content such as energy, high of macronutrient and less of micronutrient and the parent role have not played on the athletes achievement [19]–[21]. In practice, food choices are decided by the athlete himself, not his parents or coach [22]. Factors such as age, gender, training place to environmental factors are factors that will be influencing the food consumption of male junior athletes who are still in their teenager so they prefer to eat snacks with high salt or fat content [23]. Providing nutrition education among sport's leaders, coaches, parents, teachers, and the athletes themselves can effectively not only increase knowledge about balanced nutrition and fluid intake in athletes but also ensure timely management of nutrition-related problems among athletes [24], [25]. The study indicates that nutritional recommendations and diet for young athletes should also meet the requirements to ensure optimal growth, maturation, and physical development not only focus on sporting performance on young athletes [26]. Athletes who experience lack of energy due to lack of glucose availability and lack of fluids can cause athletes to tire easily and reduce their performance [27].

Table 3 shows that only 8.1% of male junior athletes are able to meet the caloric adequacy of food consumption. However, if you look at the data taken, the athlete's diet is not in accordance with his diet so that an increase in the diet according to the diet is needed for athletes to help increase energy and achieve maximum performance and quality of male junior athletes [28], [29]. When athletes choose a menu, the coach as the main food regulator for athletes usually chooses protein as the most important nutrient, fat as an unhealthy food, does not avoid vegetables and fruit and does not choose to eat a lot of rice as well as adequate fluid intake and supplements to meet the athlete's needs [30]. In addition to nutritional content, another thing that needs to be considered is the quality of the food provided, where a study suggests that most of the quality of the food provided is of low quality [31]. The provision of supplements also needs to be controlled by professionals because it is often found that athletes consume supplements that are not supposed to, have a bad content and come from the 'black market' which will affect the athlete's health [32]. Foods that help the athlete's sports or physical performance in the form of food, snacks or drinks can meet the nutritional plan for training or competition athletes also with caffeine or nitrates used as supplements for athletes [33]. Even daily energy, carbohydrates, proteins, and fat intake are not significantly correlated with BMI for age, however it is significantly related to the percentage of body fat then an increase in consumption of healthy food according to the diet still needs to be done to avoid nutritional problems in athletes [34]. Total body fat percentage that is too high can cause obesity in athletes, so the percentage of total body fat needs to be considered

in every sports training with the aim of maximizing nutrition and improving sports performance. [35].

The main goal of sports nutrition is to maximize the performance potential and health of athletes such as growth, development and maturation then in addition to food consumption, nutritional status is an important indicator in its achievement [36]. The results (see Table 3) show that there is no significant relationship ( $p$ -value  $<0.05$ ) between food consumption and nutritional status, but nutritional status is related to nutritional knowledge of athletes [37]. However, if we look at the fact that most athletes have low nutritional knowledge [38], the results of the study show (see Table 4) 80.6% of male junior athletes in Sumedang, West Java, have deficient nutritional status. School activities or programs in health promotion should make nutrition and sports education improve the nutritional status of school-age children, especially athletes and avoid chronic diseases in the future [39]. The choice of food consumption in male junior athletes also needs to be supported physically, psychologically and the psychological development of athletes that leads to the achievement of good sports nutrition so that they can meet nutritional status and food consumption in accordance with their diet [40]. Every physical and psychological condition of athletes in every sport needs to be adjusted to the load given every week and the frequency of training that is followed by junior athletes every month or year so that the competition can be followed with optimal conditions by male junior athletes [41].

## 5. Conclusions

The results showed that most male junior athletes are only able to meet 19-98% of calories per day and have not been able to meet their adequacy. The average calorie intake for male junior athletes was 2 218.8 Kcal with a percentage of 91.9% male junior athletes having less consumption. Athletes can only meet approximately 60% -80% adequacy of micronutrients and macronutrients. More than half (80.6%) of male junior athletes have poor nutritional status. The results of the chi square analysis showed that there was no significant relationship ( $p < 0.05$ ) between food consumption and the nutritional status of male junior athletes. It can be concluded that male junior athletes need to increase food consumption and nutritional status in the normal category. Professional nutrition assistance can be used as a solution to increase appropriate food consumption according to dietary recommendations for each sport and normal nutritional status in a good way. On the other hand, nutritional knowledge by participating in nutritional education counseling for parents, coaches and male junior athletes themselves can also be an alternative to improve consumption patterns and nutritional status and increase athletes' performance in competition.

## Acknowledgement

Researchers are grateful to the Institute for Research and Community Service (LPPM) Universitas Pendidikan Indonesia as a sponsor in this research, The Medical and Health Research Ethics Committee (MHREC) Universitas Gadjah Mada as the committee of ethical permission in this research, as well as other parties who assist in the research process.

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