

Knowledge, attitude, and behaviour of physical education and sports students' about dietary supplements

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Abstract. *Study Objectives:* This study was carried out to determine the knowledge, attitude, and behavior of sports students' about dietary supplements. *Method:* This study was carried out voluntarily by applying face-to-face questionnaires with 145 students aged 18-25, 37.9% female, and 62.1% male, studying at Trakya University School of Physical Education and Sports. The questionnaire includes demographic information of the participants, information and use of dietary supplements, and anthropometric measurements. *Results:* 45.5% of the students used dietary support, and the rate of dietary support usage of males (30.3%) was higher than dietary support usage of females (15.2%) ($p>0.05$). It was found that 11.7% of the students received information from doctors / dietitians, 13.8% from trainers, and 18.6% from other sources (internet, television, friends) ($p<0.05$). It was determined that the students mostly heard about branched chain amino acids, amino acids, and coenzyme Q₁₀ dietary supplements and they tried and quit products such as protein powder, multi-vitamin, and n-3 fatty acids. Participants stated that they mostly used caffeine, protein powder, and n-3 fatty acid supplements. The majority of the students stated that dietary supplements provide energy, do not benefit in irregular use, affect performance when used with physical activity, excessive protein supplements or any supplements to increase muscle mass will be beneficial, even if they are fed adequate and balanced nutrition, they should take supplements or in excess doses. They also stated that they do not have sufficient information about the label information of dietary supplements and their harmful effects in long-term use. *Conclusion:* Sports students got information about dietary supplements from the internet and their friends. There is a need for more widespread information about the correct use of individuals who do sports by obtaining information from correct sources, specific to the individual and under appropriate conditions.

Keywords: Dietary Supplement, Knowledge, Sports Nutrition, Sport Student

Introduction

Health policies that have encouraged healthy lifestyle changes in recent years have led people to a healthy diet and active lifestyle. On the other hand, the number and types of use of dietary supplements in daily life are increasing rapidly for many reasons such as strengthening health, maintaining an active life, balancing body composition, and managing body weight

(1-3). In response to such interests, there is a wide variety of dietary supplements available in pharmacies, grocery stores, and online that claim to help increase energy, build muscle, or lose weight (1). As stated in the US Dietary Supplement Health and Education Act (1994), a dietary supplement is defined as products to which at least one of the amino acids, vitamins, minerals, herbal or other botanical substances is added to increase the dietary value of the diet or to support

the diet (4). Dietary supplements are defined as “products in which at least one of the amino acids, vitamins, minerals, herbal or other botanical substances used to increase the nutritional value of the diet or to support the diet” in the US Dietary Supplement Health and Education Act (1994) (1). Demand for a large number of sports foods and supplements that are claimed to improve performance is also increasing rapidly every day (2,3). Adolescents are the target audience of the dietary supplement market (5). Because dietary supplements are widely used, the risk associated with purification and mislabeling of such products poses a worrying public health concern (1). Scientific studies have shown that many supplements put on the market do not support many of the claimed benefits, or may even cause health problems such as complications with harmful consequences for health (3,4,6,7). The increasing popularity of sports activities among young people has increased the use of dietary supplements among athletes. However, it is debated how well dietary supplement users are aware of the true nature of these products, and whether they consume them carefully remains unclear (3,4). Unlike physical activity, competition gains importance in sportive activities, which leads individuals to seek advantages that are different from traditional methods such as training and working harder (7). In a study, it was determined that 37.1% of the athletes thought that sports performance could be increased with dietary supplements (6). Evidence from the literature has also shown that nutritional information is associated with dietary intake in the general population (7-9). Similar studies have shown that sports students have insufficient knowledge about the relationship between nutrition and health, nutrition and sports performance, possible harms of diet products, and drug interactions (3,4,7,10). Researchers found that sports students consider their trainers or coaches as important and reliable sources of nutritional information (3,11,12). Nutritional status and quality have a great effect on sports performance and sports nutrition requires special training. Unfortunately, these jobs, which are under the management and control of the sports nutrition dietician, are carried out by coaches in countries with insufficient resources (7,12). Unfortunately, studies have reported that most trainers do not have specific or formal training in nutrition,

and their level of knowledge is insufficient to properly guide their athletes on this issue (3,6,11,12). While this situation changes the perceptions of trainers towards nutrition and performance of adolescent athletes, it also negatively affects the understanding and attitudes of young adolescent athletes towards nutrition and nutrition practices (12). In general, it is emphasized that the energy and nutrients needed by the athlete can be provided with a healthy diet without the need for dietary supplements or ergogenic aids (3,5,6).

Material and Method

Participants

The data of this study were collected from students studying at Trakya University School of Physical Education and Sports between 07.12.2018-07.02.2019. The study was carried out in accordance with the Declaration of Helsinki (World Medical Association, 1997) and was approved by the Ethics Committee of Trakya University (TÜTF-BAEK 2018/459) and permission from Trakya University School of Physical Education and Sports. The aim of the study was read in each class and those who agreed to participate. 145 students, aged 18-25, voluntarily participated in the study.

Study Design and Collection of Data

A questionnaire was used to collect research data. The questionnaire form consists of 4 sections that include demographic characteristics of students such as age, gender, department, students' use of dietary supplements, statements about the functions of dietary supplements, and anthropometric measurements such as body weight and height of students. Students' attitudes and behaviors related to dietary support usage status can be changed with the options of “Heard, Tried and Don't Used, Used, No Idea”; dietary support use cases were determined with the options “I agree, I have no idea, I do not agree”. Body weight was measured with a portable scale sensitive to 0.100 g without clothes and shoes. The length of the height was measured feet side by side on the Frankfurt plane

with a non-stretch measure. BMI was calculated for all students using the formula of kg/m^2 and classified according to WHO's BMI classification (13).

Statistical Analysis

In statistical analysis, Pearson Chi-Square Test was used for data less than 5 and expected frequency percentage less than 20.0%, and Fisher Exact test statistics if greater than 25.0%. The SPSS 21.0 (Statistical Package for the Social Sciences) package program was used in the statistical analysis of the data, and the confidence interval was accepted as 95.0% in statistical tests.

Results

A total of 145 students from the department of physical education teaching (39.3%), coaching (27.6%), sports management (24.1%) and recreation (9.0%) participated in the study. 37.9% of the students participating in the study were women and 62.1% were

men, and their mean age was 22.1 ± 1.17 years. The majority of the students (92.4%) were normal according to the BMI assessment (Table 1).

It was determined that 45.5% of the students were using dietary support. Male students were more likely to use dietary supplements than female students who used dietary supplements (30.3% and 15.2%, respectively) ($p > 0.05$). The majority of the students (47.0%) who used dietary supplements supply from these social networks. The sources preferred by male and female students in providing dietary supplements were similar ($p > 0.05$). The difference between female and male students (13.6% and 19.7%, respectively) who obtained dietary supplements from pharmacies and female and male students who obtained dietary supplements from the internet (16.7% and 30.3%, respectively) was not statistically significant ($p > 0.05$) (Table 2).

It was determined that the students obtained their information about dietary supplements from coaches (13.8%), health professionals (11.7%), and other sources such as the internet and friends. 11% of the students thought that the statement "The products that must be used by everyone in order to meet their dietary needs"

Table 1. General characteristics of the students

Characteristics (n=145)	$\bar{x} \pm \text{SD}$	Median	Min.-Max.
Age (years)	22.1 ± 1.2	22.0	21.0-25.0
Body weight (kg)	47.0 ± 14.4	70.0	47.0-125.0
Height (cm)	175.2 ± 10.0	175.0	150.0-206.0
Body Mass Index (kg/m^2)	22.9 ± 3.1	22.5	18.0-36.0
Gender	n		%
Female	55		37.9
Male	90		62.1
Department			
Trainer	40		27.6
Teaching	57		39.3
Recreation	13		9.0
Sports management	35		24.1
BMI classification			
Underweight	7		4.8
Normal	134		92.4
Overweight	4		2.8

Table 2. Students' usage and place of supply of dietary support by gender

Students' usage and place of supply of dietary support	Female n (%)	Male n (%)	Total n (%)	p
Students' usage of dietary support (n:145)				
Use	22 (15.2)	44 (30.3)	66 (45.5)	0.297
Not use	33 (22.8)	46 (31.7)	79 (54.5)	
Total	55 (37.9)	90 (62.1)	145 (100.0)	
Students' place of supply of dietary support (n=66)				
Pharmacy	9 (13.6)	13 (19.7)	22 (33.3)	0.284
Internet	11 (16.7)	20 (30.3)	31 (47.0)	
Supply of dietary support	2 (9.1)	11 (16.7)	13(16.7)	
Total	22 (33.3)	44 (66.7)	66 (100.0)	

Pearson chi-square test, $p < 0.05$

is correct. It was determined that the sources of information of the students who agreed with this statement were trainers (37.5%), doctor / dietician (6.5%), and others (6.5%) (not given in the table). 20.7% of the students stated that "dietary supplements are products that do not have side effects and replace natural foods and provide a healthier and stronger person" (Table 3).

It was observed that the source of information about the dietary support of 23.3% of the students who answered in this way was the trainer, 23.3% of the doctor / dietician, and 6.7% of the other sources (not given in the table). It was determined that the dietary

supplements that the students heard the most were BCAA (62.8%), amino acid (62.1%), and coenzyme Q₁₀ (60.0%). The least they hear are multivitamin (46.2%) and caffeine (49.6%). The dietary supplements that students have tried the most but not continue to use are protein powder (23.4%), multivitamin (17.9%), and n-3 fatty acids (17.9%). The students stated that they frequently used caffeine (22.1%), protein powder (15.9%), and n-3 fatty acids (15.2%) as dietary supplements. It was found that the students had no idea about branched chain amino acids (37.2%), coenzyme Q₁₀ (26.9%), and glucosamine (25.5%) (Table 4).

Table 3. Dietary support statements according to students' information sources

Information sources	Physician / Dietitian		Trainer		Other (Internet, TV, Friends)		Unmarked		Total		p
	n	%	n	%	n	%	n	%	n	%	
Products that everyone should definitely use to meet their dietary needs.	1	0.7	6	4.1	1	0.7	8	5.5	16	11.0	0.031*
Products that do not have side effects and replace natural foods. Provides to be healthier and stronger.	2	1.4	7	4.8	7	4.8	14	9.7	30	20.7	
All of them true	6	4.1	2	1.4	11	7.6	20	13.8	39	26.9	
All of them false	8	5.5	5	3.4	8	5.5	39	29.6	60	41.4	
Total	17	11.7	20	13.8	27	18.6	81	55.9	145	100.0	

Fisher exact test, * $p < 0.05$

Table 4. Student' statements on dietary supplements usage

Student' statements on dietary supplements usage* (n=145)	Heard		Tried and no use		Uses		No idea	
	n	%	n	%	n	%	n	%
Amino acids	90	62.1	21	14.4	14	9.7	20	13.8
Carbohydrate powder	86	59.3	23	15.9	10	6.9	26	17.9
Protein powder	73	50.3	34	23.4	23	15.9	15	10.4
Branched chain amino acid	91	62.8	-	-	-	-	54	37.2
L-Carnitine	74	51.0	25	17.2	13	9.0	33	22.8
Creatinine	79	54.5	24	16.6	18	12.4	24	16.5
Glucosamine	81	55.9	13	9.0	14	9.7	37	25.5
Caffeine	72	49.6	20	13.8	32	22.1	21	14.5
Multivitamins	67	46.2	26	17.9	21	14.5	31	21.4
Mineral (Fe, Zn)	83	57.2	17	11.7	13	9.0	32	22.1
Coenzyme Q ₁₀	87	60.0	13	9.0	6	4.1	39	26.9
n-3 fatty acids	74	51.0	26	17.9	22	15.2	23	15.9
Probiotic products	87	59.9	14	9.7	13	9.0	31	21.4

* Multiple options are marked

When the opinions of the students on dietary supplements are examined, 64.1% of these students stated that vitamin supplements give energy to the body, and 60.0% of them that intake of dietary supplements, as well as physical activity, affect the performance, 37.2% of the long-term use of dietary support is harmful, 33.1% of them that dietary support is necessary for an adequate and balanced diet, 30.3% of them should take more protein supplements than

required to increase muscle mass, 17.2% of the dietary supplements alone affect performance, 16.6% of the dietary supplements can replace natural foods, 12.4% of the dietary supplements label information always reflects the truth, It is seen that 12.4% of them think that it will be beneficial if the dietary supplements are used irregularly, and 11.0% of them think that the use of dietary supplements more than the required dose will provide more benefits (Table 5).

Table 5. Student' statement about dietary supports

Statements (n=145)	I agree		I have no idea		I don't agree	
	n	%	n	%	n	%
Vitamins supplements energize the body.	93	64.1	38	26.2	14	9.7
Dietary supplements are useful in case of irregular use.	18	12.4	57	39.3	70	48.3
Dietary supplements alone affect performance.	25	17.2	52	35.9	68	46.9
Dietary supports intake affects performance with physical activity.	87	60.0	41	28.3	17	11.7
More protein supplements should be taken to increase muscle mass.	44	30.3	37	25.5	64	44.2
Using more dietary supplements provides more benefits.	16	11.0	43	29.7	86	59.3
Dietary supplements replace natural foods.	24	16.6	28	19.3	93	64.1
Dietary support is needed for an adequate and balanced diet.	48	33.1	44	30.3	53	36.6
Dietary supplements label information is always correct.	18	12.4	72	49.7	55	37.9
Long-term use of dietary supplements is harmful.	54	37.2	55	37.9	36	24.9

Discussion

Adequate and balanced nutrition is of vital importance in the development and maintenance of health in every period of life. An adequate and balanced diet is one of the leading factors for athletes' health and athletic success (12). Inadequate energy and nutrient intake of athletes and elite athletes, especially adolescents, can not only negatively affect their health but also reduce their success in competitions (11). For this reason, athletes tend to use dietary supplements for a variety of reasons, such as feeling good before and after training, maintaining health, preventing or curing diseases, providing increased nutrients and increasing performance (14). Therefore, the use of sports supplements has increased in the last two decades (4). It is estimated that the average use of dietary supplements is around 50.0%, especially in developed countries (3). According to the annual study data of the Responsible Nutrition Council in America, the use of dietary supplements was found to be 68.0% in 2015, 71.0% in 2016, 75.0% in 2017, and 78.0% in 2018 (15,16). In this study, 45.5% of the participants use dietary support. The use of dietary supplements in men (30.3%) is higher than in women (15.2%) ($p > 0.05$). Although the use of dietary supplements is similar in men and women, it is observed that women's intake of iron, protein, and creatinine intake of men is higher (16). While dietary support uses vary between genders, men often use dietary support to increase sports performance, and women for general health and well-being (10). Caffeine, creatinine, vitamins and minerals, ephedrine and pseudoephedrine, protein powder, amino acids, β -hydroxy- β -methyl-butyrate, probiotics, insulin-like growth factor, erythropoietin, L-arginine, β -alanine, growth hormone, pyruvate, anabolic steroids are dietary supplements that are often used to increase sports performance (10,14). In this study, the most heard dietary supplements that the participants declared were branched chain amino acids, amino acids, and coenzyme Q₁₀, respectively. Besides, the dietary supplements the participants mostly tried and left were protein powder, multivitamin, and n-3 fatty acids; frequently used were caffeine, protein powder, and n-3 fatty acids. The dietary supplements that students have the least idea about were branched-chain amino acids, coenzyme Q₁₀, and glucosamine.

Conclusion

The use of sports nutrition supplements requires awareness and follow-up. Otherwise, their uncontrolled and excessive use can cause serious harm to health. Therefore, athletes should be informed and educated about the benefits and harms of dietary supplements, nutritional interactions, usage situations, and usage purposes (4).

Conflicts of Interest

The authors declare that there is no conflict of interest in this manuscript.

References

1. Zhao J, Wang M, Avula B, Khan IA. Detection and quantification of phenethylamines in sports dietary supplements by NMR approach. *Journal of Pharmaceutical and Biomedical Analysis*. 2018; 151: 347–355. <https://doi.org/10.1016/j.jpba.2018.01.025>.
2. Burke LM. Supplements for optimal sports performance. *current opinion in physiology*. 2019; 10: 156–165. <https://doi.org/10.1016/j.cophys.2019.05.009>.
3. Jairoun AA, Al-Hemyari SS, Shahwan M, El-Dahiyat F, Gacem SA, Jairoun M, et al. What are the beliefs and behaviours related to sport nutrition supplements, particularly regarding UAE regulatory issues, among male fitness centre members in Dubai?. *CEGH*. 2020; 8: 934–938.
4. Kotnik KZ, Jurak G, Starc G, Golja P. Faster, stronger, healthier: adolescent-stated reasons for dietary supplementation. *J Nutr Educ Behav*. 2017; 49(10): 817–826.
5. Sousa M, Fernandes MJ, Carvalho P, Soares J, Moreira P, Teixeira VH. Nutritional supplements use in high-performance athletes is related with lower nutritional inadequacy from food. *Journal of Sport and Health Science*. 2016; 5: 368–374. <http://dx.doi.org/10.1016/j.jshs.2015.01.006>.
6. Turfus SC, Smith JOL, Mansingh A, Alexander-Lindo RL, Roopchand-Martin S. Supplementation practices, perceptions and knowledge about anti-doping among jamaican high school athletes. *Performance Enhancement & Health*. 2019; 7(1–2): 100145.
7. Hardy R, Kliemann N, Evansen T, Brand J. Relationship Between Energy Drink Consumption and Nutrition Knowledge in Student-Athletes. *J Nutr Educ Behav*. 2017; 49: 19–26. <http://dx.doi.org/10.1016/j.jneb.2016.08.008>.
8. Katsagoni CN, Apostolou A, Georgoulis M, Psarra G, Bathrellou E, Filippou C, Panagiotakos DB, Sidossis LS. Schoolteachers' Nutrition Knowledge, Beliefs, and Attitudes

- Before and After an E-Learning Program *Journal of Nutrition Education and Behavior*. 2019; 51(9): 1088–1098. <https://doi.org/10.1016/j.jneb.2019.07.001>.
9. Pillai KG, Liang YS, Thwaites D, Sharma P, Goldsmith R. Regulatory focus, nutrition involvement, and nutrition knowledge. *Appetite*. 2019; 137: 267–273. <https://doi.org/10.1016/j.appet.2019.03.008>.
 10. Osterman S, Gray VB, Loy M, Coffey AB, Smallwood K, Barrack MT. Prioritized dietary supplement information needs of 307 NCAA Division I student athletes. *J Nutr Educ Behav*, in press. *J of Nutr Educ and Behav*. 2020; (20)30009-9: 1–7. doi:10.1016/j.jneb.2020.01.007.
 11. Jacob R, Lamarche B, Porvencher V, Laramee C, Valois P, Goulet C, Drapeau V. Evaluation of a theory-based intervention aimed at improving coaches' recommendations on sports nutrition to their athletes. *J Acad Nutr Diet*. 2016; 116(8): 1308–1315.
 12. Cherian KS, Gavaravarapu SM, Sainoji A, Yagnambhatt VR. Coaches' perceptions about food, appetite, and nutrition of adolescent Indian athletes- a qualitative study. *Heliyon*. 2020; 6(2): e03354.
 13. Gibson RS. *Principles of Nutritional Assessment*. Second Edition. Oxford. Newyork. 2005.
 14. Howard MS, DiDonato KL, Janovick DL, Schroeder MN, Powers MF, Azzi AG, Lengel AJ. Perspectives of athletes and pharmacists on pharmacist-provided sports supplement counseling: an exploratory study. *J Am Pharm Assoc*. 2018; 58: 30–36.
 15. CRN consumer survey on dietary supplements. 2020. Accessed: 21th August 2020. Available at: <https://www.crnusa.org/newsroom/dietary-supplement-use-reaches-all-ime-high>.
 16. Garthe I. Dietary supplements and elite athletes: when nature becomes high risk. *Curr Opinion Endocr Metab Res*. 2019; 9: 66–73.

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